



Halifax Regional
School Board

TENDER #3820

Beaufort School Renovations

Closing Date: **MONDAY, APRIL 25TH, 2016**
Closing/Opening Time: **2:00:00 P.M.**

Closing Location:

Halifax Regional School Board
33 Spectacle Lake Drive
Dartmouth, N.S. B3B 1X7

HRSB Contacts:

Jennifer King, Buyer

Tel: (902) 464-2000 #2223

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Project Location:

**1589 Walnut Street, Halifax NS
Halifax, NS, B3H 3S1**

A mandatory bidders' site meeting is scheduled for *THURSDAY APRIL 14TH, 10:00 A.M. AT THE BEAUFORT SCHOOL MAIN ENTRANCE.*

To obtain documents:

Download tender documents in .pdf format from the School Board's

Website: <http://www.hrsb.ca/about-hrsb/financial-services/purchasing/tenders/tender-listing>

The Halifax Regional School Board encourages equity and affirmative action programs.

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NOTICE – CEASATION OF PUBLIC TENDER OPENINGS

As of April 1, 2014 Public tender openings are no longer held for any tenders relating to goods, services or construction for HRSB. A list of bidders and bid amounts will be posted on the Procurement Services website (<http://novascotia.ca/tenders/tenders/ns-tenders.aspx>) shortly following the closing of the tender. All bid submissions are subject to evaluation after opening and before award of contract. The winning bidder and award amount will be posted on the Procurement Services website (<http://novascotia.ca/tenders/tenders/ns-tenders.aspx>) after evaluation.

1.0 **GENERAL**

The Halifax Regional School Board is seeking bids from qualified contractors for the ***BEAUFORT SCHOOL RENOVATIONS project as per the plans and specifications prepared by FOWLER, BAULD & MITCHELL LTD.***

1.1 **INSTRUCTIONS TO BIDDERS**

**TENDER
SUBMISSION:**

- (a) Sealed Bids will be received by:

Halifax Regional School Board
33 Spectacle Lake Drive
Dartmouth, N.S.
B3B 1X7

Until ***2:00:00 P.M., MONDAY, APRIL 25TH, 2016***, (as verified by the phone clock on the Reception desk at 33 Spectacle Lake Drive) for the following projects:

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Should the School Board Office be closed for any reason the tender closing will be postponed to the next business day.

- (b) Submit one copy of the original tender on the enclosed tender form. Each item on the form must be completed unless noted otherwise. Bids must be signed by an authorized representative of the Suppliers/Contractors. Incomplete bids will be rejected. Bids must be submitted on or before the advertised time and date in a sealed envelope clearly marked:

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(c) It is the responsibility of the bidder to ensure their submissions are received on time. Faxed bids will not be accepted.

(d) Addenda must be issued by the Board no less than three (3) business days before tender closing. Addenda cover letters shall be signed and attached to the tender documents.

1.2 **CONDITIONS OF TENDER**

- (a) No term or condition shall be implied, based upon any industry or trade practice or custom or in a practice or policy of the Board or otherwise, which is inconsistent or conflicts with the provisions contained in these instructions.
- (b) Any changes to this tender or specifications shall be stated by the Board in writing. All correspondence, inquiries, instructions, etc. in connection with the work shall be made through the office of the Halifax Regional School Board, c/o Manager of Accounting & Purchasing or representative.
- (c) Tender price must include freight, duty, and all taxes, rates and charges, which are applicable at the time the contract is awarded. It is the responsibility of the bidder to find out from the appropriate authorities what taxes, rates and charges are applicable to this tender.
- (d) The Contractor is responsible for obtaining all provincial, municipal and other permits as required for the work, and shall adhere to all regulations from regulatory bodies, including the National Building Code, 2005. They shall pay all fees for these permits. Sub-trades are responsible for obtaining permits and following regulations as they affect their work.
- (e) Invoices shall be submitted to: Halifax Regional School Board
c/o Operations Services Coordinator-Maintenance
33 Spectacle Lake Drive,
Dartmouth, NS B3B 1X7

Contact information to be supplied to the successful bidder as part of the award confirmation.

Payment: Payment terms will be considered as Net 30 days from date of invoice.

- (f) Bidders or their employees must not be employees of the Halifax Regional School Board.
- (g) The bidder must comply with Nova Scotia Fire Safety Act and all Municipal Regulations, Ordinances and other laws including the Occupational Health and Safety Act.
- (h) Persons or firms submitting tenders shall be actually engaged in the line of work required by the specifications.
- (i) When applicable, a bidder shall list, in the space provided in Section 3.3, the names of the sub-contractors they propose to use with each sub-contractor's tender price. A change in sub-contractors from this list will require permission in writing from the Board.
- (j) Except as the specifications may be modified by Addenda, the successful

contractor will be held to furnish under this tender all work as specified.

- (k) The contractor shall save, defend, and indemnify the Halifax Regional School Board against all costs which the School Board may sustain or incur by reason of any act or omission of the contractor or its' agents or sub-contractors.
- (l) Property loss and/or damage that occurs during the course of work or caused by negligence on the contractors part during the course of the work shall be reported by HRSB Operations Services to the School Insurance Program (SIP) office. Adjusters may be assigned to manage restoration of damaged, defaced or stolen HRSB property. HRSB and/or its insurer reserve the right to assign management of restoration to the adjuster. The contractor shall be responsible for all costs to repair or replace any School Board property, which has been damaged, defaced or stolen during the course of work.
- (m) The term of the contract will be from date of award to ***AUGUST 1ST, 2016.***
- (n) Where the Tender Documents stipulate a particular product, written requests for substitutes will be considered by the Board up to five (5) business days prior to the tender closing date. Such requests shall be accompanied by complete descriptive and technical information including MSDS so that a proper evaluation can be made.

When a request for approval of a product is made, the Board may grant approval and will attempt to issue an Addendum to this effect to known bidders. However, HRSB assumes no liability for the delivery of electronic transmissions.

All products used in the course of this work are to be used, stored, and maintained as per the instructions written on the MSDS sheet.

- (o) Time and Material costs must be provided as listed in Section 3.6
- (p) Unique Logistics
Completely describe how your Tender will respond to the unique logistics of each school or administrative site as set out in the Project Scope and fully describe, in the same manner, all items of equipment, service, and support you will provide to respond to those logistics and all pricing and other matters relating to them.
- (q) HRSB Discretion
The Bidder hereby acknowledges that:
 - a) HRSB shall have the right to reject any or all Tenders for any reason, or to accept any tender which HRSB in its sole, unrestricted discretion deems most advantageous to it. The lowest, or any, Tender will not necessarily be accepted and HRSB shall have the unrestricted right to:
 - i) accept any Tender, and in the event it only receives informal, non-conforming or qualified Tenders with respect to this Tender, accept any such Tender; or

- ii) Accept a Tender that is not the lowest price;
 - iii) Reject a Tender that is the lowest price even if it is the only tender received;
 - iv) Reject any Tender that contains any irregularities, informalities, conditions or qualifications;
 - v) Reject any Tender that is not accompanied by the required tender security documents;
 - vi) Reject any Tender that is not properly signed by or on behalf of the Bidder;
 - vii) Reject any Tender that contains an alteration in a quote that is not initialed by or on behalf of the Bidder;
 - viii) Reject any Tender that is incomplete or ambiguous; or
 - ix) Reject any Tender that does not strictly comply with other requirements contained in these instructions.
- b) HRSB reserves the right to consider, during the evaluation of Tenders:
- i) Information provided in the Tender itself;
 - ii) Information received in response to enquiries of credit and industry references set out in the Tender;
 - iii) The manner in which the Bidder provides services to others;
 - iv) The experience and qualification of the Bidder;
 - v) The compliance of the Bidder to HRSB's requirements and specifications;
 - vi) Such alternate goods, services, terms or conditions that may be offered, whether such offer is contained in a Tender or otherwise,
 - vii) Splitting the Tender and Project Scope into multiple parts and accepting Tenders (or portions thereof) from more than one Bidder;
 - viii) Rejecting Bidder's recommendation of a Subcontractor or any other third party associated with the Tender and jointly along with the Bidder, determine alternate acceptable third parties; and
 - ix) Any other consideration in HRSB's discretion;
- c) HRSB may rely upon the criteria it deems relevant, even if such criteria has not been disclosed to Bidder. By submitting a Tender, the Bidder acknowledges the HRSB's rights under this Section and absolutely waives any right or cause of action against HRSB and its employees, agents or Trustees by reason of HRSB's failure to accept the Tender submitted by the Bidder, whether such right or cause of action arises in contract, tort including negligence or otherwise; and
- d) HRSB shall not at any time have any obligation to deal exclusively with the Bidder. HRSB expressly reserves its rights, in its sole discretion, to seek a Tender regarding the subject matter hereof, from any person whomsoever

and at any time.

(r) **Limitation of Liability**

Bidder, by submitting a bid to this Tender, agrees that it will not claim damages, costs or expenses for whatever reason, relating in any way to this Tender and any resulting process (including without limitation any subsequent discussions or negotiations, if any, or in respect of any competitive process) and waives any and all claims against HRSB whatsoever, whether for costs, damages or expenses incurred by Bidder in preparing its Tender, in participating in this tender process (including without limitation any subsequent discussion or negotiation, if any), loss of anticipated profit or any other matter whatsoever related to this tender and any resulting process, discussions or negotiations.

(s) **Construction Contract Guidelines**

The Halifax Regional School Board acknowledges and complies with the **Nova Scotia Transportation and Public Works Construction Contract Guidelines.**

1.3 **OTHER REQUIREMENTS**

- (a) The bidder must provide with the submitted tender document a certificate indicating the completion of the Nova Scotia Construction Safety Association's Construction Safety Program or other WCB approved safety audit company that jointly sign the Certificate of Recognition with the WCB.
- (b) The bidder must provide with the submitted tender document a letter showing they are in good standing with the Worker's Compensation Board.
- (c) The bidder must provide with the submitted tender document a tentative schedule indicating timelines for completion of works. **Upon award of work, the successful bidder shall provide within three (3) business days a schedule clearly indicating timelines for completion of all aspects of the project. Shop drawings/samples must be returned to HRSB for Consultant's review within five (5) days upon award.**
- (d) The bidder must provide with the submitted tender document, an insurance certificate showing **HRSB as "ADDITIONAL INSURED"** with proof of:
- (i) Commercial General Liability insurance, including but not limited to, products liability and completed operations, contractual liability, owners and contractors liability, attached machinery extensions, endorsement, independent contractor, for a combined single limit of no less than **\$5,000,000** per occurrence; Builder's Risk Insurance in the amount of the Contract Price.
 - (ii) Commercial Auto Liability insurance covering all owned, non-owned and hired vehicles for a minimum combined single limit of **\$2,000,000** per occurrence; and
 - (iii) It is also agreed that the above insurance coverage is primary.

Upon award, the bidder shall secure and maintain the insurance as noted above at its expense during the term of the contract.

The Halifax Regional School Board must be named as additional named insurance

pertaining to the work for this project. Furthermore, Halifax Regional School Board must receive at least thirty (30) days' notice of cancellation or modification of the above insurance. Bidders shall at all times keep in force insurance as may be required.

(e) **BID SECURITY**

The bidder **MUST** provide with the submitted tender document **Bid Security** in the amount of **ten percent (10%) of the Contract Price** (before HST) in the form of a Certified Cheque, Irrevocable Standby Letter of Credit or Bid Bond payable to, or naming the Halifax Regional School Board.

BID BONDS *must be provided by a surety company licensed to issue surety bonds in the Province of Nova Scotia:*

- Provide bond on the standard CCDC Bid Bond Form, latest version, in the amount of not less than **ten percent (10%) of the Contract Price (before HST)**.
- Bid Bonds, submitted by the general contractor bidder, signed and sealed by the principal (Contractor) and Surety and shall be with an established Surety Company satisfactory to and approved by the Halifax Regional School Board.
- Where a Bid Bond is used as Bid Security, include the cost of providing the Bid Bond in the Tender Contract price.

Where **CERTIFIED CHEQUE or BANK DRAFT** is provided as bid security:

- Provide a certified cheque or bank draft, endorsed in the name of the Halifax Regional School Board, for a **sum not less than ten percent (10%) of the amount of the Contract Price (before HST)**.
- Where certified cheque or bank draft is used as Bid Security, include the cost in the Contract price.

Where the **IRREVOCABLE STANDBY LETTER OF CREDIT** is used as bid security:

- Provide an Irrevocable Standby Letter, endorsed in the name of the Halifax Regional School Board, for a sum not less than **ten percent (10%) of the Contract Price (before HST)**.
- The Irrevocable Standby Letter of Credit shall be issued by a certified financial institution subject to the Uniform Custom and Practices for Documentary Credit (1993 revision or latest revision) International Chamber of Commerce (Publication No. 500).
- Where Irrevocable Standby Letter of Credit is used as bid security, include the cost in the Tender Contract Price.

RETURN OF BID SECURITY:

- The bid security of the unsuccessful bidders will be returned to them after the contract has been signed, or previous to such time, at the discretion of the Halifax Regional School Board. The above shall apply provided a contract is awarded within sixty (60) days from the closing date of the bid. If no contract is awarded, all bid security will be returned.

(f) **CONTRACT SECURITY (ONLY REQUIRED FOR BIDS OVER \$100,000)**

For bids over \$100,000 bidders must provide **Contract Security by a surety company licensed to issue surety bonds in the Province of Nova Scotia** in the form of one of the following:

- Letter of Surety.
- Performance Bond and a Labour and Material Payment Bond OR
- Certified Cheque or Bank Draft OR Irrevocable Letter of Credit bearing the bidder's original signature, payable to or naming the Halifax Regional School Board as insured.

Bidder shall maintain performance assurance in force for a period of not less than twelve (12) months after the issue of the substantial performance certificate certified by Halifax Regional School Board and until completion of the contract.

Should it become apparent that the final cost of the project will **exceed the total amount payable by more than 10%**, the bidder shall arrange to have their bonds reissued based on the projected final cost.

Where a **LETTER OF SURETY** was used as **CONTRACT SECURITY**:

- Within ten (10) days after notification of award of the Contract, provide a Performance Bond and a Labour & Material Payment Bonds each in an amount **equal to fifty percent (50%) of the Contract Price (before HST)**, naming the Halifax Regional School Board.
- Performance Bond and Labour and Material Payment Bonds, submitted by the bidders, shall be provided at the expense of the bidder and shall be with an established Surety Company satisfactory to and approved by the Halifax Regional School Board.
- Include the cost of providing the Performance Bond and Labour and Material bond in the Contract price.

Where a **CERTIFIED CHEQUE OR BANK DRAFT** is used as **CONTRACT SECURITY**:

- The Certified Cheque or Bank Draft submitted during the bid period will be cashed and the amount retained by the Halifax Regional School Board shall serve as Performance Assurance, including the payment of all obligations arising under the Contract.
- The Certified Cheque or Bank Draft will be held in lieu of the Performance Bond and Labour and Material Bonds, providing that, at Contract award, the successful Bidder shall supplement their Certified Cheque or Bank Draft to maintain an amount of **twenty (20%) of the Contract price** (before HST) under the contract.
- The amount remaining will be returned without interest after a period of not less than twelve (12) months after the issue of the substantial performance certificate

certified by the Halifax Regional School Board and shall serve as performance assurance until completion of the contract.

- Where certified cheque or bank draft is used as Performance Assurance, include the cost of providing the certified cheque in the Contract price.

Where **an IRREVOCABLE STANDBY LETTER OF CREDIT** is used as **CONTRACT SECURITY**:

- The Irrevocable Standby Letter of Credit for a sum not less than **ten percent (10%) of the Contract price (before HST)** submitted during the bid period will be retained by the Halifax Regional School Board and shall serve as performance assurance, including the payment of all obligations arising under the contract. The irrevocable standby letter of credit shall be issued by a certified financial institution subject to the Uniform Customs and Practices for Documentary Credit (1993 revision) International Chamber of Commerce (Publication No. 500).
 - Where irrevocable standby letter of credit is used as Performance Assurance, include the cost of providing and Irrevocable Standby Letter of Credit in the Contract Price. The contractor shall provide to the Halifax Regional School Board documentation throughout the duration of the contract that the irrevocable standby letter of credit remains in full effect at all times as specified.
 - Upon expiry of the Irrevocable Standby Letter of Credit, a separate Irrevocable Standby Letter of Credit shall be provided for work requiring extended warranties for such amounts as are required by the contract.
- (g) The bidder must provide with the submitted tender document a completed copy of Appendix “E” Safety Plan information sheet. The contractor prior to commencement of work must have a safety plan in place for use by the contractor personnel regarding potential hazards and work practices specific to the site.
- (h) ***HRSB is directly responsible for the safety of its students and staff. Should contractors be required to work in or on school property while children are present, it is a MANDATORY HRSB REQUIREMENT that contractors assign the work to employees and/or sub-contractors who DO NOT have a CRIMINAL RECORD and who ARE NOT LISTED ON THE CHILD ABUSE REGISTRY. By checking the “Agreed” box at the bottom of clause 3.4 below you are confirming that you understand and will abide by this mandatory HRSB requirement. Failure to comply with this requirement may result in immediate contract termination.***
- (i) Contractors must submit warranty information with the tender bid submission and successful bidders must submit all appropriate warranty documents with final payment invoice.
- (j) Bidders are advised that, as per the Halifax Regional School Board Tobacco Free Schools and Workplace Policy, the HRSB endorses and supports implementation of the Nova Scotia Smoke Free Places Act 2002, which prohibits tobacco possession for persons under the age of 19 and declares that no person shall smoke in schools, school board

offices or on school grounds.

1.4 **AMENDMENTS OR WITHDRAWAL OF TENDER PRIOR TO BID CLOSING**

- (a) Tender may be amended or withdrawn **by post or facsimile (902) 464-0161** PRIOR to Tender Closing date and time.
- (b) Clearly indicate on the fax transmission or submitted envelope, whether your correspondence is an amendment or withdrawal and the title of the Tender. Sign and seal as required for tender, and submit at address listed under closing location on the cover of this document.

1.5 **THE CONTRACT**

1.5.1 Binding Effect of Proposal and Contract Finalization

The Bidder hereby acknowledges that its Tender constitutes a contract with HRSB, and the terms and conditions of this Tender and the bidder response (with the Tender taking precedence in the event of any inconsistency or conflict of terms) shall govern such agreement. Such contract shall remain binding upon Bidder until the earlier of:

- a) Written notice from HRSB that the Bidder's Tender is rejected as unsatisfactory; or
- b) Issuance by HRSB of its PO to the Bidder with respect to this Tender, pursuant to Section 1.2(p), and upon such issuance, the Bidder shall be regarded as the Contractor hereunder; or
- c) Execution of the Contract by both HRSB and the Bidder pursuant to Section 1.2(p); or
- d) Written notice from HRSB that it has entered a Contract with a Contractor and that the Bidder has been unsuccessful under this Tender.

1.5.2 Contract Documents

1.5.2.1 The attached form of contract (Schedule A) is a version that shall be issued to or executed by the successful bidder pursuant to the terms and conditions of this Tender. It is NOT TO BE executed and returned by the bidder as part of its (proposal or Tender response).

1.5.2.2 After the contract has been awarded and signed, the contractor will be contacted by the appropriate Regional Manager to attend a site visit to complete Appendix D of the contract – 'Undertaking to Comply and Contractors Safety Checklist' prior to the commencement of any work.

1.5.2.3 The Contract the Contractor will have with the HRSB, if awarded, will include:

- a) Such further documentation as may be negotiated and executed by the HRSB and the Contractor pursuant to Section 1.2(p); and

- b) This Tender and all of its Schedules, including without limitation any PO issued by HRSB to the Contractor, and any revisions, amendments or additional documents made thereto, if any; and
- c) The Tender, in its entirety and all promises made in the tender will be deemed covenants in the Contract and all information, representations and warranties made in the Tender will be deemed terms, representations and warranties of the Contract surviving the signing or issuance by HRSB of any additional or formal documents prepared by the HRSB.

1.5.2.4 For the purposes of evaluation and interpretation of Tenders, in the case of conflicts, discrepancies, errors or omissions between this Tender and any documentation issued or executed pursuant to Section 1.5.1, and the Tender, this Tender and such documentation shall take precedence over the Bidder response.

1.6 Your Contractual Terms

- 1.6.1 List separately any contractual terms which must be included as part of the Contract if awarded to you and which would be a condition to HRSB's acceptance of your bid.
- 1.6.2 List separately any contractual terms which you would like the HRSB to consider but which would not be a condition to the acceptance by the HRSB of your bid and which would only be part of the Contract with the HRSB with the specific further agreement of the HRSB.

2.0 SCOPE OF WORK

- (a) Location:

BEAUFORT SCHOOL RENOVATIONS – 1589 WALNUT ST, HALIFAX as per the attached drawings and specifications prepared by **FOWLER, BAULD & MITCHELL LTD.**

- (b) School/Work site access control: **Contractor's employees shall always report to the main office of a school or security officer, indicate who they are and state their purpose on site prior to starting any work in the school.** Contractor is not permitted to work on the school site without HRSB assigned representative on site unless authorized by HRSB Manager of Operations.

The outside work area shall be appropriately demarked and/or surrounded by a barrier to prevent unauthorized entry to the work area. All workers shall contain their activity to the work site area. The contractor shall only use the school staff designated washroom and lunchroom facilities. Access to the school shall only be allowed as planned in coordination with HRSB Operations and the school administration.

The contractor and sub-contractor employees shall maintain professional and courteous behaviour, including work and communications practices, at all times on the project site. Communications and work shall be conducted so as to minimize the effect on regular school occupants and their activities.

- (c) Project/Safety Coordination: The contractor shall provide to HRSB within one week of award of contract a fixed schedule for all aspects of completion of work. The safety plan outline provided with this document must be posted on site during the execution of work and will be accessible to all workers on the site.

Where applicable, a **hot work permit** will be required to be completed prior to commencement of work and all conditions of the permit must be maintained until completion of hot work. A copy of the hot work permit signed by the contractor representative shall be provided to HRSB upon completion of each hot work session. Contractor must assign a designated fire watch as noted on the permit document who shall remain on site for three hours after completion of each hot work session.

The contractor will provide access to the work site and safety plan for inspection by HRSB Operations Services administration, HRSB health and safety Manager, consultants, regulatory inspectors as may occur throughout the duration of the project.

All necessary project coordination communications between project personnel and HRSB or site administration shall be from the project foreman/supervisor through the school principal and/or the Manager of Operations.

- (d) Hours of work - All work shall be carried out during **regular working hours** unless otherwise indicated in writing by the Manager of Operations Services or a designate.

Hours of work shall comply with local ordinances and bylaws for each site.

- (e) **Site Material Control:** The contractor shall be responsible for storage of all materials required to complete the renovation. The school shall not be used for storage of materials unless otherwise approved by the principal and manager of Operations Services. Any requirement for modifications to the building in order to allow delivery and installation of the new equipment is the responsibility of the contractor.

The contractor is responsible for security of all project materials and access to the project site and/or the school through the project site at all times until completion of work and acceptance of the finished project by HRSB. Such additional security costs for security personnel or other means of security as deemed necessary by the contractor will be the sole responsibility of the contractor.

The contractor shall keep the work site free from accumulated debris caused by the employees or work and shall remove all debris at the end of each work shift. Debris shall not be deposited in HRSB controlled garbage and/or recycling containers.

All waste materials and debris created during demolition and/or construction shall be disposed of in a dumpster provided by the contractor, to be removed at the end of the construction project, using a methodology that is in compliance with the applicable HRM solid waste by laws. Otherwise, the material must be removed and disposed of off-site at the end of each working day. The waste materials may not be stored on site unless they are held in an approved project dumpster.

All temporary structures such as portable washroom facilities, materials storage trailer, work trailer, debris dumpster, vehicles, etc., shall be located a minimum of (25) twenty-five feet from the school building.

- (f) 1 Contractor is advised that the building maybe occupied when work on this project takes place. Contractor to verify all areas of construction are secured and air tight partitioned to ensure that the health and safety of the students and staff are maintained during the construction period.

2 Temporary Construction Utilities & Closures:

Contractor to erect and maintain 'dust-tight' barriers as noted. Prior to start-up, the 'dust-tight' separations must be in place as noted and reviewed by HRSB Project Manager and the Consultant. 'Dust-tight' enclosure will be reviewed during the course of construction. Contractor must maintain the current lighting levels, heating and ventilation standards in place.

3 Interior Closures and Construction Areas:

3.1 For interior/interior locations provide the following:

3.1.1 Gypsum board both sides to 9'-4", AFF.

3.1.2 3 5/8 metal stud at 16" o.c., extend every 4th stud to underside of OWSJ.

3.1.3 Provide 10ml poly from top of gypsum board to u/s deck, sealed at the top of the wall to underside of deck.

3.1.4 Provide negative pressure within the construction space exhausted to the exterior.

- 3.2 Tarps are not to be used in lieu of the described closures.
- 3.3 Construction Access & Storage:
 - 3.3.1 Proper access to the area and storage of materials to be provided by the owner.
 - 3.3.2 Location to be determined by Project Manager on site.
- 3.4 Provide and maintain BEAUFORT SCHOOL RENOVATIONS equipment during performance of the work as required by insurance companies, authorities having jurisdiction and governing codes, regulations and by-laws. Ensure no access is blocked for this purpose.
- 3.5 Contractor to coordinate a staging area for the Subcontractors for equipment, tools and material storage. Locate trailers and/or lockable waterproof sheds on site as per HRSB Project Manager's instructions.
- 3.6 Provide sanitary facilities in accordance with local authority having jurisdiction.

4 Indoor Environmental Protection:

- 4.1 There are several sources of potential contamination during a construction/renovation project. These include:
 - 4.1.1 Demolition Activities:
 - 4.1.1.1 Demolition activities release dust and fibrous materials into the air. Asbestos control is essential. Insulation in ceilings and walls, and ceiling tile all have a high fiber content that may produce substantial fibrous materials during demolition. Total suspended particulate levels may be very high with a significant portion of the total being of the respirable particle sizes.
- 4.2 Construction:
 - 4.2.1 Construction introduces additional dust and fibrous materials. Many construction materials used today emit a range of volatile organic compounds, especially formaldehyde. All glues, vapours, and gases rise from solvents used to prepare surfaces for bonding, and emissions from welding and soldering can introduce a range of metals into the air.
- 4.3 Finish Work and Materials:
 - 4.3.1 Final finishing and decorating of the renovated spaces can introduce strong odours and more VOCs. Solvents, paints and varnishes, and adhesives and other glues all add to the accumulation of these irritating compounds.
- 4.4 The Contractor shall ensure site clean-up is carried out at the end of each working day. This includes partially used containers of solvents, paints, caulking, adhesives, and ensuring that these are removed from the site. All construction debris shall be removed from the site at the end of each day, either to an approved dumpster outside the building, or removed completely from the property.

5 Preparation:

- 5.1 Inspect perimeter partitions of the construction area, above the ceiling and seal all penetrations above and below the ceiling. Carefully remove the minimum number of ceiling tiles necessary to perform the inspection and the work of sealing the partitions. HEPA vacuum above remaining ceiling tiles and grid and above existing ductwork to remove loose dust prior to removal.

- 5.2 Install new temporary 'dust tight' walls and include details of the plans for location.
- 5.3 Seal all doors leading to construction areas.
- 5.4 Any existing perimeter partitions of the construction area that do not extend to the underside of deck, Contractor to extend to ensure dust-free light area between the construction area and the remainder of the school.
- 5.5 Before any construction begins, doors between the rooms where work is being carried out and the adjacent corridor must be carefully sealed. Seal the doors completely at top, bottom, and sides. All vents, ducts, openings, etc. to be sealed. Do periodic inspections to ensure seals remain tight. Provide written information to the Project Manager.
- 5.6 Negative Pressure: Implement a system that extracts air directly from the work area, and discharges this air directly outside the work area to the outside of the building. All exhausted air is to pass through a HEPA filtering system before discharge to exterior. Place negative air pressure units in the area to be constructed in order to maintain a continuous negative pressure within the construction space. The construction area MUST be kept at a negative pressure relative to the occupied spaces.

6 During Construction:

- 6.1 Erect impermeable dust barriers to completely seal off the work area from adjacent areas.
- 6.2 Dust barriers are to be maintained and remain in place until work is completed and the facility representative has approved removal. Any damage to barriers must be repaired as soon as possible.
- 6.3 **Contractors will be held responsible for any damage, dirt or dust migration beyond the construction enclosure and all cleaning cost to rectify same will be borne by the General Contractor.**
- 6.4 Post signs on the doors indicating that there is to be absolutely no unauthorized entrance or exit through the sealed-off areas except for fire or security reasons. Ensure that the construction crew and others comply with these restrictions.
- 6.5 Clean the construction area daily.
- 6.6 Dirty or dusty footprints outside the construction area that have been left behind by people who were in the construction area are to be promptly cleaned.
- 6.7 Use water mist and commercial dust suppressing products, approved by the Owner, to control dust. Execute work by methods to minimize raising dust from construction operations.
- 6.8 In the event equipment or materials cannot be removed from the construction area, use drop sheets to cover these items.
- 6.9 Debris transported from the second floor will be by the exterior in all cases possible. Contractor to provide sealed chute to covered bins below.
- 6.10 Failure to provide adequate dust control will result in the contractor bearing the cost of any clean up, repair or replacement deemed necessary as a result of dust generated from the project.
- 6.11 Ensure that windows, doors, penetrations, electrical outlets and intake and exhaust vents are properly sealed with plastic and taped within work area.

- 6.12 For exterior work adjacent to windows in an existing facility, test window openings for air tightness and seal windows that leak.
- 6.13 Verify that all fresh air intakes facing construction operation are shut down, and sealed not to allow dust or debris intake.
- 6.14 Ventilation:
 - 6.14.1 Seal duct openings in work area until completed.
 - 6.14.2 Maintain negative pressure between work area and adjacent occupied areas by using portable ventilation equipment.
 - 6.14.3 Verify that air is exhausted directly outside and away from intake vents, or filtered through a HEPA filter before being recirculated. Where odour is a concern, ensure an approved air scrubbing material is utilized.
 - 6.14.4 The main building's air handling system shall be disconnected from use in areas of construction. This will require sealing of existing duct work on both the supply and return air systems.
- 6.15 Remedial Measures:
 - 6.15.1 Water leaks and flooding shall be reported immediately to the Project Manager.
 - 6.15.2 Detected water damage must be thoroughly investigated in consultation with the Project Manager. A plan of action will then be implemented as approved by the Project Manager.
 - 6.15.3 All investigations, removal and abatement procedures shall be conducted in a manner that does not promote dispersal of dust and spores.
- 6.16 Cleaning During Progress of Work:
 - 6.16.1 Clean work area with HEPA filter-equipped vacuums and wet mops, or both, at end of each work shift and as necessary.
 - 6.16.2 Ensure ventilation system is functioning properly and is cleaned if contaminated by soil or dust after work is complete.

7 After Construction:

- 7.1 Clean work area with HEPA filter equipped vacuums and wet mop.
- 7.2 Ensure air vents and ductwork are cleaned and seals removed.
- 7.3 If required, Contractor to conduct final indoor air quality test. Submit test results to the HRSB Project Manager.

8 Cutting and Patching

- 8.1 Provide openings larger than 8" in diameter in non-structural elements of Work for penetrations of structural, mechanical and electrical Work. Openings smaller than 8" diameter will be provided by the Sub-trades requiring same.
- 8.2 When floor cutting is required, Contractor to confirm there are no under-floor electrical or junction boxes. Contractor must utilize an electrically power operated floor saw.
- 8.3 Fit work airtight to pipes, sleeves, ducts, conduit, and after penetrations through surfaces.
- 8.4 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with approved fire-stopping and smoke sealing materials, full thickness of the construction element, as required to maintain the required fire resistance and smoke spread rating.
- 8.5 Refinish surfaces to match adjacent finishes: For continuous surfaces refinish to nearest intersection; for an assembly, refinish entire unit.

- 8.6 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

9 Progressive Cleanliness & Restoration of Damage

- 9.1 Maintain Work daily in tidy condition, free from accumulation of waste products and debris. Remove waste material and debris from site at end of each working day, and dispose of off-site. Ensure permits are obtained from authorities having jurisdiction for disposal of waste and debris.
- 9.2 Provide on-site containers for collection of waste materials and debris, and provide clearly marked separate bins for recycling.

10 Close Out Procedures:

- 10.1 Remove dust, stains, paint spots, soil grease, fingerprints and accumulations of construction materials, interior and exterior to the building. Perform cleaning in accordance with installer's instructions for each material. Final cleaning shall include:
- 10.1.1 Washing exterior paved surfaces disturbed under this contract.
- 10.1.2 Cleaning and polishing of glass and finish metals, interior of areas noted.
- 10.1.3 Cleaning of hardware, mechanical fixtures, lighting fixtures, cover plates and equipment, including polishing of their finish metal, porcelain, vitreous and glass components.
- 10.4.4 Removing of visible manufacturer's labels left on materials, components and equipment.
- 10.5.5 Cleaning of new flooring and of all other flooring disturbed under this contract.

10.2 Maintenance materials:

- 10.2.1 Maintenance materials provided shall be new, not damaged or defective, and of the same quality and manufacture as products provided in the work. If requested, furnish evidence as to type, source and quality of products provided.
- 10.2.2 Provide 3% of all hard tile, floor and walls and 4 liters of each paint colour specified.

10.3 Testing Balancing and Adjusting

Provide testing and ensure agency is a current member of AABC certified to perform services.

10.4 Demonstration of systems and equipment

Provide complete demonstration of all systems and equipment in the presence of the Owner and maintenance representations at the following times:

10.5 Submittals

- 10.5.1 Provide with application for substantial completion certificate.
- 10.5.1.1 Certificate of final inspection report from electrical utility or inspection.
- 10.5.1.2 Other reports required or specified.
- 10.5.1.3 Maintenance manuals and operating instructions.
- 10.5.2 Submit with application for release of final payment:
- 10.5.2.1 Final project record drawings including shop drawings.

- 10.5.2.2 Performance bonds which shall remain in effect for one year after takeover date.
- 10.5.2.3 Completed Liability Insurance Policy extended for one year over date.
- 10.5.2.4 Written guarantee covering all workmanship and materials used in the work.
- 10.5.2.5 Certificate from Worker's Compensation Board.
- 10.5.2.6 Maintenance Bonds as specified.
- 10.5.2.7 Maintenance Manual.
- 10.5.2.8 Spare parts and maintenance materials and list.
- 10.5.2.9 Extended warranties.

10.6 Substantial performance and final inspection procedures:

10.6.1 Provide:

An inspection of the work, identify deficiencies and defects; repair as required. Notify the consultants in writing and request Substantial Performance Final Inspection.

10.6.2 Present at the Substantial Performance Inspection will be:

10.6.2.1 The consultants and his sub-consultants that he requires and notifies.

10.6.2.2 The Owner and his consultants upon notification by the design builder.

10.6.2.3 The design builder and such sub-contractors that he considers are required.

10.6.3 The Contractor will compile a Substantial Performance deficiency list at this inspection and issue it to the Owner and his consultants.

10.6.4 Upon the Owner's completion of the deficiencies, the design builder shall submit an application for final payment and a certificate for payment will be issued by the consultant to the Board.

10.7 Substantial performance:

10.7.1 The owner will issue a Certificate of Substantial Performance when satisfied outstanding deficiencies noted during inspections prior to the Substantial Performance inspection have been corrected, and the work is substantially performed.

10.7.2 The owner reserves the right to occupy and use portions of the building(s), whether partially or entirely completed, or whether completed on schedule or not, provided such occupancy does not interfere with the Design Builders continuing work. Partial occupancy or installation by the Owner of his equipment shall not imply acceptance of Substantial Performance, in whole or in part, nor shall it imply acknowledgement that terms of the agreement are fulfilled.

10.7.3 The Certificate of Substantial Performance will be attached to the list of remaining deficiencies to be rectified before final acceptance.

10.7.4 Make submissions specified in this section.

10.8 Completion certificate:

- 10.8.1 The owner will issue a Certificate of Performance when he is satisfied that outstanding deficiencies noted during inspections have been corrected and the work is complete.
- 10.8.2 A list of remaining deficiencies to be rectified before final acceptance will be attached to the completion certificate.
- 10.8.3 Make submissions specified in this section.

10.9 Warranties:

- 10.9.1 Establishment of warranties:
 - 10.9.1.1 Warranties shall commence on date of approval of the Substantial Performance Certificate.
- 10.9.2 Warranty period:
 - 10.9.2.1 The Owner will notify the design builder of defects observed during warranty period and request him to remedy the defects in accordance with the contract documents.
 - 10.9.2.2 Thirty days before the expiration of warranties, the Owner and the design builder will inspect the work as arranged by the design builder noting defects of products and workmanship.
 - 10.9.2.3 The designer builder shall immediately remedy such noted defects.

2.1 **SITE VISITS**

- (a) Bidders will be deemed to have familiarized themselves with existing site and all other conditions which may affect performance of the Contract. No plea of ignorance of such conditions as a result of failure to make all necessary examinations and calculations will be accepted as a basis for any claims for extra compensation or an extension of time.
- (b) **A mandatory bidder's site meeting is scheduled as per the directions on the cover sheet of this document.**

3.0 **FORM OF TENDER - BIDDER DECLARES**

- (a) That this tender was made without collusion or fraud.
- (b) That the proposed work was carefully examined.
- (c) That the bidder is familiar with local conditions.
- (d) That contract documents and attachments were carefully examined.
- (e) That all the above were taken into consideration in preparation of this tender.

3.1 **BIDDER AGREES**

- (a) To enter into a contract to supply all labour, material and equipment and to do all work necessary to complete the Work as described and specified herein for the prices as per the Form of tender, Schedule of Prices, Article 3.5.
- (b) That this tender is valid for acceptance for 60 days from the time of tender Closing.
- (c) That failure to enter into a formal contract and give specified documents within time required will constitute grounds for forfeiture of this agreement.
- (d) That if Certified Cheque or bid bond is forfeited, the Owner will retain difference in money between amount of tender and amount for which owner legally contracts with another party to perform the work and will refund balance, if any, to bidder.
- (e) I/WE certify that the company listed herein is in good standing with the City of Halifax Tax Collector and all Municipal, Provincial and Federal Tax Agencies. Failure to complete this certification and maintain this status will be cause for rejection of your tender and/or cancellation of any contractual undertaking with the Board. We further agree with and accept the terms set out in this tender document.

Halifax Regional School Board

CONTRACTOR INFORMATION SHEET

***TENDER #3820
BEAUFORT SCHOOL RENOVATIONS***

FIRM _____

ADDRESS _____

E-MAIL ADDRESS _____

POSTAL CODE _____ PHONE _____ FAX _____

NAME OF PERSON SIGNING FOR FIRM _____

POSITION OF PERSON SIGNING FOR FIRM _____

The undersigned company represents and warrants that it is authorized to carry on business of this nature and that it is not prohibited by any law applicable in Nova Scotia from performing this Contract. The undersigned also acknowledges receipt and understanding of, and has taken into consideration all information presented in, this tender and agrees to be bound by its terms and conditions. The undersigned further confirms and agrees that the person whose name is set out below is fully authorized to represent the company and to bind it to this bid and the Contract awarded pursuant to it and in all matters relating to or arising out of the subject matter of this tender.

I/WE, the undersigned, having carefully examined the **#3820 BEAUFORT SCHOOL RENOVATIONS**– tender documents, and having read, understood, and accepted the Conditions of the tender which form part of the tender documents, hereby offer to provide the materials and service in strict accordance with the **#3820 BEAUFORT SCHOOL RENOVATIONS**– documents, which form part of this tender.

I/WE, hereby agree that notification of acceptance of this bid shall be in writing and may be sent by prepaid post or fax, and if sent by prepaid post, acceptance shall be deemed to have been made on the date of mailing of such notification.

3.2 **REFERENCES:**

The Bidder shall furnish particulars of at least three contracts successfully completed or currently being carried to completion. The projects quoted should preferably be approximate in nature to the Works now proposed for and be of comparable or greater size.

Contact Name & Phone #	Date		Contract Value
_____	from _____	to _____	_____
_____	from _____	to _____	_____
_____	from _____	to _____	_____
_____	from _____	to _____	_____

3.3 **SUB-CONTRACTORS:**

The Bidder shall enter the name and address of each Sub-Contractor used in making up this Tender. Only one Sub-Contractor shall be named for each part of the work to be sublet.

Subcontractor/Suppliers/Manufacturers	Service/Material

3.5 **SCHEDULE OF PRICES**

CONTINGENT UNIT PRICES: [see article 1.2 (p)]

Provide unit prices for contingency items in the event that additional work items are required in association with the scope of work as outlined in section 2.0 and the total value of unit prices shall be included in the Total Fixed Cost price.

Item No.	Description	Unit of Measurement	Unit Price
1.	_____	_____	\$ _____
2.	_____	_____	\$ _____
3.	_____	_____	\$ _____
4.	_____	_____	\$ _____
5.	_____	_____	\$ _____

3.6 **TIME AND MATERIAL PRICES:**

Provide unit prices for time and material work if no fixed price is requested in association with the work as outlined herein.

Item No.	Description	Unit of Measurement	Estimated Quantity	Unit Price
1.	_____	_____	_____	\$ _____
2.	_____	_____	_____	\$ _____
3.	_____	_____	_____	\$ _____
4.	_____	_____	_____	\$ _____
5.	_____	_____	_____	\$ _____
6.	_____	_____	_____	\$ _____

3.7 **PROPOSED FIXED PRICE**

The fixed price shall be the full inclusive value of the work. The prices submitted shall be all-inclusive and shall include for all the general and special requirements to meet the specifications of the work, including any contingent costs.

<u>Description</u>	<u>Total Fixed Price</u>
<i>BEAUFORT SCHOOL RENOVATIONS</i>	\$ _____
<i>HST (15% OF TOTAL PRICE)</i>	\$ _____
<i>TOTAL CONTRACT PRICE</i>	\$ _____

SUBSTANTIAL PERFORMANCE DATE: _____

BIDDERS HST REGISTRATION NO. _____

3.8 **SIGNATURE:**

SIGNED AND DELIVERED
in the presence of:

CONTRACTOR

Company name

Witness

Signature of Signing Officer

Name and Title (printed)

SCHEDULE A

AGREEMENT FOR SUPPLY OF SERVICES

This Agreement made effective on the _____ day of _____ in the year 20

For:

Project Name:

Location:

Tender #

by and between:

HALIFAX REGIONAL SCHOOL BOARD ("HRSB")

and

COMPANY NAME:

ADDRESS:

CITY:

PROV:

Postal Code:

(the "Contractor")

The parties agree as follows:

1. Contractor shall provide to HRSB the services set forth in Appendix "C" – Description of Services, and accompanying Exhibits (which along with all other obligations of Contractor set forth in this Agreement shall constitute the "**Services**") in accordance with the terms of this Agreement.
2. This Agreement consists of the following parts (together, the "**Agreement**"), each of which shall be construed as an integral part of this Agreement:

This signature page

Appendix "A" – General Terms and Conditions

Appendix "B" – Risk Management & Safety

**Appendix "C" – Description of Services
Exhibit A – RFP or Invitation to Tender**

Exhibit B – Response to RFP or Tender

**Appendix "D" – Undertaking to Comply Form and Contractor Safety
Checklist**

Appendix "E" – Safety Plan

Appendix "F" – Contractor Checklist

The above Appendixes and Exhibits are intended to be complementary, and what is required by any one shall be as binding as if required by all.

3. Contractor confirms that it has read this Agreement before signing it.

4. The individual signing below for Contractor warrants by his/her signature hereon that he/she has authority to bind Contractor to this Agreement.

HALIFAX REGIONAL SCHOOL BOARD CONTRACTOR

Signature: _____

Name (print): Kathryn Burlton

Title (print): *Purchasing Manager*

Date:

Signature: _____

Name (print): _____

Title (print): _____

Date: _____

SAMPLE ONLY

CONTRACTOR'S ATTENTION IS SPECIFICALLY DRAWN TO THE APPENDIX "A" TERMS AND CONDITIONS GOVERNING THIS AGREEMENT. EXECUTING PARTIES' ATTENTION IS DRAWN TO APPENDIX "C" AND APPENDIX "C" TO BE INITIALED OR EXECUTED BY EACH PARTY IN ACKNOWLEDGMENT OF THE TERMS THEREIN.

APPENDIX "A"

TERMS AND CONDITIONS

SERVICES

Services: Contractor shall provide the Services to HRSB in accordance with the terms of this Agreement, on the HRSB properties specified in Appendix "C" (the "**Description of Services**"). Except as may be otherwise expressly provided in Appendix "C", Contractor shall provide all the equipment, personnel, supplies, consumables, supervision and labour necessary to complete the Services in a good and workmanlike manner. No changes or modifications to the Services or otherwise to this Agreement shall be valid unless made in accordance with Article 5 of this Agreement. The Contractor shall employ a competent supervisor who shall be in attendance at the place of work at all times while Services are being performed.

Term: This Agreement shall commence upon and later expire upon the dates specified in Appendix "C" (such period being the "**Term**"), unless earlier terminated in accordance with the provisions of this Agreement. Should Contractor continue to provide, and HRSB continue to pay, for the Services beyond the Term, such provision of Services shall be deemed to be on a temporary basis only and terminable at any time by HRSB with or without cause, and the provisions of this Agreement shall apply in full force (save as to the termination provisions in Article 9) until such termination.

FINANCIAL TERMS, PAYMENT, LIENS

Contract Price: For and in consideration of the Contractor providing the Services in accordance with the terms of this Agreement, the HRSB agrees to pay to the Contractor the sum of

SAMPLE ONLY

\$

(*plus HST*) hereinafter referred to as the "**Contract Price**". Such Contract Price shall include any and all expenses Contractor may incur in the performance of the Services.

Invoices: The Contractor shall submit a single invoice to HRSB for all Services rendered under this Agreement unless Appendix "C" provides otherwise. Contractor's invoice shall indicate applicable sales and use taxes as separate amounts and indicate the net taxable value including all applicable discounts. HRSB shall not be obligated to pay any taxes to Contractor unless Contractor is registered with the applicable authorities and provides its registration number on the invoice. Contractor's invoice shall be in a form acceptable to HRSB and contain sufficient details to ascertain the scope of Services performed and, if requested, Contractor shall provide documentation in support of an invoice. If HRSB disputes any portion of the invoice, it shall pay such invoice less the disputed amount, subject to adjustment upon resolution of the dispute. Non-payment by HRSB of any amount in dispute shall not alleviate, diminish or modify in any respect Contractor's obligations to perform as required by and in accordance with this Agreement.

Payment of Invoices: Upon the HRSB certifying that the Services have been completed, the HRSB shall pay to the Contractor, thirty (30) calendar days from the date of such certification,

unless otherwise stipulated in Appendix "C", the full Contract Price due and payable hereunder, less any holdback required to be retained under the *Builder's Lien Act* of Nova Scotia (the "*Builder's Lien Act*"), other statutory obligation or as otherwise stipulated in Appendix "C", provided the Contractor has submitted the following:

a written statement from the supplier(s) of all materials used for the Services certifying that payment has been made in full for same or waivers of liens from such supplier(s) in due form;

a worker's wage statement containing all the information required by the HRSB pertaining to the Contractor's, and all of its subcontractors', workers. Such statement requires the name of the workers, hours worked, rate of pay, total wages received, and a signature from each worker certifying that they have received payment in full for all time worked on the job indicated on the form; and

certification that the statement is correct.

Release of Holdbacks: No holdback shall be paid to the Contractor until the Contractor has provided to the HRSB a statutory declaration in a form as set forth in Canadian Construction Documents Committee ("CCDC") Document 9A, together with evidence of compliance with the *Workers' Compensation Act*, and, if applicable, a copy of the Certificate of Title for the Lands, dated thirty (30) calendar days from the issuance of the Certificate of Substantial Performance (as defined in the *Builder's Lien Act*) of work by the Contractor, confirming that no liens have been placed against the Lands in association with Contractor's Services.

Liens: Contractor shall keep the Lands and all HRSB property free from any and all laborers', materialmen's and mechanics' liens and similar claims and encumbrances. To the fullest extent permitted by law, Contractor waives all rights to assert such liens against the Lands and all HRSB property. If Contractor fails to release and discharge any claim of lien of others against the Lands and HRSB property within FOUR (4) business days of receiving notice from HRSB, HRSB may at its option discharge or release the claim of lien, or otherwise deal with the lien claimant, and Contractor shall be liable to and shall pay HRSB any and all costs and expenses of HRSB in doing so, including all reasonable legal fees and expenses. Notwithstanding the foregoing, for the purpose of enforcing the terms of this Agreement, HRSB may apply for the following liens and rights when circumstances deem it necessary:

if the Contractor contracts for one or more jobs with HRSB, the HRSB shall have a lien on the Contract Price and extras on that job as well as on their other jobs with the HRSB;

the HRSB shall have a lien on the Contractor's equipment or supplies on any job; and

in the case of Contractor, without sufficient cause (in the opinion of the HRSB), suspending work on any job which continues for more than two (2) days, HRSB may take possession of any materials delivered to or for the Contractor on such job and use same, giving the Contractor credit for its value at not more than cost thereof to the Contractor, against any liability of the Contractor to the HRSB and may use any of the Contractor's equipment that was in use on any of the HRSB's premises until the completion of the unfinished work.

Tax: Contractor shall comply with all applicable tax laws, including but not limited to laws relating to: (i) the collection and remittance of HST; and (ii) the withholding of applicable taxes from those of its employees performing work under this Agreement. Contractor shall be liable for and shall indemnify HRSB in respect of any claims, penalties, interest or costs made or assessed against HRSB arising from Contractor's non-compliance with tax laws.

Audit: Contractor shall keep and maintain true and correct books, records and accounts with respect to the Services and any materials supplied in relation to the Services, along with invoices and monthly summaries, for a period of seven (7) years after Contractor ceases to provide the Services. Contractor shall, upon request of HRSB, make available and permit HRSB during such period to inspect, make copies of, and audit all such records. If there is any revision to charges as a result of an audit, within thirty (30) days of the audit Contractor shall pay to HRSB the full amount of any credit or HRSB shall pay to Contractor the full amount of any shortfall, as the case may be. The provisions of this Section shall survive the termination of this Agreement.

DUTIES OF THE CONTRACTOR

Sub-Contractors: Contractor shall not subcontract the whole or any part of the Services without first receiving the written consent of HRSB, which consent may be withheld in HRSB's sole discretion. Where such consent is granted, Contractor shall not be released or relieved from any obligations or liabilities of Contractor under this Agreement nor shall HRSB be prevented from pursuing any legal or equitable remedies it may be entitled to against Contractor. Contractor shall remain liable and responsible to HRSB for the actions and omissions of any subcontractor and shall ensure that any subcontractor strictly adheres to all terms of this Agreement, including any safety requirements referred to in this Agreement. When requested by HRSB, Contractor shall provide HRSB with all details concerning any and all subcontracted work.

Site Representative and Instructions: The Contractor shall identify in the Undertaking to Comply attached in Appendix "D" to this Agreement, a job site representative to act on the Contractor's behalf. This representative shall have the authority to represent the Contractor with relation to taking instruction on behalf of Contractor and entering agreements or taking such other actions on matters related to this Agreement. HRSB shall identify in Appendix "C" Description of Services, or through subsequent notice to Contractor, its project manager, who has the authority to represent HRSB and instruct Contractor on matters related to this Agreement. If the Contractor representative is not on the job site at the time of a visit by HRSB's project manager, the orders of the HRSB project manager to any worker present shall be carried out. Contractor shall not seek direction from any person on matters related to this Agreement, other than from the HRSB project manager.

DELAYS

Delays: If the Contractor is delayed in the performance of the Services, and such delay is outside the Contractor's direct control, then the schedule to perform the Services may be extended for such reasonable time as the HRSB may decide in consultation with the Contractor. No such extension shall operate to extend the Term of this Agreement. Weather is not considered a reason for delay. No extension shall be made for delay unless written notice of

delay is given to the HRSB not later than two (2) working days after the commencement of delay, providing however, that in the case of a continuing cause of delay only one notice of claim shall be necessary, and for only such period as approved by HRSB in writing, in its discretion.

Delay by HRSB: The HRSB will not, except by written notice to the Contractor, stop or delay the Services as a result of pending instructions or proposed changes in the Services.

Adherence to Schedule: If the Contractor is delayed in the performance of the Services by any cause within the Contractor's control, the Contractor shall at no cost to the HRSB take effective action to restore the Services to the original time schedule for their completion, whether or not such schedule is appended to this Agreement.

CHANGES IN THE WORK

Change Orders: The HRSB, without invalidating this Agreement, may make changes in the Services with the Contract Price and Term being adjusted accordingly, by written notice of change (a "Change Order"). No changes in the Services shall proceed without a Change Order signed by the HRSB and no claim for a change in the Contract Price or change in the Term shall be valid unless so ordered and at the same time valued by the Contractor as provided in Section 5.2.

Change Approvals: When a change in the Services is proposed or required, the Contractor shall present to the HRSB for its approval the value of the change whether an extra charge or a credit. Changes submitted for approval are to be accompanied by a detailed breakdown of labour and materials, to which shall be added supervision, overhead and profit charges. Change charges submitted shall be calculated in the following manner:

for work done by the Contractor, add to the net direct cost not more than ten (10%) percent for overhead, profit, supervision and bonding costs; and

for work done by any subcontractor, add to the net direct cost, not more than FIVE (5%) percent for overhead and profit payable to the subcontractor, and add not more than FIVE (5%) percent to the subcontractor's amount for supervision of the subcontractor by the Contractor and for bonding costs.

The HRSB will satisfy itself as to the correctness of such claim and, when approved by the HRSB, a Change Order shall be issued to the Contractor amending the Contract Price and Term as appropriate.

DEFECTIVE WORK & DISMISSAL OF WORKERS

Defective Work: Defective work is work that has been rejected by the HRSB as failing to conform to this Agreement. Contractor shall promptly correct defective work, as required to conform to this Agreement, with no change in Contract Price. If, in the HRSB's opinion, it is not expedient to correct defective work, the HRSB may deduct from the Contract Price the difference in value between the Services as performed and that required by this Agreement, the amount of which will be reasonably determined by the HRSB.

Dismissal of Workers: The Contractor shall, on the request of the HRSB, immediately dismiss from the job any person employed by the Contractor who may, in the opinion of the HRSB, be incompetent or for misconduct, and such persons shall not again be employed on the job without the prior written permission of the HRSB. Foul language will be considered as misconduct.

PRODUCT OPTIONS AND SUBSTITUTIONS

Product Selection: Contractor may:

for any products specified by non-proprietary specification in Appendix "C", select any product of any manufacturer which meets the requirements of this Agreement.

for products specified by proprietary specification and accompanied by words indicating that substitutions will not be accepted in Appendix "C", select any product or manufacturer named. Substitutions are not permitted; and

except where substitutions are not permitted, when a product is specified by proprietary specification, other unnamed products will be accepted, subject to such substitutions being the same generic type, and capable of performing the same functions and meeting or exceeding the standards of quality and performance, as the named product. Substitutions shall not require revisions to this Agreement or a Change Order.

Product Substitutions: When making a substitution, the Contractor shall represent in writing that:

Contractor has investigated substitute products and/or manufacturer and has determined that the substituted product meets the criteria specified in Section 7.1 (c);

Contractor will make any changes to the Services necessitated by the substitution as required for the Services to be complete in all respects; and

Contractor waives all claims for additional costs and time caused by substitution, which may subsequently become apparent.

COMPLIANCE WITH LAWS, SAFETY AND PRIME CONTRACTOR

Compliance with Laws: Contractor shall comply with, and shall ensure subcontractors comply with, all applicable federal, provincial, and municipal laws, regulations and by-laws and to all other applicable orders, rules and regulations of any authority having jurisdiction respecting the Services, including without restriction all applicable environmental legislation, employment standards codes and workers' compensation legislation or equivalent legislation. CONTRACTOR SHALL FURNISH HRSB WITH WRITTEN CONFIRMATION FROM THE APPLICABLE WORKERS' COMPENSATION AUTHORITIES, OR EQUIVALENT AUTHORITIES, THAT CONTRACTOR AND ANY SUBCONTRACTORS ARE IN GOOD STANDING WITH SUCH AUTHORITIES, AND NO CONTRACTOR INVOICE SHALL BE PAYABLE UNTIL SUCH CONFIRMATION IS RECEIVED.

Safety: Contractor shall comply with and shall ensure all of its agents, employees and subcontractors comply with all applicable fire, safety, health, and environmental laws and regulations, including all safety, health and environmental requirements pursuant to any government permit, license, or authorization. Contractor shall be solely responsible for ensuring the safety and health of its agents, employees and subcontractors and for ensuring that its activities do not compromise the safety of HRSB's operations.

Occupational Health and Safety Legislation: Contractor shall comply with all applicable provisions of the *Occupational Health and Safety Act* (Nova Scotia) (the "**Act**") regulations thereto. Contractor shall execute and provide to HRSB the Undertaking to Comply Form with attached Pre-Construction Meeting Contractor Safety Checklist attached as Appendix "D". Contractor shall also supply to HRSB a Certificate of Recognition (COR) form as required under the Act and other applicable legislation.

Designation of Prime Contractor: The parties agree to designate in Appendix "D" that the Contractor shall be the "prime contractor" for the work site on the Lands for the purposes of the Act, during the Term, under this Agreement. The Contractor hereby agrees that:

such obligation shall extend to protect all contractors, employees, workers and persons as specified in the Act concerning the work site notwithstanding that they have been retained by HRSB after the date of execution of Appendix "D" by the Contractor; and

HRSB may in its sole discretion notify the Contractor in writing that the Contractor shall, following the date of such notice, assume the role of the "prime contractor" under the Act with respect to the work site notwithstanding that the Contractor was not so designated in Appendix "D" at the time of its execution by the Contractor, and the Contractor hereby agrees to do so.

Responsibilities of the Prime Contractor: Contractor shall:

direct all subcontractors, other contractors, employers, workers and any other personnel at the work site on safety related matters, to the extent required to fulfill its "prime contractor" responsibilities pursuant to the Act, regardless of:

whether or not any contractual relationship exists between the Contractor and any of these entities, or

whether or not such entities have been specifically identified in this Agreement;

ensure all obligations under the Act are strictly adhered to by all personnel;

be diligent in ensuring that its subcontracts comply with all health, safety and environmental legislation;

take appropriate disciplinary action against subcontractors who contravene health, safety or environmental legislation, which includes but is not limited to the suspending of the work performed by the subcontractors, before allowing them to continue to work on the site; and

ensure that Contractor or subcontractors never place the HRSB students, staff, volunteers or the general public at risk of injury or illness related to work conducted under this Agreement.

The HRSB shall provide Contractor, where applicable, with a list of all subcontractors under contract to the HRSB, working on the work site at the same time as Contractor, as well as their contact information. Failure by the HRSB to provide such information to Contractor shall not relieve Contractor of its obligation under this Section 8.5.

HRSB Access: At all times during the Term, HRSB Project Managers, agents and designates shall have the right to access, ingress and egress any work site, building or facility where Contractor performs the Services, and any part thereof, for any purpose, and neither Contractor nor its subcontractors shall refuse such access, ingress or egress whatsoever.

TERMINATION

Insolvency: If the Contractor should be adjudged bankrupt, or makes a general assignment for the benefit of creditors because of insolvency or if a receiver is appointed, the HRSB may, without prejudice to any other right or remedy it may have, by giving the Contractor or receiver or trustee in bankruptcy written notice, immediately terminate this Agreement.

Breach by Contractor: If the Contractor should neglect to prosecute the Services properly or otherwise fail to comply with the requirements of this Agreement, the HRSB may notify the Contractor in writing that it is in default of its obligations and instruct it to correct such default within FOUR (4) business days immediately following the receipt of such notice. If the correction of the default cannot be completed in the FOUR (4) business days specified, the Contractor will be considered to be actually attempting to cure the default if it:

commences the correction of the default on a best efforts basis, in HRSB's sole opinion, within FOUR (4) business days of receiving a notice of default;

provides the HRSB with a schedule for such correction which HRSB approves by written notice to Contractor; and

completes the correction in accordance with such approved schedule and without any additional cost or delay to the HRSB.

If the Contractor fails to correct the default in the time specified or subsequently agreed upon, the HRSB, without prejudice to any other right or remedy it may have, may terminate the Contractor's right to continue with the Services in whole or in part, and/or terminate this Agreement. Such termination must be in writing to the Contractor upon thirty (30) days' notice.

Other Remedies: If this Agreement is terminated in whole or in part by the HRSB as a result of the default of the Contractor, the HRSB shall be immediately entitled to withhold any and all further payments which may be due and owing to the Contractor, complete or hire a third party to complete the Services in a manner it determines to be expedient, or to do whatever else it deems prudent or expedient in the circumstances to complete the Services.

Safety Default: This Agreement may be immediately terminated by HRSB for non-compliance by Contractor of any of its obligations under Article 8 of this Agreement.

DISPUTE RESOLUTION

Disputes Generally: Disputes between the Contractor and the HRSB as to the interpretation, application or administration of this Agreement or any failure to agree where agreement between the parties is called for, which are to be resolved between the parties, shall be settled by mediation and/or by arbitration.

Use of Mediation. Should HRSB choose to mediate a dispute:

Mediation shall take place on a confidential, without prejudice, basis with a single trained mediator who is a member of the Nova Scotia Arbitration and Mediation Society, jointly selected by the Contractor and the HRSB (the "**Mediator**"). The Mediator must be impartial and independent with no involvement in the dispute. This impartiality must be assessed by each of the parties prior to mediation. If a bias or perception of bias develops during the mediation, either party or the Mediator may terminate the mediation.

The Contractor, the HRSB and the Mediator shall agree on the fees, timing and any specific procedures and shall share the costs of mediation equally. All parties shall agree to and sign an agreement to mediate drawn up by the Mediator prior to mediation.

10.3 Arbitration: By written notice by one party to the other (a "Notice of Arbitration"), all disputes arising out of this Agreement, including its interpretation, must be submitted to binding arbitration in accordance with the provisions of the *Commercial Arbitration Act* (Nova Scotia), subject to the following:

- (a) The arbitration panel will consist of one arbitrator. If the parties fail to reach agreement on the selection of the arbitrator within 10 days following delivery of the Notice of Arbitration, any party may apply to The Supreme Court of Nova Scotia to appoint the arbitrator. The arbitrator will be qualified by education, training and industry experience to rule upon the particular dispute to be resolved.
- (b) The arbitrator will be instructed that time is of the essence in the arbitration proceeding and, in any event, the arbitration award must be made within 90 days of the submission of the dispute to arbitration and within 15 days of the conclusion of any hearing, or if there is no hearing, within 15 days of the delivery of written submissions.
- (c) The arbitration will take place in Halifax, Nova Scotia or such place as the parties may agree and will be conducted in the English language.
- (d) The arbitration award will be given in writing and will be final and binding on the parties. The award will give reasons and will deal with the question of costs of the arbitration and all related matters. The contractor and the HRSB shall share the costs of arbitration equally, unless otherwise determined by the Arbitrator.
- (e) The parties will keep all matters relating to the arbitration strictly confidential. The existence of the proceeding and any element of it (including any pleadings, briefs or other documents submitted or exchanged, any testimony or other oral submission in any award) will not be disclosed except to the arbitrator, the parties, their counsel and any person

necessary to the conduct of the proceeding, except as may be required by law or as may be lawfully required in judicial proceedings relating to the arbitration.

PERFORMANCE BOND

Bond Requirement: Contractor shall, on execution of this Agreement, provide and pay for a performance bond in the amount of fifty (50%) percent of the Contract Price and a labour and materials payment bond in the amount of fifty (50%) percent of the Contract Price issued by a bond company acceptable to the HRSB, to continue in force for one (1) year after substantial completion of the Services, covering the performance of all obligations of the Contractor and all warranties of the Contractor under this Agreement. **Required** **Not Required**

WARRANTY

Warranty: The Contractor hereby warrants that:

it shall correct promptly, at Contractor's sole expense, defects or deficiencies in the Services as a result of workmanship or materials, which appear prior to the first (1st) anniversary of the date of completion of the Services, or such longer periods as may be specified for certain products or work in Appendix "C"; and

during the construction and warranty periods, defects or deficiencies in the Services, causing an emergency condition on the Lands or premises requiring immediate remedial/emergency repairs, outside of normal working hours, will be responded to by the HRSB's operations or maintenance staff. Costs for this emergency response will be the responsibility of the Contractor, and Contractor is hereby liable to and indemnifies HRSB for all such costs.

CONFIDENTIALITY AND OWNERSHIP OF WORK PRODUCT

Confidentiality: Contractor shall:

not make use of any HRSB Confidential Information for its own personal gain or for any purpose other than is required to provide the Services;

not disclose any HRSB Confidential Information to any person except employees, consultants, subcontractors and agents who have a need to know such information consistent with the provision of the Services, but only after such person has properly assumed obligations identical in principle to those in this Section and Contractor ensures that such person at all times complies with those obligations

employ diligent efforts and exercise reasonable care to hold all HRSB Confidential Information in the strictest confidence;

not use HRSB's name for any marketing or promotional purposes and not make any public announcements or disclosure in respect of this Agreement or Contractor's relationship with HRSB without first obtaining written consent from HRSB; and

be liable to HRSB and indemnify HRSB for any breach of this Section by Contractor or its employees, consultants, subcontractors or agents.

Terms of Agreements: Neither party shall disclose the terms of this Agreement or amounts paid under it to any person without the other party's written consent, except to a party's employees, professional advisors and insurers who have a need to know such information, but only where the party ensures that such persons are under obligations of confidentiality identical in principle to those in this Section. HRSB shall not disclose Contractor's information respecting pricing or any information supplied by Contractor that is clearly marked "Confidential" to any person except HRSB's employees, consultants, subcontractors and agents who have a need to know such information.

"HRSB Confidential Information" refers to any and all information, material and data disclosed to Contractor by HRSB, or obtained by Contractor in connection with providing the Services, directly or indirectly, orally, in any written form, or in any magnetically or electronically recorded form, or by drawings or inspection of parts or equipment, and including but not limited to: (i) information, knowledge or data of an intellectual, technical, scientific, commercial or industrial nature, or of a financial, cost, pricing, or marketing nature relating to the business operations of HRSB; or (ii) any information supplied by HRSB that is clearly marked "Confidential"; but shall not include information in the public domain or information that at the time of disclosure was already known to Contractor on a non-confidential basis.

Ownership of Work Product: All property and intellectual property rights in all reports, designs, drawings, studies, specifications, software, materials, inventions and other work product created, produced or arising in connection with the performance of the Services, whether completed or in progress, and regardless of who was involved therewith, shall be owned exclusively by HRSB and either delivered to HRSB or made available for inspection by HRSB. HRSB's ownership of and title to the foregoing shall arise automatically upon its creation and not be subject to the payment of the Contract Price to Contractor. To the extent Contractor has any title to the foregoing, Contractor shall take and cause to be taken all necessary steps (including a waiver of any moral rights) to transfer title thereto to HRSB.

Survival: The provisions of this Article shall survive the expiration or termination of this Agreement.

MISCELLANEOUS PROVISIONS

Notices: Communications in writing between the parties shall be considered to have been received by the addressee on the date of delivery if delivered by hand or by facsimile, or if sent by post, to have been delivered within FOUR (4) business days of the date of mailing, when addressed to the addresses in Appendix "C":

Assignment: This Agreement is not assignable by Contractor without the prior written consent of HRSB, which consent may be withheld arbitrarily. Any purported assignment by Contractor of any of its rights, duties, or obligations under this Agreement without HRSB's written consent, shall be voidable by HRSB at its option. Contractor shall not in any event be released from its duties and obligations under this Agreement. HRSB may assign this Agreement upon providing notice to without obtaining Contractor's consent.

Binding Effect: This Agreement shall be binding upon and enure to the benefit of each of HRSB and Contractor and their respective successors and permitted assigns.

Interpretation: In this Agreement, all references to 'dollars' or '\$' are to Canadian dollars unless stated otherwise. The insertion of headings is solely for convenience of reference and shall not affect the interpretation of any provision.

Independent Contractor: The parties agree that Contractor is an independent contractor, that nothing in this Agreement shall be construed as establishing or implying a relationship of master and servant between the parties, or any joint venture or partnership between the parties, and that nothing in this Agreement shall be deemed to constitute either of the parties as the agent of the other party or authorize either party to incur any expenses on behalf of the other party or to commit the other party in any way whatsoever. Contractor and its servants, agents or employees shall at no time be deemed to be servants, agents or employees of HRSB, or be deemed to be under the control or supervision of HRSB when carrying out the Services. Without the prior written consent of HRSB.

No waiver: No party shall be deemed to have waived the exercise of any right that it holds under this Agreement unless such waiver is made in writing. No waiver made with respect to any instance involving the exercise of any such right shall be deemed to be a waiver with respect to any other instance involving the exercise of that right or with respect to any other right.

Governing Law: This Agreement shall be governed by and interpreted in accordance with the laws of the Province of Nova Scotia and the laws of Canada applicable therein, excluding any conflict of laws rules that may apply therein. The parties hereby attorn to the non-exclusive jurisdiction of the courts of the Province of Nova Scotia, without prejudice to the rights of HRSB to take proceedings in any other jurisdiction. The parties hereby waive any right to a trial by jury.

Time of the Essence: Time shall be of the essence in this Agreement.

Set-Off: HRSB shall be entitled at all times to set off any amount owing from Contractor to HRSB against any amount due or owing to Contractor with respect to this Agreement.

Entire Agreement; Invoice Terms of No Effect: This Agreement constitutes the entire agreement of the parties concerning its subject matter and no other representation, warranties or agreements, either oral or written, shall be binding upon HRSB or Contractor. This Agreement supercedes and invalidates all prior agreements, understandings, negotiations, representations and warranties, whether oral or written, with respect thereto. The terms of this Agreement shall supersede any terms attached to Contractor's invoice, which terms shall not be applicable to this Agreement and shall not be considered to be Contractor's exceptions to the provisions of this Agreement.

Counterparts: The parties may execute this Agreement by facsimile or other electronic means and in separate counterparts each of which when so executed and delivered shall be an original, and all such counterparts taken together shall constitute one instrument.

APPENDIX "B"

RISK MANAGEMENT AND SAFETY

A. INDEMNIFICATION AND INSURANCE

1. **Indemnity and Waiver:**

Contractor shall be liable to HRSB for and shall indemnify and save harmless HRSB from and against any and all claims, suits, demands, awards, actions, proceedings, losses, judgments, costs, damages, settlements or expenses (including legal costs on a solicitor and own client basis) suffered or incurred by HRSB that arise out of, result from, are based upon or are in any way connected with this Contract, including without limitation:

- (a) those resulting from any act or omission on the part of Contractor or its employees, agents and subcontractors;
- (b) those resulting from any action, suit or proceeding brought by any third party;
- (c) those brought in respect of personal injury (including injury resulting in death) or damage or destruction of tangible or intangible property, including HRSB's property;
- (d) those made under workers' compensation legislation;
- (e) those legal costs and fines resulting from the failure of Contractor, its employees, agents or subcontractors to comply with any applicable laws, regulations, by-laws, rules or orders of any government, authority or body having jurisdiction, whether identified in this Contract or applicable by-law;
- (f) those resulting from the release, discharge, seepage or other escape of any substance including chemicals, hazardous or toxic materials, substances, pollutants, contaminants or wastes, whether liquid, gaseous or of any other nature or for any breach of any applicable environmental legislation;
- (g) those resulting from any labourers', materialmen's, or mechanics' liens arising from or relating to the performance of the Contract;
- (h) those brought for actual, alleged, direct or contributory infringement of any patent, trademark, copyright, trade secret or other intellectual property right, including breach of obligations of confidentiality; and
- (i) any other claims, expenses, costs, and losses suffered, incurred or sustained by HRSB.

The foregoing liability, indemnification and hold harmless provisions shall apply to anything done or not done in connection with this Contract and by whomsoever made, regardless of whether it was caused by the negligence of Contractor or otherwise.

Contractor shall make no claim or demand against HRSB for any injury (including death), claim, expense, loss or damage to property suffered or sustained by Contractor or any other person which arises out of, or is connected, with this Contract or anything done or not done as required hereunder, or any other errors or omissions of Contractor, and hereby waives as against HRSB all such claims and demands.

The foregoing indemnity and waiver given by Contractor shall not apply to the extent of HRSB's own negligence. The onus of establishing that HRSB was negligent shall be upon Contractor. HRSB shall not be deemed to have caused or contributed thereto merely by reason of its knowledge, approval or acceptance of the materials, drawings,

specifications, supplies, equipment, procedures or services of Contractor.

For the purposes of this Section, any reference to "HRSB" shall include HRSB, together with the employees, directors, officers, superintendents, trustees, representatives and agents of HRSB; and any reference to "Contractor" shall include Contractor's directors, officers, employees, affiliates, representatives, agents and subcontractors.

2. Insurance:

Contractor shall, at its own expense, obtain and maintain during the term of this Contract, in a form and with an insurance company satisfactory to HRSB, policies of:

- (a) Commercial General Liability insurance with a limit of not less than Two Million Dollars (**\$5,000,000**) for any one loss or occurrence and in the aggregate with respect to bodily injury, personal injury and property damage, including loss of use thereof, which policy shall by its wording or by endorsement:
 - (i) include HRSB, its officers, directors, employees, agents and trustees as an additional insured with respect to the obligations assumed by Contractor under this Contract;
 - (ii) provide that, in relation to the interests of each additional insured, the Insurance shall not be invalidated by an action or inaction any other person other than the respective additional insured;
 - (iii) include a "cross liability" clause which shall have the effect of insuring each entity named in the policy as an insured in the same manner and to the same extent as if a separate policy had been issued to each;
 - (iv) extend to cover blanket Contractual liability, including the insurable liabilities assumed by Contractor under this Contract;
 - (v) extend to cover products and completed operations; such products and completed operations coverage, whether by specific policy endorsement respecting the services or by renewal of any annual practice policy, shall be kept in force during the supply of services and for a further period of 24 months following completion of supply of the services;
 - (vi) extend to cover non-owned auto liability coverage; and
 - (vii) not exclude any existing property of HRSB, but shall treat same as "third party property".
- (b) Employer's Liability Coverage which shall not be less than \$5,000,000 for each employee where Workers' Compensation coverage does not exist or the profession/trade has been indicated to be exempted from Workers' Compensation coverage.
- (c) Automobile public liability and property damage insurance in an amount not less than Two Million Dollars (\$2,000,000) all-inclusive covering the ownership, use and operation of any motor vehicles and trailers which are owned, leased or controlled by the Contractor and used in connection with this Contract; and
- (d) Property "All Risks" insurance covering Contractor's owned property, including Contractor's equipment, where applicable, and property of others in the care, custody, or control of Contractor or for which the Contractor has assumed liability, all including while in transit or storage, on a replacement cost basis. With respect to any property of HRSB, such policy shall contain a loss payee

clause in favour of HRSB;
(collectively, the "Insurance").

Contractor shall ensure that the above Insurance policies:

- (a) are endorsed to provide HRSB with not less than thirty (30) days written notice in advance of cancellation, change or amendments restricting coverage;
- (b) do not include a deductible that exceeds such maximum amount that a reasonably prudent business person would consider reasonable; and
- (c) take the form of an occurrence basis policy and not a claims-made policy.

Contractor shall, before any services are performed, provide HRSB with a copy of the certificates of insurance and, if requested by HRSB, the insurance policies evidencing all the coverage stipulated above, and HRSB may withhold payment of any invoice until it receives evidence of such coverage. Failure for any reason to furnish this proof at any time shall be a breach of the contract, allowing the HRSB to terminate the contract or at the HRSB's option, to supply such insurance and charge the cost to Contractor. The HRSB may require Contractor to have the HRSB added as an insured party to the insurance policy and/or require Contractor to furnish a certified copy of the policy for such insurance.

Contractor shall not make or cause to be made any modification, or alteration to the Insurance, nor do or leave anything undone, which may invalidate the Insurance coverage. Contractor shall be responsible for any deductible and excluded loss under the Insurance.

Contractor shall cause all subcontractors performing services to obtain and maintain the Insurance policies required by this Section.

Contractor agrees that the insurance coverage required to be maintained by it under the provisions of this Contract shall in no manner limit or restrict its liabilities under this Contract. HRSB reserves the right to maintain the insurance in good standing at Contractor's expense and to require Contractor to obtain additional insurance where, in HRSB's reasonable opinion, the circumstances so warrant.

B. COMPLIANCE WITH LEGISLATION AND REGULATIONS

1. Compliance

Contractor shall comply with and shall ensure all of its agents, employees and subcontractors comply with all applicable laws and regulations, including all safety, health and environmental requirements pursuant to any government permit, license, or authorization. Contractor shall at its cost obtain all permits and licenses required by any governing authority in order to enable Contractor to provide its goods and services and otherwise perform its obligations under the Contract.

2. Labour Code

Contractor shall comply with all applicable provisions of the *Labour Code* (Nova Scotia) and the *Employment Standards Act* (Nova Scotia) and all regulations and amendments thereto.

3. Workers' Compensation Legislation

Contractor shall comply with the *Worker's Compensation Act* (Nova Scotia) and regulations and amendments thereto, and:

- (a) if any employees perform or assist in the performance of this Contract, the Contractor shall submit, at any time requested by the HRSB, a letter from the Workers' Compensation Board (Nova Scotia) stating that Contractor has an account in good standing with the Worker's Compensation Board;
- (b) the Contractor will make the necessary returns to the Workers' Compensation Board in accordance with government regulations and will pay all fees and contributions required in connection therewith. The cost of compensation will be included in the price payable under the Contract; and
- (c) the Contractor shall submit a clearance from the Workers' Compensation Board that all fees and contributions have been paid before final payment is made by the HRSB under the Contract.

4. Canada Safety Council and Associated Standards

All electrical, electronic and gas-fired equipment must bear the required approval markings, being C.S.A. approved for entirely electrical or electronic equipment and C.G.A. or C.S.A. approved for gas fired equipment. All other similar equipment approvals must also be obtained. It shall be the responsibility of the Contractor to obtain all applicable approvals, at its own expense.

5. Nova Scotia Occupational Health and Safety Legislation

Contractor shall comply at all times with the Nova Scotia Occupational Health and Safety Act, Regulation and Code, and it's amendments thereto.

C. SAFETY REQUIREMENTS

1. Safety Responsibility

Contractor shall be solely responsible for ensuring the safety and health of its agents, employees and subcontractors and for ensuring that its activities do not compromise the safety of HRSB's operations. Contractor shall provide to its agents, employees and subcontractors, at its own expense, any and all safety gear required to protect against injuries during the performance of the services and shall ensure that its agents, employees and subcontractors are knowledgeable of and utilize safe practices in the provision of the services, such practices to be at least as stringent as those set out in HRSB's safety standards provided to Contractor from time to time.

2. Project Site Protection and Safety

The Contractor shall protect the HRSB's property, staff and students, the Contractor's staff and the public, from damage or injury by providing adequate precautions to make the work site a safe environment at all times. In addition to complying with any safety standards provided to the Contractor by HRSB, the Contractor shall:

- (a) provide all guards and fences and other safety equipment;
- (b) respond to reports of hazards by HRSB;
- (c) do the following when work generating vibration, noise or safety concerns (including without limitation jack hammering, shot blasting, sandblasting, concrete cutting and use of powder actuated fasteners) may affect HRSB property, staff, students or operations.
 - (i) coordinate with HRSB representatives;
 - (ii) schedule and coordinate hours of work with HRSB input; and

- (iii) stop operations generating vibration, noise or safety concerns when instructed by HRSB.
- (d) Contractor responsible to ensure all spaces directly beneath the roof work area are protected from potential damage of dust, debris or water infiltration or any other impact resulting from the roof replacement project. Such protection shall include installation of effective cover using minimum 4 mil plastic vapour barrier sheeting over all furniture, equipment, instruction aids, floors areas and any other items underneath the work space. Contractor must remove all sheeting upon completion of work and will be responsible for costs of restoration of damages caused by process of roof project or lack of adequate protection of property.

3. Hazardous Materials

The Contractor shall:

- (a) develop and implement a written "Hazardous Materials Information" document to ensure that all persons at the work site are made aware of the existence of any hazardous materials such as asbestos, lead-based products, and PCB's;

D. CONTRACTOR EVALUATION

1. Audit

The HRSB reserves the right to audit Contractors and their subcontractor's health and safety performances during the term of the Contract and upon its conclusion.

2. Evaluation

The HRSB reserves the right to evaluate the performance of the Contractor and such evaluation will be based upon accident/injury data and adherence to this Schedule "C", the HRSB health and safety policies, applicable legislation, and periodic inspections and reports from HRSB employees. Information collected as part of such evaluations may be used for future reference.

E. HRSB REMEDIES FOR CONTRACTOR NON-COMPLIANCE

1. Emergency Work Stoppage

The HRSB has the authority to stop progress of the work whenever, in its opinion, such stoppage is desirable for any safety-related reason. The Contractor hereby agrees that no claim for loss of time or materials may be made with respect to such stoppage unless the claim for the time and materials and their value are certified in writing by the HRSB as allowable.

2. Termination for Non-Compliance

HRSB may terminate this Contract for non-compliance with health, safety, environmental and other applicable legislation and good industry practice on the part of the Contractor or any subcontractor of the Contractor, as constituting a material breach of this Contract. In addition, the HRSB reserves the right to stop the work of the Contractor in the event of Contractor's non-compliance with applicable legislation or good industry practice. Such work stoppages shall not postpone any agreed to completion dates and any additional cost

resulting from such work stoppages shall be borne by the Contractor. Work shall not resume until the Contractor rectifies the reason for non-compliance, to HRSB's satisfaction.

3. Non-Exclusive Remedies

Contractor acknowledges and agrees that the foregoing remedies available to HRSB are non-exclusive to, and may be exercised in conjunction with, any other rights or remedies available to HRSB, under the Contract, at law or in equity, in the event of threatened or actual breach of this Contract, including injunctive relief.

SAMPLE ONLY

APPENDIX "C"

DESCRIPTION OF SERVICES

- Description of Services to be performed by Contractor**, including any applicable standards of performance:

Description of Work:

As per Tender # drawings, specifications and scope of work

- Municipal and Legal Description of the Lands:**

Location of Work

- Term:** completion of work by ,

- Invoicing:** Services are to be paid for by HRSB:

- By scheduled progress payments (as agreed by both parties)
- By single invoice upon project completion

- Holdbacks:** In compliance with "Section 13 – Holdbacks" of the *Builder's Lien Act of Nova Scotia (incl. amendments)*, a holdback in the amount of ten percent (10%) of the contract may be held up to ninety (90) days after completion of the work, to the satisfaction of the Board.

- HRSB Project Manager /Contractor Contact Information:**

CONTRACTOR INFORMATION	HRSB INFORMATION
Name: Jurisdiction of incorporation: Address: Attention: Telephone: Facsimile: E-mail: GST Registration #: WCB Registration #:	HRSB Representatives: Name: Department: Operations Services Address: 33 Spectacle Lake Drive Dartmouth, N.S., B3B 1X7 Telephone: 902 464-2000 Ext. Facsimile: 902- E-mail:

_____ _____
 Contractor's Initials HRSB's Initials

Exhibit A

Invitation To Tender

PROJECT SPECIFICATIONS/DRAWINGS WERE INCLUDED IN TENDER DOCUMENT AND ARE CONSIDERED PART OF THIS CONTRACT EVEN THOUGH THEY ARE NOT ATTACHED TO THIS DOCUMENT

Exhibit B

Response to Invitation to Tender

**A COPY OF THE SUCCESSFUL CONTRACTOR'S BID SUBMISSION IS ON FILE IN
THE PURCHASING DEPARTMENT - TENDER #3820**

APPENDIX "D"

**UNDERTAKING TO COMPLY FORM
AND CONTRACTOR SAFETY CHECKLIST**

UNDERTAKING TO COMPLY

Name of Contractor:

(the "Contractor")

Description of Agreement:

Site Location:

(the "Agreement")

7. The Contractor hereby undertakes to HRSB:
to comply with all health, safety and environmental legislation in the performance of this Agreement; and
to maintain a safe and healthy work environment during the performance of this Agreement.
8. The Contractor hereby agrees with HRSB:
that compliance with all health, safety and environmental legislation is a condition of this Agreement and that non-compliance with the same may, in HRSB's discretion, lead to the termination of this Agreement; and
to permit HRSB to audit the Contractor's health, safety and environmental records during the term of this Agreement and upon its conclusion and to cooperate fully with any such audit(s).
9. The Contractor understands that, at HRSB's discretion, any Contractor safety deficiencies will be addressed by HRSB in the following progressive steps:
the problems will be identified to the Contractor (site supervisor);
the Contractor's head office will be contacted about the problem, orally and later in writing;
if required by law to report the problem to a Provincial and or Federal Ministry, HRSB will immediately do so;
if not required by law to report the problem, and the problem remains unresolved, HRSB may report the problem; and
the Agreement may, in HRSB's discretion, be suspended or terminated and/or payment withheld by HRSB.

- 10. The Contractor acknowledges and agrees with HRSB that, depending upon the nature and/or seriousness of the deficiency, HRSB reserves the right to bypass any or all of the steps described in Section 3.
- 11. **Prime Contractor Designation:** The Contractor and the HRSB hereby agree that the Contractor shall, pursuant to Section 8.4 of the Agreement shall be the Prime Contractor.

The undersigned hereby confirms that he/she has the authority to bind the Contractor:

CONTRACTOR

**HALIFAX REGIONAL
SCHOOL BOARD**

FULL COMPANY NAME

PRINT NAME

AUTHORIZED SIGNATURE

POSITION

DATE

PRINT NAME

AUTHORIZED SIGNATURE

POSITION

DATE

SAMPLE ONLY

PRE-CONSTRUCTION MEETING
CONTRACTOR SAFETY CHECKLIST PAGE 1

MEETING DATE:	TENDER #:
---------------	-----------

SITE LOCATION:

COMPANY NAME:

CONTRACTOR REPRESENTATIVE::

HRSB REPRESENTATIVE::

√ Means complied to	X Means not complied with	n/a means not applicable
---------------------	---------------------------	--------------------------

- | | | |
|--|---|--|
| <p>1. Notice of Project filed with Nova Scotia Infrastructure (if applicable) <input type="checkbox"/></p> <p>2. Review Board Safety Compliance Undertaking to Comply Form Signed <input type="checkbox"/></p> <p>Progressive Disciplinary Action Reviewed <input type="checkbox"/></p> <p>3. Contractor Health and Safety Policy <input type="checkbox"/></p> <p>Prime Contractor and Safety Management Certificate <input type="checkbox"/></p> <p>4. Health & Safety Representatives/Joint Site Health & Safety Committee <input type="checkbox"/></p> <p>Name and Phone _____</p> <p>5. Personal Protective Equipment:</p> <p>Hard Hats <input type="checkbox"/></p> <p>Footwear <input type="checkbox"/></p> <p>Safety Glasses <input type="checkbox"/></p> | <p>8.</p> <p>9.</p> <p>10.</p> <p>11.</p> | <p>Contractor Staff Training: Emergency Response <input type="checkbox"/></p> <p>WHMIS Training Verification <input type="checkbox"/></p> <p>O H & S <input type="checkbox"/></p> <p>MSDS Received <input type="checkbox"/></p> <p>Scaffold <input type="checkbox"/></p> <p>Confined Space Code of Practice <input type="checkbox"/></p> <p>TDG Training Verification <input type="checkbox"/></p> <p>Working Alone <input type="checkbox"/></p> <p>Review Contractor Signage & Barricades <input type="checkbox"/></p> <p>Written Work Site Hazard Assessment and Control Plan/Schedule Submitted <input type="checkbox"/></p> <p>Building Fire Plan <input type="checkbox"/></p> |
|--|---|--|

SAMPLE ONLY

CONTRACTOR SAFETY CHECKLIST – PAGE 2

- | | | | |
|---|--------------------------|---|--------------------------|
| Hearing | <input type="checkbox"/> | 12. Accident Investigation/Notification/Reporting Procedure | <input type="checkbox"/> |
| Dust & Fumes | <input type="checkbox"/> | | |
| Face Protection | <input type="checkbox"/> | | |
| Others: _____ | <input type="checkbox"/> | 13. Contingency Plan for Control & Clean-up of a Spill | <input type="checkbox"/> |
| _____ | <input type="checkbox"/> | | |
| _____ | <input type="checkbox"/> | 14. Parking Upgrades/Extinguishers | <input type="checkbox"/> |
| | | | |
| 6. Equipment Certification | | 15. First Aid Kits on Site | <input type="checkbox"/> |
| Trench Boxes | <input type="checkbox"/> | | |
| | | 16. First Aiders on Staff | <input type="checkbox"/> |
| Boom Cranes | <input type="checkbox"/> | Names: _____ | |
| Scaffolds | <input type="checkbox"/> | | |
| Others: _____ | <input type="checkbox"/> | 17. Fall Protection /Safety Harness | <input type="checkbox"/> |
| _____ | <input type="checkbox"/> | | |
| _____ | <input type="checkbox"/> | 18. Methane gas Detection in Sewer | <input type="checkbox"/> |
| | | | |
| 7. Provision of Hazardous Material Information to Contract | <input type="checkbox"/> | 19. Clean Up - Good Housekeeping | <input type="checkbox"/> |
| Confirmation of Employee Awareness of Hazardous Material | <input type="checkbox"/> | | |
| Asbestos | <input type="checkbox"/> | 20. Weekly Safety Talks/Meetings | <input type="checkbox"/> |
| Lead | <input type="checkbox"/> | | |
| PCB | | | |
| Confirmation that Prime Contractor reviewed Asbestos Inventory at the work site | <input type="checkbox"/> | 21. Other Issues | <input type="checkbox"/> |

SAMPLE ONLY



APPENDIX E

Project Safety Plan Outline

During the planning of each project, environmental and occupational health and safety issues will be assessed like any other key project component.

Prior to beginning a new project, tendering Contractors shall examine the work area to identify potentially hazardous site specific situations.

Once identified, these hazards should be prioritized on this Hazard Assessments/Project Safety Plan Outline and corrective *actions* noted to eliminate or control each hazard. The dates of when and names of the persons who are responsible for completing the *action* should also be assigned.

Copies of the completed Safety Plan Outline shall be submitted as part of the tender document submittal, sent to the HRSB Operations Services Regional Manager, made available on the job site and communicated to the workers.

Project Name: _____

Project Location: _____

Project Start date: _____

Project End date: _____

Company Name: _____

Completed by: _____
(Contractor's project manager)

Date: _____

Copy to: _____

PLANNING:

Does the Contractor's Occupational Health and Safety Program deal with the work activities associated with this project? Yes No

Describe tasks to be undertaken: _____

HAZARDS ASSESSMENT:

Identify the hazards that could present themselves on this project (e.g. live electrical wires, over water, confined space, etc.) and describe what steps will be taken to prevent an incident (e.g. cover up, de-energize, safe work practices, netting, etc.). Prioritize from #1 as needing immediate action.

#	Hazard	Required Action	Completed by	Date
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

ENVIRONMENTAL ASSESSMENT:

Identify the environmental issues that could present themselves on this project (e.g. oil spills, asbestos, etc.) and describe the action that will be taken to eliminate or reduce the risk of occurrence (e.g. mop kits, air sampling, etc.)

#	Hazard	Required Action	Completed by	Date
1				
2				
3				
4				
5				

EMERGENCY RESPONSE:

In the event of an incident, pre-plan the response and write up the procedures. Minimally, the following list should be completed and posted on site:

Contact	Phone #	Contact	Phone #
Fire	911	Poison Control	428-8161
Ambulance	911	Dangerous Goods	1-800-565-1633
Doctor	911	Waste Disposal	
Police	911	Insurance	
HRSB Office	493-5110	Min/Dept of Labour	1-800-952-2687
Min./Dept.of Transport.		Min/Dept of Environment	1-800-565-1633

- Identify and arrange source of first aid, ambulance and rescue.
- Accidents will be reported to: _____
- Accidents will be investigated by: _____
- Back-up call to: _____
- HRSB # emergency/after hours: day 493-5110 after 4:00 pm 442-2476

SAFETY MEETINGS:

On this project, given the nature of the work and the anticipated size of the work force, the following frequency will apply:

Site meetings _____

Site Audits _____

Follow up with HRSB Manager: _____

SITE IMPLEMENTATION:

- Health and Safety Rep & Safety Committee:
Establish liaison between HRSB, Contractor, site administration
First Aid, PPE, other safety items as required.

- Documentation:
Applicable MSDS
Safety program
Applicable work procedures
Permits
First Aid Certification

TRAINING:

The following training/testing will be mandatory on site:

1) _____

2) _____

3) _____

TENTATIVE SCHEDULE OF WORK:

- 1) Date Project Will Commence: _____
- 2) Number of Weeks to Complete Project: _____ weeks
- 3) Expected Completion Date: _____

NOTE:

Within five (3) business days the successful bidder shall provide a schedule clearly indicating timelines for completion of all aspects of the project.

APPENDIX F

CONTRACTOR'S CHECKLIST

Enclose the following documents with your bid:

- Bid Security as required in Clause 1.3 (e)*** in the amount of 10% of the Contract Price (before HST).
- Contract Security for bids over \$100,000 as required in Clause 1.3 (f) (UPON AWARD)***
- Certificate of Insurance*** indicating a minimum of **\$5,000,000 Commercial General Liability Insurance** per occurrence and **Commercial Auto Liability Insurance** covering all owned, non-owned and hired vehicles for a minimum combined single limit of **\$2,000,000** per occurrence and **Builder's Risk Insurance** in the amount of the contract price.
- Tentative Work Schedule (Timelines)*** – Subsequently, within five (5) business days of tender award the successful bidder shall provide a schedule clearly indicating timelines for completion of all aspects of the project.
- Workers' Compensation Board Letter*** of Good Standing
- Certificate of Recognition from one of the seven safety audit companies that jointly sign with the WCB:***
 - East Coast Mobile Medical Inc.
 - HSE Integrated
 - Nova Scotia Construction Safety Association
 - Nova Scotia Trucking Safety Association
 - Occupational Health & Educational Services (2002) Inc.
 - Safety Services Nova Scotia
 - Stantec Inc.

This list can be found on WCB's website: www.wcb.ns.ca.
- Completed HRSB Safety Plan***
- Applicable Warranty Information***

00 01 10	Specification List of Contents	2
00 01 15	List of Drawings	1
DIVISION 1	GENERAL REQUIREMENTS	
01 00 02	Standard General Requirements	12
DIVISION 6	WOOD AND PLASTICS	
06 10 00.01	Rough Carpentry - Short Form	3
06 40 00	Architectural Woodwork	7
DIVISION 7	THERMAL AND MOISTURE PROTECTION	
07 84 00	Firestopping	4
07 92 10	Joint Sealing	5
DIVISION 8	DOORS AND WINDOWS	
08 00 00	Door Schedule	ON DRAWING A-10
08 11 14	Metal Doors & Frames	6
08 71 00	Door Hardware	6
08 80 50	Glazing	3
DIVISION 9	FINISHES	
09 21 16	Gypsum Board Assemblies	4
09 22 16	Non-Structural Metal Framing	2
09 51 13	Acoustical Panel Ceilings	2
09 53 00.01	Acoustical Suspension	2
09 65 19	Resilient Tile Flooring	4
09 91 23	Interior Painting	11
DIVISION 10	SPECIALTIES	
10 11 13	Whiteboards	4
10 11 23	Tackboards	3
DIVISION 21	COMMON WORKS AND FIRE SUPPRESSION	
21 05 01	Common Work Results for Mechanical - General	13
21 05 02	Common Work Results for Mechanical - Submittals	7
21 05 03	Common Work Results for Mechanical - Contract Closeout	2
21 05 04	Through-Penetration Firestopping for Mechanical Systems	6
21 13 13	Sprinkler Systems	4
DIVISION 22	PLUMBING	
22 11 16	Domestic Water Piping	2
22 13 17	Drainage, Waste and Vent Piping	2
22 42 01	Plumbing Fixtures	4
DIVISION 23	HYDRONIC	
23 05 23	Valves	4
23 05 29	Hangers and Supports	5
23 05 53	Mechanical Identification	6
23 07 00	Mechanical Thermal Insulation	6
23 09 33	Electric and Electronic Controls	5
23 21 13	Hydronic Systems	4
23 21 14	Hydronic Specialties	2
23 82 00	Hydronic Heating Units	2
DIVISION 24	AIR DISTRIBUTION	
24 05 93	Balancing of Mechanical Systems	5
24 31 13	Low Pressure Ducts to 500Pa	5
24 33 00	Air Duct Accessories	4
24 33 15	Dampers - Operating	2
24 33 16	Dampers - Fire	2
24 34 00	HVAC Fans	2
24 34 25	Packaged Exhausters	2

24 37 13	Air Terminals	3
24 72 00	Energy Recovery Equipment	2
24 81 33	Ductless Split System Units	7

DIVISION 26 ELECTRICAL

26 05 00	Common Work Results for Electrical	13
26 05 01	Electrical Submittals	7
26 05 02	Electrical Contract Closeout	3
26 05 03	Electrical Identification	9
26 05 04	Through Penetration Firestopping for Electrical Systems	7
26 05 20	Wire and Box Connectors - 0 - 1000V	1
26 05 21	Wires and Cables 0 - 1000V	6
26 05 28	Grounding and Bondng	3
26 05 29	Hangers and Supports for Electrical Systems	3
26 05 31	Splitter, Junction, Pull Boxes and Cabinets	3
26 05 32	Outlet Boxes, Conduit Boxes and Fittings	3
26 05 33.01	Surface Raceways	2
26 05 34	Conduits, Conduit Fastenings and Conduit Fittings	6
26 24 16.1	Panelboards Breaker Type	5
26 27 19	Surface Raceway Outlet Assemblies	2
26 27 26	Wiring Devices	4
26 28 13.01	Fuses - Low Voltage	2
26 28 16.02	Molded Case Circuit Breakers	3
26 28 23	Disconnect Switches - Fused and Non-fused	2
26 29 10	Motor Starters to 600V	6
26 50 00	Lighting	3
26 52 00	Emergency Lighting	3
26 5300	Exit Lights	3
26 91 13	Electrical Systems Testing and Verification	11

DIVISION 27 COMMUNICATIONS

27 05 28	Pathways for Communications Systems	4
27 10 05	Structured Cabling for Communications Systems	10
27 51 16	Public Address and Mass Notification Systems	5

DIVISION 28 ELECTRONIC SAFETY AND SECURITY

28 13 00	Access Control System Detection	5
28 16 00	Intrusion Detection	4
28 31 00.01	Multiplex Fire Alarm System	9

End of Section

ARCHITECTURAL

A-1	EXISTING CONDITIONS AND DEMOLITION
A-2	NEW CONDITIONS
A-3	ANNEX LEVEL 0 & 1
A-4	LEVEL 1
A-5	LEVEL 2
A-6	RCP LEVEL 1
A-7	RCP LEVEL 2
A-8	CASEWORK ELEVATIONS
A-9	MISC DETAILS
A-10	SCREENS, FRAMES, DOORS, SCHEDULES & JAMBS

MECHANICAL

MD-101	LEVEL 1 MECHANICAL DEMOLITION
MD-102	LEVEL 2 MECHANICAL DEMOLITION
M-101	LEVEL 1 MECHANICAL
M-102	LEVEL 2 MECHANICAL
M-103	HEATING DETAILS
M-104	AIR DISTRIBUTION DETAILS

FIRE PROTECTION

FP-101	LEVEL 1 - FIRE PROTECTION
FP-102	LEVEL 2 - FIRE PROTECTION

ELECTRICAL

E-001	ELECTRICAL LEGEND
ED-101	LEVEL 1 ELECTRICAL DEMOLITION
ED-102	LEVEL 2 ELECTRICAL DEMOLITION
EL-101	LEVEL 1 LIGHTING
EL-102	LEVEL 2 LIGHTING
EP-101	LEVEL 1 POWER
EP-102	LEVEL 2 POWER
EP-601	PARTIAL POWER RISER DIAGRAM
EP-701	PANEL SCHEDULES
EP-702	PANEL SCHEDULES, MOTOR STARTER CONTROL LIST
ES-101	LEVEL 1 SYSTEMS
ES-102	LEVEL 2 SYSTEMS
ES-501	STRUCTURED WIRING RISER DIAGRAM
ES-502	INTRUSION ALARM AND ACCESS CONTROL DETAIL
ES-503	PUBLIC ADDRESS RISER DIAGRAM
ES-504	FIRE ALARM SYSTEM RISER DIAGRAM
ES-505	SYSTEM DETAILS

PART 1 - GENERAL

- 1.1 GENERAL .1 All articles in this Section are "STANDARD General Requirements to bidders".
- 1.2 CODES .1 Perform work in accordance with National Building Code of Canada (NBC) 2010 and any other code of provincial or local application provided that in any case of conflict or discrepancy, the more stringent requirements shall apply.
- .2 Meet or exceed requirements of:
- .1 Contract documents.
- .2 Specified standards, codes and referenced documents.
- 1.3 DOCUMENTS REQUIRED .1 Maintain at job site, one copy of each of the following:
- .1 Contract drawings.
- .2 Specifications.
- .3 Addenda.
- .4 Set of documents for recording changes or deviation from drawings.
- .5 Reviewed shop drawings.
- .6 Change orders.
- .7 Modifications to Contract.
- .8 Field test reports.
- .9 Copy of approved work schedule.
- .10 Manufacturers' installation and/or application instructions.
- .11 Bonds (when applicable).
- .2 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.
- .3 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.
- .4 Keep record documents and samples available for inspection by Engineer-Architect.
- 1.4 CUTTING AND PATCHING .1 Approvals
- .1 Submit written request in advance of cutting or alteration which affects:
- .1 Structural integrity of any element of Project.
- .2 Integrity of weather-exposed or moisture-resistant elements.
- .3 Efficiency, maintenance, or safety of any operational element.
- .4 Visual qualities of sight-exposed elements.
- .5 Work of Owner or separate contractor.
- .2 Inspection
- .1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
- .2 After uncovering, inspect conditions affecting performance of work.
- .3 Beginning of cutting or patching means acceptance of existing conditions.

- .3 Execution
 - .1 Perform cutting, fitting, and patching including excavation and fill, to complete the Work.
 - .2 Remove and replace defective and non-conforming work.
 - .3 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical work.
 - .4 Perform work to avoid damage to other work.
 - .5 Prepare proper surfaces to receive patching and finishing.
 - .6 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
 - .7 Cut rigid materials using power saw or core drill. Pneumatic or impact tools not allowed.
 - .8 Restore work with new products in accordance with Contract Documents.
 - .9 Fit work airtight, weatherproof and also as detailed and as directed and/or described by Engineer - Architect to pipes, sleeves, ducts, conduit, any and all other penetrations through surfaces.
 - .10 At penetration of fire-rated wall, ceiling, or floor construction, completely seal voids with fire-rated and/or fire-resistant material, specified to thickness of construction element as required for fire rating as per manufacturers written instructions.
 - .11 Refinish surfaces to match adjacent finishes; for continuous surfaces refinish to nearest intersection or as directed by Engineer - Architect; for an assembly, refinish entire unit.

1.5 PROJECT MEETINGS

- .2 Progress Meetings.
 - .1 Schedule and administer project progress meetings every two weeks throughout progress of work for projects in excess of \$150,000.00 and/or at call of Engineer-Architect for other projects.
 - .2 Distribute written notice of each meeting four days in advance of meeting date to Engineer-Architect.
 - .3 Provide physical space and make arrangements for meetings.
 - .4 Record minutes. Include significant proceedings and decisions. Identify 'action by' parties.
 - .5 Reproduce and distribute copies of minutes within three days after each meeting and transmit to meeting participants, affected parties not in attendance and Engineer-Architect.

1.6 SUBMITTALS

- .1 Administrative
 - .1 Submit to Engineer-Architect submittals listed for review. Submit with reasonable promptness and in an orderly sequence so as to not cause delay in the Work. **Failure to submit in ample time is not considered sufficient reason for an extension of contract Time and no claim for extension by reason of such default will be allowed.**
 - .2 Present shop drawings, product data, samples and mock-ups in SI metric units.
 - .3 Work affected by submittal shall NOT PROCEED until review is complete.

- .4 Review and sign submittals prior to submission to Engineer-Architect. 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 the Work and Contract Documents. Submittals **not** stamped, signed, dated and identified as to specific project **will be returned** without being examined and shall be considered rejected.
- .5 Notify Engineer-Architect, in writing at time of submission, identifying deviations from requirements of contract Documents stating reasons for deviations.
- .6 Verify field measurements and affected adjacent Work are co-ordinated.
- .7 Contractors responsibility for errors and omissions in submission is **not relieved** by Engineer - Architect's review of submittals.
- .8 Contractor's responsibility for deviation in submission from requirements of contract documents is **not relieved** by Engineer - Architect's review.
- .9 Keep one review copy of each submission on site.
- .10 When requested by Engineer - Architect provide evidence and proof of type, source and quality of products provided and any additional information requested.
- .2 Shop Drawings and Product Data
 - .1 "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 the Work.
 - .2 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connection, 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.
 - .3 Adjustments made on shop drawings by Engineer-Architect are not intended to change Contract Price. If adjustment affect value of Work, state such in writing to Engineer - Architect **prior to proceeding** with work.
 - .4 Make changes in shop drawings as Engineer-Architect may require, consistent with Contract Documents. When resubmitting, notify Engineer - Architect in writing of any revisions other than those requested.
 - .5 Accompany submissions with transmittal letter, in duplicate, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawings, product data and sample.
 - .5 Other pertinent data.
 - .6 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as Engineer-Architect may reasonably request.
 - .7 Submit electronic copy of product data sheets or brochures for requirements requested in specification Sections and as

Engineer-Architect may reasonably request where shop drawings will not be prepared due to standardized manufacture of product.

- .8 Each Submission shall include:
- .1 Date of submission and revision date.
 - .2 Project title and complete number.
 - .3 Name, address and telephone numbers of the following:
 - .1 General contractor.
 - .2 Sub contractor.
 - .3 Manufacturer.
 - .4 Supplier.
 - .5 Installer.
 - .6 The specification section which the product is related to including article number where product is specified.
 - .7 All information requested in applicable specification sections.
 - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .5 Details of appropriate portions of work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearance.
 - .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 adjacent work.
 - .6 Delete information not applicable to project.
 - .7 Supplement standard information to provide details applicable to project.
 - .8 After Engineer-Architect's review, distribute copies.
 - .9 If upon review by Engineer-Architect, no errors or omissions are discovered or if only minor corrections are made, electronic copy will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
 - .10 **The review of shop drawings is for sole purpose of ascertaining conformance with general concept.** This review shall not mean approval of detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall **not relieve** Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting all requirements of construction and Contract Documents. Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of

construction and installation and for co-ordination of
Work of all sub-trades.

- .3 Samples
 - .1 Submit for review samples as requested in respective specification Sections. Label samples with origin and intended use.
 - .2 Deliver samples prepaid to Engineer-Architect's business address.
 - .3 Where colour, pattern or texture is criterion, submit full range of samples.
 - .4 Adjustments made on samples by Engineer-Architect are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Engineer-Architect prior to proceeding with Work.
 - .5 Make changes in samples which Engineer-Architect may require, consistent with Contract Documents.
 - .6 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.
- .4 Operating Maintenance Manuals
 - .1 Two weeks prior to Substantial Performance of the Work or as directed by the Engineer - Architect, submit to Engineer-Architect, one copy of operating and maintenance manual for review. Modify operating maintenance manuals as required by review.
 - .2 Manuals to contain the following.
 - .1 Date submitted.
 - .2 Project title, location and project number.
 - .3 Names and addresses of Contractor and all sub-contractors.
 - .4 Table of Contents in accordance to spec sections.
 - .5 Guaranties and Warranties.
 - .6 Operational information on equipment. Cleaning and lubrication schedules, filters, overhaul and adjustment schedules and similar maintenance information.
 - .7 Complete set of reviewed shop drawings.
 - .8 Complete set of project specification.
 - .3 Bind contents in a three-ring, hard covered, plastic jacketed binder. Organize contents into applicable categories of work, parallel to specifications Sections.
 - .4 On completion of Work and prior to Final Inspection, submit three copies of modified Operating Maintenance Manuals.
 - .5 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured products.
 - .6 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
 - .7 Moisture-protection and Weather-exposed Products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .5 Record Documents
 - .1 After award of Contract, Engineer-Architect will provide 2 sets of white print drawings for purpose of maintaining record drawings. Using RED INK, accurately and neatly record deviations from

- Contract Documents caused by site conditions and changes ordered by Engineer-Architect.
- .2 Record locations of concealed components of mechanical and electrical services.
 - .3 Identify drawings as "Project Record Copy". Maintain in new condition and make available for inspection on site, and at all job meetings, by Engineer-Architect.
 - .4 On completion of Work and prior to final inspection, submit record documents to Engineer-Architect for preparation of electronic "AS BUILT" documents.
 - .5 Contract Drawings and shop drawings: legibly mark each item to record actual construction, including:
 - .1 Measured 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.
 - .6 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 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
 - .3 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
 - .4 Provide servicing and lubrication schedule, and list of lubricants required.
 - .5 Include manufacturer's printed operation and maintenance instructions.
 - .6 Include sequence of operation by controls manufacturer.
 - .7 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
 - .8 Provide installed control diagrams by controls manufacturer.
 - .9 Provide Contractor's coordination drawings, with installed colour coded piping diagrams.
 - .10 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

- .11 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .12 Include test and balancing reports.
- .13 Additional requirements: As specified in individual specification sections.
- .7 Specifications: legibly mark (unless advised otherwise) each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Addenda and change orders.
- .8 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.

1.7 NOT USED

1.8 SCHEDULE

- .1 Schedules Required.
 - .1 Construction Progress Schedule.
- .2 Format
 - .1 Prepare schedule in form of horizontal bar chart.
 - .2 Provide separate bar for **each trade or operation.**
 - .3 Provide horizontal time scale identifying first work day of each week.
 - .4 Format for listings: Chronological order of start of **each item of work.**
- .3 Submissions
 - .1 Submit initial schedules **within 10 days** after award of contract, unless indicated or directed otherwise (for emergency projects for example).
 - .2 Submit electronic copy.
 - .3 Engineer-Architect will review schedule and return reviewed electronic copy within 5 days after receipt.
 - .4 Resubmit finalized schedule within 2 days after return of reviewed copy.

1.9 SITE INSTRUCTION

- .1 When a clarification or modification of the Work is required which does not require an adjustment of the Contract Price or Contract Time, the Engineer-Architect will issue a Site Instruction.
- .2 Upon receipt of a Site Instruction, the Contractor to proceed promptly with the Work.

1.10 VALUATION OF CHANGES IN THE WORK

- .1 The value of any changes in the work will be determined in one or more of the following ways, as determined by the Engineer-Architect:
 - .1 Lump Sum: An agreement between the Engineer-Architect and the Contractor on a fixed price.
 - .2 Unit Price: Refer to the Tender Form for unit prices agreed upon or as listed in the Contract.
 - .3 Cost Plus: Cost of work and percentage; or cost and fixed fee.

- .2 When determining costs using the Lump Sum or Cost Plus method, the Contractor to submit an itemized account of the cost of expenditures and savings that includes, but is not limited to, the subcontractors' and suppliers' signed quotations and breakdown estimates for material and labour (i.e. itemized materials lists and labour, including labour rates and number of hours to perform work).
- .3 When determining costs using the Lump Sum or Cost Plus method, the itemized account to include all documents and supporting data required to certify the adjustments to the Contract Price, as determined by the Engineer-Architect.
- .4 For changes where the individual trade cost is anticipated to be less than \$1,000.00, the requirement for the itemized account may be waived, however individual trade quotations must be supplied.
- .5 If appropriate submittals are not provided as required above, the Engineer-Architect will not be held responsible for costs of delays associated with this Work.

1.11 QUALITY CONTROL

- .1 Inspection
 - .1 Owner and Engineer-Architect shall have access to the Work.
 - .2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Engineer-Architect's instructions, or law of Place of the Work.
 - .3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.

1.12 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

- .1 Installation/Removal
 - .1 Provide construction facilities and temporary controls in order to execute work expeditiously.
 - .2 Remove from site all such work after use.
- .2 Weather Enclosures
 - .1 If required, provide weathertight closures approved by Engineer - Architect to unfinished door and window openings, tops of shafts and also including but not limited to any and all other openings in floors, roofs, ceilings, walls, foundation walls, etc., which are exposing the interior of the building to the exterior elements
 - .2 Close off floor areas where walls are not finished; seal off other openings; enclose building interior work area for temporary heat, if applicable.
- .3 Dust Tight Screens
 - .1 Provide dust tight screens or partitions to localize dust generating activities, and for protection of workers, finished areas of Work and public.
 - .2 Maintain and relocate protection until such Work is complete.
- .4 Dewatering
 - .1 Provide temporary drainage and pumping facilities to keep excavations and site free from standing water.
- .5 Site Storage/Loading
 - .1 Confine the Work and operations of employees to limits indicated by Contract Documents. Do not unreasonably encumber premises with Products.

- .2 Do not load or permit to be loaded any part of the Work with a weight or force that will endanger the Work.
- .6 Sanitary Facilities
 - .1 Provide sufficient sanitary facilities for workers in accordance with local health authorities.
 - .2 Maintain in clean condition.
 - .3 Existing facilities as designated may be used during construction period, only if permission is granted by Owner (when available and when applicable).
- .7 Equipment/Tool/Materials Storage
 - .1 Provide and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.
 - .2 Locate materials not required to be stored in weatherproof sheds on site in manner to cause least interference with work activities.
- .8 Project Cleanliness
 - .1 Maintain the Work in tidy condition, free from accumulation of waste products and debris.
 - .2 Remove waste material and debris from site and deposit in waste container at end of each working day.
 - .3 Clean interior areas prior to start of finish work, maintain areas free of dust and other contaminants during finishing operations.

1.13 MATERIAL
AND EQUIPMENT

- .1 Product and Material Quality
 - .1 Products, materials, equipment and articles (referred to as Products throughout specifications) incorporated in Work shall be new, not damaged or defective, and of best quality (compatible with specifications) for purpose intended. If requested, furnish evidence as to type, source and quality of Products provided.
 - .2 Defective Products, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective Products at own expense and be responsible for delays and expenses caused by rejection.
 - .3 Should any dispute arise as to quality or fitness of Products, decision rests strictly with Engineer-Architect based upon requirements of Contract Documents.
- .2 Storage, Handling and Protection
 - .1 Handle and store Products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
 - .2 Store packaged or bundled Products in original and undamaged condition with manufacturer's seals and labels intact.
 - .3 Store products subject to damage from weather in weatherproof enclosures.
- .3 Manufacturer's Instructions
 - .1 Unless otherwise indicated in specifications, install or erect Products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with Products. Obtain written instructions directly from manufacturers.
 - .2 Notify Engineer-Architect in writing, of conflicts between specifications and manufacturer's instructions, so that Engineer-Architect may establish course of action.
 - .3 Improper installation or erection of Products, due to failure in complying with these requirements, authorizes

Engineer-Architect to require removal and reinstallation at no increase in Contract Price.

- .4 Workmanship
 - .1 Workmanship shall be best quality, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Consultant if required Work is such as to make it impractical to produce required results.
 - .2 Do not employ any unfit person or anyone unskilled in their required duties.
 - .3 Decisions as to quality or fitness of workmanship in cases of dispute rest solely with Engineer-Architect, whose decision is final.
- .5 Concealment
 - .1 In finished areas, conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.
 - .2 Before installation, inform Engineer-Architect if there is a contradictory situation. Install as directed by Engineer-Architect.
- .6 Additional Requirements: as specified in individual specifications sections.

1.14 PROJECT
CLOSEOUT

- .1 Final Cleaning
 - .1 When the Work is Substantially Performed, remove surplus products, tools construction machinery and equipment not required for performance of remaining Work.
 - .2 Remove waste materials and debris from site at regularly scheduled times. Do not burn waste materials on site.
 - .3 Leave work broom clean before inspection process commences.
 - .4 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.
 - .5 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fittings, walls, and as directed by Engineer - Architect.
 - .6 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
 - .7 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.
 - .8 Broom clean and wash exterior walks, steps and surfaces.
 - .9 Remove dirt and other disfigurements from exterior surfaces.
- .2 Systems Demonstration (When applicable with new equipment and as directed by Engineer - Architect).
 - .1 Prior to final inspection, demonstrate operation of each system to Owner and Engineer-Architect.
 - .2 Instruct personnel in operation, adjustment, and maintenance of equipment and systems, using provided operation and maintenance data as basis for instruction.
 - .3 Turn over maintenance materials required by respective sections of these specifications.
- .3 Documents
 - .1 Collect reviewed all submittals and assemble documents executed by Subcontractors, suppliers, and manufacturers as per Section 01 00 02 articles 1.6.4 and 1.6.5.
 - .2 Submit material prior to final Application for Payment.
 - .3 Submit operation and maintenance data, record (project record copies) drawings.

- .4 Provide all warranties and bonds fully executed and notarized. Refer also to Section 01 00 02 articles 1.6.4 and 1.6.5.
 - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
 - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
 - .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 Interim Completion Inspection 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.
- .4 Spare Parts
 - .1 Provide spare parts, in quantities specified in individual specification sections.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to site at location as directed; place and store.
 - .4 Receive and catalogue all items. Submit inventory listing to Engineer-Architect. Include approved listings in Maintenance Manual.
 - .5 Obtain receipt for delivered products and submit prior to final payment.
- .5 Maintenance Materials
 - .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to site at location as directed; place and store.
 - .4 Receive and catalogue all items. Submit inventory listing to Engineer-Architect. Include approved listings in Maintenance Manual.
 - .5 Obtain receipt for delivered products and submit prior to final payment.
- .6 Special Tools
 - .1 Provide special tools, in quantities specified in individual specification section.
 - .2 Provide items with tags identifying their associated function and equipment.
 - .3 Deliver to site at location as directed; place and store.
 - .4 Receive and catalogue all items. Submit inventory listing to Engineer-Architect. Include approved listings in Maintenance Manual.

1.15 INSPECTION
AND DECLARATION
PROCEDURES

- .1 Contractor's Inspection: Contractor and all Subcontractors shall conduct an inspection of the Work, identify deficiencies and defects; repair as required to conform to Contract Documents. Notify Engineer-Architect in writing of satisfactory completion of Contractor's Inspection and that corrections have been made. The Contract may then request the Engineer-Architect to perform an interim completion inspection.

- .2 Interim completion Inspection: Engineer-Architects, Consultants and Contractor will perform an inspection of the Work to identify obvious defects or deficiencies. Contractor shall correct the deficiencies within a time period agreeable to Contractor and Engineer-Architect after all deficiencies are completed the Contractor may call for a final inspection.
- .3 Interim Certificate of Completion: Upon completion of the interim inspection, if Engineer-Architect is satisfied that work is substantially completed and acceptable for use, he may issue an Interim Certificate of Completion, describing portions of work not completed to his satisfaction.
- .4 Final Completion: When Engineer-Architect consider final deficiencies and defects have been corrected and it appears requirements of contract have been totally performed he may issue to the contractor a final certificate of completion.
- .5 The occupying of a completed or partially completed area will be preceded by an occupancy inspection at which time the Engineer-Architect shall list all deficiencies to the Work and advise Contractor accordingly. The user shall carry out and be responsible for day to day maintenance on the area that is occupied. Contractor shall be responsible to do maintenance on and operate any mechanical or electrical systems which are not certified complete by the Engineer-Architect. No warranties or lien periods shall begin as a result of the above described interim occupancy period.
- .6 Interim/Final Certificates of Completion: If the Engineer-Architect does not find the Work to be substantially completed and an Interim/Final Certificate is not issued, the costs associated with extra inspections shall be borne by the Contractor.
- .7 **Commencement of Lien and warranty periods: all lien and warranty periods shall commence at date of substantial completion. Warranty period shall be one year minimum from this date. Coordinate with other specification sections for additional coverage where indicated.**

PART 2 - PRODUCTS N/A

PART 3 - EXECUTION N/A

End of Section

PART 1 - GENERAL

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A123/A123M-02, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .2 ASTM A653/A653M-06, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA B111-1974 (R2003), Wire Nails, Spikes and Staples.
 - .2 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CSA O121-M1978(R2003), Douglas Fir Plywood.
 - .4 CSA O141-05, Softwood Lumber.
 - .5 CSA O151-04, Canadian Softwood Plywood.
 - .6 CSA O153-M1980 (R2003), Poplar Plywood.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .4 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber 2005.

1.2 QUALITY ASSURANCE

- .1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.
- .2 Plywood identification: by grade mark in accordance with applicable CSA standards.
- .3 Plywood, OSB and wood based composite panel construction sheathing identification: by grademark in accordance with applicable CSA standards.

PART 2 - PRODUCTS

2.1 LUMBER MATERIAL

- .1 Lumber: unless specified otherwise, softwood, S4S, moisture content 19% or less in accordance with following standards:
 - .1 CAN/CSA-O141.
 - .2 NLGA Standard Grading Rules for Canadian Lumber.
- .2 Furring, blocking, nailing strips, grounds, rough bucks, cants, curbs, fascia backing and sleepers:
 - .1 S2S is acceptable.
 - .2 Board sizes: "Standard" or better grade.
 - .3 Dimension sizes: "Standard" light framing or better grade.

.4 Post and timbers sizes: "Standard" or better grade.

2.2 PANEL MATERIALS

- .1 Douglas fir plywood: to CSA O121, standard construction.
 - .1 Urea-formaldehyde free.
- .2 Canadian softwood plywood (CSP): to CSA O151, standard construction.
 - .1 Urea-formaldehyde free.
- .3 Poplar Plywood: to CSA O153, standard construction.
 - .1 Urea-formaldehyde free.
- .4 Plywood, OSB and wood based composite panels: to CAN/CSA-O325.
 - .1 Urea-formaldehyde free.

2.3 ACCESSORIES

- .1 Nails, spikes and staples: to CSA B111.
- .2 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers.
- .3 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, explosive actuated fastening devices, recommended for purpose by manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Comply with requirements of NBC, supplemented by the following paragraphs.
- .2 Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, facings, fascia, soffit, siding and other work as required.
- .3 Align and plumb faces of furring and blocking to tolerance of 1:600.
- .4 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.
- .5 Install wood nailers, curbs and other wood supports as required and secure using galvanized fasteners.
- .6 Install sleepers as indicated.
- .7 Use caution when working with particle board. Use dust collectors and high quality respirator masks.

3.2 ERECTION

- .1 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.
- .2 Countersink bolts where necessary to provide clearance for other work.

3.3 SCHEDULES

- .1 Provide electrical equipment backboards for mounting electrical equipment as indicated. Use 19mm thick plywood on 19 x 38 mm furring around spacing, perimeter and at maximum 300 mm intermediate

End of Section

PART 1 - GENERAL

- 1.1 RELATED SECTIONS .1 Section 07 92 10 - Joint Sealing.
- 1.2 REFERENCES
- .1 American National Standards Institute (ANSI)
 - .1 ANSI A208.1-99, Particleboard.
 - .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM E1333-96, Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates From Wood Products Using a Large Chamber.
 - .2 ASTM D5116-97, Standard Guide For Small-Scale Environmental Chamber Determinations of Organic Emissions From Indoor Materials/Products.
 - .3 Architectural Woodwork Manufacturers Association of Canada (AWMAC)
 - .1 AWMAC Quality Standards for Architectural Woodwork , 2003.
 - .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-71.20-M88, Adhesive, Contact, Brushable.
 - .5 Canadian Standards Association (CSA)
 - .1 CSA B111-74(R1998), Wire Nails, Spikes and Staples.
 - .2 CSA O112.4-M1977(R1999), Standards for Wood Adhesives.
 - .3 CSA O112.5-Series-M-1977(R1999), Urea Resin Adhesives for Wood (Room- and High-Temperature Curing).
 - .6 Environmental Choice Program (EPC)
 - .1 ECP-44-92, Adhesives.
 - .2 ECP-45-92, Sealants and Caulking Compounds.
 - .3 ECP-76-98, Surface Coatings.
 - .7 National Electrical Manufacturers Association (NEMA)
 - .1 NEMA LD-3-95.
 - .8 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber , 2000.
- 1.3 SHOP DRAWINGS
- .1 Indicate details of construction, profiles, jointing, fastening and other related details.
 - .1 Scales: profiles full size, details 1/2 full size.
 - .2 Indicate materials, thicknesses, finishes and hardware.
 - .3 Indicate locations of service outlets in casework, typical and special installation conditions, and connections, attachments, anchorage and location of exposed fastenings.

- 1.4 SAMPLES
- .1 Submit duplicate samples: sample size 300 x 300 mm unless specified otherwise of MCP.
 - .2 Submit duplicate colour samples of laminated plastic for colour selection.
 - .3 Submit duplicate samples of laminated plastic joints, edging, cutouts and postformed profiles.
- 1.5 QUALITY ASSURANCE
- .1 Lumber by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.
 - .2 Plywood, particleboard, OSB and wood based composite panels in accordance with CSA and ANSI standards.
- 1.6 DELIVERY, STORAGE, AND HANDLING
- .1 Protect millwork against dampness and damage during and after delivery.
 - .2 Store millwork in ventilated areas, protected from extreme changes of temperature or humidity.
- 1.7 EXTENDED WARRANTY
- .1 Provide a written warranty on materials and workmanship for a period of five (5) years after substantial performance.

PART 2 - PRODUCTS

- 2.1 MATERIALS
- .1 Softwood lumber: unless specified otherwise, S4S, moisture content 7% or less in accordance with following standards:
 - .1 AWMAC custom grade, moisture content as specified.
 - .2 Hardwood lumber: maple moisture content 8% or less in accordance with following standards:
 - .1 National Hardwood Lumber Association (NHLA), select, or better grade, white wood only.
 - .3 Particle board core: to CAN3-0188.1, sanded faces of thickness indicated.
 - .4 Melamine Component Panel (MCP): to ANSI-A208.1:
 - .1 Core: grade M02 particle board; no added urea formaldehyde when tested in accordance with ASTM E1333.
 - .2 Thermally fused melamine, 2 sides, suede, natural Maple colour/pattern, unless noted otherwise.
 - .3 Adhesives used to fabricate laminated assemblies containing these products must contain no urea formaldehyde.
 - .4 Forest Stewardship Council (FSC) certified.
 - .5 Plastic laminate - commercial grade:
 - .1 Post forming grade - 0.030" thick.
 - .2 Flat work grade - 0.045" thick.

- .3 Approved manufacturers:
 - .1 Nevemar
 - .2 Formica.
 - .3 Arborite.
 - .4 Pionite.
- .6 Edgebanding:
 - .1 General, all exposed edges: 3mm PVC, colour and through pattern to match face panel, unless noted otherwise.
 - .2 Concealed edges only: 0.5mm (0.018") PVC, colour to match face where used on concealed shelf edges.
 - .3 All edgebanding to be applied using an edgebanding machine with heat, pressure and glue.
- .7 Douglas Fir Plywood: to CSA 0121-M, exterior grade, good one side.
 - .1 Canply/COFI certified.
 - .2 Forestry Stewardship Council (FSC) certified.
 - .3 Urea formaldehyde free.
- .8 Laminated plastic backing sheet: same thickness as face laminate.
- .9 Nails and staples: to CSA B111.
- .10 Particle board screws: low root and high thread, purpose made for installation in particle board, size to suit application.
- .11 Screws into concrete block: Tapcon by Buildex a division of ITW.
- .12 Screws and bolt caps to cover heads of fasteners used to secure cabinets to walls - pop on screw covers for 6mm diameter screws - by Spaenaur.
- .13 Gable connectors - joint connector bolt JCBB0101 Cx2 and joint connector cap JCN010 Cx2 by Richielieu.
- .14 Door and drawer bumpers: thin self-adhesive bumpers available from various sources.
- .15 Wall bumpers: bumpers about 6mm thick from various sources.
- .16 Splines: wood.
- .17 Sealant: as per section 079210.

2.2 MANUFACTURED UNITS

- .1 Casework.
 - .1 Fabricate caseworks to AWMAC custom quality grade. Generally construct casework of 19mm MCP as indicated.
 - .2 Toe kicks to be 19mm Douglas Fir plywood.
 - .3 Fabrication to be with dowels.
 - .4 Cabinet backs shall be 12mm MCP installed as full overlay or 16mm overlay where the exterior side of the gable is exposed. Secure with #8x38mm particle board screws.
 - .5 Shelves to be 19mm MCP, with 3mm black PVC edging on front edge and remaining edges to have 0.5mm black edge tape.
- .2 Countertops; typical:
 - .1 Post formed countertops and backsplashes of plastic laminate 0.039" on 19mm particleboard, with backer sheet on reverse side, no added urea formaldehyde..
 - .2 Nosing to be 180 degree, "Ultra" bullnose.
 - .3 Top of backsplash to be 90 degree.

- .4 Trim corners of countertops where required so adjacent cabinet doors, when fully open, do not contact the corner of the countertop.
- .5 Adhesives used to fabricate laminated assemblies containing these products must contain no urea formaldehyde.
- .3 Drawers:
 - .1 Fabricate drawers to AWMAC custom grade supplemented as follows:
 - .1 Fabricate drawers to AWMAC custom grade supplemented as follows:
 - .2 Sides, front and back of boxes: construct of 12mm MCP.
 - .3 Bottom: 12mm MCP - white color.
 - .4 Exposed edges of the box finished and 3mm black PVC.
 - .5 Drawer fronts to be securely fastened to drawer boxes.
 - .6 Drawer bottom to be captured in 9mm standing shoulders on all four sides, or captured in front and two sides with #8 screws at 100mm c/c on the back edge with staples between, or captured on two sides and secured with screws and staples on front and back.
 - .2 typical doors and drawer fronts to be 19mm MCP complete with 3mm PVC edging (black in color).
- .4 Cabinet hardware:
 - .1 Hinges: Richelieu # 71-665180, 170 degree swing, spring loaded, with cruciform 2 part mounting plate for 3 dimensional adjustment, Richelieu # 173H710180.
 - .2 Cabinet pulls: Richelieu 33205195 - 96mm metal pull brushed nickel or chrome.
 - .3 Cabinet locks:
 - .1 Cam Lock: Richelieu # 1882712.
 - .2 Cylinders: Richelieu # 18006011.
 - .4 Elbow catch- Richelieu - 5540 -130.
 - .5 Drawer hardware:
 - .1 Drawer slides: full extension ball bearing:
 - .1 Regular: Richelieu # 3832.
 - .2 Large/File/Heavy: Richelieu # 417 (Accuride # 4034).
 - .2 Drawer pulls: Richelieu # 33205195, 96mm metal pull, brushed nickel.
 - .3 Drawer locks: All locks keyed alike.
 - .1 Richelieu # 1842507.
 - .2 Cylinders: Richelieu # 18006011.
 - .6 Adjustable shelving:
 - .1 Pilaster strips: KV 255 ZC.
 - .2 Pilaster clips: KV 256 ZC.Note: drilled holes with shelf supports are not acceptable.
 - .7 Plastic grommets: Richelieu 3" diameter plastic grommet complete with case and cover.
 - .8 Other special hardware as noted on drawings.
 - .9 All locks within each room shall be keyed alike, with 4 keys provided per room. No two rooms shall be keyed alike.

2.3 FABRICATION

- .1 All edges not specified to have 3mm PVC edging whether exposed or concealed from view, are to be sealed with melamine tape.
- .2 Shop install cabinet hardware for doors, shelves and drawers. Recess shelf standards unless noted otherwise.
- .3 Shelving to cabinetwork to be adjustable unless otherwise noted.
- .4 Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes and other fixtures.
- .5 Shop assemble work for delivery to site in size easily handled and to ensure passage through building openings.
- .6 Obtain governing dimensions before fabricating items which are to accommodate or abut appliances, equipment and other materials.
- .7 Ensure adjacent parts of continuous laminate work match in colour and pattern.
- .8 Veneer laminated plastic to core material in accordance with adhesive manufacturer's instructions. Ensure core and laminate profiles coincide to provide continuous support and bond over entire surface. Use continuous lengths up to 2400 3000 mm. Keep joints 600 mm from sink cutouts.
- .9 Form shaped profiles and bends as indicated, using post-forming grade laminate to laminate manufacturer's instructions.
- .10 Use straight self-edging laminate strip for flatwork to cover exposed edge of core material. Chamfer exposed edges uniformly at approximately 20 degrees. Do not mitre laminate edges.
- .11 Apply laminate backing sheet to reverse side of core of plastic laminate work.
- .12 Filler strips: 19mm MCP where cabinets fit between or against a wall or at corner intersections of cabinet elevations.
- .13 Provide bumpers on all doors and drawer fronts.
- .14 Provide a bumper on the wall adjacent to every door whose handle will hit the wall.
- .15 Hinges: three per base unit or upper cabinet door, four per cabinet door above file drawers and five per full height cabinet door.

2.4 FINISHING

- .1 MCP to be chosen by Consultant from standard wood grain finishes. Finish to be suede or dolomite.
- .2 Clear finish all wood surfaces, for off-site finishing:
 - .1 Base coat of catalyzed sealing lacquer.
 - .2 Two finish coats of catalyzed top coat lacquer.
 - .1 Approved products:
 - .1 ML Campbell
 - .2 Sadolin
 - .3 Sand between all coats.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Do architectural woodwork to Custom Quality Standards of the Architectural Woodwork Manufacturers Association of Canada (AWMAC), except where specified otherwise.
- .2 Install prefinished millwork at locations shown on drawings. Position accurately, level, plumb straight.
- .3 Fasten and anchor millwork securely. Provide heavy duty fixture attachments for wall mounted cabinets.
 - .1 Cabinet bases to be secured to the floor with 38mmx25mm x 25mm metal cabinet clips. Use 5mmx23mm drop in pin bolts into floor and #8x19mm wood screws into the base. Minimum of 6 clips per base section.
 - .2 Full height cabinets to be secured to concrete block walls with 16mm x56mm Tapcon screws. Minimum of four screws per unit.
 - .3 Wall mounted upper cabinets to be secured to concrete block walls with 6mmx56mm Tapcon screws. Minimum of four per individual shelf box. Two located 2" down from the top and two at mid height.
 - .4 All gables to be connected together with specified joint connector bolt and cap. Four per cabinet.
 - .5 Where cabinets are to be attached to steel stud or wood stud walls install 50mmx150mm wood blocking between the studs in a continuous line to accept fasteners at the same spacing as for concrete block walls. Fasteners into wood blocking to be #12 x 62mm wood screws.
 - .6 All exposed bolt heads and screw heads to be covered with specified Screw and Bolt Caps.
- .4 Use draw bolts in countertop joints.
- .5 Scribe and cut as required to fit abutting walls and to fit properly into recesses and to accommodate piping, columns, fixtures, outlets or other projecting, intersecting or penetrating objects.
- .6 At junction of plastic laminate counter back splash and adjacent wall finish, apply small bead of sealant.
- .7 Apply bituminous coating over wood framing members in contact with masonry or cementitious construction.
- .8 Fit hardware accurately and securely in accordance with manufacturer's written instructions.

3.2 CLEANING

- .1 Clean millwork and cabinet work inside cupboards and drawers and outside surfaces.
- .2 Remove excess glue from surfaces.

3.3 PROTECTION

- .1 Protect millwork and cabinet work from damage until final inspection.

End of Section

PART 1 - GENERAL

- 1.1 RELATED WORK .1 Fire stopping and smoke seals within mechanical assemblies (i.e inside ducts, dampers) and electrical assemblies (i.e. inside cable trays) are specified in Division 23 and 26 respectively.
- 1.2 REFERENCES .1 Underwriter's Laboratories of Canada (ULC)
.1 ULC-S115-1995, Fire Tests of Firestop Systems.
- 1.3 SAMPLES .1 Not required.
- 1.4 SHOP DRAWINGS .1 Submit shop drawings to show proposed material, reinforcement, anchorage, fastenings and method of installation. Construction details should accurately reflect actual job conditions.
- 1.5 PRODUCT DATA .1 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.
.2 Manufacturer's engineering judgement identification number and drawing details when no ULC or cUL system is available for an application. Engineered judgement must include both project name and contractor's name who will install firestop system as described in drawing.
.3 Submit material safety data sheets provided with product delivered to job site.
- 1.6 SYSTEMS DESCRIPTION .1 Firestopping materials: in accordance with CAN1-S115M and ASTM E814 to achieve a fire protection rating of one (1) hour construction.
.2 Work of this section comprises firestop and smoke seal materials and/or systems to provide closures to fire and smoke at openings, around penetrations, at unpenetrated openings, at projecting of recessed items, and at openings and joints within fire separations and assemblies having a fire-resistance rating, including openings and spaces at perimeter edge conditions.
.3 The installed seal shall provide and maintain a fire resistance rating equivalent to the rating of the adjacent floor, wall or other fire separation assembly to the requirements of and as acceptable to the authorities having jurisdiction and to architect.
.4 Firestopping and smoke seals within mechanical (i.e. inside ducts, dampers) and electrical assemblies (i.e. inside electrical

busducts) shall be provided as part of work of Division 23 and 26 respectively. Firestopping and smoke seals around the outside of such mechanical and electrical assemblies where they penetrate fire-rated separations shall be part of the work of this section.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Fire stopping and smoke seal systems: in accordance with ULC-S115.
 - .1 Asbestos-free materials and systems capable of maintaining an effective barrier against flame, smoke and gases in compliance with requirements of ULC-S115 and not to exceed opening sizes for which they are intended and conforming to special requirements specified in 3.5.
 - .2 Firestop system rating: FT.
- .2 Service penetration assemblies: certified by ULC in accordance with ULC-S115 and listed in ULC Guide No.40 U19.
- .3 Service penetration firestop components: certified by ULC in accordance with ULC-S115 and listed in ULC Guide No.40 U19.13 and ULC Guide No.40 U19.15 under the Label Service of ULC.
- .4 Fire-resistance rating of installed fire stopping assembly in accordance with NBC.
- .5 Fire stopping and smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal.
- .6 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal.
- .7 Primers: to manufacturer's recommendation for specific material, substrate, and end use.
- .8 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.
- .9 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.
- .10 Sealants for vertical joints: non-sagging.
- .11 Smoke seals: materials for use as smoke seals only, with no requirement for a rating, may be butyl Acoustical Sealant in concealed applications, and permanently elastic, paintable latex acrylic Acoustical Sealant in exposed applications.

PART 3 - EXECUTION

3.1 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 fire stopping materials and smoke seals to manufacturer's instructions.

- .3 Maintain insulation around pipes and ducts penetrating fire separation.
- .4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

3.2 INSTALLATION

- .1 Install fire stopping and smoke seal material and components in accordance with ULC certification 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 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.
- .4 Tool or trowel exposed surfaces to a neat finish.
- .5 Remove excess compound promptly as work progresses and upon completion.

3.3 INSPECTION

- .1 Notify Consultant when ready for inspection and prior to concealing or enclosing firestopping materials and service penetration assemblies.

3.4 SCHEDULE

- .1 Firestop and smoke seal at:
 - .1 Penetrations through fire-resistance rated masonry, and gypsum board partitions and walls.
 - .2 Top of fire-resistance rated masonry and gypsum board partitions.
 - .3 Intersection of fire-resistance rated masonry and gypsum board partitions.
 - .4 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.
 - .5 Joint between floors and exterior wall assemblies.
 - .6 Penetrations through floor assemblies.
- .2 Smoke seal only at:
 - .1 Penetrations through all masonry and gypsum board partitions and walls specified as separations without ratings.
 - .2 Top of all "unrated" masonry and gypsum board partitions, as per plans. (Separations without a fire-resistant rating).jCLEAN UP
- .3 Remove excess materials and debris and clean adjacent surfaces immediately after application.
- .4 Remove temporary dams after initial set of fire stopping and smoke seal materials.

End of Section

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 Materials, preparation and application for caulking and sealants.
- .2 Text to complete other various Sections containing sealant or caulking specifications.

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM C919-02, Standard Practice for Use of Sealants in Acoustical Applications.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-19.13-M87, Sealing Compound, One-component, Elastomeric, Chemical Curing.
 - .2 CAN/CGSB-19.17-M90, One-Component Acrylic Emulsion Base Sealing Compound.
 - .3 CAN/CGSB-19.24-M90, Multi-component, Chemical Curing Sealing Compound.
- .3 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act, 1999 (CEPA).
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .5 Transport Canada (TC)
 - .1 Transportation of Dangerous Goods Act, 1992 (TDGA).

1.3 SUBMITTALS

- .1 Manufacturer's product to describe.
 - .1 Caulking compound.
 - .2 Primers.
 - .3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.
- .2 Submit duplicate samples of each type of material and colour.
- .3 Cured samples of exposed sealants for each color where required to match adjacent material.
- .4 Instructions to include installation instructions for each product used.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, handle, store and protect materials.
- .2 Deliver and store materials in original wrappings and containers with manufacturer's seals and labels, intact. Protect from freezing, moisture, water and contact with ground or floor.

1.5 PROJECT CONDITIONS

- .1 Environmental Limitations:
 - .1 Do not proceed with installation of joint sealants under following conditions:

- .1 When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4.4° C.
- .2 When joint substrates are wet.
- .2 Joint-Width Conditions:
 - .1 Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
- .3 Joint-Substrate Conditions:
 - .1 Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

- 1.6 ENVIRONMENTAL REQUIREMENTS
 - .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Labour Canada.
 - .2 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.

- 1.7 EXTENDED WARRANTIES
 - .1 For respective trade sections where sealants are used, provide a warranty of five years, for material and workmanship beyond substantial completion.

- PART 2 - PRODUCTS

- 2.1 SEALANT MATERIALS
 - .1 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.
 - .2 When low toxicity caulks are not possible, confine usage to areas which offgas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize offgas time.
 - .3 Where sealants are qualified with primers use only these primers.

- 2.2 LOW EMITTING MATERIALS
 - .1 All site-applied interior paints, coatings, adhesives, sealants, sealant primers, carpets, etc., must conform to VOC content requirements of LEED Canada-NC Version 1.0.
 - .2 Submit Material Safety Data Sheets (MSDS) for all products and materials of these types incorporated into the construction of the project as per Section 013300.

2.3 SEALANT MATERIAL DESIGNATIONS

- .1 Type 1 - Urethanes One Part:
 - .1 Self-levelling.
 - .2 Acceptable material:
 - .1 Tremco Tremflex S/L.
 - .2 Vulkem 45.
 - .3 Sonneborn SL 1.
 - .4 Sikaflex IC SL.
- .2 Type 2 - Urethanes One Part:
 - .1 Non-sag to CAN/CGSB-19.13, Type 2, MCG-2-25 colour to be selected.
 - .2 Acceptable material:
 - .1 Tremco Dymonic.
 - .2 Vulkem 116.
 - .3 Sonneborn NP 1.
 - .4 Sikaflex 1A.
- .3 Type 3 - Silicones One Part:
 - .1 To CAN/CGSB-19.22 (mildew resistant).
 - .2 Acceptable material:
 - .1 Tremco Proglaze.
 - .2 Dow 786.
 - .3 Sonneborn Omnipus.
- .4 Type 4 - Acrylic Latex One Part:
 - .1 To CAN/CGSB-19.17.
 - .2 Acceptable material:
 - .1 Tremco 100 Latex.
 - .2 Sonneborn Sonolac.
- .5 Type 5 - Acoustical Sealant:
 - .1 To CAN/CGSB-19.21.
 - .2 Acceptable material:
 - .1 Tremco acoustical sealant.
 - .2 Sonneborn Acoustical.
- .6 Type 6 - Urethanes Two Part:
 - .1 Acceptable material:
 - .1 Sikaflex 2C NS EZ Mix. For exterior joints up to 2.4 m above grade add T.G. additive to increase shore hardness.
 - .2 Approved equal.
 - .3 *Sonolastic NP2 by BASF. For exterior joints up to 2.4m above grade provide increase shore hardness. (Add#3, item 7)*
- .7 High Density Foam: Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m³ density, or neoprene foam backer, size as recommended by manufacturer.
- .8 Bond Breaker Tape: Polyethylene bond breaker tape which will not bond to sealant.

2.4 SEALANT SELECTION

- .1 Perimeters of exterior openings where frames meet exterior facade of building (i.e. brick), Sealant type: 2.
- .2 Coping joints and coping-to facade joints: Sealant type: 2.
- .3 Seal interior perimeters of exterior openings as detailed on drawings: Sealant type: 4.
- .4 Control and expansion joints on the interior of exterior surfaces of unit masonry walls: Sealant type: 4

	.5	Interior control and expansion joints in floor surfaces: Sealant type: 1.
	.6	Perimeters of interior frames, as detailed and itemized: Sealant type: 4.
	.7	Interior masonry vertical control joints (block-to-block, block-to-concrete, and intersecting masonry walls): Sealant type: 4.
	.8	Perimeter of bath fixtures (e.g. sinks, tubs, urinals, stools, waterclosets, basins, vanities): Sealant type: 3.
	.9	Exposed interior control joints in drywall: Sealant type: 4.
	.10	Acoustic sealant at perimeter and at openings in partitions: sealant Type 5.
	.11	Interior and exterior joints in tilt-up concrete panel: sealant Type 6.
<u>2.5 JOINT CLEANER</u>	.1	Non-corrosive and non-staining type, compatible with joint forming materials and sealant recommended by sealant manufacturer.
	.2	Primer: as recommended by manufacturer.
<u>PART 3 - EXECUTION</u>		
<u>3.1 PROTECTION</u>	.1	Protect installed Work of other trades from staining or contamination.
<u>3.2 SURFACE PREPARATION</u>	.1	Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.
	.2	Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair Work.
	.3	Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.
	.4	Ensure joint surfaces are dry and frost free.
	.5	Prepare surfaces in accordance with manufacturer's directions.
<u>3.3 PRIMING</u>	.1	Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.
	.2	Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to caulking.
<u>3.4 BACKUP MATERIAL</u>	.1	Apply bond breaker tape where required to manufacturer's instructions.
	.2	Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.

3.5 MIXING

- .1 Mix materials in strict accordance with sealant manufacturer's instructions.

3.6 APPLICATION

- .1 Sealant.
 - .1 Apply sealant in accordance with manufacturer's written instructions.
 - .2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.
 - .3 Apply sealant in continuous beads.
 - .4 Apply sealant using gun with proper size nozzle.
 - .5 Use sufficient pressure to fill voids and joints solid.
 - .6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.
 - .7 Tool exposed surfaces before skinning begins to give slightly concave shape.
 - .8 Remove excess compound promptly as work progresses and upon completion.
- .2 Curing.
 - .1 Cure sealants in accordance with sealant manufacturer's instructions.
 - .2 Do not cover up sealants until proper curing has taken place.
- .3 Cleanup.
 - .1 Clean adjacent surfaces immediately and leave Work neat and clean.
 - .2 Remove excess and droppings, using recommended cleaners as work progresses.
 - .3 Remove masking tape after initial set of sealant.

End of Section

PART 1 - GENERAL

1.1 RELATED SECTIONS

- .1 Section 079210 - Joint Sealing: Caulking of joints between frames and other building components.
- .2 Section 087100 - Door Hardware - General: Supply of finish hardware, including weatherstripping and mounting heights.
- .3 Section 099123 - Interior Painting.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM International)
 - .1 ASTM A653/A653M-01a, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
 - .2 CGSB 41-GP-19Ma-84, Rigid Vinyl Extrusions for Windows and Doors.
- .3 Canadian Standards Association (CSA International)
 - .1 G40.20/G40.21-98, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CSA W59-M1989(R2001), Welded Steel Construction (Metal Arc Welding) (Metric Version).
- .4 Canadian Steel Door Manufacturers' Association, (CSDMA).
 - .1 CSDMA, Specifications for Commercial Steel Doors and Frames, 1990.
 - .2 CSDMA, Recommended Selection and Usage Guide for Commercial Steel Doors, 1990.
- .5 National Fire Protection Association (NFPA)
 - .1 NFPA 80-99, Standard for Fire Doors and Fire Windows.
 - .2 NFPA 252-99, Standard Methods of Fire Tests of Door Assemblies.
- .6 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN4-S104-80(R1985), Fire Tests of Door Assemblies.
 - .2 CAN4-S105-85(R1992), Fire Door Frames Meeting the Performance Required by CAN4-S104.

1.3 DESIGN REQUIREMENTS

- .1 Design exterior frame assembly to accommodate to expansion and contraction when subjected to minimum and maximum surface temperature of -35°C to 35°C.
- .2 Maximum deflection for exterior steel entrance screens under wind load of 1.2 kPa not to exceed 1/175th of span.

1.4 SHOP DRAWINGS

- .1 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners,

- openings, glazed, louvred, arrangement of hardware and fire rating and finishes.
- .2 Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings and reinforcing, firerating, finishes.
- .3 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.

1.5 REQUIREMENTS

- .1 Steel fire rated doors and frames: labelled and listed by an organization accredited by Standards Council of Canada in conformance with CAN4-S104M NFPA 252 for ratings specified or indicated.
- .2 Provide fire labelled frame products for those openings requiring fire protection ratings, as scheduled. Test products in strict conformance with CAN4-S104, ASTM E152 or NFPA 252 and list by nationally recognized agency having factory inspection service and construct as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Hot dipped galvanized steel sheet: to ASTM A653M, ZF75, minimum base steel thickness in accordance with CSDMA Table 1 - Thickness for Component Parts.
- .2 Reinforcement channel: to CSA G40.20/G40.21, Type 44W, coating designation to ZF75.

2.2 DOOR CORE MATERIALS

- .1 Honeycomb construction:
 - .1 Structural small cell, 24.5 mm maximum kraft paper 'honeycomb', weight: 36.3 kg per ream minimum, density: 16.5 kg/m³ minimum sanded to required thickness.
 - .2 Stiffened: face sheets laminated and welded, insulated core.
 - .1 Fibreglass: to CAN/ULC-S702, semi-rigid density 24 kg/m³, for sound insulated door.
 - .2 Polyurethane: to CAN/ULC-S704 rigid, modified poly/isocyanurate, closed cell board. Density 32 kg/m³ For thermal insulated door.

2.3 ADHESIVES

- .1 Honeycomb cores and steel components: heat resistant, spray grade, resin reinforced neoprene/rubber (polychloroprene) based, low viscosity, contact cement.
- .2 Polyurethane cores: heat resistant, epoxy resin based, low viscosity, contact cement.

<u>2.4 PRIMER</u>	.1	Touch-up prime CAN/CGSB-1.181.
<u>2.5 PAINT</u>	.1	Field paint steel doors and frames in accordance with Section 09 91 23 - Interior Painting. Protect weatherstrips from paint. Provide final finish shall be free of scratches or other blemishes.
<u>2.6 ACCESSORIES</u>	.1	Door silencers: single stud rubber/neoprene type.
	.2	Exterior and interior top caps: steel.
	.3	Fabricate glazing stops as formed channel, minimum 16 mm height, accurately fitted, butted at corners and fastened to frame sections with counter-sunk oval head sheet metal screws.
	.4	Door bottom seal: Refer to section 08 71 10.
	.5	Metallic paste filler: to manufacturer's standard.
	.6	Fire labels: metal rivited.
	.7	Sealant: refer to section 07 92 10.
	.8	Glazing: Refer to section 08 80 50.
	.9	Make provisions for glazing as indicated and provide necessary glazing stops.
	.1	Provide removable stainless steel glazing beads for use with glazing tapes and compounds and secured with countersunk stainless steel screws.
	.2	Design exterior glazing stops to be tamperproof.
<u>2.7 FRAMES FABRICATION</u>	.1	Fabricate frames in accordance with CSDMA specifications.
<u>GENERAL</u>	.2	Fabricate frames to profiles and maximum face sizes as indicated.
	.3	Exterior frames: 16 GA. welded thermally broken type construction.
	.4	Interior frames: 16 GA. welded type construction. Sound door shall have 14 GA. Frame.
	.5	Blank, reinforce, drill and tap frames for mortised, templated hardware, and electronic hardware using templates provided by finish hardware supplier. Reinforce frames for surface mounted hardware.
	.6	Protect mortised cutouts with steel guard boxes.
	.7	Prepare frame for door silencers, 3 for single door, 2 at head for double door.
	.8	Manufacturer's nameplates on frames and screens are not permitted.
	.9	Conceal fastenings except where exposed fastenings are indicated.
	.10	Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.
	.11	Insulate exterior frame components with polyurethane insulation.

2.8 FRAME ANCHORAGE

- .1 Provide appropriate anchorage to floor and wall construction.
- .2 Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb.
- .3 Provide 2 anchors for rebate opening heights up to 1520 mm and 1 additional anchor for each additional 760 mm of height or fraction thereof.
- .4 Locate anchors for frames in existing openings not more than 150 mm from top and bottom of each jambs and intermediate at 660 mm o.c. maximum.

2.9 FRAMES: WELDED TYPE

- .1 Welding in accordance with CSA W59.
- .2 Accurately mitre or mechanically joint frame product and securely weld on inside of profile.
- .3 Cope accurately and securely weld butt joints of mullions, transom bars, centre rails and sills.
- .4 Grind welded joints and corners to a flat plane, fill with metallic paste and sand to uniform smooth finish.
- .5 Securely attach floor anchors to inside of each jamb profile.
- .6 Weld in 2 temporary jamb spreaders per frame to maintain proper alignment during shipment.

2.10 DOOR FABRICATION
GENERAL

- .1 Doors: swing type, flush, with provision for glass and/or louvre openings as indicated.
- .2 Exterior doors: hollow steel construction. Interior doors: honeycomb construction.
- .3 Fabricate doors with longitudinal edges welded. Seams: grind welded joints to a flat plane, fill with metallic paste filler and sand to a uniform smooth finish.
- .4 Blank, reinforce, drill doors and tap for mortised, templated hardware and electronic hardware.
- .5 Factory prepare holes 12.7 mm diameter and larger except mounting and through-bolt holes, on site, at time of hardware installation.
- .6 Reinforce doors where required, for surface mounted hardware. Provide flush steel top caps to exterior doors. Provide inverted, recessed, spot welded channels to top and bottom of interior doors.
- .7 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.
- .8 Provide fire labelled doors for those openings requiring fire protection ratings, as scheduled. Test such products in strict conformance with CAN4-S104 ASTM E152 NFPA 252 and list by nationally recognized agency having factory inspection service and construct as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.
- .9 Manufacturer's nameplates on doors are not permitted.

2.11 DOORS: HONEYCOMB CORE CONSTRUCTION .1 Form each face sheet for interior doors from 16 GA. sheet steel with honeycomb core laminated under pressure to face sheets.

2.12 HOLLOW STEEL CONSTRUCTION .1 Form each face sheet for exterior doors from 16 GA. sheet steel.
.2 Form each face sheet for interior doors from 16 GA sheet steel, for sound insulated door.
.3 Reinforce doors with vertical stiffeners, securely welded to each face sheet at 150 mm on centre maximum.
.4 Fill voids between stiffeners of exterior doors with polyurethane core.
.5 Fill voids between stiffeners of interior sound doors with fibreglass core.

PART 3 - EXECUTION

3.1 INSTALLATION GENERAL .1 Install labelled steel fire rated doors and frames to NFPA 80 except where specified otherwise.
.2 Install doors and frames to CSDMA Installation Guide.

3.2 FRAME INSTALLATION .1 Set frames plumb, square, level and at correct elevation.
.2 Secure anchorages and connections to adjacent construction.
.3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 1200 mm wide. Remove temporary spreaders after frames are built-in.
.4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.
.5 Caulk perimeter of frames between frame and adjacent material.
.6 Maintain continuity of air barrier and vapour retarder where applicable.

3.3 DOOR INSTALLATION .1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 00 - Door Hardware - General.
.2 Provide even margins between doors and jambs and doors and finished floor and thresholds as follows.
.1 Hinge side: 1.0 mm.
.2 Latchside and head: 1.5 mm.
.3 Finished floor and thresholds: 13 mm.
.3 Adjust operable parts for correct function.
.4 Install louvres, supplied by Division 15.

.1 Touch up with primer finishes damaged during installation.

3.4 FINISH REPAIRS

.2 Fill exposed frame anchors and surfaces with imperfections with metallic paste filler and sand to a uniform smooth finish.

3.5 GLAZING

.1 Install glazing for doors and frames in accordance with Section 08 80 50 - Glazing.

End of Section

PART 1 – GENERAL

1.1 Related Sections

- | | | |
|----|-----------------------|-------------------------|
| .1 | Steel Doors & Frames: | Section 08 11 00 |
| .2 | Wood Doors: | Section 08 14 16 |

1.2 Reference Standards

- .1 Standard hardware location dimensions in accordance with the Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers Association.
- .2 ANSI/BHMA A156.2–2011, Bored and Preassembled Locks and Latches.
- .3 ANSI/BHMA A156.1–2013, Butts and Hinges.
- .4 ANSI/BHMA A156.3–2014, Exit Devices
- .5 ANSI/BHMA A156.4–2013, Door Controls (Closers).
- .6 ANSI/BHMA A156.5-2014, Auxiliary Locks and Associated Products
- .7 ANSI/BHMA A156.6-2010, Architectural Door Trim.
- .8 ANSI/BHMA A156.7-2014, Template Hinge Dimensions
- .9 ANSI/BHMA A156.8-2010, Door Controls – Overhead Holders
- .10 ANSI/BHMA A156.13-2012, Mortise Locks and Latches
- .11 ANSI/BHMA A156.15-2011, Closer/Holder Release Device.
- .12 ANSI/BHMA A156.16-2013, Auxiliary Hardware.
- .13 ANSI/BHMA A156.18-2012, Materials and Finishes
- .14 ANSI/BHMA A156.19-2013, Power Assist and Low Energy Power Operated Doors.
- .15 ANSI/BHMA A156.21-2014, American National Standards for Thresholds.
- .16 ANSI/BHMA A156.22-2012, Door Gasketing and Edge Seal Systems.

1.3 Requirements Regulatory Agencies

- .1 Hardware for doors in fire separations and exit doors to be certified by ULI / ULC, a Canadian Certification Organization accredited by Standards Council of Canada.

1.4 Samples

- .1 When requested, submit samples of hardware items in accordance with Section 01 00 02 – Standard General Requirements.

- .2 Identify each sample by label indicating applicable specification paragraph number, brand name and number, finish and hardware package number.
- .3 After approval, samples will be returned for incorporation in the Work.

1.5 Hardware Schedule

- .1 Submit contract hardware schedule using the standard DHI format for finish hardware schedules in accordance with Section 01 00 02 – Standard General Requirements
- .2 Clearly indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.

1.6 Maintenance Data

- .1 Provide operation and maintenance data for door closers, locksets, door holders and fire exit devices for incorporation into manual specified in Section 01 00 02 – Standard General Requirements.
- .2 Brief maintenance staff regarding proper care, cleaning and general maintenance of door hardware items.

1.7 Maintenance Materials

- .1 Provide maintenance materials in accordance with Section 00 01 10.
- .2 Supply two sets of wrenches for door closers, locksets and fire exit hardware.

1.8 Delivery and Storage

- .1 Store finishing hardware in locked, clean and dry area.
- .2 Package each item of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.

PART 2 – PRODUCTS

2.1 Hardware Items

- .1 Use one manufacturer's products only for all similar product groups.
- .2 The product numbers listed in the finish hardware schedule are to be used as the standard of acceptance for all items and are from the following group of manufacturers:

Full Mortise Hinges	Ives
Locksets, Deadlocks	Sargent
Rim Cylinders	Schlage
Exit Devices, Trims	Von Duprin
Power Supplies	Von Duprin
Door Closers, E/M Holders	LCN
Floor/Wall Stops, Flush Bolts	Ives Hardware
Push Plates, Pulls & Kickplates	Ives Hardware
Thresholds, Sound Seal, Door Bottoms & Sweeps, Astragals & Weatherstripping	DraftSeal

2.2 Door Hardware

- .1 Butts and hinges:
 - .1 Butts and continuous hinges: designated by letter and numeral identifiers, followed by size and finish, as listed in Hardware Schedule.
 - .2 Self-closing hinges and pivots: designated by letter and numeral identifiers as listed in Hardware Schedule.
 - .3 Butt hinges on exterior doors and locked doors opening out shall have non removable pins (NRP) and doors equipped with door closers or in high traffic areas shall have ball bearing (BB) hinges.
 - .4 Specified product - butt hinges: Ives

- .2 Locks and latches:
 - .1 Bored and preassembled locks and latches: to ANSI/BHMA A156.2, Series 4000 bored lock, grade 2, meeting A117.1 Accessibility code; designed for function and keyed as stated in Hardware Schedule.
 - .2 Normal strikes: ANSI, lip projection not to exceed ¼" beyond jam.
 - .3 Cylinders: 6-pin Standard Core, Keyed to Existing Sargent MK system.
 - .4 Lever Handles: Sargent "L" design as listed in schedule.
 - .5 Finish to be Satin Chrome 626.
 - .6 Specified product: Sargent

- .3 Exit Devices:
 - .1 to be heavy duty, grade 1, modern design push bar style, wide or narrow stile, to meet ANSI, ULC, NFPA and ADA certification, to have thru-bolted trim, heavy-duty steel I-beam bar, and heavy gauge latch head with reinforced bracket. All lever trims to be free-wheeling, vandal-resistant, and all devices to have deadlocking latchbolts.
 - .2 Finish to be Satin Chrome 626, for complete devices and trim. Functions and trims to be as listed in Hardware Schedule.
 - .3 Specified product: Von Duprin

- .4 Door Closers and Accessories:
 - .1 Door controls (closers): to meet or exceed ANSI A156.4 Grade 1 requirements; to be heavy duty cast iron bodies with adjustable spring power and have separate valves for latching, closing and backcheck control. All closer arms to be forged steel with power adjustment arm bracket.
 - .2 All closers are to be non-sized to suit door and opening, and to have full covers with finish 689. Brackets, shoes, and plates are to be included for proper mounting of closers. All closers shall have minimum 25 - year warranty.
 - .3 Specified product: LCN

- .5 Overhead stops/holders:
 - .1 Door controls (overhead stops/holders): to meet or exceed ANSI A156.8 Grade 1 requirements; to be heavy duty slide track type with heavy duty shock absorber spring and non-metal slide block and shock block, non-handed.
 - .2 to be brass or stainless steel material in Satin Chrome 652 finish.
 - .3 Specified product: Glynn-Johnson

- .6 Auxiliary locks:
 - .1 to meet ANSI A156.16 -1989 requirements, to be heavy-duty and finished in 626.
 - .2 Cylinders: rim or mortise type, "S" Keyway, keyed to **Existing** Schlage Master Key system as directed, finished to 626, for installation in existing exit devices as listed in Hardware Schedule.
 - .3 Specified product: Schlage

- .7 Architectural door trim:
 - .1 to meet ANSI A156.6-1994 requirements, type 304 stainless steel, finished 630.
 - .2 Door protection plates: kick plate type 304 stainless steel, 1.27 mm thick stainless steel, finished to 630.
 - .3 Push plates: type 304 stainless steel, 1.27 mm thick stainless steel, finished to 630.
 - .4 Push/Pull units: type 304 stainless steel, 1" thick stainless steel, finished to 630.
 - .3 Specified product: Ives Hardware

- .8 Door bottom seal:
 - .1 Heavy duty, door seal of extruded aluminum frame and solid closed cell neoprene seal, surface mounted, adjustable, automatic retract mechanism when door is open, clear anodized finish.
 - .2 Specified product: Draft Seal

- .9 Weatherstripping:
 - .1 Head and jamb seal:
 - .1 Extruded aluminum frame and solid closed cell neoprene insert, clear anodized finish.
 - .2 Adhesive backed santoprene material.
 - .2 Door Sweep:
 - .1 Extruded aluminum frame and closed cell neoprene, one inch drop, clear anodized finish.
 - .3 Specified product: Draft Seal

- .10 Astragal:
 - .1 adjustable, compensating, extruded aluminum frame with pile insert, clear anodized finish.
 - .2 Specified product: Draft Seal

2.3 Fastenings

- .1 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.
- .2 Exposed fastening devices to match finish of hardware.
- .3 Where pull is scheduled on one side of door and push plate on other side, supply fastening devices, and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.
- .4 Use fasteners compatible with material through which they pass.

2.4 Keying

- .1 All cylindrical locksets, deadlocks, and exit device trims to have 6-pin core cylinders keyed to suit, and be keyed to existing Schlage or Sargent Master Key system. Doors, padlocks and cabinet locks to be keyed differently, keyed alike, keyed alike in groups, master-keyed or grandmaster keyed as directed. Prepare detailed keying schedule in conjunction with owner's representative.
- .2 Provide three (3) change keys for every lock in this Contract.
- .3 Provide six (6) master keys for each MK or GMK group.

PART 3 – EXECUTION

3.1 Installation Instructions

- .1 Furnish metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.
- .2 Furnish manufacturer's instructions for proper installation of all hardware components.
- .3 Install hardware to standard hardware location dimensions in accordance with Canadian Imperial Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers' Association.
- .4 Where door stop contacts door pulls, mount stop to strike bottom of pull.

3.2 SCHEDULE

Hardware Set # H-1 - Pair Doors, A-008.3; Each to have:

- 6 Hinges Ives 5BB1 4 ½" x 4" - 652
- 2 Flush Bolts Ives FB458 x 12" - 626
- 1 Lockset Sargent 28-7G04-LL x MK'D - 626
- 2 O/H Door Stops Glynn-Johnson 454S - 626

Hardware Set # H-2 - Single Doors, 103.1, 106.1; Each to have:

- 1 Lockset Sargent 28-7G05-LL x MK'D - 626 – Re-use from T/MP Door 125
- 1 Lockset Sargent 28-7G05-LL x MK'D - 626 – Re-use from C-P Door 126
- Balance of hardware - Existing

Hardware Set # H-3 - Single Doors, 112A.1, 112B.1, 125.1, 126.1, 217.2; Each to have:

- 1 Lockset Sargent 28-7G05-LL x MK'D - 626 – Re-use from Office Door 123
- 1 Lockset Sargent 28-7G05-LL x MK'D - 626 – Re-use from Office Door 124
- 1 Lockset Sargent 28-7G05-LL x MK'D - 626 – Re-use from Admin Door 127
- 1 Lockset Sargent 28-7G05-LL x MK'D - 626 – Re-use from Training Door 125
- 1 Lockset Sargent 28-7G05-LL x MK'D - 626 – Re-use from Director Door 128
- Balance of hardware – Re-use Existing

Hardware Set # H-4 - Single Doors, 126.2, 126.3, 217.1, 223.2, 223.3, 226.2, 226.3; Each to have:

- 1 Deadbolt Sargent 28-486 x MK'D x 161 - 626
- Balance of hardware (hinges) - Existing

Hardware Set # H-5 - Pair Doors, 130.1; Each to have:

- 6 Hinges Ives 5BB1 4 ½" x 4 ½" - 652
- 2 Exit Devices Von Duprin 9827L-BE-F x 996L-BE-06 x LBR - 626
- 2 Door Closers LCN 4031 REG - 689
- 2 Floor Stops Ives FS439 - 626
- 1 Set Door Seal Draftseal DS44D x 20 ft. - BN
- 2 Door Sweeps Draftseal DS138C x 36" - CA
- 1 Set Astragals DraftSeal DS163S x 84" (2 pcs.) - CA
- 2 E/M Door Holders LCN SEM7830 x SEM7810-514/7810-E200 x 120 Volt - SP28

Hardware Set # H-6 - Pair Doors, 206A.1; Each to have:

6 Hinges Ives 5BB1HW 5 x 4 ½" - 652
2 Flush Bolts Ives FB458 x 12" - 626
1 Lockset Sargent 28-7G04-LL x MK'D - 626
2 O/H Door Stops Glynn-Johnson 905S - 626

Hardware Set # H-7 - Exterior Entrance Doors, 100.1, 107.1, Stair 4 Entr.; Each to have:

1 Rim Cylinder Schlage 20-001 x "S" Section x MK'D - 626
Balance of hardware - Existing

Hardware Set # H-8 - Exterior Entrance Door, Bungalow; Each to have:

1 Request to Exit Detector Kantech T-Rex
1 Power Supply Von Duprin PS902 x 900-8F x 900-BBK
Balance of hardware - Existing

END OF SECTION

PART 1 - GENERAL

- 1.1 RELATED SECTIONS .1 Section 064000 - Architectural Woodwork.
.2 Section 081114 - Metal Doors and Frames.
- 1.2 REFERENCES .1 Canadian General Standards Board (CGSB).
.1 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass.
.2 CAN/CGSB-12.3-M91, Flat, Clear Float Glass.
.3 CAN/CGSB-12.8-97, Insulating Glass Units.
.4 CAN/CGSB-12.11-M90, Wired Safety Glass.
.5 CAN/CGSB-12.6-M91, Transparent (One-Way) Mirrors.
.2 Flat Glass Manufacturers Association (FGMA).
.1 FGMA Glazing Manual - 1997.
- 1.3 SUBMITTALS .1 Closeout Submittals:
.1 Provide maintenance data including cleaning instructions for incorporation into manual.
- 1.4 SITE CONDITIONS .1 Environmental Requirements:
.1 Install glazing when ambient temperature is 10 degrees C minimum. Maintain ventilated environment for 24 hours after application.
.2 Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

PART 2 - PRODUCTS

- 2.1 MATERIALS: FLAT GLASS .1 Float glass: to CAN/CGSB-12.3, Glazing quality, 6mm thick.
.2 Safety glass: to CAN/CGSB-12.1, transparent 6mm thick.
.1 Type 2-tempered.
.2 Class B-float.
.3 Wired glass: to CAN/CGSB-12.11, 6mm thick.
.1 Type 1-Polished both sides (transparent).
.2 Wire mesh styles 2-Hexagonal.
- 2.2 ACCESSORIES .1 Setting blocks: Neoprene 80-90 Shore A durometer hardness to ASTM D2240, to suit glazing method, glass light weight and area.
.2 Spacer shims: Neoprene 50-60 Shore A durometer hardness to ASTM D2240, 75 mm long x one half height of glazing stop x thickness to suit application. Self adhesive on one face.

- .3 Glazing tape:
 - .1 Closed cell polyvinyl chloride foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume 2%, designed for compression of 25%, to effect an air and vapour seal.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: Comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.2 EXAMINATION

- .1 Verify that openings for glazing are correctly sized and within tolerance.
- .2 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.

3.3 PREPARATION

- .1 Clean contact surfaces with solvent and wipe dry.
- .2 Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- .3 Prime surfaces scheduled to receive sealant.

3.4 INSTALLATION: INTERIOR WET/DRY METHOD (TAPE AND SEALANT)

- .1 Perform work in accordance with FGMA Glazing Manual IGMAC and Laminators Safety Glass Association - Standards Manual for glazing installation methods.
- .2 Cut glazing tape to length and install against permanent stops, projecting 1.6 mm above sight line.
- .3 Place setting blocks at 1/4 points, with edge block maximum 150mm from corners.
- .4 Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of light or unit.
- .5 Install removable stops, with spacer shims inserted between glazing and applied stops at 600mm intervals, 6mm below sight line.
- .6 Fill gaps between light and applied stop with sealant to depth equal to bite on glazing, to uniform and level line.
- .7 Trim protruding tape edge.

3.5 PROTECTION OF FINISHED WORK

- .1 After installation, mark light with an "X" by using removable plastic tape or paste.

End of Section

PART 1 - GENERAL

1.1 RELATED SECTIONS

- .1 Section 092216 - Non-structural Metal Framing.
- .2 Section 061000.01 - Rough Carpentry.

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM C36/C36M-01, Specification for Gypsum Wallboard.
 - .2 ASTM C79/C79M-01, Standard Specification for Treated Core and Non-treated Core Gypsum Sheathing Board.
 - .3 ASTM C442/C442M-01, Specification for Gypsum Backing Board, Gypsum Coreboard, and Gypsum Shaftliner Board.
 - .4 ASTM C475-01, Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 - .5 ASTM C514-01, Specification for Nails for the Application of Gypsum Board.
 - .6 ASTM C557-99, Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.
 - .7 ASTM C630/C630M-01, Specification for Water-Resistant Gypsum Backing Board.
 - .8 ASTM C840-01, Specification for Application and Finishing of Gypsum Board.
 - .9 ASTM C1002-01, Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 - .10 ASTM C1047-99, Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
 - .11 ASTM C1280-99, Specification for Application of Gypsum Sheathing Board.
 - .12 ASTM C1178/C1178M-01, Specification for Glass Mat Water-Resistant Gypsum Backing Board.
- .2 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-1988(R2000), Surface Burning Characteristics of Building Materials and Assemblies.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials in original packages, containers or bundles bearing manufacturers brand name and identification.
- .2 Store materials inside, level, under cover. Keep dry. Protect from weather, other elements and damage from construction operations and other causes.
- .3 Handle gypsum boards to prevent damage to edges, ends or surfaces. Protect metal accessories and trim from being bent or damaged.

1.4 SITE ENVIRONMENTAL REQUIREMENTS

- .1 Maintain temperature minimum 10 degrees C, maximum 21 degrees C for 48 hours prior to and during application of gypsum boards and joint treatment, and for at least 48 hours after completion of joint treatment.
- .2 Apply board and joint treatment to dry, frost free surfaces.
- .3 Ventilation: Ventilate building spaces as required to remove excess moisture that would prevent drying of joint treatment material immediately after its application.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Standard board: to ASTM C36 regular, and Type X, 5/8" thick, 4'-0" wide x maximum practical length, ends square cut, edges bevelled. Use this board for ceiling and bulkheads, and for walls higher than 8'-0" A.F.F. Use Type X for walls requiring structural fire rating or rated separation, for all GWB ceilings, bulkheads and general patches and repairs.
- .2 For all GWB in Room A-008, use glass-mat moisture resistant gypsum board: paperless, coated glass mat faced water resistant treated core gypsum board; conforming to ASTM C1396 and ASTM D3273; 5/8" (16mm) thick, 48" (1200mm) wide.
- .3 Metal furring runners, hangers, tie wires, inserts, anchors: to CSA A82.30.
- .4 Drywall furring channels: 0.5 mm core thickness galvanized steel channels for screw attachment of gypsum board.
- .5 Resilient drywall furring : 0.5 mm base steel thickness galvanized steel for resilient attachment of gypsum board.
- .6 Nails: to ASTM C514.
- .7 Steel drill screws: to ASTM C1002.
- .8 Laminating compound: as recommended by manufacturer, asbestos-free.
- .9 Casing beads, corner beads, control joints and edge trim: to ASTM C1047, zinc-coated by electrolytic process, 0.5 mm base thickness, perforated flanges, one piece length per location. Casing beads shall be filler type.
- .10 Sealants: in accordance with Section 07 92 10 - Joint Sealing.
- .11 Acoustic sealant: as per Section 07 92 10 - Joint Sealing.
- .12 Joint compound: to ASTM C475, asbestos-free.
- .16 Acoustic insulation, mineral fibre of average density 2.50 lb/C.F., or fibreglass batts, 89mm thickness, or as otherwise shown on drawings.

PART 3 - EXECUTION

3.1 ERECTION

- .1 Do application and finishing of gypsum board in accordance with ASTM C840 except where specified otherwise.
- .2 Do application of gypsum sheathing in accordance with ASTM C1280.
- .3 Erect hangers and runner channels for suspended gypsum board ceilings in accordance with ASTM C840 except where specified otherwise.

- .4 Support light fixtures by providing additional ceiling suspension hangers within 6 inches of each corner and at maximum 24 inches around perimeter of fixture.
- .5 Install work level to tolerance of 1:1200.
- .6 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers and grilles.
- .7 Furr for gypsum board faced vertical bulkheads within and at termination of ceilings.
- .8 Furr above suspended ceilings for gypsum board fire and sound stops and to form plenum areas as indicated.
- .9 Install wall furring for gypsum board wall finishes in accordance with ASTM C840, except where specified otherwise.
- .10 Furr openings and around built-in equipment, cabinets, access panels, on four sides. Extend furring into reveals. Check clearances with equipment suppliers.
- .11 Furr beams, columns, pipes and exposed services where indicated and/or exposed to view..
- .12 Erect drywall resilient furring transversely across studs spaced maximum 24 inches on centre and not more than 6 inches from ceiling/wall juncture. Secure to each support with 1-1/2 inches common nail.
- .13 Install 6 inches continuous strip of 1/2 inch gypsum board along base of partitions where resilient furring installed.

3.2 APPLICATION

- .1 Do not apply gypsum board until bucks, anchors, blocking, sound attenuation, electrical and mechanical work are approved.
- .2 Apply single and double layer gypsum board to wood or metal furring or framing using screw fasteners for first layer, screw fasteners for second layer. Maximum spacing of screws 12 inches on centre.
 - .1 Single-Layer Application:
 - .1 Apply gypsum board on ceilings prior to application of walls in accordance with ASTM C840.
 - .2 Apply gypsum board vertically or horizontally, providing sheet lengths that will minimize end joints.
 - .2 Double-Layer Application:
 - .1 Install gypsum board for base layer and exposed gypsum board for face layer.
 - .2 Apply base layer to ceilings prior to base layer application on walls; apply face layers in same sequence. Offset joints between layers at least 10 inches.
 - .3 Apply base layers at right angles to supports unless otherwise indicated.
 - .4 Apply base layer on walls and face layers vertically with joints of base layer over supports and face layer joints offset at least 10 inches with base layer joints.
- .3 Apply 1/2 inch diameter bead of acoustic sealant continuously around periphery of each face of partitioning to seal gypsum board/structure junction where partitions abut fixed building components. Seal full perimeter of cut-outs around and

- penetrations in partitions where perimeter sealed with acoustic sealant.
- .4 Install ceiling boards in direction that will minimize number of end-butt joints. Stagger end joints at least 10 inches.
- .5 Install gypsum board on walls vertically to avoid end-butt joints. At high walls, install boards horizontally with end joints staggered over studs, except where local codes or fire-rated assemblies require vertical application.
- .6 Install gypsum board with face side out.
- .7 Do not install damaged or damp boards.
- .8 Locate edge or end joints over supports. Stagger vertical joints over different studs on opposite sides of wall.

3.3 INSTALLATION

- .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 secured. Mitre and fit corners accurately, free from rough edges. Secure at 6 inches on centre.
- .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. Seal joints with sealant.
- .4 Construct control joints of preformed units set in gypsum board facing and supported independently on both sides of joint.
- .5 Provide continuous polyethylene dust barrier behind and across control joints.
- .6 Locate control joints at changes in substrate construction and at approximate 32 feet spacing on long corridor runs.
- .7 Install control joints straight and true.
- .8 Install access doors to electrical and mechanical fixtures specified in respective sections.
 - .1 Rigidly secure frames to furring or framing systems.
- .9 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.
- .10 Finish corner beads, control joints and trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.
- .11 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after surface finish is completed.
- .12 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.
- .13 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.

End of Section

PART 1 - GENERAL

- 1.1 RELATED SECTIONS .1 Section 092116 - Gypsum Board Assemblies.
- 1.2 REFERENCES .1 American Society for Testing and Materials International, (ASTM).
- .1 ASTM C645-00, Specification for Nonstructural Steel Framing Members.
 - .2 ASTM C754-00, Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- .2 Canadian General Standards Board (CGSB).
- .1 CAN/CGSB-19.21-M87, Sealing and Bedding Compound Acoustical.

PART 2 - PRODUCTS

- 2.1 MATERIALS .1 Non-load bearing channel stud framing: to ASTM C645, 1-1/2 inch stud size, roll formed from 20 gauge thickness hot dipped galvanized steel sheet, for screw attachment of gypsum board lath. Knock-out service holes at 18 inch centres. Where abuse resistant GWB is not required stud material thickness may be 0.24 gauge.
- .2 Floor and ceiling tracks: to ASTM C645, in widths to suit stud sizes, 1-1/4 inch flange height.
- .3 Metal channel stiffener: 3/4x1-1/2 inch size, 17 gauge thick cold rolled steel, coated with rust inhibitive coating.
- .4 Acoustical sealant: to CAN/CGSB-19.21. See Section 079210, Joint Sealing.

PART 3 - EXECUTION

- 3.1 ERECTION .1 Align partition tracks at floor and ceiling and secure at 24 inch on centre maximum. Use stud crimper to provide gradual curve of track where required.
- .2 Install damp proof course under stud shoe tracks of partitions on slabs on grade.
- .3 Place studs vertically at 16 inch on centre and not more than 2 inch 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.
- .4 Erect metal studding to tolerance of 1:1000.
- .5 Attach studs to bottom and ceiling track using screws.

- .6 Coordinate simultaneous erection of studs with installation of service lines. When erecting studs ensure web openings are aligned.
- .7 Co-ordinate erection of studs with installation of door/window frames and special supports or anchorage for work specified in other Sections.
- .8 Provide two studs extending from floor to ceiling at each side of openings wider than stud centres specified. Secure studs together, 2 inches apart using column clips or other approved means of fastening placed alongside frame anchor clips.
- .9 Install heavy gauge single jamb studs at openings.
- .10 Erect track at head of door/window openings and sills of sidelight/window openings to accommodate intermediate studs. Secure track to studs at each end, in accordance with manufacturer's instructions. Install intermediate studs above and below openings in same manner and spacing as wall studs.
- .11 Frame openings and around built-in equipment, cabinets, access panels, on four sides. Extend framing into reveals. Check clearances with equipment suppliers.
- .12 Provide 20 ga. sheet metal, 8 inches wide stud or furring channel secured between studs for attachment of fixtures behind lavatory basins, toilet and bathroom accessories, millwork and other fixtures including grab bars and towel rails, attached to steel stud partitions. sheet metal to attach to a minimum of 3 studs.
- .13 Install steel studs or furring channel between studs for attaching electrical and other boxes.
- .14 Extend partitions to ceiling height except where noted otherwise on drawings.
- .15 Maintain clearance under beams and structural slabs to avoid transmission of structural loads to studs. Use 2 inch leg ceiling tracks.
- .16 Install continuous insulating strips to isolate studs from uninsulated surfaces.
- .17 Install two continuous beads of acoustical sealant under studs and tracks around perimeter of sound control partitions.

3.2 CLEANING

- .1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

End of Section

PART 1 - GENERAL

- 1.1 SUMMARY .1 Section Includes:
.1 Materials and application of acoustical units for direct application or for application and installation within a suspended ceiling.
.2 Related Sections:
.1 Section 095300.01 - Acoustical Suspension.
- 1.2 REFERENCES .1 American Society for Testing and Materials International (ASTM)
.1 ASTM C423-02a, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
.2 ASTM E1264-98, Standard Classification for Acoustical Ceiling Products.
.2 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-92.1-M89, Sound Absorptive Prefabricated Acoustical Units.
.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
.1 Material Safety Data Sheets (MSDS).
- 1.3 SUBMITTALS .1 Submit duplicate full size 1 sample of each type acoustical units.
- 1.4 DELIVERY, STORAGE AND HANDLING .1 Protect on site stored or installed absorptive material from moisture damage.
.2 Store extra materials required for maintenance, where directed by Consultant.
- 1.5 ENVIRONMENTAL REQUIREMENTS .1 Permit wet work to dry before beginning to install.
.2 Maintain uniform minimum temperature of 15 degrees C and humidity of 20-40% before and during installation.
.3 Store materials in work area 48 hours prior to installation.
- 1.6 EXTRA MATERIALS .1 Provide acoustical units amounting to 2% of gross ceiling area for each pattern and type required for project.
.2 Ensure extra materials are from same production run as installed materials.
.3 Clearly identify each type of acoustic unit, including colour and texture.
.4 Deliver to Owner upon completion of the work of this section.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Type AT-1 Acoustic units for suspended ceiling system where indicated on drawings to match existing: to CAN/CGSB-92.1. 2'-0" x 4'-0" x 3/4", humidity resistant square edged; lay-in; Class A; fine fissured; NRC 0.55; white. Acceptable material:
 - .1 Armstrong Fine Fissured, Catalogue 1729.
 - .2 CGC Radar Clima Plus, Catalogue 2410.
 - .3 Celo Tex Hytone Fine Fissured, Catalogue HHF-197

- .2 Type AT-2 Acoustic units for suspended ceiling system where indicated on drawings to match existing: to CAN/CGSB-92.1. 2'-0" x 2'-0" x 3/4", humidity resistant square edged; lay-in; Class A; fine fissured; NRC 0.55; white. Acceptable material:
 - .1 Armstrong Fine Fissured, Catalogue 1728.
 - .2 CGC Radar Clima Plus, Catalogue 2210.
 - .3 Celo Tex Hytone Fine Fissured.

- .3 Type AT -3 Acoustic units for suspended ceiling system with one hour rating to match existing, where indicated on drawings: to CAN/CGSB-92.1. Fire-resistance rated, certified for use in 1 hour floor/ceiling assembly, UL Design BXUV.G205. 2'-0" x 4'-0" x 3/4", humidity resistant square edged, lay-in, fire fissured. Weight to exceed 1.00 lbs/S.F.; no hold down clips required. Acceptable material:
 - .1 CGC RadarClima Plus Firecode, Catalogue 2415.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Do not install acoustical panels until work above ceiling has been inspected by Consultant.

3.2 INSTALLATION

- .1 Install acoustical panels in ceiling suspension system.

3.3 APPLICATION

- .1 Install acoustical units as per reflected ceiling plan.
- .2 Scribe acoustic units to fit adjacent work. Butt joints tight, terminate edges with moulding.

3.4 INTERFACE WITH OTHER WORK

- .1 Coordinate with Section 09 22 27 - Acoustical Suspension.
- .2 Coordinate ceiling work to accommodate components of other sections, such as light fixtures, diffusers, speakers, sprinkler heads, to be built into acoustical ceiling components.

End of Section

PART 1 - GENERAL

- 1.1 RELATED SECTIONS
- .1 Section 092116 - Gypsum Board Assemblies: Suspension systems for gypsum board ceilings.
 - .2 Section 095113 - Acoustical Ceilings: Acoustical units.
 - .3 Division 23: Trim for recessed mechanical fixtures.
 - .4 Division 26: Trim for recessed light fixtures.
- 1.2 REFERENCES
- .1 American Society for Testing and Materials (ASTM International)
 - .1 ASTM C635-00, Specifications for the Manufacture, Performance and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.
 - .2 ASTM C636-96, Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
- 1.3 DESIGN REQUIREMENTS
- .1 Maximum deflection: 1/360th of span to ASTM C635 deflection test.
- 1.4 REGULATORY REQUIREMENTS
- .1 Fire-resistance rated suspension system: certified by a Canadian Certification Organization accredited by Standards Council of Canada.
- PART 2 - PRODUCTS
- 2.1 MATERIALS
- .1 Heavy duty system to ASTM C635.
 - .2 Basic materials for suspension system: commercial quality cold rolled steel zinc coated.
 - .3 Suspension system: Non-fire rated for use with AT-2 ceiling tiles made up as follows: Exposed tee bar grid components; shop painted satin sheen colour. Components die cut. Main tee with double web, rectangular bulb and 1" rolled cap on exposed face for ceilings. Cross tee with rectangular bulb; web extended to form positive interlock with main tee webs; lower flange extended and offset to provide flush intersection. Provide 2'-0" x 4'-0". Main tees shall be spaced at 4'-0".
 - .4 Fire resistance rated suspension system: certified for use in 1 hour rated ceiling, components and dimensions as for AT-1 Ceilings, in compliance with UL Design BXUV-G205 floor/ceiling assembly, Certified two directional exposed tee bar grid. For use with AT-1 ceiling tiles. Ceiling grid must be CGC DXL, approved for use with UL Design G205.

- .5 Hanger wire shall be #12 SWG galvanized steel wire twist-tied to steel joists, installed in accordance with UL Design G205.
- .6 Hanger inserts: purpose made.
 - .1 Acceptable materials:
 - .1 Hilti HCA ceiling anchor.
 - .2 ITW Ramset RA 5170.
 - .3 VCANTIE Wire wedge anchor.
- .7 Accessories: splices, clips, wire ties, retainers and wall mouldings flush to complement suspension system components, as recommended by system manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Installation: in accordance with ASTM C636 except where specified otherwise.
- .2 Install suspension system to manufacturer's instructions.
- .3 Do not erect ceiling suspension system until work above ceiling has been inspected by Consultant.
- .4 Secure hangers to overhead structure using attachment methods as indicated.
- .5 Install hangers spaced at maximum 1200 mm centres and within 150 mm from ends of main tees.
- .6 Lay out system according to reflected ceiling plan.
- .7 Ensure suspension system is co-ordinated with location of related components.
- .8 Install wall moulding to provide correct ceiling height.
- .9 Completed suspension system to support super-imposed loads, such as lighting fixtures diffusers grilles and speakers.
- .10 Support at light fixtures, diffusers with additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.
- .11 Interlock cross member to main runner to provide rigid assembly.
- .12 Frame at openings for light fixtures, air diffusers, speakers and at changes in ceiling heights.
- .13 Finished ceiling system to be square with adjoining walls and level within 1:1000.

3.2 CLEANING

- .1 Touch up scratches, abrasions, voids and other defects in painted surfaces.

End of Section

PART 1 - GENERAL

1.1 REFERENCES

- .1 American Society for Testing and Materials (ASTM International)
 - .1 ASTM F1066-99, Specification for Vinyl Composition Floor Tile.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-25.20-95, Surface Sealer for Floors.
 - .2 CAN/CGSB-25.21-95, Detergent-Resistant Floor Polish.
- .3 CSA A126.2-M1984, Vinyl Asbestos and Vinyl Composition Floor Tile.
- .4 CAN/CSA-A126.5-87, Resilient Wall Base.

1.2 SAMPLES

- .1 Not required.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for resilient flooring for incorporation into manual.

1.4 ENVIRONMENTAL REQUIREMENTS

- .1 Maintain air temperature and structural base temperature at flooring installation area above 20°C for 48 hours before, during and for 48 hours after installation.
- .2 Deliver materials in good condition to the job site in the manufacturer's original unopened containers that bear the name and brand of the manufacturer, project identification and shipping and handling instructions.
- .3 Store materials in clean, dry, enclosed space off the ground, and protect from the weather and from extremes of heat and cold. Protect adhesives from freezing. Store flooring, adhesives and accessories in the spaces where they will be installed for at least 48 hours before beginning installation.

1.5 EXTRA MATERIALS

- .1 Provide maintenance materials of resilient tile flooring, base and adhesive.
- .2 Provide 2% of the gross amount of each colour, pattern and type flooring material required for this project for maintenance use.
- .3 Extra materials to be from same production run as installed materials.
- .4 Clearly identify each container of floor tile and each container of adhesive.
- .5 Deliver to Owner upon completion of the work of this section.
- .6 Maintenance materials may not be used for deficiency corrections.

1.6 EXTENDED WARRANTY

- .1 Provide a written warranty on materials and workmanship, for a period of five years after Substantial Performance.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Resilient flooring must:
 - .1 Meet or exceed all applicable governmental and industrial safety and performance standards.
 - .2 Be manufactured and transported in such a manner that all steps of the process, including the disposal of waste products arising therefrom, will meet the requirements of all applicable governmental acts, by laws and regulations including, for facilities located in Canada, the Fisheries Act and the Canadian Environmental Protection Act (CEPA).
- .2 Vinyl composition tile: to CSA A126.1 1/8" thick x 12"x12" size, in standard colours selected by Consultant. Tile shall meet ASTM F1066, Class 2 - through pattern. Allow for 5 colors.
 - .1 Acceptable materials:
 - .1 Armstrong Standard Excelon "Imperial".
 - .2 Mannington Essentials.
 - .3 Amtico Colour Through.
 - .4 Domco Azroc Cortina.
 - .5 Fextile Flex-Thru.
 - .6 Approved equal.
- .3 Resilient base: to CAN/CSA-A126.5, Type 1, rubber Style B-cove minimum 4'-0" and 4" high x 1/8" thick, including premoulded end stops and external corners for coved base only, of colour selected by Consultant.
 - .1 Acceptable material:
 - .1 Amtico rubber Cove Base.
 - .2 Johnsonite Rubber Cove Base.
 - .3 Wall Flowers by Marley Flexco.
- .4 Primers and adhesives: recommended by flooring manufacturer for specific material on applicable substrate, above, at or below grade, and which comply with VOC content requirements specified..
- .5 Sub-floor filler and leveller: as recommended by flooring manufacturer for use with their product.
- .6 Metal edge strips: aluminum extruded, smooth, mill finish with lip to extend under floor finish, shoulder flush with top of adjacent floor finish.
- .7 Sealer: type recommended by flooring.
- .8 Wax: type recommended by flooring manufacturer.

PART 3 - EXECUTION

3.1 INSPECTION

- .1 Examine subfloors prior to installation to determine that surfaces are smooth and free from cracks, holes, ridges, and other defects that might prevent adhesive bond or impair durability or appearance of the flooring material.

- .2 Inspect subfloors prior to installation to determine that surfaces are free from curing, sealing, parting and hardening compounds and other foreign materials that might prevent adhesive bond. Visually inspect for evidence of moisture, alkaline salts, carbonation, dusting, mold or mildew.
- .3 Ensure concrete floors are dry by performing subfloor Calcium Chloride Tests in accordance ASTM F 1869 and bond tests to determine if surfaces are dry and free of curing and hardening compounds, ready to receive flooring.
- .4 Report conditions contrary to contract requirements that would prevent a proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.
- .5 Failure to call attention to defect or imperfections will be construed as acceptance and approval of the subfloor. Installation indicates acceptance of substrates with regard to conditions existing at the time of installation.

3.2 SUB-FLOOR TREATMENT

- .1 Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes and other defects with sub-floor filler.
- .2 Clean floor and apply filler; trowel and float to leave smooth, flat hard surface. Prohibit traffic until filler cured and dry.
- .3 Prime concrete and plywood sub-floor to flooring manufacturer's printed instructions.

3.3 TILE APPLICATION

- .1 Provide a high ventilation rate, with maximum outside air, during installation, and for 48 to 72 hours after installation. If possible, vent directly to the outside. Do not let contaminated air recirculate through a district or whole building air distribution system.
- .2 Apply adhesive uniformly using recommended trowel in accordance with flooring manufacturer's instructions. Do not spread more adhesive than can be covered by flooring before initial set takes place.
- .3 Lay flooring with joints parallel to building lines to produce symmetrical tile pattern. Border tiles minimum half tile width. Refer to drawings for flooring patterns.
- .4 Install flooring to square grid pattern with all joints aligned.
- .5 As installation progresses, and after installation, roll flooring in 2 directions with 45 kg minimum roller to ensure full adhesion.
- .6 Cut tile and fit neatly around fixed objects.
- .7 Install feature strips and floor markings where indicated. Fit joints tightly.
- .8 Terminate flooring at centerline of door in openings where adjacent floor finish or colour is dissimilar. Install flooring under all built-in casework.
- .9 Install metal edge strips at unprotected or exposed edges where flooring terminates, or material changes.

3.4 BASE APPLICATION

- .1 Lay out base to keep number of joints at minimum. Base joints at maximum length available or at internal or premoulded corners.
- .2 Clean substrate and prime with one coat of adhesive.

- .3 Apply adhesive to back of base.
- .4 Set base against wall and floor surfaces tightly by using 3 kg hand roller.
- .5 Install straight and level to variation of 1:1000.
- .6 Scribe and fit to door frames and other obstructions. Use premoulded end pieces at flush door frames.
- .7 Cope internal corners. Use premoulded corner units for right angle external corners. Use formed straight base material for external corners of other angles, minimum 12" each leg.
- .8 Apply base to all built-in millwork.

3.5 INITIAL CLEANING AND WAXING

- .1 Remove excess adhesive from floor, base and wall surfaces without damage.
- .2 Clean, seal and wax floor and base surface using two coats of sealer and two coats of wax. Use materials recommended by the owner, for compatibility with maintenance procedures and products.
Material shall be:
 - .1 Floor Finish - Clean-it High Performance (18%) 8007-20-01
 - .2 Stripper - Liberty N-Scrub 4007-20
 - .3 Floor Sealer - Poly Seal
- .3 Clean and wax floors prior to Substantial Performance inspection.

3.6 PROTECTION OF FINISHED WORK

- .1 Protect new floors from time of final set of adhesive until final final inspection.
- .2 Prohibit traffic on floor for 48 hours after installation.

End of Section

PART 1 - GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 Material and installation of site applied paint finishes to new and existing interior surfaces, including site painting of shop primed surfaces.

1.2 REFERENCES

- .1 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33
- .2 Environmental Protection Agency (EPA)
 - .1 EPA Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 - 1995, (for Surface Coatings).
- .3 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .4 Master Painters Institute (MPI)
 - .1 MPI Architectural Painting Specifications Manual, 2004.
- .5 National Fire Code of Canada - 1995
- .6 Society for Protective Coatings (SSPC)
 - .1 SSPC Painting Manual, Volume Two, 8th Edition, Systems and Specifications Manual.

1.3 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Contractor: minimum of five years proven satisfactory experience.
 - .2 Journeymen: qualified journeymen who have "Tradesman Qualification Certificate of Proficiency" engaged in painting work.
 - .3 Apprentices: working under direct supervision of qualified trades person in accordance with trade regulations.
- .2 Retain purchase orders, invoices and other documents to prove that all materials utilized in this contract meet requirements of the specifications. Produce documents when requested by Consultant.
- .3 Manufacturer's obligations:
 - .1 The manufacturer shall play an active role in the application of their product during the period of this contract.
 - .2 The manufacturer shall be represented at all relevant meetings by a qualified technical representative, trained as a paint inspector with a minimum of 5 years experience.
 - .3 The project shall be subdivided into "Sector's of Work".
 - .4 A minimum of three inspections per sector from the Manufacturer's representative must be made prior to and during application of this work to ensure proper application.

- .4 Standard of Acceptance:
 - .1 Walls. No defects visible from a distance of 900mm at 90 degrees to surface.
 - .2 Ceilings. No defects visible from floor at 45 degrees to surface when viewed using final lighting source.
 - .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

1.4 SUBMITTALS

- .1 Product Data:
 - .1 Submit product data and instructions for each paint and coating product to be used.
 - .2 Submit product data for the use and application of paint thinner.
 - .3 Submit one copy of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS). Indicate VOCs during application and curing.
- .2 Samples:
 - .1 Submit full range colour sample chips to indicate where colour availability is restricted.
 - .2 Test reports: submit certified test reports for paint from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
 - .1 Lead, cadmium and chromium: presence of and amounts.
 - .2 Mercury: presence of and amounts.
 - .3 Organochlorines and PCBs: presence of and amounts.
 - .3 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .4 Closeout Submittals: submit maintenance data for incorporation into manual. Include the following:
 - .1 Product name, type and use.
 - .2 Manufacturer's product number.
 - .3 Colour numbers.
 - .4 MPI Environmentally Friendly classification system rating.

1.5 MAINTENANCE

- .1 Extra Materials:
 - .1 Deliver to extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with - Contract Closeout.
 - .2 Quantity: provide one - four litre can of each type and colour of primer and finish coating. Identify colour and paint type in relation to established colour schedule and finish system.
 - .3 Delivery, storage and protection: comply with Consultant requirements for delivery and storage of extra materials.

1.6 DELIVERY, STORAGE AND HANDLING .1

Packing, Shipping, Handling and Unloading:

.1 Deliver and store materials in original containers, sealed, with labels intact.

.2 Acceptance at Site:

.1 Identify products and materials with labels indicating:

.1 Manufacturer's name and address.

.2 Type of paint or coating.

.3 Compliance with applicable standard.

.4 Colour number in accordance with established colour schedule.

.3 Remove damaged, opened and rejected materials from site.

.4 Storage and Protection:

.1 Provide and maintain dry, temperature controlled, secure storage.

.2 Store materials and supplies away from heat generating devices.

.3 Store materials and equipment in well ventilated area with temperature range 7 degrees C to 30 degrees C.

.5 Store temperature sensitive products above minimum temperature as recommended by manufacturer.

.6 Keep areas used for storage, cleaning and preparation clean and orderly. After completion of operations, return areas to clean condition.

.7 Remove paint materials from storage only in quantities required for same day use.

.8 Fire Safety Requirements:

.1 Provide one 9 kg Type ABC fire extinguisher adjacent to storage area.

.2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.

.3 Handle, store, use and dispose of flammable and combustible materials in accordance with National Fire Code of Canada requirements.

1.7 SITE CONDITIONS .1

Heating, Ventilation and Lighting:

.1 Ventilate enclosed spaces 24 hours/dry during installation.

.2 Provide heating facilities to maintain ambient air and substrate temperatures above 5 degrees C for Alkyd and 7 degrees C for latex paints for 24 hours before, during and after paint application until paint has cured sufficiently.

.3 Provide continuous ventilation for seven days after completion of application of paint.

.4 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.

- .5 Provide minimum lighting level of 270 Lux on surfaces to be painted.
- .2 Temperature, Humidity and Substrate Moisture Content Levels:
 - .1 Unless pre-approved written approval by Specifying body and product manufacturer, perform no painting when:
 - .1 Ambient air and substrate temperatures are below 10 degrees C.
 - .2 Substrate temperature is above 32 degrees C unless paint is specifically formulated for application at high temperatures.
 - .3 Substrate and ambient air temperatures are not expected to fall within MPI or paint manufacturer's prescribed limits.
 - .4 The relative humidity is over 85% or when the dew point is more than 3 degrees C variance between the air/surface temperature. Paint should not be applied if the dew point is less than 3 degrees C below the ambient or surface temperature. Use sling psychrometer to establish the relative humidity before beginning paint work.
 - .5 Rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.
 - .6 Ensure that conditions are within specified limits during drying or curing process, until newly applied coating can itself withstand 'normal' adverse environmental factors.
 - .2 Perform painting work when maximum moisture content of the substrate is below:
 - .1 Allow new concrete and masonry to cure minimum of 28 days.
 - .2 15% for wood.
 - .3 12% for plaster and gypsum board.
 - .3 Test for moisture using calibrated electronic Moisture Meter. Test concrete floors for moisture using "cover patch test".
 - .4 Test concrete, masonry and plaster surfaces for alkalinity as required.
- .3 Surface and Environmental Conditions:
 - .1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
 - .2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits.
 - .3 Apply paint when previous coat of paint is dry or adequately cured.
- .4 Additional interior application requirements:
 - .1 Apply paint finishes when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.
- .5 Submit Material Safety Data Sheets (MSDS) for all products and materials of these types incorporated into the construction fo the project.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project.
- .2 Provide paint materials for paint systems from single manufacturer.
- .3 Qualified products: only paint materials listed in this specification and acceptable for use on this project. Only first line products are acceptable for use on this project.
- .4 Conform to latest MPI requirements for interior painting work including preparation and priming.
- .5 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) in accordance with MPI Architectural Painting Specification Manual "Approved Product" listing.
- .6 Linseed oil, shellac, and turpentine: highest quality product from approved manufacturer listed in MPI Architectural Painting Specification Manual, compatible with other coating materials as required.
- .7 Ensure manufacture and process of both water-borne surface coatings and recycled water-borne surface coatings does not release:
 - .1 Matter in undiluted production plant effluent generating 'Biochemical Oxygen Demand' (BOD) in excess of 15 mg/L to natural watercourse or sewage treatment facility lacking secondary treatment.
 - .2 Total Suspended Solids (TSS) in undiluted production plant effluent in excess of 15mg/L to natural watercourse or a sewage treatment facility lacking secondary treatment.
- .8 Recycled water-borne surface coatings to contain 50% post-consumer material by volume.
- .9 Recycled water-borne surface coatings must not contain:
 - .1 Lead in excess of 600.0 ppm weight/weight total solids.
 - .2 Mercury in excess of 50.0 ppg weight/weight total product.
 - .3 Cadmium in excess of 1.0 ppm weight/weight total product.
 - .4 Hexavalent chromium in excess of 3.0 ppm weight/weight total product.
 - .5 Organochlorines or polychlorinated biphenyls (PCBS) in excess of 1.0 ppm weight/weight total product.

2.2 COLOURS

- .1 Match existing adjacent colours where possible.
 - .2 A colour schedule will be provided by the Consultant for new areas.
-
- .1 Perform colour tinting operations prior to delivery of paint to site.

2.3 MIXING AND TINTING

- .2 Mix paste, powder or catalyzed paint mixes in accordance with manufacturer's written instructions.
- .3 Use and add thinner in accordance with paint manufacturer's recommendations. Do not use kerosene or similar organic solvents to thin water-based paints.
- .4 Thin paint for spraying in accordance with paint manufacturer's instructions.
- .5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

2.4 GLOSS/SHEEN RATINGS

- .1 Paint gloss is defined as sheen rating of applied paint, in accordance with following values:

	Gloss @ 60 degrees	Sheen @ 85 degrees
Gloss Level 1 - Matte Finish (flat)	Max. 5	Max. 10
Gloss Level 2 - Velvet-Like Finish	Max.10	10 to 35
Gloss Level 3 - Eggshell Finish	10 to 25	10 to 35
Gloss Level 4 - Satin-Like Finish	20 to 35	min. 35
Gloss Level 5 - Traditional Semi-Gloss Finish	35 to 70	
Gloss Level 6 - Traditional Gloss	70 to 85	
Gloss Level 7 - High Gloss Finish	More than 85	

- .2 Gloss level ratings of painted surfaces as noted on Finish Schedule.

2.5 INTERIOR PAINTING

Paint formula types are based on the following manufacturers' products:

- .1 PPG: Pittsburgh Paints.
 - .2 BM: Benjamin Moore.
 - .3 ICI: ICI< Glidden
-
- .1 Paint PT-1: for gypsum board walls, apply:
 - .4 One coat latex primer (PPG Code 9-900). Two coats of acrylic latex eggshell (PPG Code 89-Line) @ 1.5 to 2.0 mils DFT per coat.
 - .5 One coat latex primer (BM 586). Two coats acrylic latex eggshell (BM 223) @ 1.5 to 2.0 mils DFT per coat.
 - .6 One coat latex primer (ICI 59113). Two coats acrylic latex eggshell (ICI 59113) @ 1.5 to 2.0 mils DFT per coat.
 - .2 Paint PT-2: For steel doors and frames, apply:
 - .1 One coat primer (PPG Code 90-715) @ 1.5 to 2.0 DFT. Two coats of scrubable satin 100% acrylic (PPG Code 90-400 Series) @ 2.0 to 3.0 mils DFT per coat.
 - .2 One coat primer (BM 586) @ 1.5 to 2.0 mils DFT. Two coats of scrubable satin 100% acrylic (BM 218) @ 2.0 to 3.0 mils DFT per coat.

- .3 One coat primer (ICI 4020) @ 1.5 to 2.0 mils DFT. Two coats of scrubable satin 100% acrylic (ICI 4206) @ 2.0 to 3.0 mils DFT per coat.
- .3 Paint PT-3: For shop primed metal apply:
 - .1 Two coats Pitt Tech, waterborne gloss enamel (PPG 90-374).
 - .2 Two coats Devflex 4208QD Quick Dry Interior/Exterior waterborne gloss enamel.
- .4 Paint PT-4: For wood trim to receive solid color, apply:
 - .1 One coat latex primer (PPG Code 17-21). Two coats acrylic latex semi-gloss (PPG code 19 Line) @ 1.5 to 2.0 mils DFT per coat.
 - .2 One coat latex primer (BM 586). Two coats acrylic latex semi-gloss (BM 224) @ 1.5 to 2.0 mils DFT per coat.
 - .3 One coat latex primer (ICI 59113). Two coats acrylic latex semi-gloss (ICI 59211) @ 1.5 to 2.0 mils DFT per coat.
- .5 Paint PT-5: For gypsum board ceilings in dry areas, apply:
 - .1 One coat latex primer (PPG Code 9-900). Two coats flat latex (PPG Code 6-70) @ 1.5 to 2.0 mils DFT per coat.
 - .2 One coat latex primer (BM 586). Two coats flat latex (BM 219) @ 1.5 to 2.0 mils DFT per coat.
 - .3 One coat latex primer (ICI 59113). Two coats flat latex (ICI 9450) @ 1.5 to 2.0 mils DFT per coat.
- .6 Paint PT-6: For wood interior doors, apply:
 - .1 One coat 100% acrylic primer (PPG Code 17-21). Two coats acrylic latex semi-gloss (PPG Code 19 Line) @ 1.5 to 2.0 mils DFT per coat.
 - .2 One coat 100% acrylic primer (BM 563). Two coats acrylic latex semi-gloss (BM 224) @ 1.5 to 2.0 mils DFT per coat.
 - .3 One coat 100% acrylic primer (ICI 59113). Two coats acrylic latex semi-gloss (ICI 59211) @ 1.5 to 2.0 mils DFT per coat.
- .7 Paint PT-7: for electrical panel plywood backboards, apply:
 - .1 Two coats of fire retardant latex (PPG Code 42-7).
 - .2 n/a
 - .3 Two coats of fire retardant latex (ICI Safecoat 451).
- .8 Paint PT-8: For unprimed ferrous metals, pipes, etc., apply:
 - .1 One coat Pitt Tech Primer (PPG Code 90-715). Two coats of adjacent ceiling or wall finish.
 - .2 One coat acrylic latex metal primer (BM M04). Two coats of adjacent ceiling or wall finish.
 - .3 One coat Devoe metal primer (ICI 4020). Two coats of adjacent ceiling or wall finish.
- .9 Paint PT-9: For clear finish on finish carpentry, apply:

- .1 One coat satin acrylic polyurethane thinned 25% (PPG Code 77-49). Three coats gloss acrylic polyurethane (PPG Code 77-45) @ 2 mils DFT per coat.
- .2 One coat satin acrylic polyurethane thinned 25% (BM 422). Three coats gloss acrylic polyurethane (BM 423) @ 2 mils DFT per coat.
- .3 One coat satin acrylic polyurethane thinned 25% (ICI 1840). Three coats gloss acrylic polyurethane (ICI 1830) @ 2 mils DFT per coat.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheet.

3.2 GENERAL

- .1 Perform preparation and operations for interior painting in accordance with MPI Architectural Painting Specifications Manual except where specified otherwise.
- .2 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.3 EXAMINATION

- .1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Consultant damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.
- .2 Conduct moisture testing of surfaces to be painted using properly calibrated electronic moisture meter, except test concrete floors for moisture using simple "cover patch test". Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.
- .3 Maximum moisture content as follows:
 - .1 Stucco, plaster and gypsum board: 12%.
 - .2 Wood: 15%.

3.4 PREPARATION

- .1 Protection:
 - .1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore surfaces as directed by Consultant.
 - .2 Protect items that are permanently attached such as Fire Labels on doors and frames.
 - .3 Protect factory finished products and equipment.
- .2 Surface Preparation:
 - .1 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface

- mounted equipment, fittings and fastenings prior to undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.
- .2 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
 - .3 Place "WET PAINT" signs in occupied areas as painting operations progress.
- .3 Clean and prepare surfaces in accordance with MPI Architectural Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:
- .1 Remove dust, dirt, and other surface debris by vacuuming, wiping with dry, clean cloths or compressed air.
 - .2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.
 - .3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
 - .4 Allow surfaces to drain completely and allow to dry thoroughly.
 - .5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.
 - .6 Use trigger operated spray nozzles for water hoses.
 - .7 Many water-based paints cannot be removed with water once dried. Minimize use of mineral spirits or organic solvents to clean up water-based paints.
- .4 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.
- .5 Where possible, prime non-exposed surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.
- .1 Apply vinyl sealer to MPI #36 over knots, pitch, sap and resinous areas.
 - .2 Apply wood filler to nail holes and cracks.
 - .3 Tint filler to match stains for stained woodwork.
- .6 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.
- .7 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements. Remove traces of blast products from surfaces, pockets and corners to be painted by brushing with clean brushes, blowing with clean dry compressed air or vacuum cleaning.
- .8 Touch up of shop primers with primer as specified.

3.5 APPLICATION

- .1 Apply paint by brush, roller or airless sprayer. Conform to manufacturer's application instructions unless specified otherwise.
- .2 Brush and Roller Application:
 - .1 Apply paint in uniform layer using brush and/or roller type suitable for application.
 - .2 Work paint into cracks, crevices and corners.
 - .3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
 - .4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces free of roller tracking and heavy stipple.
 - .5 Remove runs, sags and brush marks from finished work and repaint.
- .3 Spray application:
 - .1 Provide and maintain equipment that is suitable for intended purpose, capable of atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
 - .2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.
 - .3 Apply paint in uniform layer, with overlapping at edges of spray pattern. Back roll first coat application.
 - .4 Brush out immediately all runs and sags.
 - .5 Use brushes and rollers to work paint into cracks, crevices and places which are not adequately painted by spray.
- .4 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access.
- .5 Apply coats of paint continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
- .6 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.
- .7 Sand and dust between coats to remove visible defects.
- .8 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.

3.6 MECHANICAL/
ELECTRICAL EQUIPMENT

- .1 Paint finished area exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as indicated.
- .2 Other unfinished areas: leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks.
- .3 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.
- .4 Do not paint over nameplates.
- .5 Keep sprinkler heads free of paint.

- .6 Paint inside of ductwork where visible behind grilles, registers and diffusers with primer and one coat of matt black paint.
- .7 Paint both sides and edges of backboards for telephone and electrical equipment before installation. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.

3.7 SITE TOLERANCES

- .1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.
- .2 Ceilings: no defects visible from floor at 45 degrees to surface when viewed using final lighting source.
- .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

3.8 FIELD QUALITY CONTROL

- .1 Interior painting and decorating work shall be inspected by a Paint Inspection Agency (inspector) acceptable to the specifying authority and local Painting Contractor's Association. Painting contractor shall notify Paint Inspection Agency a minimum of one week prior to commencement of work and provide a copy of project painting specification, plans and elevation drawings (including pertinent details) as well as a Finish Schedule.
- .2 Interior surfaces requiring painting shall be inspected by Paint Inspection Agency who shall notify Consultant and in writing of defects or problems, prior to commencing painting work, or after prime coat shows defects in substrate.
- .3 Standard of Acceptance:
 - .1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.
 - .2 Ceilings: no defects visible from floor at 45 degrees degrés to surface when viewed using final lighting source.
 - .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.
- .4 Field inspection of painting operations to be carried out by independent inspection firm as designated by Consultant.
- .5 Advise Consultant when surfaces and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.
- .6 Cooperate with inspection firm and provide access to areas of work.
- .7 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements.

3.9 RESTORATION

- .1 Clean and re-install hardware items removed before undertaken painting operations.
- .2 Remove protective coverings and warning signs as soon as practical after operations cease.
- .3 Remove paint splashings on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.

- .4 Protect freshly completed surfaces from paint droppings and dust to approval of Consultant. Avoid scuffing newly applied paint.
- .5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Consultant.

End of Section

PART 1 - GENERAL

- 1.1 RELATED SECTIONS
- .1 Section 099123 - Interior Painting.
 - .2 Section 101123 - Tackboards.
- 1.2 REFERENCES
- .1 Aluminum Association (AA).
 - .1 DAF 45-03, Designation System for Aluminum Finishes.
 - .2 American National Standards Institute (ANSI).
 - .1 ANSI 208.1-79, Particleboard, Mat-formed Wood.
 - .3 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM A653/A653M-02a, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM A924/A924M-99, Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
 - .4 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB-11.3-M87, Hardboard.
 - .5 Environmental Choice Program (ECP).
 - .1 CCD-046-95, Adhesives.
 - .6 Porcelain Enamel Institute (PEI).
 - .1 PEI 501 Porcelain Enamel.
- 1.3 SUBMITTALS
- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheets.
 - .2 Shop Drawings:
 - .1 Indicate location, type, size, panel arrangement, backing, hardware, anchor or mounting details, frame or trim and accessories.
 - .3 Closeout Submittals:
 - .1 Provide operation and maintenance data for incorporation into manual.
- 1.4 WARRANTY
- .1 Provide an extended manufacturer's warranty for a period of 24 years beyond expiration of the performance assurance requirement.

PART 2 - PRODUCTS

- 2.1 MATERIALS
- .1 Laminating adhesive: to manufacturer's standard.

- .2 Joint reinforcement: concealed mechanical jointing system to provide straight, rigid, continuously supported, tight butt, flush joints at surface.
 - .3 Anchor clips, brackets and fasteners: concealed type recommended by manufacturer for fixed mounting.
 - .4 Facings:
 - .1 Steel sheet: 0.28mm thickness, commercial quality to ASTM A526, pre-cleaned and treated to ensure maximum adhesion of an acid resistant type A (for Whiteboard) porcelain enamel.
 - .5 Core
 - .1 Fibreboard: to CAN/ULC-S706.
 - .6 Backing:
 - .1 Steel sheet, 0.22mm thickness.
- 2.2 MANUFACTURED UNITS
- .1 Fixed whiteboards. See plans for size and location.
 - .2 Acceptable materials:
 - .1 Delta Duro Porcelain whiteboard.
 - .2 A.S.P. Series 3000 Porcelain whiteboard.
 - .3 Canadian Blackboard.
- 2.3 COMPONENTS
- .1 Extruded aluminum: aluminum Association alloy AA6063-T5. Minimum 1.5 mm thick.
 - .2 Whiteboard trim and framing perimeter trim or frame map rail bottom rail with integral chalk trough and end closures, of manufacturer's standard sections appropriate for installation conditions.
 - .1 Standard of quality for each acceptable material:
 - .1 Chalkrail - Delta 201-S, with closed ends.
 - .2 Frame - Delta 203-S.
 - .3 Map rail - Delta 206-S.
- 2.4 ACCESSORIES
- .1 Manufacturer's standard accessories.
- 2.5 FABRICATION
- .1 Fabricate whiteboard panels to sizes shown on drawings. Panels of all lengths shall be one piece without joints.
 - .2 Factory laminate whiteboards, consisting of 0.28mm facing sheet, with 1/2" core and 0.22mm backing sheet. Adhesive in accordance with manufacturers recommendations.
 - .3 Make finished panels flat and rigid and fit with joint reinforcement.
 - .4 Install trim on panels in factory. Make mitres and joints to hair-line fit, free of rough edges. Use concealed brackets to reinforce and hold joints tight and flush. No exposed fasteners permitted.
 - .5 Overlap trim 1/4" onto panels. Provide closed ends for markertroughs of similar material and mechanically fastened to marker troughs.

2.6 FINISHES

- .1 Whiteboard writing surfaces:
 - .1 Porcelain enamel: to Porcelain Enamel Institute Standards PEI S104 regards durability, smoothness of texture, colour continuity. Gloss factor of 6-8 as measured by 45 degree glossmeter:
 - .1 Surface finish for dry erasable markers and suitable for use as a projection screen: white colour.
 - .2 Aluminum trim finishes:
 - .1 Finish exposed surfaces of aluminum components in accordance with Aluminum Association Designation System for Aluminum Finishes.
 - .1 Clear anodic finish.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.2 INSTALLATION

- .1 Install whiteboards in accordance with manufacturer's instructions, parallel to floor with uniform vertical surface plumb and level, to provide rigid, secure writing surface. See drawings for mounting heights.
- .2 Install trim and framing around whiteboard panels. Make mitres and joints to hair-line fit, free of rough edges. Use concealed brackets to reinforce and hold joints tight and flush. No exposed fasteners permitted. Overlap trim 6 mm onto panels.
- .3 Mechanical attachment:
 - .1 To concrete or solid masonry use lag screw and expansion bolts or screws and fibre plugs as appropriate for stresses involved.
 - .2 To hollow masonry use toggle bolts or equivalent.
 - .3 To wood or sheet metal use screws. Secure into framing members in stud walls.

3.3 CLEANING

- .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .2 Clean surfaces after installation using manufacturer's recommended cleaning procedures.
- .3 Clean aluminum with damp rag and approved non-abrasive cleaner.
- .4 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

End of Section

PART 1 - GENERAL

- 1.1 RELATED SECTIONS
- .1 Section 099123 - Interior Painting.
 - .2 Section 101113 - Whiteboards.
- 1.2 REFERENCES
- .1 Aluminum Association (AA).
 - .1 DAF 45-03, Designation System for Aluminum Finishes.
 - .2 American National Standards Institute (ANSI).
 - .1 ANSI 208.1-79, Particleboard, Mat-formed Wood.
 - .3 Environmental Choice Program (ECP).
 - .1 CCD-046-95, Adhesives.
 - .4 Underwriters' Laboratories of Canada (ULC).
 - .1 CAN/ULC-S102-M88(R2000), Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 CAN/ULC-S706-02, Wood Fibre Thermal Insulation for Buildings.
- 1.3 SUBMITTALS
- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheets
 - .2 Shop Drawings:
 - .1 Indicate location, type, size, panel arrangement, backing, hardware, anchor or mounting details, frame or trim and accessories.
 - .3 Samples:
 - .1 Submit actual colour samples from manufacturer's full range for selection of colours.
- 1.4 WARRANTY
- .1 Provide a manufacturer's warranty for a period fo 9 years beyond the expiration of performance assurance requirements.

PART 2 - PRODUCTS

- 2.1 MATERIALS
- .1 Laminating adhesive: to manufacturer's standard.
 - .2 Mounting adhesive: to manufacturer's standard.
 - .3 Anchor clips, brackets and fasteners: concealed type recommended by manufacturer for fixed vertical mounting.
 - .4 Facings:
 - .1 Plastic sealed tackboard: plastic sealed cork with burlap back, 3 mm thick, colour selected later from manufacturers standard range.
 - .5 Backing:
 - .1 Fibreboard 10mm thick, sealed at edges.

2.2 MANUFACTURED UNITS

- .1 Fixed tackboards:
 - .1 Acceptable material:
 - .1 Delta, complete with Resisto Trim.
 - .2 A.S.P. "Prestige" series 5000.
 - .3 Canadian Blackboard.
- .2 See plans for size and location.

2.3 COMPONENTS

- .1 Extruded aluminum: aluminum Association alloy AA6063-T5. Minimum 1.5 mm wall thickness.
- .2 Tackboard trim and framing: perimeter trim or frame of manufacturer's standard sections appropriate for installation conditions.
 - .1 Standard of quality: framing trim - Delta 203-S.

2.4 FABRICATION

- .1 Fabricate tackboard panels to sizes shown on drawings.
- .2 Factory laminate tackboards, consisting of 3mm facing sheet, with 10mm backing sheet.
- .3 Install trim on panels in factory. Make mitres and joints to hair-line fit, free of rough edges. No exposed fasteners permitted.
- .4 Overlap trim 1/4" onto panels.

2.5 FINISHES

- .1 Aluminum trim finishes:
 - .1 Finish exposed surfaces of aluminum components in accordance with Aluminum Association Designation System for Aluminum Finishes.
 - .1 Clear anodic finish.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.2 INSTALLATION

- .1 Install tackboards in accordance with manufacturer's instructions, parallel to floor with uniform vertical surface plumb and level, to provide rigid, secure surface. See drawings for mounting heights.
- .2 Install trim and framing around tackboard panels. Make mitres and joints to hair-line fit, free of rough edges. No exposed fasteners permitted. Overlap trim 1/4" onto panels.
- .3 Mechanical attachment:
 - .1 To concrete or solid masonry use lag screw and expansion bolts or screws and fibre plugs as appropriate for stresses involved.

- .2 To hollow masonry use toggle bolts or equivalent.
- .3 To wood or sheet metal use screws. Secure into framing members in stud walls.

3.3 CLEANING

- .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .2 Clean surfaces after installation using manufacturer's recommended cleaning procedures.
- .3 Clean aluminum with damp rag and approved non-abrasive cleaner.
- .4 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

End of Section

1 General

1.1 GENERAL

- .1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section.
- .2 This section covers items common to all sections of Division 21, 22, 23, 24 and 25.

1.2 INTENT

- .1 It is the intent of these specifications to outline the method, materials, and quality of equipment to be furnished and installed hereinafter specified and/or shown on the drawings.
- .2 The Mechanical Contractor shall be responsible for the installation of all equipment, materials, and accessories, and the labour required for the completion of this contract to the full satisfaction and acceptance of the Consultant. Misinterpretation of either the drawings or the specifications will not relieve the Contractor of responsibility.

1.3 DEFINITIONS

- .1 "CONCEALED" - mechanical services and equipment in hung ceiling spaces and non-accessible chases and furred spaces.
- .2 "EXPOSED" - will mean "not concealed" as defined herein.
- .3 "Domestic Water" includes domestic cold water, domestic hot water, tempered hot water and domestic hot water recirculation.
- .4 "Hydronic" includes hot water heating and glycol supply and return piping.
- .5 "Provide" will mean "Supply and install".

1.4 REFERENCE STANDARDS

- .1 The most stringent requirements of local municipal by-laws, provincial codes and following codes and standards shall be followed.
- .2 In no instance shall the Standard established by the contract documents be reduced by the application of any other codes.
- .3 General
 - .1 Nova Scotia Building Code Regulations Effective January 31, 2015.
 - .2 National Building Code of Canada - 2010.
 - .3 National Fire Code of Canada - 2010.

- .4 National Plumbing Code of Canada - 2010.
- .5 National Energy Code of Canada for Buildings 2011.
- .6 The following standards/codes are referenced in the above codes:
- .7 ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- .8 ASTM A795/A795M Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use
- .9 CSA B52 Mechanical Refrigeration Code.
- .10 CSA C22.1 Canadian Electrical Code, Part 1 Safety Standard for Electrical Installations.
- .11 CSA C22.2 No. 155 Electric Duct Heaters.
- .12 NFPA 13 Installation of Sprinkler Systems.
- .13 SMACNA Round Industrial Duct Construction Standards
- .14 SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- .15 ULC-S505, Fusible Links for Fire Protection Service.
- .16 CAN/ULC-S102 Test for Surface Burning Characteristics of Building Materials and Assemblies
- .17 CAN/ULC S110 Test for Air Ducts.

1.5 EQUIPMENT INSTALLATION

- .1 Unions or flanges: provide for ease of maintenance and disassembly.
- .2 Space for servicing, disassembly and removal of equipment and components: provide as recommended by manufacturer or as indicated.
- .3 Install equipment, rectangular cleanouts and similar items parallel to or perpendicular to building lines.

1.6 ANCHOR BOLTS AND TEMPLATES

- .1 Supply anchor bolts and templates for installation by other divisions.

1.7 ELECTRICAL

- .1 Electrical work to conform to Electrical Contract including the following:
 - .1 Supplier and installer responsibility is indicated in Motor, Control and Equipment Schedule on electrical drawings and related mechanical responsibility is indicated on Mechanical Equipment Schedule on mechanical drawings.
 - .2 Control wiring and conduit is specified in Electrical Contract except for conduit, wiring and connections which are related to mechanical control systems specified in Mechanical Contractor. Refer to Electrical Contract for quality of materials and workmanship.
 - .3 Power supply to boilers is by Electrical Contractor. Field wiring of boiler components is the responsibility of Mechanical Contractor.

- .2 Coordinate with Electrical Contractor to ensure that all controlled equipment is correctly connected for operation in accordance with plans and specifications, including supplying all necessary electrical interconnection information and location to Electrical Contractor.

1.8 EXISTING SYSTEMS

- .1 Connections into existing systems to be made at time approved by Consultant. Request written approval of time when connections can be made.
- .2 Be responsible for damage to existing plant by this work.
- .3 Ensure that all plumbing, heating, ventilation and other mechanical systems and services remain operational during the course of the renovation of the existing building and, if necessary, this Contractor shall be responsible for providing such temporary services by cutting off, altering, adapting, relocating and connecting existing services and disconnecting and removing such temporary or existing services upon providing new permanent services as detailed on all drawings. The site shall be examined to determine the extent of the temporary services and all co-ordination shall be made with the Owner's Representative. All costs shall be included in the Tender Price.
- .4 Existing equipment, piping, ducting, etc. not being re-used under new schemes, shall be removed whether shown on drawings or not. The General Contractor shall repair all openings resulting from the removal of existing mechanical equipment and services. All costs shall be included in the Tender Price.

1.9 CUTTING AND PATCHING

- .1 Refer to Division 1.

1.10 DRAWINGS

- .1 The drawings accompanying this specification are to be considered as diagrammatic only and do not show all the structural and construction details. Any information involving measurements of the building shall be taken from the architectural and structural drawings, and at the building site. Make without additional charge any necessary changes or additions to the runs to accommodate structural conditions.
- .2 The Mechanical drawings are not to be scaled.
- .3 The drawings and the specifications shall be considered an integral part of the contract documents. Neither the drawings nor the specifications shall be used alone. Misinterpretation of any requirements of either plans or specifications shall not change the requirements of the specifications for proper completion of the work to the full approval of the Consultant.

- .4 Except where dimensioned, indicate general Mechanical layouts only. Because of the small scale of Mechanical drawings, it is not possible to show all offsets, fittings and accessories which may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves and accessories which are required to meet the conditions.
- .5 The drawings indicate the general location and route to be followed by the pipes, ducts, conduits, etc., which are installed under this contract. Where the required conduit work, piping, ductwork, etc., is not shown on the plans or only shown diagrammatically, these shall be installed as tight as possible to structural members, concrete, ceilings, and walls to interfere as little as possible with the free use of the space through which they pass.
- .6 The drawings and specifications are intended to supplement each other so that any details shown on the drawings are not mentioned in the specifications, or vice versa, shall be executed in the same manner as if contained in the specifications and shown on the drawings.
- .7 Should any discrepancy appear between these specifications and the drawings to cause doubt as to the true meaning and intent of the drawings and specifications, a ruling shall be obtained from the Consultant before submitting the tender. If this is not done it will be assumed that the more expensive alternative has been included in the contract.
- .8 Layouts on the Mechanical drawings are based on the specified equipment, including mechanical and electrical connections and physical dimensions. Alternate equipment and systems proposed by the Contractor for use on this project, which necessitates changes in service connections to perform the specified functions may be considered by the Consultant, however, any required modifications or additions shall be done at no additional cost to the Owner. Furthermore, if it is found that the provisions made regarding space conditions and code required clearances are not met, the right is reserved by the Consultant to require installation of the equipment specified.

1.11 CONTRACT DOCUMENTS

- .1 Before submitting tender for his work, each Contractor shall examine the contract documents (electrical drawings, structural drawings, and architectural drawings and specifications) to ascertain that the work can be carried out as shown on these drawings and herein specified. No extra will subsequently be allowed to cover any omission and/or oversight for not having made a thorough inspection of the contract documents.

1.12 EXAMINE THE SITE AND CONDITIONS

- .1 Each Contractor shall visit and examine the site and the local conditions affecting this work. No allowance will be made later for any expenses occurred through failure to make these examinations.

1.13 USE OF MECHANICAL SYSTEMS DURING CONSTRUCTION

- .1 **Use of the permanent ventilating systems for supplying ventilation during the construction period is not permitted.**
- .2 **Use of the permanent heating equipment within the boiler room for supplying heat during the construction period is not permitted.**

1.14 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with the Project Waste Reduction Workplan. Refer to Division 1.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Project Waste Management Plan

1.15 LOW VOC MATERIALS

- .1 All site applied coatings, adhesives & sealants must conform to low VOC content requirements.
- .2 Provide Material Safety Data Sheets for all products and materials of these types incorporated into the work.

2 Products

2.1 MATERIAL

- .1 For the purpose of uniformity similar materials shall be by one manufacturer.
- .2 Standard of Acceptance and/or Acceptable Material:
 - .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 and when used in conjunction with a referenced standard, shall be deemed to supplement the standard.
 - .3 Acceptable Manufacturer:
 - .1 Means that item manufactured by named and specified manufacturer, meeting the specification and referenced standard regarding performance, quality of material and workmanship shall be deemed acceptable.
- .4 Refer to Instructions to Bidders for requirements of additional Acceptable Manufacturers or Acceptable Material.

2.2 ELECTRICAL DEVICES AND PANELS.

- .1 All electrical equipment and devices to be CSA certified and manufactured to standard quoted.
- .2 The assembly of combinations of electrical components, such as, relays, current transformers, BAS devices, transformers, fuse blocks, transducers or other certified components in an enclosure to form an overall electrical assembly shall be CSA certified.
- .3 Where field modifications are made to certified electrical equipment, arrange and pay for field certification by CSA.

2.3 MOTORS

- .1 Provide motors for mechanical equipment as specified.
- .2 If delivery of specified motor will delay delivery or installation of any equipment, install motor approved by Consultant for temporary use. Final acceptance of equipment will not occur until specified motor is installed.
- .3 Three (3) phase motors, 745 Watts (1.0 HP) and larger: Minimum (NEMA Premium) nominal efficiency in accordance with CAN/CSA C390 "*Test Methods, Marking Requirements and Energy Efficiency Levels for Three-Phase Induction Motors*"
- .4 Definite Purpose Inverter-Ready Motors and meet NEMA MG 1 Part 31.4.4.2.
 - .1 Suitable for current and/or future variable frequency drives (VFD's).
 - .2 Exceptions: unit heaters, cabinet heaters, cabinet fans and where noted.
- .5 Motors under 370 Watts (1/2 HP): speed as indicated, continuous duty, built-in overload protection, resilient mount, single phase, 120 V, 60 Hertz, unless otherwise specified or indicated.
- .6 Motors 370 Watts (1/2 HP) and larger: EEMAC Class B, squirrel cage induction, speed as indicated, continuous duty, drip proof, ball bearing, 3 phase, 208 V, 60 Hertz, maximum temperature rise 40° C, unless otherwise specified or indicated.
- .7 Service factor 1.15.
- .8 Totally enclosed fan cooled (TEFC) where specified.

2.4 BELT DRIVES

- .1 Fit reinforced belts in sheaves matched to drive. Multiple belts to be matched sets.
- .2 Use cast iron or steel sheaves secured to shafts with removable keys unless otherwise specified.

- .3 For motors under 7.5kW (10 HP): standard adjustable pitch drive sheaves, having plus or minus 10% range. Use mid-position of range for specified r/min.
- .4 For motors 7.5kW (10 HP) and over: sheaves with split tapered bushing and keyway having fixed pitch unless specifically required for item concerned. Provide sheaves of correct size to suit balancing.
- .5 Minimum drive rating: 1.5 times nameplate rating on motor. Keep overhung loads within manufacturer's design requirements on prime mover shafts.
- .6 Tension belts to manufacturer's recommendations before start-up and after first (100) hours of operation using calibrated belt tensioning gauge. Submit report showing the recommended and actual tension on all units.

2.5 GUARDS

- .1 Provide guards for unprotected drives.
- .2 Provide means to permit lubrication and use of test instruments with guards in place.
- .3 Guards for belt drives:
 - .1 Expanded metal screen welded to steel frame.
 - .2 Minimum 1.3 mm (18 Ga.) thick sheet metal tops and bottoms.
 - .3 38 mm (1 1/2") diameter holes on both shaft centers for insertion of tachometer.
 - .4 Removable for servicing.
- .4 Install belt guards to allow movement of motors for adjusting belt tension.
- .5 Guard for flexible coupling:
 - .1 "U" shaped, minimum 1.6 mm (16 Ga.) thick galvanized mild steel.
 - .2 Securely fasten in place.
 - .3 Removable for servicing.
- .6 Unprotected fan inlets or outlets:
 - .1 Wire or expanded metal screen, galvanized, 20 mm (3/4") mesh.
 - .2 Net free area of guard: not less than 80% of fan openings.
 - .3 Securely fasten in place.
 - .4 Removable for servicing.

2.6 EQUIPMENT SUPPORTS

- .1 Equipment supports supplied by equipment manufacturer: specified elsewhere in Mechanical Contractor.
- .2 Equipment supports not supplied by equipment manufacturer: fabricate from structural grade steel.

- .3 Exterior supports to be hot dipped galvanized. Touch up field welds and bolt holes with cold galvanized paint
- .4 Mount interior base mounted equipment on chamfered edge housekeeping pads, supplied by General Contractor.
 - .1 Nominal 100 mm (4") high and minimum 100 mm (4") larger all around than equipment.
 - .2 Provide detailed drawing to Others showing location of pads.
 - .3 Ensure bases are level prior to placement of equipment.
- .5 Mount exterior base mounted equipment on chamfered edge reinforced housekeeping pads, supplied by General Contractor.
 - .1 Minimum 300 mm (12") high and minimum 100 mm (4") larger all around than equipment.
 - .2 Provide detailed drawing to Others showing location of pads.
 - .3 Ensure bases are level prior to placement of equipment.

2.7 PAINT

- .1 Apply at least one coat of primer paint to ferrous supports, pipe hangers and site fabricated work.
- .2 Primer to be The Master Painters Institute MPI #23 with VOC < 351 grains/L

2.8 PIPE PENETRATION THROUGH WALLS AND FLOOR

- .1 Do not grout or bond sprinkler piping, drainage waste and vent piping, domestic water and hydronic pipes solid to walls or floors.
- .2 Provide cast in place temporary collar, core drill slab or sleeve all sprinkler piping, drainage waste piping, plumbing vent piping, domestic water and hydronic pipes penetration through floors.
- .3 Sleeve all sprinkler piping, drainage waste and vent piping, domestic water, hydronic pipes and control conduits through all mechanical room slabs above grade.
- .4 For all sprinkler piping, drainage waste piping, plumbing vent piping, domestic water, hydronic pipes and control conduits through all masonry walls, provide sleeves. Maintain a minimum uniform 1/4" (6 mm) clearance all around or as required for smoke seal, acoustic seal and/or fire stopping.
- .5 For all sprinkler piping, drainage waste piping, plumbing vent piping, domestic water, hydronic pipes and control conduits through all drywall walls, coordinate with other trades to ensure there is minimum uniform 6 mm clearance all around or as required for smoke seal, acoustic seal and/or fire stopping.

- .6 Insulation on domestic cold water piping and hydronic piping to be continuous through Walls and Floor.
- .7 Ensure no contact between copper tube / pipe and ferrous sleeve or concrete.
- .8 Coat exposed exterior surface of ferrous sleeves with heavy application of zinc rich paint to CAN/CGSB-1.181-92 coating, zinc-rich organic, ready mixed.

2.9 PIPE SLEEVES

- .1 For floors into Mechanical Rooms, provide schedule 40 sleeves with annular fin continuously welded to sleeve. Extend 50 mm above finish floor.

2.10 DUCT SLEEVES

- .1 Refer to Section 24 33 16 Dampers-Fire and details on drawings for sleeves at fire dampers.
 - .1 Clearance between wall and sleeve shall not exceed requirements.

2.11 SMOKE SEAL AND/OR ACOUSTIC SEAL

- .1 Firestop all pipe penetration through fire rated walls and fire rated floor.
 - .1 Refer to Section 21 05 04 Through-Penetration Firestopping for Mechanical Systems
- .2 Where non rated walls extend from floor to floor or floor to roof deck and non-rated floors.
 - .1 Smoke seal and/or acoustic seal all pipes, both sides of wall/floor.
 - .2 Smoke seal and/or acoustic seal between duct and wall, both sides of wall/floor.

2.12 FIRESTOPPING

- .1 Firestopping material and installation within annular space between pipes, ducts, insulation and adjacent fire separation
 - .1 Refer Section 21 05 04 Firestopping for Mechanical Systems for material.

2.13 ESCUTCHEONS

- .1 On pipes passing through walls, partitions, floors and ceilings in finished areas.
- .2 Chrome or nickel plated brass or Type 302 stainless steel, split piece type.
 - .1 Standard of Acceptance:
 - .1 Grinnell Fig 2 and 13.
- .3 Outside diameter to cover opening or sleeve.
- .4 Inside diameter to fit around finished pipe.

2.14 ACCESS DOORS

- .1 Supply access doors to concealed mechanical equipment for operating, inspecting, adjusting and servicing.
- .2 Size:
 - .1 Sized to access concealed services
 - .2 Minimum 600 x 600 mm (24" x 24") for body entry
 - .3 Minimum 300 x 300 mm (12" x 12") for hand entry
 - .4 Minimum 150 mm (6") larger than access door in ductwork.
 - .5 Unless otherwise noted.
- .3 Door flush with frame.
- .4 For unrated construction
 - .1 Allen Key lock(es)
 - .2 Flat door type
 - .1 Rounded safety corners
 - .2 One piece outer flange welded to mounting frame
 - .3 One piece concealed hinge
 - .4 Formed door type
- .5 For fire rated construction
 - .1 Pull ring or raised knurled knob operated latch bolt
 - .2 Interior latch release
 - .3 Automatic closer
 - .4 Hinged door
 - .5 Flanged frame
 - .6 For walls: 1- 1/2 hour 'B' label
 - .7 For ceiling membrane: 1 hour label
- .6 Material:
 - .1 Special areas such as tiled or marble surfaces: use stainless steel with brushed satin or polished finish as directed by Consultant.
 - .2 Remaining areas: use prime coated steel.
- .7 Installation:
 - .1 Locate so that concealed items are accessible.
 - .2 Locate so that hand or body entry (as applicable) is achieved.
 - .3 Install in accordance with manufacturer's recommendation
- .8 Acceptable material:

	Unrated Walls	Fire Rated Walls	Fire Rated Ceilings
Acudor	EB-2002 or UF-5000	FB-5050	FW-5050
Cendrex	AHD	PFI	
Mifab	UA	MPFR	MPFR

2.15 DIELECTRIC COUPLINGS

- .1 Lead Free
- .2 Compatible with and to suit pressure rating of piping system.
- .3 Where pipes of dissimilar metals are jointed.
- .4 Pipes NPS 2 and under: isolating unions.
 - .1 Acceptable material:
 - .1 Watts LF3000 Series
- .5 Pipes NPS 2-1/2 and over: isolating flanges.

2.16 DRAINS VALVES

- .1 In accordance with Section 23 05 23 Valves.

2.17 HANGERS AND SUPPORTS

- .1 As per Section 23 05 29 Hangers and Supports.

2.18 IDENTIFICATION

- .1 As per Section 23 05 53 Mechanical Identification.

2.19 INSULATION

- .1 As per Section 23 07 00 Mechanical Thermal Insulation.

3 Execution

3.1 INSTALLATION

- .1 Install all work in accordance with authorities having jurisdiction and manufacturer's requirements. In case of conflicting requirements, the more stringent shall apply.

3.2 PROTECTION OF OPENINGS

- .1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.
- .2 No fans to be started until the project has been cleaned to the satisfaction of the Consultant.

3.3 TESTS

- .1 Give 4 working days written notice of date for tests.

- .2 Insulate or conceal work only after testing by contractor and review by Consultant.
- .3 Conduct tests in presence of Consultant or representative authorized by the Consultant.
- .4 Bear costs including retesting and making good.
- .5 Test drainage, waste and vent piping for leakage in accordance with National Plumbing Code of Canada and authorities having jurisdiction. Maintain test pressure without loss for a minimum of 1 hour for water test and 2 hours for air test otherwise specified.
- .6 In addition to leakage test, test main storm and sanitary drainage piping for grade by ball test in accordance with National Plumbing Code of Canada and authorities having jurisdiction or provide copy of video of underground piping..
- .7 Test domestic hot, recirculation and cold water piping at 1 1/2 times system operating pressure or minimum 860 kPa (125 psig), whichever is greater. Maintain test pressure without loss for a minimum of 2 hours otherwise specified.
- .8 Test backflow preventers in accordance with manufacturer's recommendation and the requirements of the local water utility.
- .9 Test sprinkler system to NFPA 13 and authorities having jurisdiction.
- .10 Hydronic Piping:
 - .1 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 (125 psig), whichever is greater.
- .11 Equipment: test as specified in relevant sections.
- .12 Prior to tests, isolate all equipment or other parts which are not designed to withstand test pressures of test medium.
- .13 Provide signed copies of all tests within 2 weeks of completion of each test.

3.4 PAINTING

- .1 Prime and touch up marred finished paintwork to match original.
- .2 Restore to new condition, finishes which have been damaged too extensively to be merely primed and touched up.
- .3 Paint the balancing damper handles where concealed.

3.5 CEILING MOUNTED EQUIPMENT.

- .1 Locate ceiling space mounted equipment (e.g. valves, exhaust fans, , motorized dampers) within 900 mm (36") of the finished ceiling for safe access.

END OF SECTION

1 General

1.1 REFERENCE STANDARDS

- .1 In accordance with Section 21 05 01 Mechanical General Requirements

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 In accordance with Division 1
- .2 Shop Drawings to be Project Specific
- .3 All Shop Drawings to be Metric.
- .4 Prior to submitting shop drawings, the Mechanical Contractor to review the shop drawing to ensure that they meet the requirements of the contract documents in all respects, that they are clear and legible, all options are being provided are clearly indicated and that the dimensions, weights, power requirements, quantities and capacity are consistent with the requirements of the contract documents.
- .5 Assembled in groups and bound in sets.
- .6 On cover/front page indicate total number of pages in submission.
- .7 Consecutively number each page.
- .8 Shop Drawings to list components that are shipped loose.
- .9 Shop Drawings to include **Project Specific** wiring diagrams.
- .10 Shop Drawings for items with BACnet® control to include **Project Specific** list of BACnet® read/write variables. Also refer to Section 21 05 01 Mechanical General Requirements and Section 25 05 02 BAS: Submittals
- .11 Attach a Mechanical Contractor's Shop Drawing Review Confirmation to each shop drawing confirming the following:
 - .1 The mechanical shop drawings have been reviewed by the Mechanical Contractor and all items are in conformance with the contract documents Yes No
 - .2 Project specific model numbers and/or options are indicated Yes No
 - .3 Mechanical Contractor: _____
 - .4 Mechanical Contractor Project Representative: _____
 - .5 Mechanical Contractor Signature: _____
 - .6 Item: _____
 - .7 Specification Section and item number: _____
 - .8 Drawing reference: _____

- .12 Where specified in Division 1, submit electronic copies of shop drawings. In addition to the electronic shop drawing, submit one hard copy to the office of the mechanical consultant.
- .13 Section 21 05 04 Firestopping for Mechanical
 - .1 Submit Product Data: Manufacturer's specifications and technical data for each material including the composition and limitations, documentation of ULC or cUL firestop systems to be used and manufacturer's installation instructions to comply with Division 1.
 - .2 Provide data showing firestopping method for mechanical services including but not limited to the following:
 - .1 Pipe through rated Wall
 - .1 Type W1: Steel pipe
 - .2 Type W2: Copper pipe
 - .3 Type W3: Insulated DCW Copper Pipe (Insulation and vapor barrier continuous through wall)
 - .4 Type W4: Cast iron pipe
 - .5 Type W5: NPS 1½ to 2 PVC pipe
 - .6 Type W6: NPS 3 to 6 PVC pipe
 - .7 Type W7: over NPS 6 PVC pipe
 - .2 Pipe through floor assembly.
 - .1 Type F1: Steel pipe
 - .2 Type F2: Copper pipe
 - .3 Type F3: Insulated DCW Copper Pipe (Insulation and vapor barrier continuous through floor assembly)
 - .4
 - .5 Type F4: Cast iron pipe
 - .6 Type F5: NPS 1½ to 2 PVC pipe
 - .7 Type F6: NPS 3 to 6 PVC pipe
 - .8 Type F7: over NPS 6 PVC pipe
 - .3 Type FS-1: floor drains
 - .4 Type FS-2: floor mounted water closets
 - .5 Smoke sealing of angles at fire dampers
 - .6 Smoke sealing of pipes through no-rated walls
 - .3 Name of qualified installer.
 - .4 Manufacturer's engineering judgment identification number and drawing details when no ULC or cUL system is available for an application. Engineering judgment must include both project name and contractor's name who will install firestop system as described in drawing.
 - .5 Submit material safety data sheets provided with product delivered to job-site.
- .14 Section 21 13 13 Sprinklers
 - .1 Working plans and design requirements in accordance with NFPA 13.
 - .2 Hydraulic calculations.
 - .3 Components.
- .15 Section 22 42 01 Plumbing Specialties.
 - .1 Trap Seal Primers.

- .16 Section 22 42 03 Plumbing Fixtures.
 - .1 Label each sheet as to fixture type.
 - .2 Indicate roughing-in dimensions incorporating dimensions indicated on drawings.

- .17 Section 22 10 10 Plumbing Pumps
 - .1 Pump Performance Curves.

- .18 Section 23 05 29 Hangers and Supports
 - .1 Upper attachments for ducts.
 - .2 Upper attachments for pipes.
 - .3 Pipe hangers
 - .4 Description of where each type of upper attachment and hanger will be utilized

- .19 Section 23 07 00 Mechanical Thermal Insulation
 - .1 Each type of insulation
 - .2 Canvas

- .20 Section 24 31 13 Low Pressure Ducts to 500 Pa
 - .1 Duct construction table showing metal gauges, type of joints and type of support.

- .21 Section 24 33 16 Dampers - Fire.
 - .1 Integral Sleeve Fire Dampers.
 - .2 Fire damper installation instruction.

- .22 Section 24 32 48 Sound Attenuation.
 - .1 Separate for each piece of attenuation equipment.

- .23 Section 24 34 25 Package Exhausters.
 - .1 Fan curves and sound rating data showing point of operation.

- .24 Section 24 37 13 Air Terminals

- .25 Section 24 81 34 Ductless Split System Units

- .26 Section 24 72 00 Energy Recovery Equipment.
 - .1 Wiring Diagram
 - .2 Motor characteristics.

- .27 Section 25 05 01 BAS: General Requirements.
 - .1 Refer to Section 25 05 02 BAS: Submittals
 - .2 Copy of Control Wiring Electrical Wiring Permit

- .28 Shop drawings and product data shall show:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances, e.g. access door swing spaces.

- .29 Shop drawings and product data shall be accompanied by:
 - .1 Detailed drawings of bases, supports, and anchor bolts.
 - .2 Acoustical sound power data, where applicable.
 - .3 Points of operation on performance curves.
 - .4 Manufacturer to certify as to current model production.
 - .5 Certification of compliance to applicable codes.
 - .6 Wiring diagrams and electrical characteristics specified for unit supplied.

1.3 START UP REPORT MANUAL

- .1 Custom designed and contain material pertinent to this project only and to provide full and complete coverage of subjects referred to in this section.
- .2 Operating and maintenance manual to be approved by and final copies deposited with Consultant before final inspection.
- .3 Organize by specification section.
- .4 Conform to requirements of Division 1, supplemented and modified by requirements specified in this section.
- .5 Start Up and Performance data to include:
 - .1 Equipment manufacturer's performance data sheets with point of operation as left after commissioning is complete.
 - .2 Start up and verification reports
 - .3 Testing, adjusting and balancing reports as specified in Section 24 05 93, Testing, Adjusting and Balancing (TAB) of Mechanical Systems.
- .6 Submittals:
 - .1 Submit a copy of the complete Start Up Report Manual to Consultant for Review.
 - .2 Start Up Report Manual Part 1
 - .1 Start up and verification reports as required with application for substantial performance certificate as per Section 21 05 03, Common Work Results for Mechanical Contract Closeout.
 - .3 Start Up Report Manual Part 2
 - .1 Start up and verification reports as required with application for release of final payment as per Section 21 05 03, Common Work Results for Mechanical Contract Closeout.
 - .4 Submission of individual data will not be accepted unless so directed by Consultant.
 - .5 Make changes as required and re-submit as directed by Consultant.
 - .6 Refer to Division 1 for quantity of Manuals (minimum 2).
 - .7 Hard-back, 25 mm (1") 3 ring, D-ring binders.
 - .8 Binders to be 2/3 maximum full.
 - .9 Provide index to full volume in each binder.
 - .10 Identify contents of each manual on cover and spine.
 - .11 Include names, addresses, telephone numbers of each sub-contractor having installed equipment, local representative for each item of equipment, each system.

- .12 Provide full Table of Contents in each manual. Assemble each manual to conform to Table of Contents with tab sheets placed before instructions covering subject.

1.4 OPERATING AND MAINTENANCE (O&M) MANUAL

- .1 Operating and maintenance manual to be reviewed by the Consultant and final copies deposited with Consultant before application for substantial performance certificate
- .2 Organize by specification section.
- .3 O&M Manuals to be custom designed and contain material pertinent to this project only and to provide full and complete coverage of subjects referred to in this section.
- .4 Customize O&M data from manufacturer's to suit this project.
 - .1 Provide site specific manual or
 - .2 Neatly cross out non applicable generic information in the manual.
 - .3 In Manufacturer's literature, highlight model supplied for this project.
- .5 Conform to requirements of Division 1, supplemented and modified by requirements specified in this section.
- .6 Project records and O&M manuals specified in this section are to be completely separate entity from those specified in Division 1.
- .7 Operation data to include:
 - .1 Control schematics for each system including environmental controls.
 - .2 Description of each system and its controls.
 - .3 Description of operation of each system at various loads together with reset schedules and seasonal variances.
 - .4 Operation instruction for each system and each component.
 - .5 Description of actions to be taken in event of equipment failure.
 - .6 Valves schedule.
 - .7 Color coding chart.
- .8 Maintenance data shall include:
 - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
 - .2 Data to include schedules of tasks, frequency, tools required and task time.
- .9 Submittals:
 - .1 Include a copy of all reviewed mechanical shop drawings.
 - .2 Submit a copy of the complete O&M Manual to Consultant for Review.
 - .3 Submission of individual data will not be accepted unless so directed by Consultant.
 - .4 Make changes as required and re-submit as directed by Consultant.
 - .5 Refer to Division 1 for quantity of Manuals (minimum 2).

- .6 Hard-back, 50 mm (2") 3 ring, D-ring binders.
 - .7 Binders to be 2/3 maximum full.
 - .8 Provide index to full volume in each binder.
 - .9 Identify contents of each manual on cover and spine.
 - .10 Include names, addresses, telephone numbers of each sub-contractor having installed equipment, local representative for each item of equipment, each system.
 - .11 Provide full Table of Contents in each manual. Assemble each manual to conform to Table of Contents with tab sheets placed before instructions covering subject.
-
- .10 Provide maintenance data for the following:
 - .1 Section 24 72 00 Energy Recovery Equipment
 - .2 Section 24 34 00 Packaged Fans
 - .3 Section 24 37 13 Air Terminals
 - .4 Section 24 81 34 Ductless Split System Units
 - .11 Prepare and insert into operation and maintenance manual, additional data when need for same becomes apparent during demonstrations and instructions specified above.

1.5 RECORD DRAWINGS

- .1 In accordance with Division 1.
- .2 Site Records:
 - .1 Make available for reference purposes and inspection at all times. Provide sets of white prints as required for each phase of the work. Mark thereon all changes as work progresses and as changes occur. This shall include change orders, site instructions, and changes to existing mechanical systems, control systems and low voltage control wiring.
 - .2 Obtain AutoCAD drawing files from the consultant. The Contractor to update at his own expense the AutoCAD files to show the as-built conditions.
 - .3 On a regular basis, transfer information to the AutoCAD files, revising drawings to show all work as actually installed. These AutoCAD files will at their completion, become the as-built drawings for this project.
 - .4 Ensure that the modifications follow the same standard as the original file, that is, layer control, line weights, line types, etc.
 - .5 Make available for reference purposes and inspection at all times.
- .3 Record Drawings:
 - .1 Prior to start of Testing, Adjusting and Balancing (TAB), finalize production of record drawings.
 - .2 Identify each drawing in lower right hand corner in letters at least 13 mm (1/2") high as follows: "RECORD DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (date).

- .3 Include on the Record Drawings the identification number off all terminal units and as installed location.
 - .4 Include on the Record Drawings as installed location of all temperature sensors and/or thermostats
 - .5 Submit to Consultant for approval and make corrections as directed.
 - .6 TAB to be performed using as-built drawings.
 - .7 Submit completed hard copy of as-built drawings with Operating and Maintenance Manuals.
 - .8 Submit computer disk with the AutoCAD files to the consultant at the time specified in Division 1.
 - .9 Include all sections shown on interference drawings.
- .4 Where products are specified by manufacturer and/or model, update AutoCAD file to show installed manufacturer and model.
- 2 Products N/A**
- 3 Execution N/A**

END OF SECTION

1 General

1.1 REFERENCE STANDARDS

- .1 In accordance with Section 21 05 01 Common Work Results for Mechanical.

1.2 SUBMITTALS

- .1 Start-up Report.
 - .1 Provide start-up reports as listed below.
 - .2 Reports to show model number, serial number, voltage and rated amperes.
 - .3 If during start up there is an operation concern, repeat start-up after operation concern has been corrected.
- .2 Section 21 05 02 Mechanical Submittals.
 - .1 Operation and Maintenance Manuals.
 - .2 Record drawings.
- .3 Section 21 05 03 Common Work Results for Mechanical Contract Closeout.
 - .1 Confirmation of Demonstration and Operating and Maintenance Instruction.
- .4 Section 24 72 00 Energy Recovery Equipment.
 - .1 Start-up Report.
- .5 Section 24 05 93 Balancing (TAB) of Mechanical Systems.
 - .1 TAB Report.

1.3 DEMONSTRATION AND OPERATING AND MAINTENANCE INSTRUCTIONS

- .1 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
- .2 Use operation and maintenance manual, as-built drawings, audio visual aids, etc. as part of instruction materials.
- .3 Instruction duration time requirements at Substantial Performance as follows:
 - .1 Mechanical: 8 hours.
- .4 Where deemed necessary, Owner may record these demonstrations on video tape for future reference.

2 Products N/A

3 Execution

3.1 CLEANING

- .1 Clean mechanical (building) systems in accordance with Division 1.
- .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.

3.2 VERIFICATION

- .1 In context of this paragraph "verify" to include "demonstrate" to consultant.
- .2 Timing: commission only after start-up deficiencies rectified.
- .3 Access doors: verify size and location relative to items to be services.
- .4 Verification reports:
 - .1 Record all results on approved report forms.
 - .2 Include signature of tester and supervisor.
- .5 Verification:
 - .1 Notify Consultant 24 hr before commencing tests.

END OF SECTION

1 General

1.1 GENERAL

- .1 The General Conditions of the contract as well as provisions of Division 1 and Section 21 05 01 Mechanical General Requirements, Section 21 05 02 Mechanical Submittals and Section 21 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

- .1 In accordance with Section 21 05 01 Mechanical General Requirements.

1.3 DEFINITIONS

- .1 Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in fire rated wall and floor assemblies.

1.4 GENERAL DESCRIPTION OF THE WORK OF THIS SECTION

- .1 Penetrations for the passage of duct, piping, and other mechanical equipment through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.

1.5 RELATED WORK OF OTHER SECTIONS

- .1 Coordinate work of this section with work of other sections as required to properly execute the work and as necessary to maintain satisfactory progress of the work of other sections, including:
 - .1 Section 23 07 00 Mechanical Thermal Insulation.

1.6 QUALITY ASSURANCE

- .1 A manufacturer's direct representative to be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.
- .2 Firestop System installation must meet requirements of CAN4-S115-M or ULC S-115-M tested assemblies.
- .3 Firestop materials and methods: conform to applicable governing codes having local jurisdiction.

- .4 For those firestop applications that exist for which no ULC or cUL tested system is available through a manufacturer, a manufacturer's engineering judgment derived from similar ULC or cUL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineer judgment drawings must follow requirements set forth by the International Firestop Council.

1.7 INSTALLER QUALIFICATIONS

- .1 Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer's products per specified requirements.

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and ULC or cUL label where applicable.
- .2 Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.
- .3 Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements.
- .4 Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.
- .5 Do not use damaged or expired materials.

1.9 PROJECT CONDITIONS

- .1 Do not use materials that contain flammable solvents.
- .2 Scheduling
 - .1 Schedule installation of Cast In Place firestop devices after completion of floor formwork, metal form deck, or composite deck but before placement of concrete.
 - .2 Schedule installation of other firestopping materials after completion of penetrating item installation but prior to covering or concealing of openings.
 - .3 Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.
 - .4 Weather conditions: Install of firestop materials when temperatures are within the manufacturer's recommended limitations for installation printed on product label and product data sheet.
 - .5 During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

2 Products

2.1 FIRESTOPPING, GENERAL

- .1 Use only firestop products that have been ULC or cUL tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.
- .2 Provide firestopping composed of components that are compatible with each other, the substrates forming openings and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.
- .3 Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

2.2 ACCEPTABLE MANUFACTURERS

- .1 Subject to compliance with through penetration firestop systems listed in U.L.C Fire Resistance Directory – Volume III or UL Products Certified for Canada (cUL) Directory, provide products of the following manufacturers as identified below:
 - .1 Hilti (Canada) Limited.
 - .2 Other manufacturers listed in the U.L.C Fire Resistance Directory – Volume III or UL Products Certified for Canada (cUL) Directory

2.3 MATERIALS

- .1 Cast-in place firestop devices are installed prior to concrete placement for use with non-combustible and combustible plastic pipe (closed and open piping systems) penetrating concrete floors.
 - .1 Standard of Acceptance:
 - .1 Hilti CP 680 Cast-In Place Firestop Device
- .2 Sealants or caulking materials for use with non-combustible items including steel pipe, copper pipe and electrical metallic tubing (EMT).
 - .1 Standard of Acceptance:
 - .1 Hilti FS-ONE Intumescent Firestop Sealant, Hilti CP 604 Self Leveling Firestop Sealant, Hilti CP 620 Fire Foam
- .3 Sealants or caulking materials for use with sheet metal ducts.
 - .1 Standard of Acceptance:
 - .2 Hilti CP 601s Elastomeric Firestop Sealant, Hilti CP 606 Flexible Firestop Sealant, Hilti FS-ONE Intumescent Firestop Sealant, Hilti CP 604 Self Leveling Firestop Sealant.

- .4 Intumescent sealants or caulking materials for use with combustible items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed or cable bundles and plastic pipe.
 - .1 Standard of Acceptance:
 - .1 Hilti FS-ONE Intumescent Firestop Sealant, Hilti CP 620 Fire Foam

- .5 Firestop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems) tested to 50 Pa. differential.
 - .1 Standard of Acceptance:
 - .1 Hilti CP 642 Firestop Collar, Hilti CP 643 Firestop Collar, Hilti CP 645 Wrap Strips

- .6 Materials used for large size/complex penetrations made to accommodate multiple steel and copper pipes.
 - .1 Standard of Acceptance:
 - .1 Hilti FS 635 Trowel able Firestop Compound, Hilti FS 657 FIRE BLOCK, Hilti CP 620 Fire Foam

- .7 Non curing, re-penetrable materials used for large size/complex penetrations made to accommodate multiple steel and copper pipes.
 - .1 Standard of Acceptance:
 - .1 Hilti FS 657 FIRE BLOCK

Fire Resistance Rating of Separation	Required ULC or cUL “F” Rating of Firestopping Assembly
30 minutes	20 minutes
45 minutes	45 minutes
1 hour	45 minutes
1.5 hours	1 hour
2 hours	1.5 hours
3 hours	2 hours
4 hours	3 hours

- .8 For combustible pipe penetrations through a Fire Separation provide a firestop system with a “F” Rating as determined by ULC or cUL which is equal to the fire resistance rating of the construction being penetrated.

- .9 For penetrations through a Fire Wall or horizontal Fire Separation provide a firestop system with a “FT” Rating as determined by ULC or cUL which is equal to the fire resistance rating of the construction being penetrated.

3 Execution

3.1 PREPARATION

- .1 Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

- .2 Verify penetrations are properly sized and in suitable condition for application of materials.
- .3 Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.
- .4 Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
- .5 Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.
- .6 Do not proceed until unsatisfactory conditions have been corrected.

3.2 FIRE STOPPING

- .1 Firestopping to include all Mechanical services including but not limited to the following:
 - .1 PVC, cast iron or copper piping to floor drains above grade.

3.3 COORDINATION

- .1 Coordinate location and proper selection of cast-in-place Firestop Devices with trade responsible for the work. Ensure device is installed before placement of concrete.
- .2 Responsible trade to provide adequate spacing of field run pipes to allow for installation of cast-in-place firestop devices without interferences.

3.4 INSTALLATION

- .1 Regulatory Requirements: Install firestop materials in accordance with ULC Fire Resistance Directory or UL Products Certified for Canada (cUL) Directory.
- .2 Seal all holes or voids made by penetrations to ensure an air and water resistant seal.
- .3 Consult with mechanical consultant, project manager and damper manufacturer prior to installation of ULC or cUL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.
- .4 Protect materials from damage on surfaces subjected to traffic.

3.5 FIELD QUALITY CONTROL

- .1 Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.

- .2 Keep areas of work accessible until inspection by applicable code authorities.
- .3 Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.
- .4 Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.
- .5 Keep areas of work accessible until inspection by applicable code authorities.
- .6 Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.
- .7 Install a warning card that is clearly visible adjacent to all openings. This card should contain the following information:
 - .1 Warning that the opening has being fire stop protected
 - .2 Indicate the fire stop system used (ULC or cUL)
 - .3 F rating or FT rating
 - .4 Fire stop product(s) used
 - .5 Person to contact and phone number in case of modification or new penetration of fire stop system

3.6 FIRE STOPPING

- .1 Firestopping to include all Mechanical services including but not limited to the following: PVC, cast iron or copper piping to floor drains above grade.

3.7 ADJUSTING AND CLEANING

- .1 Remove equipment, materials and debris, leaving area in undamaged, clean condition.
- .2 Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 21 05 01 Mechanical General Requirements, Section 21 05 02 Mechanical Submittals and Section 21 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 SUBMITTAALS

.1 In accordance with Section 21 05 02 Mechanical General Requirements.

1.3 PRODUCTS/SYSTEMS

- .1 Products/Systems: as per listed and described below.
- .2 Refer to “Instruction to Bidders” for method of applying for Alternatives Products/Systems prior to close of tender.

1.4 REFERENCE STANDARDS

.1 In accordance with Section 21 05 01 Mechanical Submittals.

1.5 ENGINEERING DESIGN CRITERIA

- .1 Design drawings to suit existing conditions and be complete as per NFPA 13.
- .2 No alterations to layout shown without written instruction except for minor co-ordination items.

1.6 COORDINATION

.1 In accordance with Section 21 05 02 Mechanical General Requirements.

2 Products

2.1 PIPE AND FITTINGS

- .1 All pipe to be stamped as per NFPA 13 and listed for Fire Service.
- .2 Steel Pipe to ASTM A-53/A-135/A-795 as per NFPA 13.
 - .1 Application:
 - .1 Mains
 - .2 Branch lines
 - .3 Branch pipe to heads.
 - .2 NPS 2 and Smaller Pipe Joints:
 - .1 Schedule 40: Screwed, Roll Grooved Couplings or Victaulic F.I.T.
 - .2 Schedule 10: Roll Grooved Couplings or Victaulic F.I.T.
 - .3 Non-Threaded Dynaflo: Victaulic F.I.T.

- .3 NPS 2½ up to NPS 8 Pipe Joints:
 - .1 Schedule 40: Welded, Flanged, Roll Grooved Couplings.
 - .2 Schedule 10: Roll Grooved Couplings.

- .3 Pipe fittings, screwed, flanged or welded:
 - .1 Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250 to ASME B16.1
 - .2 Malleable Iron Threaded Fittings: Classes 150 and 300 to ASME B16.3.
 - .3 Gray Iron Threaded Fittings: Classes 125 and 250 to ASME B16.4
 - .4 Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard to ASME B16.5
 - .5 Factory-Made Wrought Buttwelding Fittings to ASME B16.9
 - .6 Forged Fittings, Socket-Welding and Threaded to ASME B16.1
 - .7 Buttwelding Ends to ASME B16.25

- .4 Braided Flexible Hose Assembly Fittings are not acceptable.

- .5 Threadable thinwall not acceptable

2.2 ROLL GROOVED COUPLINGS AND FITTINGS

- .1 Where rolled grooved couplings and fittings are used, they shall be of the same manufacturer.

- .2 Ductile iron to ASTM A-536 or malleable iron to ASTM A-47 coupling housings painted with alkyd enamel.

- .3 Gaskets.
 - .1 Grade "E" EPDM Type A.
 - .2 -34° C to +110° C temperature range.
 - .3 ULC listed for sprinkler systems.

- .4 Ductile iron to ASTM A-536 or malleable iron to ASTM A-47 fittings painted with alkyd enamel.

- .5 Coupling Bolts/Nuts:
 - .1 Heat treated carbon steel, track head to ASTM A-183 minimum tensile 110,000 psi.

- .6 Standard of Acceptance:
 - .1 Victaulic Co. of Canada couplings and grooved-end fittings.

- .7 Acceptable Manufacturers:
 - .1 Anvil Gruvlok

2.3 VALVES

- .1 ULC listed for fire protection service.

- .2 Up to NPS 2: Bronze, screw ends, OS&Y gate.
- .3 NPS 2 1/2 and over: cast iron, flanged or roll grooved ends, indicating butterfly valve.

2.4 SPRINKLER HEADS

- .1 In accordance with NFPA 13 and ULC listed for fire service.
- .2 Chrome in finished areas.
- .3 Bronze in service areas and concealed areas.

2.5 HANGERS AND SUPPORTS

- .1 ULC listed for Fire Protection.
- .2 As per Section 23 05 29 Hangers and Supports and NFPA 13, whichever is more stringent.

2.6 IDENTIFICATION

- .1 As per Section 23 05 53 Mechanical Identification.
- .2 In accordance with NFPA 13.

2.7 SIGNS

- .1 Signs for control drain and test valves: to NFPA 13.

2.8 SLEEVES AND PIPE PENETRATIONS THROUGH WALLS AND FLOORS

- .1 As per Section 21 05 01 Mechanical General Requirements.

3 Execution

3.1 INSTALLATION

- .1 Install in accordance with NFPA 13, contract documents and local authority having jurisdiction, whichever is more stringent
- .2 Install pipes close to building structure to minimize furring, conserve headroom and space.
- .3 Run piping parallel to building lines. Elevation offsets using industry standard screwed or grooved fittings. Building angle offsets using swing joints (with auxiliary drains where required)
- .4 Test to acceptance in accordance with NFPA 13.
- .5 Testing to be witnessed by authorities having jurisdiction.

- .6 Where applicable, allow ample clearance between sprinkler piping in ceiling spaces and top of light fixtures for relocation of fixtures under future renovations.
- .7 Locate ceiling space mounted equipment (e.g. valves, drains, etc.) within 900 mm (36") of the finished ceiling for safe access.
- .8 Allow for extra sprinkler heads, fittings, all associated piping and associated labor in Mechanical Rooms, for air handling equipment and large ducts and in areas where large ducts may be located exposed under ceiling, to maintain adequate coverage.

3.2 COORDINATION

- .1 Closely coordinate design and installation of Sprinkler System piping and equipment with Mechanical Contractor Mechanical and Electrical contractor.

3.3 SPRINKLER HEADS

- .1 Pendent sprinklers with piping concealed above the ceiling are to be located as follows:
 - .1 Aligned symmetrically with normal fabrication and installation tolerances utilizing rigid pipe.
 - .2 Centered (one way or both) in suspended ceiling tile.
 - .3 Located minimum 150 mm from T-bar.
- .2 Extended escutcheons where head is obstructed by surface mounted light.

3.4 ACCESS DOORS

- .1 In accordance with Section 21 05 01 Mechanical General Requirements.

3.5 GUARDS

- .1 Provide guards around sprinkler heads in mechanical, electrical, storage, and telephone rooms, around ventilation equipment, in service areas, and other areas that may be requested by authorities having jurisdiction, to protect against possible mechanical injury.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 21 05 01 Mechanical General Requirements, Section 21 05 02 Mechanical Submittals and Section 21 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

- .1 In accordance with Section 21 05 01 Mechanical General Requirements.

2 Products

2.1 PIPING

- .1 Domestic hot, tempered, cold and recirculation tubing, within building.
 - .1 Above ground: copper tube, hard drawn, type L to ASTM B88.
- .2 Trap Primer lines
 - .1 Where exposed and concealed above grade: Copper tubing as above.

2.2 FITTINGS FOR COPPER

- .1 ASME/ANSI B16 Series
- .2 Brass or bronze flanges and flanged fittings.
- .3 Cast brass or bronze threaded fittings, Class 125 & 250.
- .4 Cast bronze or wrought copper and bronze.
 - .1 NPS 2 and under: Lead free solder to ASTM B32.
 - .2 NPS 2 1/2 and over: Roll Grooved or Silfos.
- .5 Press Fitting:
 - .1 Copper and copper alloy press fittings conforming to material requirements of ASME B16.18 or ASME B16.22 and performance criteria of IAPMO PS 117.
 - .2 EPDM sealing elements for press fittings.
 - .3 Factory installed sealing elements.
 - .4 Press ends with leakage path feature that assures leakage of liquids from inside the system past the sealing element of an unpressed connection. The function of this feature is to provide the installer quick and easy identification of connections which have not been pressed prior to putting the system into operation.
 - .5 Acceptable Material: Viega Copper ProPress fittings.

2.3 JOINTS FOR COPPER

- .1 Solder/brazing: lead free to ASTM B32.
- .2 Press connections: Copper and copper alloy press connections in accordance with the manufacturer's installation instructions.

2.4 ROLL GROOVED COUPLINGS AND FITTINGS

- .1 Where rolled grooved couplings and fittings are used, they shall be of the same manufacturer.
- .2 Sized to copper-tube dimensions.
- .3 Ductile iron coupling housings to ASTM A-536 with a copper alkyd enamel paint.
- .4 Rigid Grooved type Couplings: Housings cast with offsetting angle-pattern bolt pads to provide rigidity and system support.
- .5 Flush Seal Gaskets:
 - .1 Molded EPDM Compound to ASTM D-2000 -34° C to 110° C temperature range.
 - .2 Suitable for domestic cold water, domestic hot water, domestic hot water recirculation.
 - .3 Classified in accordance with ANSI/NSF-61 for potable water service
- .6 Fittings: NPS 2 to 4 Copper per ASTM B-75. NPS 6 Bronze Sand Casting per ASTM B-584.
- .7 Coupling Bolts/Nuts: Heat treated carbon steel, track head to ASTM A-183 minimum tensile 110,000 psi.
- .8 Fittings: NPS 2 and larger: roll grooved to CSA B242. Cast bronze to ANSI/ASME B16.18 or wrought copper ANSI/ASME B16.22.
- .9 Standard of Acceptance:
 - .1 Victaulic Co. of Canada Style 606 Rigid Couplings with Grade E Flush Seal Gasket, Style 641 Flange Adapters and Copper Connection Fittings.
 - .2 Victaulic Co. of Canada Style 607 Quick-Vic Rigid Couplings with EHP gasket for direct stab installation without field disassembly.
- .10 Acceptable Material: Anvil Gruvlok

2.5 MECHANICALLY FORMED TEE CONNECTIONS

- .1 Mechanically extracted collars formed in a continuous operation, consisting of drilling a pilot hole and drawing out the tube surface to form a collar having a height of not less than three times the thickness of the tube wall.

- .2 Mechanically Formed Tee Connections can be used on NPS 1 and larger pipe. Use only where branch is a minimum of one size smaller than run pipe.
- .3 Branch notched to conform with the inner curve of the run tube, dimpled to insure penetration of the branch tube into the collar is of sufficient depth for brazing and that the branch tube does not obstruct the flow in the main line tube.
- .4 Brazed joints.

2.6 VALVES

- .1 As per Section 23 05 23 Valves.

2.7 HANGERS AND SUPPORTS

- .1 As per Section 23 05 29 Hangers and Supports.

2.8 INSULATION

- .1 As per Section 23 07 00 Mechanical Thermal Insulation

3 Execution

3.1 INSTALLATION

- .1 Connect to fixtures and equipment in accordance with manufacturer's instructions unless otherwise indicated.
- .2 Install pipes close to building structure to minimize furring, conserve headroom and space. Run piping parallel to walls. Group piping wherever possible.
- .3 Install groups of piping parallel to each other, spaced to permit application of insulation, identification, and service access, on individual hangers or trapeze hangers.
- .4 Cut square, ream and clean tubing and tube ends, clean recesses of fittings and assemble without binding.
- .5 Wipe all pipes of soldering flux as the joint is completed.
- .6 Assemble all piping using fittings manufactured to ANSI standards.
- .7 Install DCW piping below and away from DHW and DHWR and all other hot piping so as to maintain temperature of cold water as low as possible.
- .8 Where pipe sizes differ from connection sizes of equipment, install reducing couplings close to equipment. Reducing bushings are not permitted.

- .9 Lay copper tubing so that it is not in contact with dissimilar metal and will not be kinked or collapsed.
- .10 Use non-corrosive lubricant or Teflon tape applied to male thread.
- .11 Provide di-electric couplings wherever piping of dissimilar metals are joined.
- .12 Install swing or swivel joints to connect risers to mains.
- .13 Buried trap primer lines
 - .1 Lay in well compacted washed sand in accordance with AWWA Class B bedding.
 - .2 Continuous without joints.

3.2 ROLL GROOVED CONNECTIONS

- .1 In accordance with manufacturer's recommendations.
- .2 Cut ends of roll grooved pipe square, with seating surface clean and free from indent and score marks.

3.3 PRESS CONNECTION INSTALLATION

- .1 In accordance with the manufacturer's installation instructions.
- .2 Fully inserted tubing into the fitting and the tubing marked at the shoulder of the fitting.
- .3 Check the fitting alignment against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting.
- .4 Pressed the joints using the tool(s) approved by the manufacturer.

3.4 MECHANICALLY FORMED TEE CONNECTIONS

- .1 Mechanically Formed Tee Connections can be used on NPS 1 and larger pipe. Use only where branch is a minimum of one size smaller than run pipe.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 21 05 01 Mechanical General Requirements, Section 21 05 02 Mechanical Submittals and Section 21 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

- .1 In accordance with Section 21 05 01 Mechanical General Requirements.

2 Products

2.1 PIPING, FITTINGS AND JOINTS

- .1 NPS 1 ¼ and larger: Type DWV Copper to ASTM B306.
 - .1 Fittings:
 - .1 Cast brass: to CSA B158.1.
 - .2 Wrought copper: to ANSI B16.29.
 - .2 Solder/brazing: Lead free to ASTM B32.
- .2 Cast Iron Pipe: to CAN/CSA-B70 Cast Iron Soil Pipe, Fittings and Means of Joining.
 - .1 Above Ground Sanitary Storm and Vent to CSA B-70, Product to be manufactured in ISO 9000 and ISO 14001 Facility
 - .2 Acceptable material for pipe.
 - .1 Bibby Ste-Croix: All sizes.
 - .2 Tyler: up to and including NPS 4
 - .3 Hub & Spigot Joint.
 - .1 Self locking positive compression EPDM gasket
 - .2 Acceptable material.
 - .1 Bibby Ste-Croix Bi-Seal.
 - .2 Tyler Ty-Seal.
- .3 Cast Iron Pipe Mechanical Joints: to and listed to CAN/ULC S-102.2-10 and CAN/CSA-B602 Mechanical couplings for drain, waste, and vent pipe and sewer pipe
 - .1 Acceptable material.
 - .1 Bibby Ste-Croix
 - .1 Series 2000.
 - .2 Husky SD4000 Heavy Duty
 - .2 Tyler MJ (No hub) coupling.
- .4 PVC to CAN/CSA-B181.2, CAN/CSA-B182.1 and CAN/CSA-B182.2
 - .1 PVC DWV 25-50: with solvent weld joints with flame spread not more than 25 and smoke developed classification not more than 50.
 - .1 Pipe and fittings by one manufacturer.

- .2 Acceptable material:
 - .1 IPEX System XFR™ 15-50

	Copper	Cast Iron	PVC DWV 25 -50
Above Grade Storm	Y	Y	Y
Above Grade Sanitary& Vent	Y	Y	Y

2.2 RELIEF VALVE PIPING AND DRAINS

- .1 All sizes: copper tube, hard drawn, type L to ASTM B88
 - .1 Applications: relief valve piping, etc.
- .2 NPS 1 ¼ and larger: Copper DWV or PVC DWV 25-50 as described above
 - .1 Applications: air handling drains, plenums, A/C drains, etc.

2.3 HANGERS SUPPORTS

- .1 As per Section 23 05 29 Hangers and Supports.

2.4 INSULATION

- .1 As per Section 23 07 00 Mechanical Thermal Insulation

3 Execution

3.1 INSTALLATION

- .1 Install piping parallel to building lines and close to walls and ceilings to conserve headroom and space and to grade indicated.
- .2 Cast Iron
 - .1 In accordance with manufacturer requirements.
 - .2 Torque coupling connections to manufacturer requirements.

3.2 RELIEF VALVE PIPING AND DRAINS

- .1 Turn down at floor drain.
- .2 Cut end of discharge pipe at 45°.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 21 05 01 Mechanical General Requirements, Section 21 05 02 Mechanical Submittals and Section 21 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

- .1 In accordance with Section 21 05 01 Mechanical General Requirements.

1.3 FIXTURES AND TRIM

- .1 All plumbing fixtures of same type to be by one Manufacturer.
- .2 All vitreous china plumbing fixtures in any one washroom or location to be the product of one manufacturer.
- .3 Trim of same type to be product of one manufacturer.
- .4 Exposed plumbing brass to be chrome plated.

1.4 LEAD FREE

- .1 In accordance with NSF/ANSI 372 Drinking water system components – Lead Content or California Health and Safety Code (Section 116875; commonly known as AB1953) or Vermont Bill S.152

2 Products

2.1 LAVATORY & SINK TRIM

- .1 T-4 Lead Free Trim: chrome plated brass, 200 mm deckmount centerset supply fitting, swing spout, vandal resistant laminar flow 5.7 L/min outlet, 62 mm lever handles with vandal resistant screws, NPS 1/2 IPS male inlets and coupling nuts.
 - .1 Acceptable Material:
 - .1 Delta Commercial Cambridge Brass 26C3223.
 - .2 Chicago Faucet AB1100-1000VP-E36VP.
 - .3 Kohler K-7825-K-CP with K-16010-4 and outlet as noted above.
 - .4 Zurn Z871G1XL-18F.

2.2 P- TRAP

- .1 PT-3 P-Trap: NPS 1 ½ chrome plated cast brass P-trap with cleanout and deep flange. Where concealed PT-4 P-Trap can be used.

- .1 Acceptable Material:
 - .1 Cambridge Brass 33T360 trap.
 - .2 McGuire 8912 trap.
 - .3 Oakville Stamping & Bending 96 trap.
 - .4 Watts Brass & Tubular Products 504 1735 trap.
 - .5 Zurn Z8702BD-PC
- .2 PT-4 P-Trap: NPS 1 ½ Cast brass trap with removable trap dip and cleanout or NPS 1 ½ PVC DWV 25-50 with removable trap dip and cleanout.

2.3 FIXTURE SUPPLIES

- .1 Lead Free chrome plated ¼ turn fixture supplies with chrome plated flexible copper riser wheel handle stops, screwed inlet with chrome plated brass nipple and escutcheons on each service to each fixture.
 - .1 SUP-1 Acceptable Materials for Lavatories:
 - .1 Brasscraft KTR400A C-w/NIP Lead Free.
 - .2 Zurn Z8802Q-XL-LR-PC Lead Free
 - .2 Lead Free concealed ¼ turn fixture supplies with escutcheons on each service to each fixture. Copper pipe to the faucet. Tailpieces and nuts.
 - .1 SUP-3 for sinks:
 - .1 SUP-1
 - .2 Brasscraft KTR15 Angle or KTR19 Straight Lead Free.
 - .3 Lead Free Ball valve in accordance with Section 23 05 23 Valves on each service.

2.4 SINKS

- .1 SSC-1: single compartment, ledge back, Type 302 stainless steel, self-rimming, undercoated, countertop installation with clamps, crumb cup strainer, 3 hole drilling, mirror finished rim and satin finished bowl.
 - .1 Nominal Bowl Size: 450 x 400 x 175 mm.
 - .2 Acceptable Material:
 - .1 Franke Kindred Canada Ltd.QSL2020.
 - .2 AMI Novanni 1017B.
 - .3 Franke Commercial LBS6807-1

.2 Sink Schedule

<u>Symbol</u>	<u>Sink</u>	<u>Trim</u>	<u>Trap</u>	<u>Supplies</u>
CS-1	SSC-1	T-4	PT-4	SUP-3

2.5 FIXTURE TRAPS

- .1 P-traps complete with cleanouts on all fixtures which do not have built-in traps.

- .2 Separate cleanout in stack is required where two or more sinks or lavatories connect to common stack using double sanitary tee.
- .3 Running traps where indicated on drawing.

2.6 ROUGHING-IN OF FIXTURES

- .1 For equipment supplied by others, provide rough-in complete with valved supplies, wastes and vents, capped.

3 Execution

3.1 FIXTURE INSTALLATION

- .1 Connect fixtures complete with supplies and drains, trapped, supported level and square.
- .2 Hot water faucets shall be on left.
- .3 For counter top stainless steel sinks, see architectural drawings for counter top heights and location of fixtures.
- .4 For other fixtures refer to drawings for mounting heights.
- .5 Ensure floor mounted fixtures are on a level base continuous around perimeter.
- .6 In accordance with National Building Code and National Plumbing Code of Canada.
- .7 Service fixtures as follows:

<u>Fixture</u>	<u>Waste NPS</u>	<u>Vent NPS</u>	<u>Cold Water NPS</u>	<u>Hot Water NPS</u>
Sinks	1 1/2	1 1/4	1/2	1/2

3.2 ADJUSTING

- .1 Conform to water conservation requirements specified this section.
- .2 Adjustments.
 - .1 Adjust water flow rate to design flow rates.
 - .2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.
- .3 Checks.
 - .1 Outlets: operation, cleanliness.

3.3 SINK TRIM

- .1 Provide key for vandal resistant outlets.
- .2 Clean outlet screens.

3.4 BRASS TRAPS, SUPPLIES AND ASSOCIATED PIPE

- .1 Where exposed to view, paint with aluminum paint.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 21 05 01 Mechanical General Requirements, Section 21 05 02 Mechanical Submittals and Section 21 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

- .1 In accordance with Section 21 05 01 Mechanical General Requirements.

1.3 MANUFACTURED ITEMS

- .1 All valves of one type to be by one manufacturer.

1.4 LEAD FREE

- .1 In accordance with NSF/ANSI 372 Drinking water system components – Lead Content or California Health and Safety Code (Section 116875; commonly known as AB1953) or Vermont Bill S.152

2 Products

2.1 VALVES NPS 2 AND UNDER

- .1 Lead Free Ball Valves NPS 2 and under soldered and screwed:
.1 Application
.1 Section 22 11 16 Domestic Water Piping
.2 Section 23 21 13 Hydronic Systems
.2 Quarter-turn: 4130 kPa (600 psi) W.O.G., bronze, large port.
- .2 Lead Free Swing Check Valves NPS 2 and under, soldered and screwed:
.1 Application
.1 Section 22 11 16 Domestic Water Piping
.2 Section 23 21 13 Hydronic Systems
.2 1380 kPa (200 psi) W.O.G., bronze body, bronze swing disc, screw in cap, regrindable seat.

- .3 Acceptable material:

NPS 2 and under	Lead Free Ball	Lead Free Check
Apollo	77CLF-100/77CLF-200	161S-LF/161T-LF
Crane	LF9201/LF9202	LF37/LF1340
Milwaukee	UPBA150/ UPBA100	UP1509/UP509
Apollo	77CLF-100/77CLF-200	161S-LF/161T-LF
Nibco	S-685-80-LF /T -685-80-LF	S-413-Y-LF / T-413-Y-LF
Kitz	868/869	822T/823T
Watts	LFB6080/ LFB6081	LFCV/LFCVS

2.2 VALVES NPS 2 AND OVER FOR HYDRONIC

- .1 Gate Valves NPS 2 1/2 and over, flanged
 - .1 Application
 - .1 Section 23 21 13 Hydronic Systems
 - .2 Rising stem: class 125, 1380 kPa (200 psi) W.O.G., FF flange, cast-iron body, OS&Y bronze trim.
- .2 Check Valves NPS 2-1/2 and up, flanged:
 - .1 Application
 - .1 Section 23 21 13 Hydronic Systems
 - .2 Condensate
 - .2 Class 125, 1380 kPa (200psi) W.O.G., cast iron body, FF flange, renewable seat, bronze disc, bolted cap.
- .3 NPS 2-1/2 to 10, lug wafer butterfly:
 - .1 Application: Section 23 21 13 Hydronic Systems
 - .2 200 CWP @ 93° C, cast iron body with uncoated bronze disc and 316 stainless steel stem, replaceable EPDM seat, locking handle, gear operators NPS 6 and over.

- .4 Acceptable material:

NPS 2-1/2 and up Flanged	Cast Iron Gate	Check	Lug Wafer Butterfly
Crane Canada Inc.	465 1/2	373	44-BSZ-L/G
Jenkins Valves 92 Inc.	454J	587J	2231-ELJ/GJ
Kitz	72	78	6122EL/G
Red-White/Toyo	421 A	435A	
Milwaukee	F-2885-M	F2974M	CL2/3-24E L/G
Newman Hattersley	T504	T651	Series 45-313321/2
Nibco	FE-617-0	FE918B	LC2008-3/5
Bray	-	-	34-01/04
Keystone	-	-	F1020 CBE2

2.3 GROOVED END VALVES NPS 2 AND OVER FOR HYDRONIC

- .1 Check Valves NPS 2 1/2 to 4 for grooved end pipe:
 - .1 Class 125, 860 kPa (125 psi), ductile iron body, stainless steel discs, stainless steel spring, stainless steel shaft, EPDM seat.
- .2 Butterfly Valves NPS 2-1/2 and over grooved end body:
 - .1 Housing: Ductile iron conforming to ASTM A-536, grade 65-45-12 or ASTM A-395, grade 65-45-15
 - .2 Body: Carbon steel, electroplated
 - .3 Seat/Liner: Grade "E" EPDM. Temperature range -34° C to +110° C.
 - .4 ANSI/NSF 61 for cold +86°F/+30°C and hot 180°F/+82°C potable water service.
 - .5 Stem-Upper/Lower: 416 stainless steel
 - .6 Disc: Aluminum bronze
 - .7 Locking handle, gear operators NPS 6 and over.

- .3 Acceptable material:

NPS 2-1/2 and up Grooved	Check	Butterfly
Victaulic	Vic 716	Vic 300 MasterSeal
Anvil	7800	Series 7600
Nibco	-	GD-4765-3/5

2.4 ROOM HEATING UNIT VALVE

- .1 NPS 1-1/4 and under: Ball Valve with union or Min. 860 kPa (125 psi), bronze body renewable composition disc, screwed straight or angle bonnet, threaded/solder union tail piece.
- .2 On supply piping, wheel handle.
- .1 Acceptable Material:
- .1 Dahl Brothers Canada Ltd. 11042/11041
 - .2 Red-White/Toyo 250/253
 - .3 Kitz 106/107
 - .4 Ball Valve with union
- .3 On return piping, memory balancing valve with flow measuring device
- .4 Acceptable Material:
- .1 Dahl Brothers Canada Ltd. 13012/13013 MV-2
 - .1 2000 series Venturion for 0.003 to 0.13 l/s (0.4 to 2.0 USgpm)
 - .2 6000 series Venturion for 0.11 to 0.38 l/s (1.75 to 6.0 USgpm)
 - .2 Circuit Balancing Valve with union

2.5 DRAIN VALVES AND GAUGE COCKS

- .1 Lead Free Drain Valves
- .1 Locate at low points of mains, branches and risers.
 - .2 At domestic water branch isolation valves, provide drain unless branch can be drained through a fixture.
 - .3 At hydronic branch isolation valves, provide drain unless branch can be drained through a hydronic unit.
 - .4 Equipment drain valves line size.
 - .5 Minimum NPS 1/2 unless otherwise specified.
 - .6 Ball valve with hose end male thread and cap with chain.
- .2 Lead Free Gauge Cocks
- .1 NPS 1/4 screwed.
 - .1 Application
 - .1 Pressure Gauge
 - .2 Air vents
 - .3 Where indicated
 - .2 Quarter-turn: 1725 kPa (250 psi) W.O.G., bronze.

.3 Acceptable material:

	Drain valves	Gauge Cocks
Apollo	77CLF-100-HC/77CLF-200-HC	77CLF-100/77CLF-200
Kitz	868/869 w/cap and chain.	868/869
Nibco	S-685-80-LF-HC /T -685-80-LF-HC	S-685-80-LF /T -685-80-LF
Watts	LFB6080/ LFB6081 w/cap and chain	LFB6080/ LFB6081
Milwaukee	UPBA150/ UPBA100 w/cap and chain	UP1509/UP509

2.6 CIRCUIT BALANCING VALVE

.1 Hydronic:

- .1 Y style globe valve, designed to provide precise flow measurement and control, with valved ports for connected to differential pressure meter.
- .2 Accuracy: Readout to be within plus or minus 2% of actual flow at design flow rate.
- .3 Flow control: At least four (4) full turns of handwheel with digital handwheel and tamperproof concealed mechanical memory.
- .4 Positive shut-off.
- .5 Memory stop.
- .6 Connections:
 - .1 Screwed or soldered: NPS ½ and NPS ¾
 - .2 Screwed: NPS 1 to NPS 2.
- .7 Standard of Acceptance:
 - .1 S. A. Armstrong CBV.
 - .1 NPS ½ LF for 0.03 to 0.125 l/s (0.5 to 2.0 USgpm)
 - .2 NPS ¾ LF for 0.03 to 0.19 l/s (0.5 to 3.0 USgpm)
 - .3 Standard CBV for other flows
- .8 Acceptable Material:
 - .1 Hattersley 1710 and 737
 - .2 Tour and Anderson STA-D/F.
 - .3 Anvil Series GBV
 - .4 Oventrop Hydrocontrol 106 Series
 - .5 Victaulic 78 Series.

3 Execution

3.1 GENERAL

- .1 Install valves with stems upright or horizontal unless approved otherwise.
- .2 Line size.

3.2 CIRCUIT BALANCING VALVES

- .1 Maintain Manufacturer's recommended minimum straight pipe diameters.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 21 05 01 Mechanical General Requirements, Section 21 05 02 Mechanical Submittals and Section 21 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

- .1 In accordance with Section 21 05 01 Mechanical General Requirements.

2 Products

2.1 GENERAL

- .1 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

2.2 UPPER ATTACHMENTS

- .1 Preformed metal supports with 3 fasteners per side
 - .1 Steel Deck
 - .2 Galvanized.
 - .3 Min 45 kg Static Load
 - .4 Application:
 - .1 NPS ½ or ¾ domestic water piping or heating piping.
 - .2 Up to NPS 2 Plumbing vent.
 - .3 Maximum size duct: 500 mm (20").
 - .5 Acceptable material: Brak-It
- .2 Caddy clip for 6 mm (¼") rod Min 90 kg Static Load.
 - .1 Steel beam, channel, joist or angle.
 - .2 Application: Ductwork.
- .3 Steel washer plate with double locking nuts.
 - .1 Steel Joist.
 - .2 Application: Cold and hot, plumbing and hydronic piping, any size and ductwork.
- .4 Universal C-Clamp.
 - .1 Top of steel beam, top of channel, top of joist or angle.
 - .2 Application: Cold and hot, plumbing and hydronic piping, NPS 6 and under and ductwork.

.5 Acceptable material:

	CCTF/Hunt	E. Myatt & Co	Taylor Pipe Supports	Anvil	Carpenter and Paterson Pipe Hangers Ltd.
Welded eye rod	95	440		278	
Coach screw with Flattened end		#3 size 2			
Coach screw	58N	461	61	142	
Steel washer plate	560	545	80	60	260
Universal C-Clamp	56/56N/56NW		406/407	92/93/94	
C-Clamp	57	586	301	86	238

.6 Universal C-Clamp to NFPA 13 Requirements.

- .1 Top of steel beam, top of channel, top of joist or angle.
- .2 Application: Sprinkler.
- .3 Acceptable Material:
 - .1 CCTF/Hunt Fig. 56N/56NW.
 - .2 Anvil Fig. 92/93.
 - .3 Tolco Fig. 65/66.

.7 For pipes and ducts parallel to steel structure:

- .1 Insert into floor slab above or
- .2 Steel member from structural member to structural member.
- .3 Double locking nuts.

2.3 MIDDLE ATTACHMENT (ROD)

- .1 Cadmium plated steel threaded rod:
 - .1 Acceptable Material:
 - .1 Carpenter & Paterson Pipe Hangers Ltd. Fig. 94.
 - .2 CCTF/Hunt Fig. 99P.
 - .3 Anvil Fig. 146.

2.4 PIPE ATTACHMENT

- .1 Adjustable clevis hanger: to MSS-SP69, type 1, ULC listed.
- .2 Long adjustable clevis hanger: to MSS-SP69, Type 1 ULC listed.
- .3 Copper plated or epoxy coated adjustable clevis hanger:
- .4 Adjustable clevis hanger for cast iron pipe:
 - .1 Application: Insulated and uninsulated cast iron pipe. All sizes.
- .5 Black carbon steel riser clamp to MSS-SP69, Type 8, ULC listed.
 - .1 Application: Steel pipes and Cast iron pipe.

- .6 Copper plated carbon steel to MSS-SP69, Type 8, ULC listed:
 - .1 Application: Copper pipes.

- .7 Acceptable material:

	CCTF/ Hunt	E. Myatt & Co	Taylor Pipe Supports	Anvil	Carpenter and Paterson Pipe Hangers Ltd.
Adjustable clevis hanger	32N	124	24Z	260	100
Long adjustable clevis hanger	32U	124L	24L	300	286
Copper plated or epoxy coated clevis hanger	30C/E	151CT or 56	52	CT65	100CT
Clevis hanger for cast iron pipe	33AC	126	27AC	590	
Black carbon steel riser clamp	40	183	82	261	126
Copper plated riser clamp	42C	150CT	85	CT121	126CT

- .8 Double hook with double locking nut.
 - .1 Application: Insulated and uninsulated cast iron pipe: NPS 6 and under.
 - .2 Acceptable Material:
 - .1 Bibby Ste. Croix 6602 to 6606

- .9 Adjustable swivel ring hanger: to MSS-SP69, Type 10, ULC listed, tapped per NFPA 13 Standard.
 - .1 Application: Sprinkler piping.
 - .2 Acceptable Material:
 - .1 CCTF/Hunt Fig. 20.
 - .2 Anvil Fig. 69.
 - .3 Tolco Fig. 2.

3 Execution

3.1 PIPE SUPPORT SPACING

- .1 Plumbing and Hydronic: Spacing and middle attachment (rod) diameter as specified in paragraphs below or as in table below, whichever is more stringent
 - .1 Plumbing piping: to National Plumbing Code of Canada.
 - .2 Authority having jurisdiction.
 - .3 Flexible joint roll groove pipe: in accordance with table below, but not less than one hanger at joints and not less than one hanger per pipe length over 1200 mm (4'0").
 - .4 Within 300 mm (12") of each elbow.
 - .5 Risers at each floor.
 - .6 Minimum hanger rod size as per full size manufacturer's recommendation and table below, whichever is greater.

Pipe Size: NPS	Rod Diameter	Maximum Spacing Steel	Maximum Spacing Copper
up to ¾	10 mm (3/8")	2100 mm (7'0")	1500 mm (5'0")
1 to 1-1/4	10 mm (3/8")	2100 mm (7'0")	1800 mm (6'0")
1-1/2	10 mm (3/8")	2750 mm (9'0")	2400 mm (8'0")
2	10 mm (3/8")	3000 mm (10'0")	2750 mm (9'0")
2-1/2	10 mm (3/8")	3350 mm (11'0")	3000 mm (9'10")
3	13 mm (1/2")	3650 mm (12'0")	3000 mm (9'10")
4	13 mm (1/2")	4250 mm (14'0")	3000 mm (9'10")

Pipe Size: NPS	Rod Diameter	Maximum Spacing Cast Iron	Maximum Spacing PVC
Up to 4	10 mm (3/8")	3000 mm (9'10")	1200 mm (4'0")
Over 4	13 mm (1/2")	3000 mm (9'10")	1200 mm (4'0")

- .2 Sprinkler Piping: Spacing and middle attachment (rod) diameter as specified in paragraphs below or as in table below, whichever is more stringent

- .1 To NFPA 13.
- .2 Authority having jurisdiction.
- .3 Within 300 mm (12") of each elbow.
- .4 Risers at each floor.
- .5 Where roll grooved pipe is used, any piece 1200 mm (48") or longer shall have a minimum of one support.
- .6 Minimum hanger rod size as per full size manufacturer's recommendation, NFPA 13 and table below, whichever is greater.

Pipe Size: NPS	Rod Diameter	Maximum Spacing Steel
up to 1-1/4	10 mm (3/8")	2100 mm (7'0")
1-1/2	10 mm (3/8")	2750 mm (9'0")
2	10 mm (3/8")	3000 mm (10'0")
2-1/2	10 mm (3/8")	3350 mm (11'0")
3	13 mm (1/2")	3650 mm (12'0")
4	13 mm (1/2")	4250 mm (14'0")
6	20 mm (3/4")	4570 mm (15'0")
Over 8	22 mm (7/8")	4570 mm (15'0")

- .3 At Steel Joists
- .1 Locate hangers at panel points of OWSJ for piping perpendicular to OWSJ.
 - .2 Locate steel support members at panel points of OWSJ for piping parallel to OWSJ.
 - .3 For parallel runs of piping NPS 2 ½ and over.
 - .1 Where perpendicular to OWSJ support on alternating OWSJ.

3.2 PLUMBING AND HYDRONIC PIPE ATTACHEMENT APPLICATIONS

- .1 Upper Attachment as noted above.
- .2 Middle attachment as noted above.

- .3 Pipe Attachment Application
 - .1 Uninsulated steel pipe: All sizes.
 - .1 Adjustable clevis hanger.
 - .2 Hot insulated steel pipe: NPS 4 and under.
 - .1 Long adjustable clevis hanger.
 - .3 Copper pipe: All sizes.
 - .1 Copper plated or epoxy coated adjustable clevis hanger.
 - .4 PVC: All sizes.
 - .1 Adjustable clevis hanger.

3.3 SPRINKLER PIPE ATTACHMENT APPLICATION

- .1 Upper Attachment as noted above.
- .2 Middle attachment as noted above.
- .3 Pipe Attachment Application, All sizes.
 - .1 Adjustable swivel ring hanger.

3.4 DUCT HANGERS

- .1 In accordance with Section 24 31 13 Metal Ducts - Low Pressure to 500 Pa

3.5 MIDDLE ATTACHMENT (ROD)

- .1 Trim excess threaded rod off within 13 mm (1/2") of attachment nut.

3.6 HANGER INSTALLATION

- .1 Offset hanger so that rod is vertical in operating position.
- .2 Adjust hangers to equalize load.
- .3 Provide double nuts at middle attachment (rod) top and bottom.
- .4 Where building structural members or inserts are not suitably located provide supplementary steel channels or angles, support these channels and angles only from the top of structural members. Drill holes in the channels and angles for insertion of hanger rods. If the holes are cut out with a torch, provide a back-up steel plates with drilled holes for inserting hanger rods. Secure each hanger rod to the channels and angles using a steel back-up plate where applicable and steel washers and a lock-nut system. All channels, angles and hanger rod upper supports shall have a load capacity of five (5) times the load to be supported from them.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 21 05 01 Mechanical General Requirements, Section 21 05 02 Mechanical Submittals and Section 21 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

- .1 In accordance with Section 21 05 01 Mechanical General Requirements.

2 Products

2.1 MANUFACTURERS NAMEPLATES

- .1 Provide metal nameplate on each piece of equipment, mechanically fastened complete with raised or recessed letters. Locate nameplates so that they are easily read. Do not insulate or paint over nameplates.
- .2 Include registration plates (e.g. Pressure vessel, Underwriters' Laboratories and CSA Approval). Indicate size, equipment model, manufacturer's name, serial number, voltage, cycle, phase and power of motors.

2.2 SYSTEM NAMEPLATES

- .1 Color:
 - .1 Hazardous: white letters, red background
 - .2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).
- .2 Construction:
 - .1 2.4 mm (3/32") thick, laminated plastic or white anodized aluminum, matte finish, square corners, letters accurately aligned and machine engraved into core.
- .3 Equipment type, number and service or area or zone of building it serves to be identified.
- .4 Sizes:
 - .1 Conform to following table:

Size 1	10 mm x 50 mm (3/8" x 2")	1 line	5 mm (0.2") high letters
Size 2	13 mm x 75 mm (1/2" x 3")	1 line	6 mm (0.25") high letters
Size 6	25 mm x 100 mm (1" x 4")	1 line	13 mm (1/2") high letters
Size 9	75 mm x 150 mm (3" x 6")	3 line	13 mm (1/2") high letters
 - .2 Use average of 25 letters/numbers (maximum) per nameplate.
 - .3 Use Size 1.
 - .1 Control Components.

- .4 Use Size 2.
 - .1 Packaged fans.
 - .2 Fire dampers
 - .3 Packaged fans less than 560 watts (3/4 HP)
 - .4 Reheat coils
 - .5 Motorized Dampers
- .5 Use Size 6.
 - .1 Control panels.
 - .2 Junction boxes.
 - .3 Relay panels.
- .5 Mechanically fasten nameplates.

2.3 EQUIPMENT CONCEALED IN CEILING

- .1 At valves, balancing dampers, air vents, drains and electrical components located above T-bar ceiling or access doors, provide self-adhering color disc as near as possible to where item is located.
- .2 Where valves, balancing dampers, air vents, drains or electrical component has primary and secondary color, provide a 20 mm (3/4") primary color disc with a 10mm (3/8") secondary color disc centered on the primary disc.
- .3 Where primary color only, provide a 20 mm (3/4") primary color disc.
- .4 In addition to the System Nameplates noted above provide a second identical plate on the underside of the ceiling grid or access door frame as close as possible to the location of the following:
 - .1 Fire dampers
 - .2 Packaged fans less than 560 watts (3/4 HP)
 - .3 Reheat coils
 - .4 Motorized Dampers
- .5 Fasten nameplates with contact cement.

2.4 PIPE IDENTIFICATION

- .1 General: Identify medium by lettered legend, classification by primary and secondary colors, direction of flow by arrows.
- .2 Primary color bands: 50 mm (2") wide.
- .3 Secondary color bands: 50 mm (2") wide, 75 mm (3") in from one end of primary color band.

.4 Legend: block capitals to following table:

Outside Diameter of Pipe or Insulation	Size of Letters
Up to 30 mm	13 mm
38 mm to 50mm	20 mm
63 mm to 150 mm	38 mm
Over 150 mm	50 mm

.5 Arrows:

- .1 Outside diameter of pipe/insulation 75 mm (3") and greater: 150 mm long x 50 mm high. (6" long x 2" high.)
- .2 Outside diameter of pipe/insulation less than 75 mm (3"): 100 mm long x 50 high (4" long x 2" high.)
 - .1 Use double headed arrows where flow is reversible.

.6 Material:

- .1 Paint for Stencil: Low VOC and environmentally friendly
- .2 Color bands:
 - .1 Plastic coated cloth material with protective overcoating and waterproof contact adhesive undercoating, suitable for 100% RH and continuous operating temperature of 150° C and intermittent temperature of 200° C. Apply to prepared surfaces. Wrap tape around pipe or pipe covering with ends overlapping one (1) pipe diameter. Cut band to length, don't tear off.
 - .2 Acceptable Manufacturer:
 - .1 WH Brady Inc.
 - .2 Seton Name Plate Corp.

.7 Colors:

- .1 Where not covered by table below, submit legend, primary and secondary classification colors to Consultant for approval.

.8 Table: Pipe and valve identification.

Pipe Marker Legend	Valve Legend	Tag Primary Color	Secondary Color
Dom. Cold Water	DCW	Green	None
Dom. Hot Water	DHW	Green	None
Dom. Hot Water Recirculation	DHWR	Orange	None
Sanitary Sewer	-	Green	None
Vent (plumbing)	-	Green	None
Hot Water Heating Supply	HWS	Yellow	Black
Hot Water Heating Return	HWR	Yellow	Black
Glycol Heating Supply	GWS	Yellow	Black
Glycol Heating Return	GWR	Yellow	Black
Refrigerant Suction (Include Refrig No.)	REF.S (No.)	Yellow	Black
Refrigerant Liquid			

(Include Refrig No.) Refrigerant Hot Gas	REF.L (No.)	Yellow	Black
(Include Refrig No.)	REF.HG (No.)	Yellow	Black

- .9 Legend and arrows:
 - .1 Black or white to contrast with primary color.
- .10 Heating: Label zones.
- .11 Sprinkler:
 - .1 Mains.
 - .2 Cross mains.

2.5 DUCTWORK

- .1 50 mm (2") high black stenciled letters and directional flow arrows 150 mm long x 50 mm high (6" long x 2" high).
- .2 Indicate "Supply", "Exhaust", "Washroom Exhaust", with directional arrow and "Fan System No."

2.6 VALVE TAGS

- .1 38 mm (1 1/2") square laminated plastic with corner hole.
- .2 Horizontal 13 mm (1/2") letters accurately aligned and machine engraved into core.
- .3 Face color to match primary color of piping identification.
- .4 Core color to match secondary color of piping identification.

2.7 CEILING COLOR DISCS

- .1 At valves, balancing dampers, air vents, drains and electrical components located above T-bar ceiling or access doors, provide self-adhering color disc as near as possible to where item is located.
- .2 Where valves, balancing dampers, air vents, drains or electrical component has primary and secondary color, provide a 20 mm (3/4") primary color disc with a 10mm (3/8") secondary color disc centered on the primary disc.
- .3 Where primary color only, provide a 20 mm (3/4") primary color disc.

2.8 BALANCING DAMPER

- .1 Paint the balancing damper handles where concealed.

2.9 ELECTRICAL COMPONENTS SUPPLIED BY DIVISION 21 TO 25

- .1 Identify electrically fed equipment supplied by Division 25 as per Section 25 05 03 BAS Identification.

2.10 WARNING SIGNS

- .1 Equipment (e.g. motors, starters) under remote automatic control: provide orange colored signs warning of automatic starting under control of BAS.
- .2 Sign to read: "Caution: This equipment is under automatic remote control of BAS" or equivalent to Consultant's approval.

3 Execution

3.1 GENERAL

- .1 Provide ULC and CSA registration plates as required by Respective agency.

3.2 MANUFACTURERS NAMEPLATES

- .1 Locate nameplates so that they are easily read.
- .2 Do not insulate or paint over plates.

3.3 SYSTEM NAMEPLATES

- .1 In conspicuous location to facilitate easy reading from operating floor to properly identify equipment and/or system.
- .2 Provide stand-offs for nameplates on hot surfaces and insulated surfaces.

3.4 LOCATION OF PIPING AND DUCTWORK IDENTIFICATION

- .1 On long straight runs in open areas in boiler rooms and equipment rooms, so that at least one is clearly visible from any one viewpoint in operating areas or walking isles and not at more than 50' intervals.
- .2 In addition to above, label Non Potable Cold Water not at not more than 7.5 meter (25') intervals.
- .3 Adjacent to all changes in direction.
- .4 At least once in each small room through which piping passes.
- .5 Both sides of visual obstruction or where run is difficult to follow.

- .6 On both sides of any separation such as walls, floors and partitions.
- .7 Where piping or ductwork is concealed in service chase, or other confined space, at entry and leaving points and adjacent to each access opening and not more than 15 meter (50') intervals.
- .8 At beginning and end points of each run and at each piece of equipment in run.
- .9 At point immediately upstream of major manually operated or automatically controlled valves or damper. Where this is not possible, place identification as close to valve or damper as possible, preferably on upstream side.
- .10 Legend to be easily and accurately readable from usual operating areas and all readily accessible points.
- .11 Plane of legend to be approximately at right angles to most convenient line of sight with consideration of operating positions, lighting conditions, reduced visibility of color or legends caused by dust and dirt and risk of physical damage.
- .12 Stencil over final finish only.
- .13 Beside each access door.

3.5 VALVE TAGS

- .1 Secure tags to valve handle with non-ferrous chains or closed "S" hooks for valves except at plumbing fixtures and radiation.
- .2 Provide one copy of valve schedule mounted in frame with non-glare glass where directed by Consultant. Provide one copy in each operating and maintenance instruction manual.
- .3 Consecutively number valves in system.

3.6 DUCTWORK & PIPING

- .1 In finished public areas where piping and ductwork are exposed ductwork and piping does not require identification.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 21 05 01 Mechanical General Requirements, Section 21 05 02 Mechanical Submittals and Section 21 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

- .1 In accordance with Section 21 05 01 Mechanical General Requirements.

1.3 DEFINITIONS

- .1 Refer to Section 21 05 01 Common Work Results for Mechanical - General.
- .2 Legend
 - .1 ASJ: All Service Jacket
 - .2 SSL: Self-Sealing Lap
 - .3 FSK: Foil-Scrim-Kraft; jacketing
 - .4 PSK: Poly-Scrim-Kraft; jacketing
 - .5 PVC: Polyvinyl Chloride

1.4 ENVIRONMENTAL REQUIREMENTS

- .1 Maintain ambient conditions required by manufacturers of tapes, adhesives, mastics, cements and insulation materials.
- .2 Follow manufacturer's recommended handling practices.

2 Products

2.1 GENERAL

- .1 Components of insulation system to have maximum flame spread rating of 25 and maximum smoke developed rating of 50 in accordance with CAN/ULC-S102.
- .2 Materials to be tested in accordance with ASTM C411.

2.2 PIPE INSULATION

- .1 P-2 Formed Mineral Fiber with ASJ Vapour Barrier to 454° C
 - .1 Application for piping, valves and fittings on:
 - .1 Domestic water piping
 - .2 Hydronic piping
 - .3 Where indicated.

- .2 Material:
 - .1 CAN/CGSB 51.9 Mineral Fiber Thermal Insulation for Piping
 - .2 CGSB 51-GP-52 Vapour Barrier Jacket and Facing Material.
 - .3 Self-seal lap closure including ASJ butt strips.
- .3 Thermal Conductivity "k" shall not exceed 0.034 W/m° C at 24° C mean temperature when tested in accordance with ASTM C335.
- .4 Thickness:
 - .1 Domestic Cold Water
 - .1 13 mm (1/2") on NPS 1/2 pipe.
 - .2 25 mm (1") on NPS 3/4 and over.
 - .2 Domestic Hot Water and Domestic Hot Water Recirculation.
 - .1 13 mm (1/2") on NPS 1/2 pipe on branch vertical drops concealed in walls (25 mm (1") on horizontal to the branch vertical drops concealed in walls.)
 - .2 25 mm (1") on NPS 1/2 to NPS 2.
 - .3 38 mm (1 1/2") on NPS 2 1/2 and over.
 - .3 Hydronic: Interior of building
 - .1 25 mm (1") on NPS 3/4 to NPS 2
 - .2 38 mm (1 1/2") on NP NPS 2 1/2 and over.
- .5 All pipe insulation shall be by one manufacturer.
- .6 Copper tube size for copper pipe.

.2 Acceptable Material:

	Owens-Corning	Manson Insulation Inc.	Knauf Fiber Glass	Johns Manville Insulations
P-2	Fiberglas SSL-II	Alley K-APT	ASJ-SSL	Micro Lok AP-T

2.3 DUCT INSULATION

- .1 D-2 Mineral Fiber Blanket with ASJ Vapour Barrier 4° to 120° C
 - .1 Application: on concealed cold or dual temperature ducting.
 - .1 Outside air intake from louver to unit.
 - .2 All exhaust air or relief air ducting for 3 meters (measured on centerline of duct) from roof deck or exterior wall
 - .3 Exhaust air discharge from heat recovery unit.
 - .4 Where indicated.
 - .2 Material
 - .1 CAN/CGSB 51.11 Mineral Fiber Blanket.
 - .2 CGSB 51-GP-52 Vapour Barrier Jacket and Facing Material.
 - .3 Thickness:
 - .1 Two layers of duct insulation for outside air intakes to air handling units and heat recovery ventilators.
 - .2 Two layers of duct insulation for exhaust from heat recovery devices in air handling units and heat recovery ventilators.
 - .3 One layer of duct insulation for exhaust air ducting

- .2 D-4 Mineral Fiber Rigid with ASJ Vapour Barrier to 4° to 120° C
 - .1 Application: on exposed cold or dual temperature ducting.
 - .1 Outside air intakes from louver to unit.
 - .2 All exhaust air or relief air ducting for 3 meters (measured on centerline of duct) from roof deck or exterior wall.
 - .3 Exhaust air discharge from heat recovery unit.
 - .4 Where indicated.
 - .2 Material:
 - .1 CAN/CGSB 51.11 Rigid Mineral Fiberboard.
 - .2 CGSB 51-GP-52 Vapour Barrier, Jacket and Facing Material.
 - .3 Thickness:
 - .1 One 25 mm (1") layer for air conditioned supply ducts.
 - .2 One 51 mm (2") layer of duct insulation for outside air intakes to air handling units and heat recovery ventilators.
 - .3 One 51 mm (2") layer of duct insulation for exhaust from heat recovery devices in air handling units and heat recovery ventilators.
 - .4 One 51 mm (2") layer of duct insulation for exhaust air ducting from exhaust/return fan associated with an air handling unit.
 - .5 One 50 mm (2") layer of duct insulation for outside air duct for boiler rooms, for outside air ducts serving mechanical rooms, for combustion air intakes and outside air ducts serving electrical rooms.
 - .6 One 25 mm (1") layer of duct insulation for exhaust air from boiler rooms, for exhaust air ducts serving mechanical rooms and for exhaust air ducts serving electrical rooms.

.3 Acceptable Material:

	Owens-Corning	Manson Insulation Inc.	Knauf Fiber Glass	Johns Manville Insulations
D-2	All Service Faced Duct Wrap	Alley Wrap FSK	Duct Wrap - FSK	Microlite Fiber Glass Duct Wrap Insulation.
D-4	Vapor Seal Duct Insulation AF-530	AK Board FSK	Insulation Board FSK	814 Spin Glass

2.4 FASTENINGS

- .1 Tape: self-adhesive, 100 mm (4") wide. ULC labeled for less than 25 flame spread and less than 50 smoke developed.
 - .1 Standard of Acceptance:
 - .1 S. Fattal Insultape.
- .2 Fire resistive lap seal adhesive: quick-setting for joints and lap sealing of vapour barriers.
 - .1 Standard of Acceptance:
 - .1 Monsey Bakor Inc. 230-39.

- .3 Fire resistive lagging adhesive: for cementing canvas lagging cloths to pipe insulation.
 - .1 Standard of Acceptance:
 - .1 Monsey Bakor Inc. 120-09.
- .4 Fire restrictive contact adhesive: quick setting.
 - .1 Standard of Acceptance:
 - .1 Monsey Bakor 230-38.
- .5 Pins:
 - .1 Weld pins 4 mm (5/32") diameter, with 32 mm (1 1/4") diameter head for installation through the insulation. Length to suit thickness of insulation.
 - .2 Standard of Acceptance:
 - .1 Duro Dyne, Clip-Pin
 - .3 Weld pins 4 mm (5/32") diameter, for installation prior to applying insulation. Length to suit thickness of insulation. Nylon retain clips 32 mm (1 1/4") round.
 - .4 Standard of Acceptance:
 - .1 Duro Dyne Spotter Pins with Spotter-Clips.

2.5 JACKETS

- .1 Canvas.
 - .1 Plain weave, cotton fabric at 6.5 oz/yd² (220 g/m²).
 - .2 ULC label every 600 mm (2 ft.)
 - .3 Standard of Acceptance:
 - .1 S. Fattal Thermocanvas
 - .2 Application:
 - .1 Exposed insulated piping
 - .2 Exposed insulated ductwork
- .2 PVC.
 - .1 CGSB 51-GP-53M PVC sheets.
 - .2 0.4 mm (0.015") thick minimum.
 - .3 Fitting covers, one piece, premoulded to match.
 - .4 Application on exposed insulated piping where noted below:
 - .1 Section 22 11 16 Domestic Water Piping for elbows and mechanical couplings only
 - .2 Section 22 13 17 Drainage Waste and Vent Piping for exposed RWL located within gym OWSJ.
 - .3 Section 23 21 13 Hydronic Systems: Piping and Fittings for elbows and mechanical couplings only
 - .5 Standard of Acceptance:
 - .1 Proto.
 - .2 The Sure-Fit System.
 - .3 Zeston 2000 PVC.

3 Execution

3.1 APPLICATION

- .1 Apply insulation after required tests have been completed and approved by Consultant.
- .2 Verify that all piping, equipment, and ductwork are tested and approved prior to insulation installation.
- .3 Verify that all surfaces are clean, dry and without foreign material before applying insulation materials.
- .4 Surfaces shall be clean and dry when installed and during application of insulation and finishes.
- .5 Apply insulation materials, accessories and finishes in accordance with manufacturer's recommendations and as specified herein.
- .6 All surface finishes shall be extended in such a manner as to protect all raw edges, ends and surfaces of insulation.
- .7 On piping with insulation and vapour barrier, maintain integrity of vapour barrier over full length of pipe without interruption at sleeves, fittings and supports.
- .8 On ductwork with insulation and vapour barrier, maintain integrity of vapour barrier over full length of duct or surface, without penetration for hangers, standing duct seams and without interruption at sleeves. Do not break continuity of insulation vapour barrier with hangers or rods. Insulate strap hangers 100 mm (4") beyond insulated duct.
- .9 On equipment with insulation and vapour barrier, maintain integrity of vapour barrier over full length without interruption at sleeves, fittings and supports.

3.2 PIPE INSULATION INSTALLATION

- .1 Performed: sectional up to NPS 12, sectional or curved segmented above NPS 12.
- .2 Multi-layered: staggered butt joint construction.
- .3 Vertical pipe over NPS 3: insulation supports welded or bolted to pipe directly above lowest pipe fitting. Thereafter, locate on 15' centers.
- .4 Expansion joints in insulation: terminate single layer and each layer of multiple layers in straight cut at intervals recommended by manufacturer. Leave void of 25 mm (1") between terminations. Pack void tightly with P-3 flexible mineral insulation.
- .5 Seal and finish exposed ends and other terminations with insulating cement.

- .6 Expansion joints in piping: provide for adequate movement of expansion joint without damage to insulator or finishes.
- .7 Insulation is not required for:
 - .1 Chrome plated piping, valves and fittings.
- .8 Fastenings
 - .1 Secure pipe insulation by tape at each end and center of each section, but not greater than 900 mm (36") on centers.

3.3 DUCT INSULATION INSTALLATION

- .1 General:
 - .1 Adhere and seal vapour barrier using vapour seal adhesives.
 - .2 Stagger longitudinal and horizontal joints, on multilayered insulation.
- .2 Board Insulation fastenings:
 - .1 On rectangular ducts, use 50% coverage of insulating cement and weld pins at 1 pin per square foot, but not less than 2 rows per side and bottom.
 - .2 Secured with speed washers.
 - .3 All joints, breaks and punctures sealed with appropriate pressure-sensitive foil tape or glass fabric and vapor barrier mastic.
 - .4 Apply 20 gauge galvanized sheet metal corners to all duct work in mechanical rooms.
 - .5 Seal duct insulation vapor barrier to air handling unit.
 - .6 At exterior wall, Seal duct insulation vapor barrier to building envelope air barrier.
- .3 Flexible Blanket Insulation fastenings:
 - .1 Firmly butt all joints.
 - .2 The longitudinal seam of the vapor barrier must be overlapped a minimum of 50 mm (2").
 - .3 All penetrations and damage to the facing shall be repaired using pressure-sensitive foil tape, or mastic prior to system startup.
 - .4 Pressure-sensitive foil tapes shall be a minimum 75 mm (3") wide and shall be applied with moving pressure using a squeegee or other appropriate sealing tool.
 - .5 Secured to the bottom of rectangular ductwork over 600 mm (24") wide using mechanical fasteners on 450 mm (36") centers. Care should be exercised to avoid over-compression of the insulation during installation.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 21 05 01 Mechanical General Requirements, Section 21 05 02 Mechanical Submittals and Section 21 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

- .1 In accordance with Section 21 05 01 Mechanical General Requirements.

1.3 WIRING

- .1 If departures from the contract drawings are deemed necessary, details of such departures, including changes in related portions of the project and the reasons therefore, shall be submitted with drawings for approval.
- .2 Incorporate surge transient protection in the design of the system to protect all electrical components in all control equipment.

1.4 SYSTEM DESCRIPTION

- .1 Electrical: Hard wiring between field control devices.

1.5 PERMITS, FEES AND INSPECTIONS

- .1 Control Wiring
 - .1 Wiring shall be installed by an Electrician
 - .2 Electrical Wiring Permits
 - .1 Submit to Electrical Inspection Department and Supply Authority necessary number of Control Drawings and Control Specifications for examination and approval prior to commencement of work
 - .2 Pay associated fees.
 - .3 Furnish Certificates of Acceptance from Inspection Department and authorities having jurisdiction on completion of work.

2 Products

2.1 ELECTRICAL COMPONENTS

- .1 Conduit System: In accordance with Section 26 05 34: Conduits, Conduit Fastenings and Conduit Fittings.
- .2 Wires
 - .1 In accordance with Section 26 05 22 Wires and Cables (0 - 1000 V) and Section 27 05 28 Pathways for Communications Systems except as specified herein.

- .2 Where FT4 jacket is used, jacket to be Yellow.
- .3 All wire to bear CSA Label.
- .4 All wire to be rated at 600 volt.
- .5 All wire to bear CSA Label, 600 volt, FT-4.
- .6 Below 50V control wiring:
 - .1 Minimum No. 14 stranded.
 - .2 Minimum two conductor No. 18 AWG solid copper or No. 20 AWG, stranded twisted pair for field wiring of each digital device.
 - .3 Minimum No. 22 AWG solid copper for multi-conductor wiring having four or more conductors.
 - .4 Minimum two conductor No. 18 AWG, solid copper, or No. 20 AWG, stranded twisted pair, shielded for field wiring of each analog input.
- .3 Junction Pull Boxes And Cabinets
 - .1 In accordance with Section 26 05 31 Splitters, Junction, Pull Boxes and Cabinets.
 - .2 Size to suit the wiring for the control system and to allow for future expansion capabilities specified for the system.
- .4 Outlet Boxes, Conduit Boxes And Fittings:
 - .1 In accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.

2.2 ROOM THERMOSTATS

- .1 Provide thermostats with scale settings and temperature graduations in both Celsius and Fahrenheit units.
- .2 Be tamper proof with locking Allen key operated covers.
- .3 Adjustable with adjustment keys.
- .4 Provide CSA approved for line voltage electric thermostat.
- .5 Approximate thermostat locations are shown on the drawings. All final positions shall be approved by the Consultant.

2.3 THERMOSTAT (HEAVY-DUTY, LINE VOLTAGE: HEATING)

- .1 Heavy-duty line voltage thermostat for heating with:
 - .1 Full load rating: 16 A at 120 V.
 - .2 Temperature setting range: 5° C to 30° C.
 - .3 Thermometer range: 5° C to 30° C.
 - .4 Markings in 5° C increments.
 - .5 Differential temperature fixed at 1.1° C.

2.4 ELECTRONIC CONTROL DAMPER OPERATORS

- .1 Spring return for "fail-safe" in Normally Open or Normally Closed position as indicated.

- .2 Refer to Section 24 33 15 Dampers - Operating for damper size limits. Provide separate actuators per section for multiple section dampers.
- .3 Operator: size so as to control dampers against maximum pressure or dynamic closing pressure (whichever is greater).
- .4 Power requirements: 5 VA maximum at 24 VAC.
- .5 Operating range: 0 - 20 VDC
- .6 Spring return for "fail-safe" in normally open or normally closed position as indicated.
- .7 Provide adjustable external stops to limit stroke in either direction.
- .8 For electric damper operators, only 75% of the manufacturer's rated motor torque shall be used in calculating damper operator requirements.
- .9 Provide multiple operators wired to operate in unison where required.

2.5 DAMPER END SWITCHES

- .1 Activated by damper blade movement and mounted securely on damper frame.
- .2 Rotary action steel slotted lever with plastic roller.
- .3 Two electrically isolated single pole changeover micro switches.
- .4 Contact rating of 10 amperes at 120 V AC.
- .5 CSA approved and bear a ULC label.

3 Execution

3.1 ELECTRICAL GENERAL

- .1 Do complete installation in accordance with requirements of:
 - .1 Electrical Contractor, this specification.
 - .2 CSA 22.1 Canadian Electrical Code.
- .2 Fully enclose or properly guard electrical wiring, terminal blocks, high voltage above 70 V contacts and mark to prevent accidental injury.
- .3 Check factory connections and joints. Tighten where necessary to ensure continuity.
- .4 Holes through exterior wall and roofs: flash and make weatherproof.
- .5 In accordance with Section 27 05 28 Pathways for Communications Systems.

- .6 All EMT conduit stubs are to be “bonded” to ground as required by Canadian Electrical Code.
- .7 Supported independently and not secured to ductwork, piping or electrical conduits except at drops to duct or pipe mounted sensors or actuators.
- .8 Support wiring every 4 feet. Securely anchor to structure or equipment.
- .9 Install all wiring parallel to or at right angles to building lines.
- .10 Install wiring in mechanical, electrical or service rooms exposed. Conceal all other wiring.
- .11 Where equipment, ducts or pipes are insulated, install control wiring on stand-offs.
- .12 Do not cover with insulation.
- .13 Secure approval for damper motor locations and supports.
- .14 Coordinate with all other trades so that piping does not interfere with other work.
- .15 Conduit sizes to suit wiring requirements and to allow for future expansion capabilities specified for systems.
- .16 Maximum conduit fill not to exceed 40%.
- .17 Design drawings do not show conduit layout.
- .18 Tests: use only qualified personnel. Demonstrate that:
 - .1 Circuits are continuous, free from shorts, unspecified grounds.
 - .2 Resistance to ground of all circuits is greater than 50 Megohms.
- .19 Provide Consultant with test results showing locations, circuits, results of tests.
- .20 Wiring in main junction boxes and pull boxes to terminate on terminal blocks only, clearly and permanently identified. Junctions or splices not permitted for sensing or control signal covering wiring.

3.2 CONTROL DEVICES

- .1 Identify each wire, terminal for external connections with permanent number marking identical to diagram.
- .2 Performance Verification:
 - .1 Operate switches and controls to verify functioning.
 - .2 Perform start and stop sequences of contactors and relays.
 - .3 Check that interlock sequences, with other separate related starters, equipment and auxiliary control devices, operate as specified.

3.3 CONTROL COMPONENTS AND MOTOR STARTERS

- .1 AC Current sensors
 - .1 For motor control centers and for individual magnetic starters, AC Current sensors are supplied and installed by Electrical Contractor. Refer to Section 26 29 10 Motor Starters to 600 V and Section 26 24 19 Motor Control Devices. Provide necessary adapters to utilize these devices.
 - .2 For thermal overload switches, AC Current sensors are supplied and installed by this Section.

- .2 Relays and Relay Bases
 - .1 For motor control centers and for individual magnetic starters, relays and relay bases are supplied and installed by Electrical Contractor. Refer to Section 26 29 10 Motor Starters to 600 V and Section 26 24 19 Motor Control Devices. Provide necessary adapters to utilize these devices.
 - .2 For thermal overload switches, relays and relay bases are supplied and installed by this Section.

- .3 The AC Current sensors, Relays and Relay Bases that are provided by Electrical Contractor are for use by the Controls. Provide necessary hardware, adapters and devices as required for the Controls to utilize this equipment. Should modifications be required to the supplied devices to facilitate interfacing with the Controls, all necessary modifications, equipment, programming, etc. shall be carried out by the Controls contractor, at no additional cost to the Owner. Further, if the Controls Contractor modifies the control components located in the starter enclosures, the services of CSA will be required to visit the site and perform a field certification of each modified starter. Include all costs for the field certification in the Controls Contract.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 21 05 01 Mechanical General Requirements, Section 21 05 02 Mechanical Submittals and Section 21 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

- .1 In accordance with Section 21 05 01 Mechanical General Requirements.

2 Products

2.1 PIPE, FITTINGS, COUPLINGS AND JOINTS

- .1 ASME/ANSI B16 series
- .2 Welded pipe and fitting connections where noted on drawing
- .3 Steel Pipe to ASTM A-53/A-135 Grade B.
 - .1 Application: Hydronic
 - .2 NPS 2 and Smaller Pipe Joints:
 - .1 Schedule 40: Screwed or Roll Grooved Couplings.
 - .3 NPS 2½ up to NPS 8 Pipe Joints:
 - .1 Schedule 40: Welded, Flanged, Roll Grooved Couplings.
 - .4 Screwed fittings with Teflon tape.
 - .5 Flanges: plain or raised face.
 - .6 Pipe fittings, screwed, flanged or welded: to ASME/ANSI B16 series
 - .1 Cast iron pipe flanges: Class 125.
 - .2 Malleable iron screwed fittings: Class 150.
 - .3 Steel pipe flanges and flanged fittings, Steel butt-welding fittings
 - .4 Unions, malleable iron
 - .5 Bolts and nuts: to ASME/ANSI B18.2.1 and ASME/ANSI B18.2.2.
- .4 Copper Tube: Type L hard drawn to ASTM B88M.
 - .1 Application: Hydronic
 - .1 Solder/brazing: lead free to ASTM B32.
 - .2 Brazed with Sil-Fos BCuP5: to ANSI/AWS A5.8.
 - .3 Cast bronze threaded fittings.
 - .4 Wrought copper and copper alloy solder joint pressure fittings.
 - .5 Cast copper alloy solder joint pressure fittings.
 - .2 Press Fitting:
 - .1 Application: Hydronic
 - .2 Copper and copper alloy press fittings conforming to material requirements of ASME B16.18 or ASME B16.22 and performance criteria of IAPMO PS 117.
 - .3 EPDM sealing elements for press fittings.

- .4 Factory installed sealing elements.
- .5 Press ends with leakage path feature that assures leakage of liquids from inside the system past the sealing element of an unpressed connection. The function of this feature is to provide the installer quick and easy identification of connections which have not been pressed prior to putting the system into operation.
- .6 Acceptable Material: Viega Copper ProPress fittings.

2.2 ROLL GROOVED COUPLINGS AND FITTINGS

- .1 Where rolled grooved couplings and fittings are used, they shall be of the same manufacturer.
- .2 Grooved products to have current CRN Numbers.
- .3 Ductile iron to ASTM A-536 or malleable iron to ASTM A-47 coupling housings painted with alkyd enamel.
- .4 Rigid Grooved type Couplings: Housings cast with offsetting angle-pattern bolt pads to provide rigidity and system support and hanging in accordance with ANSI B31.1 and B31.9.
- .5 Gaskets: Molded EPDM Compound to ASTM D-2000, -34° C to +120° C temperature range. Suitable all hydronic piping including hot water heating, glycol and chilled water supply and return piping.
- .6 Ductile iron to ASTM A-536 or malleable iron to ASTM A-47 fittings painted with alkyd enamel.
- .7 Coupling Bolts/Nuts: Heat treated carbon steel, track head to ASTM A-183 minimum tensile 110,000 psi.
- .8 Application
 - .1 Flexible couplings: At elbows except at pumps and coil connections.
 - .2 Rigid Couplings: Elsewhere.
- .9 Standard of Acceptance:
 - .1 Victaulic Co. of Canada Style 07 Zeroflex couplings with Grade E gasket, and grooved-end fittings.
 - .2 Victaulic Co. of Canada Style 107 Quick-Vic Installation ready rigid coupling, with EHP gasket for direct stab installation without field disassembly.
 - .3 Victaulic Co. of Canada Style 77 Flexible Couplings
 - .4 Victaulic Co. of Canada Style 117 Quick-Vic Installation ready flexible coupling, with EHP gasket for direct stab installation without field disassembly.
- .10 Acceptable Manufacturers: Anvil Gruvlok

2.3 VALVES

- .1 In accordance with Section 21 05 01 Common Work Results for Mechanical – General.

2.4 RELIEF VALVE PIPING AND DRAINS

- .1 All sizes: Steel Pipe as noted above.

2.5 HANGERS SUPPORTS

- .1 As per Section 23 05 29 Hangers and Supports.

2.6 INSULATION

- .1 As per Section 23 07 00 Mechanical Thermal Insulation

3 Execution

3.1 INSTALLATION

- .1 Cut piping square, ream, ensure free of cuttings and foreign material.
- .2 Install pipes close to building structure to minimize furring, conserve headroom and space. Run piping parallel to walls. Group piping wherever possible.
- .3 Slope piping in direction of flow wherever possible. Slope for positive drainage and venting.
- .4 Use eccentric reducers for pipe size changes at wall fin connections to provide positive drainage or positive venting
- .5 Where pipe sizes differ from connection sizes of equipment, install reducing fittings close to the equipment. Reducing bushings are not acceptable.
- .6 Provide clearance for installation of insulation and access for maintenance of equipment, valves and fittings. Install piping, unions and flanges so that any fixed piping does not interfere with removal of coils, tubes or tube bundles.
- .7 Assemble piping using fittings manufactured to ANSI standards.
- .8 Saddle type branch fittings may be used on mains if branch line is half size or smaller than main. Hole saw or drill and ream main to maintain full inside diameter of branch line prior to welding saddle or installing mechanical T.
- .9 Minimum size NPS 3/4.
- .10 Forced water supply and return piping to be taken off main at 45° angle vertically from each main or branch. All runout made from main using four joint swing connection to permit expansion and avoid strain on equipment.

- .11 Ensure that proper clearance around equipment permits performance of service maintenance, that height clearance for piping is adequate. Check final location with Consultant if different from that shown prior to installation.

3.2 RELIEF VALVE PIPING AND DRAINS

- .1 Turn down at floor drain.
- .2 Cut end of discharge pipe at 45°.

3.3 ROLL GROOVED COUPLINGS AND FITTINGS

- .1 Roll grooved product manufacturer to supply on site product installation training.

3.4 PRESS CONNECTION INSTALLATION

- .1 In accordance with the manufacturer's installation instructions.
- .2 Fully inserted tubing into the fitting and the tubing marked at the shoulder of the fitting.
- .3 Check the fitting alignment against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting.
- .4 Pressed the joints using the tool(s) approved by the manufacturer.

3.5 FLUSHING AND CLEANING

- .1 Refer to Section 23 25 00 HVAC Water Treatment Systems.

3.6 TESTING

- .1 Test system in accordance with Section 21 05 01 Common Work Results for Mechanical – General.
- .2 Repair any leaking joints, fittings or valves and retest.
- .3 For glycol systems, retest after filling with specified quality of glycol.

3.7 CONTROLS

- .1 Install sensor wells and control valves supplied by Controls.

END OF SECTION

1 General

1.1 GENERAL

- .1 The General Conditions of the contract as well as provisions of Division 1 and Section 21 05 01 Common Work Results for Mechanical – General, Section 21 05 02 Common Work Results for Mechanical – Submittals and Section 21 05 03 Common Work Results for Mechanical - Contract Closeout, are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

- .1 In accordance with Section 21 05 01 Common Work Results for Mechanical - General.

2 Products

2.1 AUTOMATIC AIR VENT

- .1 Standard float vent with brass body and NPS 1/8 connection and rated at 690 kPa (100 psig) working pressure.
 - .1 Provide separate gauge cock. Refer to section 23 05 23 Valves
- .2 Float: solid material suitable for 115° C working temperature.
- .3 Standard of Acceptance
 - .1 Standard Vent: Amtrol 701.
- .4 Acceptable Manufacturer:
 - .1 Bell & Gossett
 - .2 Taco Canada Ltd.
 - .3 Tuthill Fill-Rite 150.

3 Execution

3.1 GENERAL

- .1 Install according to piping layout. Pipe drains and blow off connections to nearest drain.
- .2 Maintain proper clearance around equipment to permit performance of service maintenance. Check final location with Consultant if different from that indicated prior to installation.
- .3 Should deviations beyond allowable clearances arise, request and follow Consultant's directive.
- .4 Check that all openings for appurtenances and equipment operating weight conform to shop drawings.
- .5 If accessories, ancillaries, are received knocked down, check assembly with Consultant.

3.2 AIR VENTS

- .1 Install at high points of systems and where indicated.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 21 05 01 Mechanical General Requirements, Section 21 05 02 Mechanical Submittals and Section 21 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

- .1 In accordance with Section 21 05 01 Mechanical General Requirements.

2 Products

2.1 GENERAL

- .1 Capacity: As per schedule on drawing.
- .2 Motor In accordance with Section 21 05 01 Common Work Results for Mechanical General.

2.2 STANDARD CONTINUOUS WALL CONVECTORS

- .1 Finish cabinet with factory applied baked primer coat.
- .2 Provide access doors for valves & vents.
- .3 Provide for noiseless expansion of all components.
- .4 Heating elements: seamless copper tubing, mechanically expanded into flanged collars of evenly spaced aluminum fins, 100 x 100 mm (4" x 4") nominal, suitable for sweat fittings.
- .5 Element hangers: ball bearings or Teflon cradle type providing unrestricted longitudinal movement on enclosure brackets. Space brackets 900 mm (36") centers maximum and within 300 mm (12") of joint.
- .6 Standard enclosures:
 - .1 Minimum 1.6 mm (16 Ga.) thick steel complete with die formed end caps having no knock-outs, with inside corners, outside corners, as indicated.
 - .2 Full length channel at top of wall edge.
 - .3 Height as indicated.
 - .4 Support rigidly top and bottom, on wall mounted brackets.
 - .5 Joints and filler pieces to be clear of cover grilles.
 - .6 Slip joint construction.
- .7 Where wall to wall, allow sufficient space for end cap removal but not greater than 3".

- .8 Where wall to wall, provide wall to wall enclosure with wall trim. Trim the wall trim piece to match the contour of the wall and trim edge of the wall trim so that the wall trim doesn't cover any of the radiation grille.
- .9 Dimensions for enclosures: measure site conditions. Do not scale from drawing.
- .10 Prime painted.
- .11 Standard of Acceptance:
 - .1 Engineered Air as per schedule on drawings.
- .12 Acceptable Manufacturers:
 - .1 Rosemex
 - .2 Rittling
 - .3 Trane
 - .4 Sigma Corporation

3 Execution

3.1 INSTALLATION

- .1 Install according to piping layout. Provide for pipe movement during normal operation.
- .2 Maintain proper clearance around equipment to permit performance of service maintenance. Check final location with Consultant if different from that indicated prior to installation.
- .3 Should deviations beyond allowable clearances arise, request and follow Consultant's directive.
- .4 Check that all openings for appurtenances and operating weight conform to shop drawings.
- .5 If accessories, ancillaries, are received knocked down, check assembly with Consultant.
- .6 Venting: Install screwdriver vent on convector, terminating inside access door.
- .7 Clean all finned tubes and comb straight.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 21 05 01 Mechanical General Requirements, Section 21 05 02 Mechanical Submittals and Section 21 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

- .1 In accordance with Section 21 05 01 Mechanical General Requirements.

1.3 GENERAL

- .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.
- .2 Standard: TAB to be to most stringent of this section or TAB standards of AABC NEBB, SMACNA and ASHRAE.
- .3 TAB of all systems, equipment, components and controls specified Mechanical Contractor.

1.4 PURPOSE OF TAB

- .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
- .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.
- .3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.

1.5 EXCEPTIONS

- .1 TAB of systems and equipment regulated by codes, standards to be to satisfaction of authority having jurisdiction.

1.6 CO-ORDINATION

- .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.
- .2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

1.7 PRE-TAB REVIEW

- .1 Review contract documents before project construction is started and confirm in writing to Consultant adequacy of provisions for TAB and all other aspects of design and installation pertinent to success of TAB.
- .2 Review specified standards and report to Consultant in writing all proposed procedures which vary from standard.
- .3 During construction, coordinate location and installation of all TAB devices, equipment, accessories, measurement ports and fittings.

1.8 START-UP

- .1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.
- .2 Follow special start-up procedures specified elsewhere in Mechanical Contractor.

1.9 OPERATION OF SYSTEMS DURING TAB

- .1 Operate systems for length of time required for TAB and as required by Consultant for verification of TAB reports.

1.10 START OF TAB

- .1 Notify Consultant 7 days prior to start of TAB.
- .2 Start TAB only when building is essentially completed, including:
 - .1 Installation of ceilings, doors, windows, other construction affecting TAB.
 - .2 Application of weather-stripping, sealing, caulking.
 - .3 All pressure, leakage, other tests specified elsewhere Mechanical Contractor.
 - .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:
 - .1 Proper thermal overload protection in place for electrical equipment.
 - .2 Air systems:
 - .1 Filters in place, clean.
 - .2 Duct systems clean.
 - .3 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances.
 - .4 Correct fan rotation.
 - .5 Fire and volume control dampers installed and open.
 - .6 Coil fins combed, clean.
 - .7 Access doors, installed, closed.
 - .8 All outlets installed, volume control dampers open.

- .3 Liquid systems:
 - .1 Flushed, filled, vented.
 - .2 Correct pump rotation.
 - .3 Strainers in place, baskets clean.
 - .4 Isolating and balancing valves installed, open.
 - .5 Calibrated balancing valves installed, at factory settings.
 - .6 Chemical treatment systems complete, operational.

1.11 APPLICATION TOLERANCES

- .1 Do TAB to following tolerances of design values:
 - .1 HVAC systems except Dust Collector: plus 10%, minus 5%.
 - .2 Hydronic systems: plus or minus 10%.

1.12 ACCURACY TOLERANCES

- .1 Measured values to be accurate to within plus or minus 2% of actual values.

1.13 INSTRUMENTS

- .1 Prior to TAB, submit to Consultant list of instruments to be used together with serial numbers.
- .2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.
- .3 Calibrate within 3 months of TAB. Provide certificate of calibration to Consultant.

1.14 TAB REPORT

- .1 Format to be in accordance with reference standard.
- .2 TAB report to show all results in units specified on drawings and to include:
 - .1 System schematics.
- .3 Submit 3 copies of TAB Report to Consultant for verification and approval, in D-ring binders, complete with index tabs.

1.15 VERIFICATION

- .1 All reported results subject to verification by Consultant.
- .2 Provide manpower and instrumentation to verify up to 30% of all reported results.
- .3 Number and location of verified results to be at discretion of Consultant.
- .4 Bear costs to repeat TAB as required to satisfaction of Consultant.

1.16 SETTINGS

- .1 After TAB is completed to satisfaction of Consultant, replace drive guards, close all access doors, lock all devices in set positions, ensure sensors are at required settings.
- .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.

1.17 COMPLETION OF TAB

- .1 TAB to be considered complete only when final TAB Report received and approved by Consultant.

1.18 AIR SYSTEMS

- .1 TAB all systems, equipment, components, controls specified Mechanical Contractor.
- .2 Measurements: to include, but not limited to, following as appropriate for systems, equipment, components, controls:
 - .1 Air velocity.
 - .2 Static pressure.
 - .3 Velocity pressure.
 - .4 Air flow rate.
 - .5 Cross sectional area
 - .6 RPM: Fan and Motor
 - .7 Electrical power:
 - .1 Voltage
 - .2 Current draw
- .3 Locations of equipment measurements: To include, but not be limited to, following as appropriate:
 - .1 Inlet and Outlet of each:
 - .1 Fan
 - .2 Coil
 - .3 Filter
 - .4 Damper
 - .5 Other auxiliary equipment
- .4 Locations of systems measurements to include, but not be limited to, following as appropriate:
 - .1 Main ducts
 - .2 Main branch ducts
 - .3 Sub-branch ducts
 - .4 Each supply, exhaust and return air inlet and outlet
 - .5 Other auxiliary equipment
 - .6 All areas served by system

2 Products (N/A)

3 Execution

3.1 TAB AGENCIES:

- .1 Acceptable Agencies
 - .1 Atlantic Indoor Air Audit Co.
 - .2 Barrington Air Balance Service
 - .3 Griffin Air Balance Limited
 - .4 Scotia Air Balance 1996 Limited
 - .5 System Balance Limited

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 21 05 01 Mechanical General Requirements, Section 21 05 02 Mechanical Submittals and Section 21 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

- .1 In accordance with Section 21 05 01 Mechanical General Requirements.

2 Products

2.1 SEAL CLASSIFICATION

- .1 Ductwork classification as follows:

Maximum Pressure	SMACNA Seal Class
500 Pa	C
- .2 Class C: transverse joints and connections made air tight with gaskets, sealant and tape or combination thereof. Longitudinal seams unsealed.

2.2 GALVANIZED STEEL

- .1 Lock forming quality: to ASTM A653, Z90 zinc coating.
- .2 Thickness, fabrication and reinforcement: to ASHRAE and SMACNA or as indicated.
- .3 Minimum 26 gauge
- .4 Satin coat for all exposed ductwork outside mechanical rooms.
- .5 Use oil free material and take all necessary measures to prevent contamination
- .6 Joints: to ASHRAE and SMACNA and/or proprietary manufactured duct joint.
 - .1 Acceptable Material: for proprietary joints:
 - .1 Ductmate Canada Ltd.
 - .2 Exanno Nexus

2.3 RECTANGULAR DUCTWORK

- .1 Cross break ducts 450 mm (18") and larger for stiffening.
- .2 Same gauge on all sides and based on the greater cross sectional dimension.
- .3 Reinforce flat slip joints of ducts over 450 mm (18").

2.4 ROUND DUCTWORK

- .1 Factory fabricated conduit consisting helically wound galvanized steel straps with spiral lock seams.
- .2 For concealed branch ductwork up to 350 mm (14") diameter, longitudinal seams.
- .3 Rectangular ductwork may be convert to equivalent size round provided that the project space limitations are properly addressed.
- .4 Use conical "T"s for 90⁰ Branch takeoff
- .5 Use long radius elbows where space permits.
- .6 Galvanized steel of the following minimum gauges:

Duct Diameter	Straight Lengths of Spiral Duct Gauge	Round Duct fittings	Plain Duct Gauge
200 mm and smaller	26	24	24
225-350	26	24	24
375-650	24	20	N/A
685-915	22	20	N/A

2.5 FITTINGS

- .1 Fabrication: to SMACNA.
- .2 Radiused elbows:
 - .1 Rectangular: Standard radius (Centerline radius 1.5 times width of duct) or short radius with single thickness turning vanes.
 - .2 Round: Smooth radius or 5 piece. Centerline radius is 1.5 times diameter.
- .3 Mitered elbows, rectangular:
 - .1 To and including 400 mm: Single thickness turning vanes.
 - .2 Over 400 mm: Double thickness turning vanes.
- .4 Branch Ducts
 - .1 Rectangular: Refer to Details on drawings.
 - .2 Round: Conical T as per SMACNA
- .5 Main supply duct branches without splitter damper. Provide branch and main duct balancing dampers.
- .6 Sub branch duct with 45° entry and balancing damper on branch.

- .7 Transitions:
 - .1 Diverging: 20° maximum included angle.
 - .2 Converging: 30° maximum included angle.
- .8 Offsets: square elbows and/or full radiused elbows as indicated.
- .9 Obstruction deflectors: maintain full cross-sectional area. Maximum included angles as for transitions.

2.6 FIRESTOPPING

- .1 Retaining angles all around duct, on both sides of fire separation.
- .2 Firestopping material and installation must not distort duct.

2.7 SEALANT

- .1 Sealant: non-flammable, water base duct sealant.
- .2 Temperature range of -30° C to +93° C.
- .3 Flame spread rating of not more than 25.
- .4 Smoke developed classification of not more than 50.
- .5 Standard of Acceptance:
 - .1 Duro Dyne DSW

2.8 TAPE

- .1 Poly-vinyl treated, open weave fiberglass tape.
- .2 50 mm (2") wide.
- .3 Standard of Acceptance:
 - .1 Duro Dyne FT-2.

2.9 HANGERS AND SUPPORTS

- .1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct.
- .2 Maximum size rectangular and round duct supported by strap hanger: 500 mm (20").
- .3 Rectangular Hangers: angle iron with steel rods to ASHRAE and SMACNA following table:

<u>Duct Size</u>	<u>Angle Size</u>	<u>Rod Size</u>	<u>Spacing</u>
up to 750 mm	25 x 25 x 3mm	6 mm	2400 mm
751 to 900 mm	38 x 38 x 3 mm	6 mm	2400 mm
901 to 1500 mm	38 x 38 x 3 mm	10 mm	2400 mm
1501 to 2100 mm	50 x 50 x 3 mm	10 mm	1500 mm
2101 and over	50 x 50 x 6 mm	10 mm	1500 mm

- .4 Round Hangers: strap/band with steel rods to ASHRAE and SMACNA following table:

<u>Duct Size</u>	<u>Strap Size</u>	<u>Rod Size</u>	<u>Spacing</u>
up to 610 mm	25 x 0.85 mm	6 mm	2400 mm
611 to 900 mm	25 x 1 mm	10 mm	2400 mm

- .5 Upper attachment:

.1 As per Section 23 05 29 Hangers and Supports

- .6 Middle attachment (Rod):

.1 As per Section 23 05 29 Hangers and Supports

3 Execution

3.1 GENERAL

- .1 Install ducts in accordance with ASHRAE and SMACNA.
- .2 Support risers in accordance with ASHRAE and SMACNA.
- .3 Install breakaway joints in ductwork on each side of fire separation.
- .4 Seal between ducts and walls of mechanical room.
- .5 Where ducts are shown passing through rated fire separations provide fire dampers (in accordance with Section 24 33 16, Dampers Fire) and associated angle frames as per fire damper manufacturer's recommendations

3.2 HANGERS

- .1 Strap hangers: install in accordance with SMACNA.
 - .1 Minimum 25 mm (1") wide extending down 2 sides and 50 mm (2") under duct.
 - .2 Fasten to sides and bottom of duct.
- .2 Angle hangers: complete with locking nuts and washers.
 - .1 Rod attached to angle within 50 mm (2") of the duct sides.

3.3 SEALING & TAPING

- .1 Apply sealant to outside of joint to manufacturer's recommendations.

- .2 Bed Tape in sealant and recoat with minimum of 1 coat of seal and to manufacturer's recommendation.

3.4 PROTECTION AND CLEANING

- .1 Seal and protect open ends of ductwork continuously during construction.

3.5 CONTROL DAMPERS

- .1 Install control dampers supplied by Section 24 33 15 Dampers - Operating and supplied with fans.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 21 05 01 Mechanical General Requirements, Section 21 05 02 Mechanical Submittals and Section 21 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

- .1 In accordance with Section 21 05 01 Mechanical General Requirements.

2 Products

2.1 ACCESS DOORS IN DUCTS

- .1 Non-insulated ducts:
 - .1 Sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 26 Ga. thick complete with sheet metal angle frame.
 - .1 Gasketed, Frameless or Framed.
- .2 Insulated ducts:
 - .1 Sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 26 Ga. thick complete with sheet metal angle frame and insulation thickness as per adjacent duct.
 - .1 Gasketed or Framed.
 - .2 Standard of Acceptance:
 - .1 Kees FH-IS with door insulation thickness as per adjacent duct.
- .3 Intake and exhaust plenums:
 - .1 Hinged.
 - .2 Gasketed
 - .3 Flanged mounted.
 - .4 Insulation stop.
- .4 Hardware for framed:
 - .1 Up to 300 x 300 mm (12" x 12") 2 sash locks
 - .2 325 mm to 450 mm (13" to 18") 4 sash locks
 - .3 Safety chain except for hinged.
 - .4 Lift out handle for access doors 450 x 450 mm (18" x 18") and over.
 - .5 Access doors into intake and exhaust plenums.
 - .1 Gasketed
 - .2 Hinged
 - .3 Flanged mounted.
 - .4 Insulation stop

- .5 For round ducts up to 16", provide sheet metal rolled to duct size with gasket, hinge and latches (file of sharp edges of duct opening). For round ducts over 16", provide square duct adapter and access doors.

2.2 FLEXIBLE CONNECTIONS

- .1 Frame: galvanized sheet metal frame 1.6 mm (16 Ga.) thick with fabric clenched by means of double locked seams.
- .2 Material: Fire resistant, self extinguishing, neoprene coated glass fabric, temperature rated at -40° to +90° C, density of 1.3 kg/m².

2.3 TURNING VANES

- .1 Factory or shop fabricated single thickness without trailing edge, to recommendation of SMACNA.

2.4 BALANCING DAMPERS

- .1 Standoffs for insulated ducts.
- .2 Splitter Dampers
 - .1 Single thickness construction of same material as duct but one sheet metal thickness heavier.
 - .2 Control rod with locking device.
 - .3 Bend end of rod to prevent end from entering duct.
 - .4 Pivot: piano hinge.
- .3 Single Blade Dampers
 - .1 Of same material as duct, but one sheet metal thickness heavier. V-groove stiffened.
 - .2 Size and configuration to SMACNA, except maximum height 250 mm (10").
 - .3 Locking quadrant.
 - .4 Inside and outside end bearings.
- .4 Multi-Bladed Dampers
 - .1 Factory manufactured of material compatible with duct.
 - .2 Opposed blade: configuration to SMACNA.
 - .3 Maximum blade height: 100 mm (4").
 - .4 Bearings: pin in bronze bushings.
 - .5 Linkage: shaft extension with locking quadrant.
 - .6 Channel frame of same material as adjacent duct, complete with angle stop.

2.5 NON-METALLIC ACOUSTIC INSULATED FLEXIBLE DUCTWORK

- .1 Pressure drop coefficients listed below are based on relative sheet metal duct pressure drop coefficient of 1.00.

- .2 Flame spread rating not to exceed 25. Smoke developed rating not to exceed 50.
- .3 Factory Fabricated, non-collapsible, coated mineral base perforated fabric type helically supported by steel wire with factory applied flexible glass fiber acoustic insulation with vapour barrier.
- .4 Performance: Working pressure: -125 Pa to 1500 Pa (-1/2" to + 6" WG.), R = 4.2
- .5 Acceptable material:
 - .1 Thermaflex M-KE.
 - .2 Dundas Jafine SPC

2.6 BOND CONNECTIONS

- .1 6 mm x 40 mm long grounding bolts
- .2 Hex nuts and star washers.
- .3 #12 AWG bonding conductor with Green jacket or round tinned Copper Braid with crimped lugs of equivalent AWG.

3 Execution

3.1 INSTALLATION

- .1 Install in accordance with recommendations of SMACNA
- .2 Flexible connections.
 - .1 Length of connection: 150 mm (6").
 - .2 Minimum distance between metal parts when system in operation: 75 mm (3").
- .3 Bond connections
 - .1 Bond across each flexible duct connection.
 - .2 Bonding bolts: drill hole, install bolt with star washers both sides and secure with nut.
 - .3 Length of bond connection determined by contractor.
 - .4 Locate bond connection so they are visible from the floor level.
- .4 Access doors:
 - .1 Size:
 - .1 600 x 600 mm (24" x 24") for person size entry and plenums.
 - .2 300 x 300 mm (12" x 12") for service entry.
 - .2 Location:
 - .1 At fire dampers.
 - .1 Minimum 300 x 300 mm (12" x 12") for ducts where both dimensions are under 450 mm (18").

- .2 Minimum 450 x 450 mm (18" x 18") for ducts where both dimensions are 450 mm (18") and over.
- .3 Locate as close as possible to fire damper.
- .4 If requested, Demonstrate that fire damper links can be replaced.
- .2 At control dampers, person size for access to linkage.
- .3 At plenums, intake and exhaust.
- .4 At devices requiring maintenance.
- .5 At locations required by code.

3.2 FLEXIBLE DUCT INSTALLATION

- .1 Install in accordance with SMACNA.
- .2 Maximum 15° change in direction in flexible ductwork. For changes in direction of more than 15°, use rigid ductwork for the change.
- .3 Fasten flexible duct to rigid duct with sheet metal screws adjacent to the flexible duct wire and tape flexible duct ends.

3.3 BALANCING DAMPERS

- .1 Install balancing dampers for all branch supply, return and exhaust ducts.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 21 05 01 Mechanical General Requirements, Section 21 05 02 Mechanical Submittals and Section 21 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

- .1 In accordance with Section 21 05 01 Mechanical General Requirements.

2 Products

2.1 OPERATING DAMPERS

- .1 Sizes:
 - .1 Blades maximum 150 mm (6") wide and 1200 mm (48") long.
 - .2 Modular maximum 1525 mm (60") wide and 1525 mm (60") high.
 - .3 Multiple sections with stiffening mullions and separate actuators.
- .2 Materials:
 - .1 Frame: extruded aluminum.
 - .2 Blades: extruded aluminum.
 - .3 Bearings: Nylon.
 - .4 Provide additional thrust bearings for vertical blades.
 - .5 Linkage: zinc plated steel.
 - .6 Seals: PVC and/or SS spring on side, top and bottom of frame and along all blade edges and blade ends.
- .3 Performance characteristics:
 - .1 2% maximum allowable leakage against 2.5 kPa (10" w.g.) differential.
 - .2 Temperature range minus 40° C to 90° C.
- .4 Flanged to duct connection
- .5 Insulated Dampers
- .6 Standard of Acceptance:
 - .1 Insulated: T. A. Morrison Series 9000.
- .7 Acceptable Manufacturer
 - .1 Alumavent
 - .2 Nailor Industries
 - .3 Ruskin with T-Flange Frame
 - .4 Trolec
 - .5 Ventex

3 Execution

3.1 INSTALLATION

- .1 Install in accordance with recommendations of SMACNA

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 21 05 01 Mechanical General Requirements, Section 21 05 02 Mechanical Submittals and Section 21 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

- .1 In accordance with Section 21 05 01 Mechanical General Requirements.

1.3 MOCKUP

- .1 Refer to Section 21 05 02 Common Work Results for Mechanical - Submittals

2 Products

2.1 FIRE DAMPERS

- .1 Listed and bear label of ULC and shall meet requirements of Provincial Fire Marshal and authorities having jurisdiction.
- .2 Mild steel, factory fabricated for fire rating requirement to maintain integrity of fire wall and/or fire separation.
- .3 Top hinged: round or square; interlocking type
- .4 Fusible link actuated, weighted to close and lock in closed position when released or having negator-spring-closing operator for multi-leaf type or roll door type in horizontal position with vertical air flow.
- .5 Integral Sleeve
 - .1 Minimum 1.3 mm (18 Ga.)
 - .2 Minimum 450mm (18") long.
 - .3 Extend minimum 150 mm (6") on both sides of wall.
 - .4 Extend minimum 150 mm (6") above and below floor assembly.
- .6 Acceptable Manufacturer:
 - .1 Alumavent
 - .2 AMI
 - .3 E. H. Price
 - .4 Leader
 - .5 Nailor Industries
 - .6 Penn Ventilator Canada Ltd.
 - .7 Ruskin.
 - .8 Ventex

3 Execution

3.1 INSTALLATION

- .1 Install fire dampers in accordance with National Building Code and fire damper manufacturer's requirements.
- .2 For wall installation, utilize the "Two Angle" installation method except at "Grille Mount"
- .3 For floor installation, utilize the "Two Angle" or "One Angle" installation method.
- .4 For proprietary manufactured duct joint (such as Ductmate), utilize plastic cleats.
- .5 Maintain integrity of fire wall and/or fire separation.
- .6 After completion and prior to concealment obtain approvals of complete installation.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 21 05 01 Mechanical General Requirements, Section 21 05 02 Mechanical Submittals and Section 21 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

- .1 In accordance with Section 21 05 01 Mechanical General Requirements.

2 Products

2.1 FANS GENERAL

- .1 Capacity: airflow, static pressure, rpm, bhp, motor, model, size, sound power data and as indicated on schedule.
- .2 Fans: statically and dynamically balanced, constructed in conformity with AMCA 99.
- .3 Sound ratings: comply with AMCA (Air Moving and Conditioning Association) 301, tested to AMCA 300.
- .4 Performance ratings: based on tests performed in accordance with ANSI/AMCA 210, and ANSI/ASHRAE 51.
- .5 Motors: In accordance with Section 21 05 01 Common Work Results for Mechanical General.
- .6 Accessories and hardware: matched sets of V-belt drives, adjustable slide rail motor bases, belt guards, coupling guards, fan safety screens, and as indicated.
- .7 Factory primed before assembly in colour standard to manufacturer.
- .8 Scroll casing drains: as indicated.
- .9 Bearing lubrication systems plus extension lubrication tubes where bearings are not easily accessible.
- .10 Vibration isolation: to Section 23 05 48 - Vibration Controls.
- .11 Flexible duct connections: to Section 24 33 00 – Air Duct Accessories.

2.2 CENTRIFUGAL FANS

- .1 Fan wheels:
 - .1 Welded steel construction.
 - .2 Maximum operating speed of centrifugal fans not more than 50% of first critical speed.
 - .3 Air foil, forward curved, backward inclined blades, as indicated.
- .2 Bearings: split pillow-block grease lubricated ball or roller self-aligning type with oil retaining, dust excluding seals and a certified minimum rated life of 200,000 h in accordance with (Anti-Friction Bearing Manufacturers Association) AFBMA L-10 life standard. Bearings to be rated and selected in accordance with AFBMA 9 and AFBMA 11.
- .3 Housings:
 - .1 Volute with inlet cones: fabricated steel for wheels 300 mm or greater, steel for smaller wheels, braced, and with welded supports.

2.3 FAN SELECTIONS

- .1 Based on Manufacturer named as Standard of Acceptance. The approval of equipment of other manufacturers named in the acceptable materials list shall be subject to meeting the performance and sound power levels. The fan manufacturer shall also be responsible for all electrical changes caused by the change in motor size.

3 Execution

3.1 FAN INSTALLATION

- .1 Install fans as indicated, complete with resilient mountings specified in Section 23 05 48 - Vibration Controls, flexible duct connections in accordance with Section 24 33 00 – Air Duct Accessories.
- .2 Provide sheaves and belts required for final air balance.
- .3 Access doors and access panels to be easily accessible.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 21 05 01 Mechanical General Requirements, Section 21 05 02 Mechanical Submittals and Section 21 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

- .1 In accordance with Section 21 05 01 Mechanical General Requirements.

2 Products

2.1 FANS GENERAL

- .1 In accordance with Section 24 34 00 HVAC Fans.
- .2 Motor: In accordance with Section 21 05 01 Common Work Results for Mechanical - General
- .3 Capacity: airflow/static pressure rpm, motor, model and size and sound ratings as per schedule on drawings.
- .4 Statically and dynamically balanced.
- .5 Bear AMCA Certified Air Performance Rating Seal.
- .6 Bearings: sealed lifetime bearings or of self aligning type with oil retaining, duct excluding seals and a certified minimum rated life of 80,000 h in accordance with AFBMA L10 life standard. Bearings to be rated and selected in accordance with AFBMA9 and AFBMA 11.

2.2 ROOF EXHAUST FAN

- .1 Centrifugal V belt driven.
- .2 Spun aluminum housing complete with resilient mounted motor and fan.
- .3 Aluminum backward inclined wheel.
- .4 Aluminum pre-punched base with welded corners
- .5 Adjustable motor sheave.
- .6 Mesh 13 mm (1/2") diameter aluminum birdscreen.
- .7 Disconnect within fan housing.

- .8 Cadmium plated securing bolts and screws.
- .9 Standard of Acceptance:
 - .1 Loren Cook Co. as per schedule on drawings.
- .10 Acceptable Manufacturer:
 - .1 Acme
 - .2 Penn Ventilator Co. Inc.
 - .3 Greenheck.
 - .4 Jenco Fan Inc.

2.3 CENTRIFUGAL CABINET FAN

- .1 Centrifugal direct drive.
- .2 Back draft damper.
- .3 Galvanized steel housing.
- .4 Disconnect within fan housing.
- .5 Inlet grille or inlet collar as indicated.
- .6 Acoustically lined housing.
- .7 Standard of Acceptance:
 - .1 Loren Cook Co. as per schedule on drawings.
- .8 Acceptable Manufacturer:
 - .1 Acme
 - .2 Penn Ventilator.
 - .3 Greenheck.
 - .4 Jenco Fan Inc.

3 Execution

3.1 INSTALLATION

- .1 Provide fan sheaves required for final air balance.
- .2 Coordinate roof and wall openings with other trades.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 21 05 01 Mechanical General Requirements, Section 21 05 02 Mechanical Submittals and Section 21 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 21 05 01 Mechanical General Requirements.

1.3 MANUFACTURED ITEMS

.1 Product of one manufacturer for generic type, i.e. grilles and registers by one, diffusers by one, or same.

2 Products

2.1 GENERAL

.1 Capacity: As per schedule on drawing.

.2 Provide standard product to meet capacity, throw, noise level, throat and outlet velocity.

.3 Frames:

.1 Steel: standard with exposed welded joints and mitered corners.

.2 Aluminum: extruded with mechanical fasteners and mitered corners.

.4 Finish: Off white baked enamel.

.5 Diffusers

.1 Square type.

.2 Fixed pattern.

.3 Adjustable pattern where noted.

.4 Plaster frame where installed in drywall ceilings.

.6 Standard of Acceptance:

.1 E. H. Price as per schedule.

.7 Acceptable Manufacturer:

.1 Krueger

.2 Titus

.3 Nailor Industries

2.2 FIRE STOP FLAPS & BLANKET

- .1 ULC listed and labeled.
- .2 Construct of minimum 1.6 mm (16 Ga.) thick sheet steel with 1.6 mm (1/16") thick non-asbestos ULC listed insulation and corrosion-resistant pins and hinges.
- .3 Flaps to be held open with fusible link conforming to ULC-S505-1974 and close at 75° C or as indicated.
- .4 Thermal Blanket:
 - .1 Non-asbestos ceramic thermal blanket.
 - .2 Follow slope of diffusers.
- .5 Acceptable Material:
 - .1 E. H. Price CK-2000-1 3.2 mm (1/8")
 - .2 Nailor Industries 0725
 - .3 Ruskin K-H
 - .4 AMI CTB and AMI-55CRD

2.3 ELECTRIC DUCT HEATERS

- .1 Bear CSA label.
- .2 Galvanized steel frame.
- .3 Open coil elements made of nickel-chromium designed for minimum airflow.
- .4 Ceramic coil support.
- .5 Silent mercury contactors with 24 volt coil.
- .6 Control transformer with fused secondary.
- .7 Built-in, prewired pressure differential switch.
- .8 Power and control terminals.
- .9 Primary thermal cutout (Hi Limit).
- .10 Disconnect switch.
- .11 Stages as indicated.
- .12 Suitable for airflow indicated.

- .13 Standard of Acceptance:
 - .1 Chromalax as per drawings.

- .14 Acceptable Material:
 - .1 E. H. Price
 - .2 Neptronic
 - .3 PM Wright
 - .4 Titus
 - .5 Thermolec
 - .6 Nailor Industries

3 Execution

3.1 INSTALLATION

- .1 Install with flat head cadmium plated screws in countersunk holes where fastenings are visible.

3.2 FIRE STOP FLAPS & BLANKET

- .1 Provide for grilles, registers and diffusers in all fire rated ceilings.

3.3 ELECTRIC DUCT HEATERS

- .1 Submit start-up report for each unit following TAB including the following:
 - .1 Measured voltage
 - .2 Measured Amperage
 - .3 Control sequenced verification

END OF SECTION

General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 21 05 01 Mechanical General Requirements, Section 21 05 02 Mechanical Submittals and Section 21 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

- .1 In accordance with Section 21 05 01 Mechanical General Requirements.

1.3 OPERATION AND MAINTENANCE DATA

- .1 In accordance with Section PT 24 74 02 Packaged Outdoor HVAC Equipment Heat Recovery

2 Products

2.1 GENERAL

- .1 Service during Enthalpy Type Air to Air Rotary Heat Exchanger warranty period: Provide parts and labor service during the building and extended warranty for the heat recovery devices including a minimum of four (4) visits and materials and provide a written report confirming operation of the heat recovery device.

2.2 HEAT RECOVERY UNITS

- .1 Indoor draw through heat recovery unit consisting of heat recovery cores, ventilation air fan, exhaust air fan, necessary dampers, temperature sensors, and microprocessor controls.
- .2 Unit Cabinet
 - .1 Constructed of 20 gauge G60 mill galvanized steel.
 - .2 Insulated throughout with 20 mm ($\frac{3}{4}$ "") foil faced fire retardant material.
 - .3 Full access door on side of cabinet shall hinge up and be fully removable.
- .3 Heat Recovery Cores
 - .1 Rugged aluminum cores designed for cross flow air to air heat exchange.
 - .2 Cross leakage less than 2%.
 - .3 Fully removable for cleaning.
- .4 Drain Pans
 - .1 Sloped drain pans with recessed bottom drains with NPS 3/4 NPT male fittings.

- .5 Fans
 - .1 Direct drive, double inlet fan wheels with forward curve blades designed for continuous operation at all operating speeds. Fan wheels shall be mill galvanized steel.
- .6 Motors
 - .1 3 speed permanent split capacitor type motors.
 - .2 4 pole type operating at 1625 RPM.
- .7 Electrical Requirements
 - .1 Single point power connection.
 - .2 120/1.
- .8 Filtration
 - .1 20 pores per inch, permanent, washable, foam filters.
- .9 Controls
 - .1 Factory mounted and factory wired microprocessor control operating on 120 volt/1 phase/60 Hz current.
 - .2 Quick disconnect type. Service connections.
 - .3 Door interlock switch to disconnect power when access door is opened.
 - .4 Remote fan interlock on call for ventilation.
 - .5 Selection of low or medium speed as minimum setting.
 - .6 3 stage defrost time control.
- .10 Standard of Acceptance
 - .1 Nu-Air Ventilation Systems Inc.
- .11 Acceptable Manufacturers
 - .1 Lifebreath by Nutech Energy Systems
 - .2 Venmar CES Ventilation.

3 Execution

3.1 INSTALLATION

- .1 Support independently of adjacent ductwork.

3.2 START-UP

- .1 Utilize factory trained technician.
- .2 Submit written start-up report for each unit including the following:
 - .1 Confirmation of equipment installation is in accordance with manufacturer's recommendations.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 21 05 01 Mechanical General Requirements, Section 21 05 02 Mechanical Submittals and Section 21 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

- .1 In accordance with Section 21 05 01 Mechanical General Requirements.

1.3 WARRANTY

- .1 For refrigeration compressors, the building warranty period is extended to 5 years.
- .2 If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer. This warranty does not include labor.

2 Products

2.1 GENERAL

- .1 DX refrigeration.
- .2 Bear CSA label.
- .3 Rated in accordance with ARI Standard 210 and bear the ARI label.
- .4 A full charge of R-410-A for 7500 mm (25 feet) of refrigerant tubing shall be provided in the condensing unit.
- .5 A dry air holding charge shall be provided in the evaporator.
- .6 System efficiency shall meet or exceed 10.0 SEER.

2.2 PERFORMANCE

- .1 Based on 26.6° C DB, 19.4° C WB for the indoor unit and 35° C DB, 23.8° C WB for the outdoor unit.

2.3 INDOOR UNIT

- .1 General:
 - .1 Factory assembled, wired and run tested. Contained within the unit all factory wiring, piping, control circuit board and fan motor.

- .2 Have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function and a test run switch. Indoor unit and refrigerant pipes will be charged with dry air instead of R22 before shipment from the factory.
- .3 White finish casing.
- .2 Coil:
 - .1 Nonferrous construction with smooth plate fins on copper tubing.
 - .2 The tubing inner grooves for high efficiency heat exchange.
 - .3 All tube joints brazed with phoscopper or silver alloy.
 - .4 Pressure tested at the factory.
 - .5 A condensate pan and drain provided under the coil.
 - .6 Condensate pump able to raise drain water 825 mm (33") above the condensate pan.
- .3 Electrical:
 - .1 120 volts, 1 phase, 60 hertz.
- .4 Wall Units
 - .1 Consist of a slim silhouette, compact wall mounted evaporator section with wireless controller.
 - .2 Multi directional drain and refrigerant piping offering four (4) directions for refrigerant piping and two (2) directions for draining shall be standard.
 - .3 There shall be a separate back plate which secures the unit firmly to the wall.
 - .4 Fan:
 - .1 Line-flow fan direct driven by a single motor.
 - .2 The fan shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings.
 - .3 A manual adjustable guide vane shall be provided with the ability to change the airflow from side to side (left to right).
 - .4 A motorized air sweep flow louver shall provide an automatic change in airflow by directing the air up and down to provide for uniform air distribution.
 - .5 Three (3) speeds, High, Medium and Low.
 - .5 Filter: Return air shall be filtered by means of an easily removable washable filter.
 - .6 Filter: Return air filtered by means of a long-life filter to provide approximately 2,500 hours of use in a normal office environment before cleaning.
- .5 Wireless Control for Wall Units
 - .1 Wireless controller to perform input functions necessary to operate the system.
 - .2 Power On-Off switch, Mode Selector, Temperature Setting, Timer Control, Fan Speed Select and Auto Vane selector.
 - .3 Temperature changes by 1° C increments with a range of 18 – 30° C.

- .4 The microprocessor located in the indoor unit shall have the capability of sensing return air temperature and indoor coil temperature, receiving and processing commands from the wireless controller, providing emergency operation and controlling the outdoor unit.
- .5 12 volts, DC control voltage between the indoor unit and the outdoor unit.
- .6 Capable of automatic restart when power is restored after power interruption.
- .7 Control the continued operation of the air sweep louvers, as well as provide on/off and system/mode function switching.

2.4 OUTDOOR UNIT

- .1 General: Designed specifically for use with the indoor units.
- .2 Completely factory assembled, piped and wired.
- .3 Each unit run tested at the factory.
- .4 Unit Cabinet: fabricated of galvanized steel, bonderized and finished with a powder coated baked enamel.
- .5 Fan:
 - .1 Either one or two direct drive propeller type fans.
 - .2 The motor inherent protection, be permanently lubricated bearings.
 - .3 The fan motor mounted for quiet operation.
 - .4 The fan provided with a raised guard to prevent contact with moving parts.
 - .5 Horizontal discharge airflow.
- .6 Coil:
 - .1 Nonferrous construction with lanced or corrugated plate fins on copper tubing.
 - .2 Protected with an integral metal guard.
 - .3 Refrigerant flow from the condenser controlled by means of a metering orifice.
- .7 Compressor:
 - .1 Multiple as required for capacity or multi-evaporators
 - .2 High performance rotary.
 - .3 Crankcase heater factory mounted on the outside of the compressor.
 - .4 Accumulator.
 - .5 Internal thermal overload.
 - .6 High pressure safety switch.
 - .7 Mounted to avoid the transmission of vibration.
 - .8 Capable of operating at -18° C ambient temperature without additional low ambient controls. Wind baffle if required.
- .8 Electrical:
 - .1 208 volts, 1 phase, 60 hertz.
 - .2 Controlled by the microprocessor located in the indoor unit.

- .3 The control voltage between the indoor unit and the outdoor unit shall be 12 volts, DC.

2.5 STANDARD OF ACCEPTANCE

- .1 Mitsubishi as per schedule on drawing

2.6 ACCEPTABLE MANUFACTURERS FOR WALL MOUNTED UNITS

- .1 Eubank to the requirements listed above.
- .2 Friedrich to the requirements listed above.
- .3 Fujitsu to the requirements listed above.
- .4 Hitachi to the requirements listed above.
- .5 Samsung to the requirements listed above.

2.7 REFRIGERATION PIPING

- .1 Between compressor, outdoor coil and indoor coil, complete with all refrigerant metering devices and valves.

.2 TUBING

- .1 For halogenetic refrigerants.
- .2 Deoxidized, dehydrated and sealed.
- .3 Annealed copper tube: to ASTM B280, with minimum wall thickness as per CSA B52 and ANSI/ASME B31.5.
- .4 Size: as per manufacturer's recommendations.

.3 FITTINGS

- .1 Service: design pressure 2000 kPa (300 psi) and temperature 121° C.
- .2 Brazed: wrought copper to ANSI/ASME B16.22.

.4 JOINTS

- .1 Brazing materials conform to ANSI/AWS A5.8 and be SIL-FOS-15 phosphor-copper-silver alloy for copper piping jointed by copper fittings; silver solder for brass fittings; 95-5 solder for connections to equipment or accessories.

2.8 REFRIGERATION PIPE INSULATION

- .1 Components of insulation system to have maximum flame spread rating of 25 and maximum smoke developed rating of 50 in accordance with CAN/ULC-S102.

- .2 Flexible elastomeric pipe insulation
 - .1 Application: All refrigeration discharge, hot gas and liquid lines.
 - .2 Thickness: 25 mm (1").
 - .3 Acceptable Material:
 - .1 AP Armaflex by Armacell
- .3 Insulation Support System
 - .1 Application at: Pipe Supports.
 - .2 Thickness: As per adjacent insulation.
 - .3 Acceptable Material:
 - .1 Armafix IPH pipe hanger by Armacell
- .4 Joint Sealer
 - .1 Acceptable Material:
 - .1 Armstrong 520
- .5 Insulation Tape
 - .1 Acceptable Material:
 - .1 Armstrong AP Tape by Armacell
- .6 Exterior finish
 - .1 Aluminum alloy: Apply in accordance with ASTM B209M.
 - .2 Application: Exterior refrigerant piping.
 - .3 Crimped or embossed jacketing 0.4 mm (0.016") thick with longitudinal slip joints and 50 mm (2") end laps with factory attached protective liner on interior surface. Aluminum alloy butt straps with mechanical fasteners.
 - .4 On fittings: 0.4 mm (0.016") thick, die shaped components with factory attached protective liner on interior surface.

3 Execution

3.1 INSTALLATION

- .1 Install unit flat and level.
- .2 Secure with hold-down bolts.
- .3 Make all piping connections.
- .4 Nothing to obstruct ready access to all components or to prevent removal of components for servicing.
- .5 Provide refrigerant piping between Indoor and Outdoor Section.

3.2 PIPING INSTALLATION

- .1 Purge refrigerant lines and fittings.
- .2 When multiple runs are installed, spread pipes 6" minimum to allow for expansion and contraction.

- .3 Install straight, parallel and close to walls and ceilings, with specified pitch.
- .4 Keep elbows and fittings to minimum.
- .5 Correlate equipment provided with Consultant and propose changes to line sizing required, before proceeding with installation.
- .6 Grade horizontal pipe carrying gases 1:240 down in direction of flow.
- .7 Locate double risers in hot gas or suction piping as required by manufacturer.
- .8 Install piping to prevent condensate or oil from flowing back into compressor or evaporator.
- .9 Connect branch suction lines from top of suction main using wye-fitting. Install ancillaries and accessories such as back pressure compensating regulators and back pressure regulators horizontal.
- .10 To avoid interference with services to compressor, do not obstruct view of oil level bulls-eye or run piping.
- .11 Enclose tubing exposed to mechanical injury in rigid or flexible conduit.
- .12 Keep piping joints sealed except when fabricating.
- .13 Limit breakable joints to equipment connections not normally brazed. Limit flared joints to 10 mm (3/8") nominal OD for field assembly and 16 mm (5/8") nominal OD for factory assembly.
- .14 Bleed dry nitrogen into piping when sweating connections.
- .15 Braze flexible pipe vibration isolators and stub connectors on sealed hermetic compressors using alloys which melt at 620° C, 600° C or below.
- .16 Directly connect vibration isolators to compressor and firmly anchor other end.

3.3 PIPE INSULATION

- .1 Seal all joints. Orient seams to face down
- .2 Provide insulation support system at each pipe support. Seal insulation to insulation support system.

3.4 INSTALLATION AND TESTING

- .1 Install and test in accordance with CSA B52 and ANSI/ASME B31.5.
- .2 Support and protect exposed refrigerant piping on roof to Consultant's satisfaction.

3.5 START-UP

- .1 Startup of unit to be performed by factory authorized and trained mechanics.
- .2 In the presence of and in cooperation with the HVAC unit manufacturer's representative and Electrical Contractor, start-up the unit and ensure that the unit is capable of performing all steps in the sequence of operation.
- .3 Submit start-up report including the following information:
 - .1 Complete unit description.
 - .2 Voltage each phase.
 - .3 Current draw by each piece of equipment.
 - .4 All equipment setpoints which are field adjustable.
 - .5 Refrigeration circuits operating conditions.
 - .6 All information on manufacturer's startup report.

3.6 DRIP PANS

- .1 Provide NPS 1 trapped drain for each drain connection.

END OF SECTION

1 General

1.1 GENERAL

- .1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section. The Executed Agreement including General Conditions and Supplementary Conditions applicable sections of Division 0 and Division 1, Section 26 05 00 Common Work Results for Electrical, Section 26 05 01 Electrical Submittals and Section 26 05 02 Electrical Contract Closeout, applicable drawings and amendments are part of and to be read in conjunction with this Section.
- .2 This section covers items common to all sections of Divisions 26, 27, 28.

1.2 FUNCTIONAL PERFORMANCE TESTING (FPT)

- .1 Refer to Section 26 91 13 Electrical Systems Testing and Verification for Functional Performance Testing (FPT).
- .2 The correction of all electrical deficiencies identified throughout the project associated with the Work shall be a condition of Substantial Performance and shall be corrected prior to achieving Substantial Performance.
- .3 An Owner performed Functional Performance Testing (FPT) Program independent of other processes specified shall be carried out upon receipt of written verification from the General Contractor that:
 - .1 All systems are complete and operational in all respects.
 - .2 All specified reports and documents have been submitted and approved.
 - .3 All tests, commissioning and start-up processes described elsewhere in the specification are complete.
 - .4 All demonstrations have been completed and documented.
 - .5 All defects and deficiencies identified during the commissioning of all electrical systems have been corrected.
- .4 Prior to Functional Performance Testing (FTP), submit the following documentation:
 - .1 Record drawings.
 - .2 Operations and maintenance manuals.
 - .3 Documentations listed in Section 26 05 02 - Electrical Contract Closeout.
 - .4 Written confirmation of System Demonstration and Operating and Maintenance Instructions have been performed in accordance with Section 26 05 02– Electrical Contract Closeout.
- .5 Deficiencies or discrepancies discovered during the FPT process are to be immediately rectified by the Electrical Contractor.
- .6 The contractor shall return copies of the deficiency lists to owner via the Engineer with all corrected items signed off.

1.3 RELATED SPECIFICATIONS THAT FORM PART OF THE ELECTRICAL CONTRACT.

- .1 Commissioning
 - .1 Commissioning of Electrical Systems supplied by the Electrical Contractor.

1.4 INTENT

- .1 It is the intent of these specifications to outline the method, materials, and quality of equipment to be furnished and installed hereinafter specified and/or shown on the drawings.

1.5 DEFINITIONS

- .1 "CONCEALED" - electrical services and equipment in hung ceiling spaces and non-accessible chases and furred spaces.
- .2 "EXPOSED" - will mean "not concealed" as defined herein.
- .3 "PROVIDE"- means supply and install. Wherever in the Contract Documents the word "provide" is used in any form, it shall mean that the Work concerned shall include both supply and installation of the products required for completion of that part of the Work.

2 CODES AND STANDARDS

- .1 Do complete installation in accordance with CSA C22.1-15 except where specified otherwise.
- .2 Ensure that all electrical equipment is field marked to warn persons of the potential electric shock and arc flash hazards, as per CSA C22.1-15, Rule 2-306.
- .3 CSA Z462-15 Workplace Electrical Safety Standard.
- .4 Comply with CSA Certification Standards and Electrical Bulletins in force at time of tender submission.
- .5 Comply with CAN/CSA C860-11 standard for Exit Lights.
- .6 Abbreviations for electrical terms: to CSA Z85-1983.

3 CARE, OPERATION AND START-UP

- .1 Instruct operating personnel in the operation, care and maintenance of equipment.
- .2 Arrange and pay for the services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components.

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

4 VOLTAGE RATINGS

- .1 Operating voltages: to CAN3-C235-83.
- .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard
Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

5 PERMITS, FEES, CONTRIBUTION TO CONSTRUCTION FEES AND UTILITY INSPECTION SERVICES

- .1 Electrical Permits
 - .1 Submit to Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work. Send copy of permit to Engineer.
 - .2 The following electrical permits are required:
 - .1 Electrical Wiring Permit.
 - .2 Communications Cabling Permit.
 - .3 Pay associated fees.
 - .4 Furnish Certificates of Acceptance from Inspection Department and authorities having jurisdiction on completion of work.

6 MATERIALS AND EQUIPMENT

- .1 Provide materials and equipment in accordance Division 1.
- .2 Equipment and material to be CSA certified, and manufactured to standard quoted.
- .3 Factory assembled control panels and component assemblies.
- .4 Arrange and pay for field certification by CSA, as may be required.

7 ELECTRIC MOTORS EQUIPMENT AND CONTROLS

- .1 Supplier and installer responsibility is indicated on the drawings.
- .2 Control wiring and conduit is the responsibility of the electrical contractor, except for conduit, wiring and connections which are related to control systems specified in the mechanical contract documents and shown on mechanical drawings.

8 FINISHES

- .1 Shop finish metal enclosure surfaces by removal of rust and scale, cleaning, application of rust resistant primer inside and outside, and at least two coats of finish enamel.
 - .1 Paint indoor switchgear and distribution enclosures light grey to EEMAC 2Y-1-1958.
- .2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .3 Clean, prime, and paint exposed hangers, racks, fastenings to prevent rusting.
- .4 Where wire guards are specified in other sections, they are to be constructed of stainless steel. Painted steel is not acceptable.

9 WIRING TERMINATIONS

- .1 Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.
- .2 Panel boards are to be equipped in the factory with proper sized lugs to suit the conductor size.
- .3 All stranded conductors (including phase, neutrals, grounds and bonds) prior to terminating under device bolts; i.e. light switches, receptacles, circuit breakers, etc., are to be twisted together so as to form a single conductor.
- .4 Ensure all bonding conductors entering electrical enclosures, such as panel tubs, splitters, junction and pull boxes 150 mm x 150 mm (6 in. x 6 in.) and larger, etc. are terminated on terminal strips which are electrically continuous and fastened to the metal non-current carrying portion of the enclosure with a minimum of two bolts, c/w lock washers.

10 MANUFACTURER'S AND CSA LABELS

- .1 Visible and legible after equipment is installed.

11 WARNING SIGNS

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

12 SINGLE LINE RECORD ELECTRICAL DIAGRAMS

- .1 The Consultant will provide up-dated single line Record electrical drawings to the electrical contractor. The electrical contractor is to provide Plexiglas frames for the following drawings:
 - .1 Structured Wiring System riser.

- .2 Voice and Data Record drawings of the floor plans.
 - .3 Fire Alarm riser.
 - .4 Intrusion Detection System riser.
 - .5 Public Address System riser.
- .2 Provide a legend of the colour coding used to identify the system as detailed in 26 05 03.
- .3 Drawings 600 mm x 600 (24 in. x 24 in.) mm minimum size.
- .4 Locate the following Record drawings in the Storage 232
- .1 Structured Wiring System riser.
 - .2 Voice and Data Record drawings of the floor plans.
 - .3 Fire Alarm riser.
 - .4 Intrusion Detection System riser.
 - .5 Public Address System riser.

13 OUTLETS

- .1 Locate outlets in accordance with Division 1.
- .2 Do not install outlets back-to-back in wall; allow minimum 150 mm (6 in.) horizontal clearance between boxes.
- .3 All outlets shall have brushed stainless steel coverplates regardless of the system involved, including light switches, receptacles, communication outlets, etc.
- .4 Change location of outlets at no extra cost or credit, providing distance does not exceed 3 metres (10 feet), and information is given before installation.
- .5 Locate light switches on latch side of doors. Locate disconnect devices in mechanical rooms on latch side of door.

14 MOUNTING HEIGHTS

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .2 Verify mounting height of equipment before proceeding with installation.
- .3 Confirm with Architectural elevations prior to mounting exterior electrical devices, lights, public address, etc.
- .4 Install electrical equipment at the following heights unless indicated otherwise.
 - .1 Local switches: As indicated.

- .2 Wall receptacles:
 - .1 General: As Indicated.
 - .2 Above top of continuous baseboard heater: 178 mm (7 in.).
 - .3 Above top of counters or splash back: 178 mm (7 in.).
 - .4 In mechanical rooms: 1370 mm AFF (54 in.).
- .3 Panelboards: 1980 mm (78 in) AFF to top of 42 circuit panels.
- .4 Communications system outlets: As Indicated.
- .5 Exit Fixtures: 2286 mm AFF (90 in.) .
- .6 Emergency Lights – 2286 mm AFF (90 in.) .
- .7 Emergency Remote Heads – 2286 mm AFF (90 in.) .
- .8 F/A stations: As indicated.
- .9 F/A signaling units: 305 mm (12 in.) below finished ceiling.

15 PROTECTION

- .1 Protect exposed live equipment during construction for personnel safety.
- .2 Shield and mark live parts "LIVE 120 VOLTS", or with appropriate voltage.
- .3 Arrange for installation of temporary doors for rooms containing electrical distribution equipment. Keep these doors locked except when under direct supervision of electrician.

16 LOAD BALANCE

- .1 Measure phase current to panelboards with normal loads and lighting operating at time of acceptance. Adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
- .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
- .3 Test and record phase and neutral currents on panelboards, operating under normal load. State hour and date on which each load was measured, and voltage at time of test.

17 CONDUIT AND CABLE INSTALLATION

- .1 Install cables, conduits, and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.
- .2 All wiring is to be concealed unless noted otherwise. Where this is not possible due to existing construction, metal surface mounted raceways are to be used. Refer to Specification Section 26 05 33.01.
- .3 Where conduits cross building expansion joints, provide conduit expansion joints with telescoping sleeve and insulated bushings.

18 SLEEVES AND FIRESTOPPING

- .1 Where conduits, cables and cable troughs pass through assemblies, provide firestopping. Refer to Architectural Drawings for location of assemblies.
- .2 Terminate sleeves flush with floor except in mechanical rooms, where sleeves will terminate 50 mm (2 in.) above finished floor.

19 FIELD QUALITY CONTROL

- .1 All electrical work to be carried out by qualified, licensed electricians or apprentices as per the conditions of the Provincial Act respecting manpower vocational training and qualification. Employees registered in a provincial apprentices program shall be permitted, under the direct supervision of a qualified licensed electrician, to perform specific tasks - the activities permitted shall be determined based on the level of training attained and the demonstration of ability to perform specific duties.
- .2 Conduct and pay for tests of the following:
 - .1 Power distribution system including phasing, voltage, grounding and load balancing.
 - .2 Circuits originating from branch distribution panels.
 - .3 Lighting and its control.
 - .4 Motors, heaters and associated control equipment including sequenced operation of system where applicable.
 - .5 Polarity check on all receptacles.
 - .6 Fire Alarm System.
 - .7 Structured wiring system.
 - .8 Public Address Systems.
 - .9 Intrusion Detection System.
 - .10 Emergency lighting system.
 - .11 Exit signage.
- .3 Furnish Manufacturer's, certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.
- .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .5 Submit test results for Engineer's review.

20 DISTRIBUTION SYSTEM EQUIPMENT STARTUP CHECKS

- .1 Panelboards.
 - .1 Review the installation of all panel boards. Include the cost of measuring phase currents and voltages. Clean all panel board tubs. Re-torque all connections within panel boards. Provide written report.

21 MOTOR OVERLOAD OVERCURRENT PROTECTION

- .1 Set and record all motor overload devices in accordance with nameplate information, manufacturer's recommendations and the 2015 edition of the CEC. Ensure proper overcurrent devices are installed. Include these records in the Project Maintenance Manual.

22 SUPPLY CONDUCTOR INSULATION

- .1 Ensure that the insulation rating on branch circuits feeding all electrical loads comply with the 2015 edition of the CEC, and the manufacturer's recommendations.

23 DRAWINGS

- .1 Electrical drawings are not intended to show structural details or architectural features.
- .2 The electrical drawings are not to be scaled.
- .3 Electrical drawings, except where dimensioned, indicate general layouts only. Investigate structural and finish conditions and the work of all other trades affecting this work and arrange work accordingly.
- .4 Coordinate the elevation of all outlet boxes with architectural drawings and report any conflicts to Engineer prior to installation.
- .5 All electrical junction boxes must be accessible at the completion of the project. Coordinate the location of each junction box with the proposed location of mechanical services prior to installation.
- .6 Layouts on the electrical drawings are based on the specified equipment (Standard of Acceptance), including electrical power connections, number of conductors and conduit sizes, and physical dimensions. Alternate equipment and systems proposed by the Contractor for use on this project (Acceptable Manufacturers) which necessitate changes in service connections, numbers of conductors and conduit sizes to perform the specified functions may be considered by the Engineer, however, any required modifications or additions to the electrical contract or the work of other trade contractors shall be done at no additional cost to the Owner. Furthermore, if it is found that the provisions made regarding space conditions and code required clearances are not met, the right is reserved by the Consultant to require installation of the equipment specified (Standard of Acceptance).

24 ACCESS DOORS

- .1 The electrical contractor is to provide access doors to concealed electrical junction boxes, pull boxes and miscellaneous equipment for operating, inspecting, adjusting and servicing. Access doors are to be supplied which meet or exceed the fire resistance rating of the partition or ceiling in which they are being installed. Refer to Architectural drawings for location of fire resistance ratings.

- .2 Do not use access doors provided by other trade contractors for accessing concealed electrical services.
- .3 Flush mounted 600 mm x 600 mm (24 in. x 24 in.) for body entry and 300 mm x 300 mm (12 in. x 12 in.) for hand entry unless otherwise noted. Doors to open 180 degrees, have rounded safety corners, concealed hinges, screwdriver latches and anchor straps.
- .4 Material:
 - .1 Special areas such as tiled or marble surfaces: use stainless steel with brushed satin or polished finish as directed by Consultant.
 - .2 Remaining areas: use prime coated steel.
 - .3 Fire rated where installed in fire rated construction.
 - .4 Provide panels in glazed tile walls of 2.5mm (12 gauge) 304 stainless steel #4 finish, with recessed frames secured with counter-sunk flush-head screws.
 - .5 Provide panels in plaster surfaces with recessed doors with welded metal lath ready to accept plaster and with a plaster grommet for door key access.
 - .6 Provide other access doors of 2.5mm (12 gauge), flush with concealed hinges, anchor strap and lock, all factory prime coated.
 - .7 Supply details of doors prior to installation.
 - .8 Mark all lay-in tiles that are used for access in a manner approved by the Consultant.
- .5 Installation:
 - .1 Locate so that concealed items are accessible.
 - .2 Locate so that hand or body entry (as applicable) is achieved.
 - .3 Installation is specified in applicable sections.
- .6 Acceptable Manufacturers:
 - .1 Acudor
 - .2 LeHage
 - .3 SMS
 - .4 Zurn

25 CONNECTION OF EQUIPMENT

- .1 Provide all connections required by the equipment supplied by this Division.
- .2 Provide all connections required by equipment supplied by the Owner or by other Divisions. Examine all Drawings and Specifications and identify all requirements.
- .3 Provide all necessary accessories to make connections, including flexible connectors, etc.

26 SPRINKLER PROOF HOODS

- .1 All distribution equipment within ventilated enclosures (panelboards, MCCs, etc.) located in the building shall be protected from the direct spray from sprinkler heads to the satisfaction of the Inspection Authority by the use of non-combustible hoods.

- .2 Distribution conduits exiting or entering equipment enclosures equipped with sprinkler hoods shall be installed with raintight EMT connectors equipped with a rubber "O" Ring gasket.

27 CO-ORDINATION

- .1 Co-ordinate the Work of this Division with all other Divisions for locations of openings, spaces, services, sleeves, ducts, pipes, supports, connections, etc. Where conflicts occur, reroute conduits, cable troughs, outlets, lighting, equipment, etc as required. Advise Engineer of proposed changes, and obtain written authorization, prior to proceeding.
- .2 Contractor is to review Architectural millwork drawings and advise the Engineer of any conflicts with lighting and/or electrical outlets. This review is to take place prior to electrical rough-in in all affected areas.
- .3 The layout of electrical equipment within mechanical rooms is approximate only.
- .4 Ensure that the location of all mechanical equipment within mechanical rooms is coordinated with the location of all electrical equipment which resides within these rooms.
- .5 Provide pertinent information to Mechanical contractor to assist him in the installation of mechanical services. This would include routing of all major electrical conduits, etc. Make adjustments as required to coordinate the installation of electrical services and equipment with those of other trades.

28 INSTALLATION REQUIREMENTS

- .1 Install all products and services to follow building planes. Installation shall permit free use of space and maximum headroom to the satisfaction of the Consultant.
- .2 Confirm the exact location of fixtures, outlets and connections. Confirm location of connection points for equipment supplied under other Divisions.
- .3 Install all equipment and appurtenances to allow free access for adjustment, maintenance and/or replacement.
- .4 Provide all hangers, supports and fasteners such that no undue stresses are imposed on the structure and systems. Ensure that the load onto structures does not exceed the maximum loading per square metre as shown on structural drawings. Equipment supports not supplied by equipment manufacturer are to be fabricated using structural grade steel.
- .5 Exterior supports are to be galvanized, unless noted otherwise.
- .6 Install all products and services in accordance with the respective manufacturer's recommendations.

- .7 High velocity explosive activated tools shall not be used. Only low velocity system types are permitted.
- .8 Provide caps and seal all open ends of installed conduits to prevent the entrance of foreign substances.
- .9 Install all services capped for future possible use such that easy access is provided for future connections.

29 FIELD REVIEW

- .1 The Consultant and Owner shall have access to the site at all times for review of the work.
- .2 Correct any deficiencies as they are reported during the performance of the Work.

30 UNIFORMITY

- .1 All equipment and materials which serve a similar function shall be from one manufacturer and one product line (i.e.: panelboards, starters, major systems, etc.).

31 CUTTING AND PATCHING

- .1 It is the responsibility of the Electrical Contractor to provide all required cutting and patching associated with the installation of electrical systems, devices, conduit, wire, etc., unless noted otherwise.
- .2 Restore all surfaces to a finish acceptable to the Owner.

32 MATERIAL

- .1 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 and when used in conjunction with a referenced standard, shall be deemed to supplement the standard.
- .2 Acceptable Manufacturer:
 - .1 Means that item, manufactured by named and specified manufacturer, shall be deemed acceptable provided it meets the specification and referenced standard regarding performance and quality of material and workmanship, as outlined under Standard of Acceptance (above).
- .3 Refer to Instructions to Bidders for requirements of additional Acceptable Manufacturers or Acceptable Material.

33 TORQUES FOR WIRE TERMINATION

- .1 For proper termination of conductors, it is very important that field connections be made properly tight.
- .2 Where possible, obtain and comply with Manufacturer's instructions on the equipment.
- .3 In the absence of Manufacturer's instructions, make terminations in conformance with the values given in Tables D6 and D7 of the 2015 CEC.

34 CABLE TIES AND TYE WRAPS

- .1 Cable ties and tye wraps are only permitted to be used to provide limited support for bundling purposes only. These devices are not intended to provide the primary support for conduits or cables.
- .2 Cable Ties are not to be used for the support of cable or conductor runs between boxes and fittings.

35 WORKING SPACE ABOUT ELECTRICAL EQUIPMENT

- .1 Arrange installation as required to maintain minimum working space around electrical equipment in conformance with CSA C22.1-15.

36 PLYWOOD BACKBOARDS

- .1 Electrical Contractor will provide all plywood backboards required for mounting his electrical equipment.
- .2 Plywood used for backboards requires a visible stamp indicating that the material is Fire Retardant Treated Wood (FRTW) and meets Underwriters Laboratories FR-S rating or a flame spread and smoke index rating denoting a surface-burning characteristic rating of 25 or less for flame spread and smoke developed, with no VOCs or Formaldehyde .

37 DUST CONTROL AND PROTECTION OF LIGHT FIXTURES

- .1 Electrical Contractor will supply and install temporary protective sheeting for each light fixture to ensure that dust cannot enter the enclosure during the construction period.
- .2 Electrical Contractor will remove and dispose of the protective sheeting at the end of construction related activities when the building is considered to be clean.

38 LOW V. O. C. MATERIALS

- .1 All site applied coatings, adhesives & sealants must be low VOC content type.
- .2 Provide Material Safety Data Sheets for all products & materials of these types incorporated into the work.

39 EXISTING SERVICES

- .1 The Electrical Contractor shall ensure that all light, power, heat, fire alarm, telephone and other electrical systems and services remain operational during the course of the work in the existing building, and if necessary, this Contractor shall be responsible for providing such temporary services by cutting off, altering, adapting, relocating and connecting existing services and disconnecting and removing such temporary or existing services upon providing new permanent services as detailed on all drawings. The site shall be examined to determine the extent of the temporary services and all co-ordination shall be made with the Owner's Representative. All costs shall be included in the Tender Price.
- .2 Existing redundant equipment, wiring etc. not being re-used under new schemes, shall be removed whether shown on drawings or not. This contractor shall repair all openings resulting from the removal of existing electrical equipment and services. All unused outlet boxes (where it is not practical to remove same) shall be blanked with stainless steel cover plates. All costs shall be included in the Tender.
- .2 Existing electrical junction boxes which are to remain in use following the renovation must be accessible. The electrical contractor is to coordinate with the mechanical contractor and review the location of all mechanical services being installed under this phase of construction. The electrical contractor shall be responsible altering, adapting, relocating and reconnecting existing services as required to ensure accessibility. All costs shall be included in the Tender.

*****END OF SECTION*****

1 General

1.1 GENERAL

- .1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section. The Executed Agreement including General Conditions and Supplementary Conditions (Section 00 73 00), applicable sections of Division 0 and Division 1, Section 26 05 00 Common Work Results for Electrical, Section 26 05 01 Electrical Submittals and Section 26 05 02 Electrical Contract Closeout, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 ELECTRICAL PERMITS AND RCDD CERTIFICATES

- .1 Prior to submitting the first progress claim , provide the following permits and certificates:
- .1 As per Section 26 05 00 provide copies of the following electrical permits:
 - .1 Electrical Wiring Permit.
 - .2 Communications Cabling Permit.
 - .2 As per Section 27 10 05, provide a copy of the following:
 - .1 The Registered Communication Distribution Designer's (RCDD) certificate.
 - .2 Proof of membership in BICSI.

1.3 HOURLY LABOUR RATE

- .1 Submit the proposed hourly labour rate for review in a timely manner after contract award.
- .2 Refer to General Conditions of Contract.
- .3 The hourly labour rate will be based on the following components:

Base Rate	\$
Holiday and Vacation Pay	\$
Sub-Total	\$
EI	\$
WCB	\$
Group Insurance	\$
CPP	\$
Group Pension	\$
Other Payroll Burdens (Please specify)	\$
IIF & Con Fund	\$
Training and Education	\$
ISO Program	\$
Safety Program	\$
Sub-Total	\$
Total Payroll Hourly Cost	\$

Small Tools (5%)	\$
Site Supervision (5%)	\$
Total Hourly Labour Cost	\$

1.4 EQUIPMENT IDENTIFICATION

- .1 As per 26 05 03 submit proposed nomenclature for all lamicooid plates for engineer's approval.

1.5 SHOP DRAWINGS

- .1 In accordance with Division 1
- .2 All Shop Drawings to be Metric.
- .3 Assembled in groups and bound in sets.
- .4 On cover/front page indicate total number of pages in submission.
- .5 Consecutively number each page.
- .6 Where specified in Division 1, submit electronic copies of shop drawings. In addition to the electronic shop drawing, submit one hard copy to the office of the electrical consultant.
- .7 Note that prior to submitting shop drawings for motor control equipment, the supplier of this equipment must obtain a copy of the mechanical control wiring schematics and produce **PROJECT SPECIFIC** wiring diagrams for each starter. These wiring diagrams must indicate the equipment being controlled (for example Exhaust Fan #EF-3) and include a reference to all components connected to the control circuit (For example, motorized dampers, end switches, low limits, fire alarm shutdown, etc.). Provide an individual wiring diagram prepared and labeled for each starter. Failure to provide the information detailed above will result in a resubmission of the affected shop drawings.
- .8 Provide shop drawings for the following Sections:
 - .1 Section 26 05 04 - Through-Penetration Firestopping for Electrical Systems.
 - .2 Section 26 27 26 - Wiring Devices.
 - .3 Section 26 29 10 - Motor Starters to 600 V.
 - .4 Section 26 28 16.02 - Molded Case Circuit Breakers.
 - .5 Section 26 28 23 - Disconnect Switches Fused and Non-Fused.
 - .6 Section 26 29 01 - Contactors.
 - .7 Section 26 24 16.01 - Panelboards Breaker Type.
 - .8 Section 26 28 13.01 - Fuses - Low Voltage.
 - .9 Section 26 50 00 - Lighting Equipment.

- .10 Section 26 53 00 - Exit Lights.
- .11 Section 26 52 00 - Unit Equipment for Emergency Lighting.
- .12 Section 27 10 05 - Structured Cabling for Communications Systems.
- .13 Section 27 51 16 - Public Address Systems.
- .14 Section 28 13 00 - Access Control System.
- .15 Section 28 16 00 - Intrusion Detection.
- .16 Section 28 31 00.01 - Multiplex Fire Alarm System.

1.6 PROGRESS CLAIMS

- .1 Progress claims are to be submitted with the following breakdown, as a minimum:
 - .1 Mobilization.
 - .2 Conduit Rough-in.
 - .3 Wire and Cable.
 - .4 Wiring Devices.
 - .5 Distribution.
 - .6 Lighting Equipment.
 - .7 Emergency and Exit Lighting systems.
 - .8 Electrical Systems Testing and Verification.
 - .9 Structured Wiring System.
 - .10 Access Control system.
 - .11 Intrusion Detection system.
 - .12 Fire Alarm System.
 - .13 Commissioning.
 - .14 Contract Closeout Documentation.
- .2 Ensure that each item in the Progress Claim breakdown includes all components required to provide a fully working system, including hardware, components and all associated conduit and wire.
- .3 The first electrical progress claim may be withheld until such time as the required breakdown is submitted.
- .4 Material on Site.
 - .1 Refer to General Conditions of Contract.
 - .2 All claims for material on site must be supported by supplier's invoices showing supplier's unit prices including taxes.
 - .3 Material on site shall not be claimed under the "work complete" portion of the claim.
 - .4 Material eligible to be claimed as "material on site" must be large, project specific equipment, (i.e.; material specifically manufactured for this project) such as switchboards, motor control centres, light fixtures, etc.
 - .5 General material which is not considered project specific such as conduit, connectors, fittings, wire, small tools, etc., are not eligible to be claimed as "material on site."

- .6 Project specific equipment may be claimed as “material on site” subject to the following:
 - .1 Claim to show previous material on site and deduct the amount of previously claimed material that was incorporated into the work during the current month.
 - .2 Claim to show material brought on site this month supported by a copy of the supplier’s invoices showing supplier’s unit prices including taxes.
- .7 Invoices submitted for a “material on site” claim will not be considered by the engineer unless they are examined and initialed by both the Electrical Contractor and the General Contractor.

1.7 OPERATING AND MAINTENANCE MANUAL

- .1 Operation and maintenance manual to be approved by, and final copies deposited with Consultant before final inspection.
- .2 Operation data to include:
 - .1 Schematics for each system.
 - .2 Description of each system and its controls.
 - .3 Description of operation of each system.
 - .4 Operation instruction for each system and each component.
 - .5 Description of actions to be taken in event of equipment failure.
 - .6 Colour coding chart.
- .3 Maintenance data shall include:
 - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
 - .2 Data to include schedules of tasks, frequency, tools required and task time.
- .4 Performance data to include:
 - .1 Equipment manufacturer's performance data sheets with point of operation as left after system verification is complete.
 - .2 Equipment performance verification test results.
 - .3 Insulation resistance testing and panelboard phase current measurement records.
 - .4 Special performance data as specified elsewhere.
- .5 Approvals:
 - .1 Submit 2 copies of draft Operation and Maintenance Manual to Consultant for approval. Submission of individual data will not be accepted unless so directed by Consultant.
 - .2 Make changes as required and re-submit as directed by Consultant.
- .6 Provide maintenance data for the following:
 - .1 Section 26 27 26 - Wiring Devices.

- .2 Section 26 29 10- Motor Starters to 600 V.
- .3 Section 26 28 16.02 - Molded Case Circuit Breakers.
- .4 Section 26 28 23 - Disconnect Switches Fused and Non-Fused.
- .5 Section 26 29 01 - Contactors.
- .6 Section 26 24 16.01 - Panelboards Breaker Type.
- .7 Section 26 50 00 - Lighting Equipment.
- .8 Section 26 53 00 - Exit Lights.
- .9 Section 26 52 00 - Unit Equipment for Emergency Lighting.
- .10 Section 27 10 05 - Structured Wiring System.
- .11 Section 27 51 16- Public Address System.
- .12 Section 28 13 00 - Access Control System.
- .13 Section 28 16 00 - Intrusion Detection.
- .14 Section 28 31 00.01 - Multiplex Fire Alarm System.

- .7 Provide one copy of all approved shop drawings for each maintenance manual.

1.8 START UP REPORT MANUAL

- .1 Custom designed and containing material pertinent to this project only and to provide full and complete coverage of subjects referred to in this section.
- .2 Operating and maintenance manual to be approved by and final copies deposited with Consultant before final inspection.
- .3 Organize by specification section.
- .4 Conform to requirements of Division 1, supplemented and modified by requirements specified in this section.
- .5 Start Up and Performance data to include:
 - .1 Equipment manufacturer's performance data sheets after commissioning is complete.
 - .2 Start up and verification reports as per Section 26 05 02, Electrical Contract Closeout.
 - .3 Final inspection report from NSPI.
 - .4 Signed off training records.
 - .5 Closeout Documentation as per 26 05 02, Paragraph 1.3.
- .6 Submittals:
 - .1 Submit a copy of the complete Start Up Report Manual to Consultant for Review.
 - .2 Refer to Division 1 for quantity of Manuals (minimum 3).
 - .3 Hard-back, 25 mm (1") 3 ring, D-ring binders.
 - .4 Binders to be 2/3 maximum full.
 - .5 Provide index to full volume in each binder.
 - .6 Identify contents of each manual on cover and spine.

- .7 Include names, addresses, telephone numbers of each sub-contractor having installed equipment, local representative for each item of equipment, each system.
- .8 Provide full Table of Contents in each manual. Assemble each manual to conform to Table of Contents with tab sheets placed before instructions covering subject.

1.9 SPARE PARTS AND MAINTENANCE MATERIALS

- .1 Provide the following spare parts to the Owner or his designated representative. Retain a signed copy of transmittal and insert in operation and maintenance manuals.
 - .1 Section 26 28 13.01 Fuses-Low Voltage
 - .1 Three (3) spare fuses of each type and size installed.
 - .2 Section 26 29 10 - Motor Control:
 - .1 Provide the following spare parts for each type and size of starter.
 - .1 Two (2) sets of auxiliary contacts.
 - .2 One (1) control transformer.
 - .3 Five (5) control fuses.
 - .4 Four (4) indicating LEDs.
 - .3 Section 26 05 00 - Lighting:
 - .1 10% spare lamps for each lamp type provided.
 - .3 Section 26 52 00 - Unit Equipment for Emergency Lighting:
 - .1 Two (2) surface mount unit, 72 watt unit, c/w two heads.
 - .2 Two (2) T-Bar mount unit, 72 watt unit, c/w two heads.
 - .3 Four (4) remote unit, c/w two heads.
 - .4 Section 26 53 00 - Exit Lights:
 - .1 Four (4) double face Exit sign.
 - .5 Section 28 16 00 - Intrusion Detection:
 - .1 Two (2) DSC PK5500 keypads.
 - .2 Two (2) DSC BV500 motion detectors.
 - .4 Two (2) Sentrol 1078H door contacts for steel doors.
 - .6 Section 28 31 00.01 - Multiplex Fire Alarm System:
 - .1 Two (2) Multisensor Detectors.
 - .2 Two (2) Pull Stations.
 - .3 Two (2) Horn/Strobe Electronic Signals.

1.10 RECORD DRAWINGS

- .1 Site records:
 - .1 Provide sets of white prints as required for each phase of the work. Mark thereon all changes as work progresses and as changes occur. This shall include change orders, site instructions and changes to electrical systems.
 - .2 Make available for reference purposes and inspection at all times.
 - .3 Produce record drawings in accordance with Division 1.

- .2 Where products are specified by manufacturer and/or model, update AutoCAD file to show installed manufacturer and model.

- .3 Record Drawings:
 - .1 Prior to start of Testing and System verification finalize production of as-built drawings.
 - .2 Identify each drawing in lower right hand corner in letters at least 1/2" (13 mm) high as follows: -"RECORD DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW ELECTRICAL SYSTEMS AS INSTALLED" (DATE).
 - .3 Submit to Consultant for approval and make corrections as directed.

*****END OF SECTION *****

1 General

1.1 GENERAL

- .1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section. The Executed Agreement including General Conditions and Supplementary Conditions (Section 00 73 00), applicable sections of Division 0 and Division 1, Section 26 05 00 Common Work Results for Electrical, Section 26 05 01 Electrical Submittals and Section 26 05 02 Electrical Contract Closeout, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 FUNCTIONAL PERFORMANCE TESTING (FPT)

- .1 Refer to Section 26 91 13 Electrical Systems Testing and Verification for Functional Performance Testing (FPT).
- .2 The correction of all electrical deficiencies identified throughout the project associated with the Work shall be a condition of Substantial Performance and shall be corrected prior to achieving Substantial Performance.
- .3 Deficiencies discovered during the FPT process are to be immediately rectified by the Electrical Contractor. A condition of Substantial Performance shall be the correction of all electrical deficiencies identified throughout the project associated with this work.
- .4 The contractor shall return copies of the deficiency lists to Owner via the Engineer with all corrected items signed off.
- .5 The FPT Deficiency list will form part of the Substantial Performance Inspection list specified in Division 1.

1.3 CLOSEOUT DOCUMENTATION

- .1 Section 26 05 00: Common Work Results for Electrical
 - .1 Copy of electrical permits from Utility.
 - .2 Single line electrical diagrams.
 - .3 Final Inspection certificate(s) from Inspection Authority.
- .2 Section 26 05 01 - Electrical Submittals:
 - .1 Shop drawing and product data.
 - .2 Operating and Maintenance Manual.
 - .3 Spare parts.
 - .4 Record drawings.
- .3 Section 26 05 03: Identification.
 - .1 Submission of proposed equipment identification lamicoid plates for approval.

- .4 Section 26 27 26: Wiring Devices.
 - .1 Written confirmation of receptacle polarity check.
- .5 Section 26 29 10: Motor Starters & Motor Controls.
 - .1 Complete list of all motors, starters, motor hp, motor FLA and installed solid state overload.
 - .2 Field report.
- .6 Section 26 52 00: Unit Equipment for Emergency Lighting.
 - .1 Written Guarantee.
- .7 Section 26 91 13: Electrical Systems Testing and Verification.
 - .1 Verification and Test Forms.
- .8 Section 27 10 05: Structured Cabling for Communications Systems.
 - .1 Testing and Verification Report & Certificate.
- .9 Section 27 51 16: Public Address and Mass Notification Systems.
 - .1 Public Address System Testing & Verification Certificate.
- .10 Section 28 13 00: Access Control System
 - .1 System Verification Report and Certificate.
- .11 Section 28 16 00: Intrusion Detection.
 - .1 Security System Verification Report and Certificate.
 - .2 Remote monitoring verification report and certificate.
- .12 Section 28 31 00.01: Multiplex Fire Alarm System.
 - .1 Fire Alarm Verification Report and Certificate.
 - .2 Provide remote monitoring report and verification certificate.
 - .3 Floor plans indicating measured sound levels.

1.4 DEMONSTRATION AND OPERATING AND MAINTENANCE INSTRUCTIONS

- .1 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
- .2 Use operation and maintenance manual, as-built drawings, audio visual aids, etc. as part of instruction materials.
- .3 Instruction duration time requirements at Substantial Performance as follows:
 - .1 Fire Alarm System (Life Safety)
(2 Hours)
 - .2 Exit and Emergency Lighting (Life Safety)

- .3 (2 Hours)
Lighting System – Fixtures and Controls
 - .4 (2 Hours)
Power Distribution System
 - .5 (2 Hours)
Voice/Data – Structured Cabling System
 - .6 (4 Hours)
Public Address and Mass Notification Systems.
 - .7 (2 Hours)
Intrusion Detection System
- .4 Following the completion of each training and demonstration session, the contractor is to obtain an attendance sheet signed off by those personnel who have received training.
- .5 Where deemed necessary, Owner may record these demonstrations on video tape for future reference.
- 2 Products N/A**
- 3 Execution N/A**

*****END OF SECTION*****

1 General

1.1 GENERAL

- .1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section. The Executed Agreement including General Conditions and Supplementary Conditions (Section 00 73 00), applicable sections of Division 0 and Division 1, Section 26 05 00 Common Work Results for Electrical, Section 26 05 01 Electrical Submittals and Section 26 05 02 Electrical Contract Closeout, applicable drawings and amendments are part of and to be read in conjunction with this Section.
- .2 N. S. Structured Cabling Guidelines requirements for backbone, cross connect identification, rack identification, etc.

1.2 IDENTIFICATION REQUIREMENTS

- .1 All electrical equipment shall be identified by the use of Lamicoid plates. This includes all distribution equipment (Distribution Panels and Branch Circuit Wiring Panels, etc.).
- .2 All equipment and enclosures receiving connections to the building power distribution system shall have their panel and circuit number identified by the use of Lamicoid plates. This includes equipment supplied by the electrical contractor, the mechanical contractor and all other divisions.
- .3 All equipment located on the roof which receives an electrical connection provided by the electrical contractor requires a lamicoid identification plate affixed to the equipment in a conspicuous location. Identification is to be installed on a part of the equipment not normally removed for maintenance. This includes equipment supplied by the electrical contractor, the mechanical contractor and all other divisions.
- .4 All electrical junction, pull boxes and splitters installed in areas with drop ceilings shall be colour coded inside and out with appropriate coloured paint. **All paint is to be applied prior to installation and not with-in the confines of the building.**
- .5 All electrical junction, pull boxes and splitters installed in areas without drop ceilings (exposed) shall be colour coded on the inside only with appropriate coloured paint. **All paint is to be applied prior to installation and not with-in the confines of the building.** Install an appropriately coloured dot on the exterior of the cover plate to indicate box function.
- .6 All conduit couplings installed in areas with drop ceilings shall be colour coded with appropriate coloured paint. **All paint is to be applied prior to installation and not with-in the confines of the building.**

- .7 Where conduits are installed in a room where no conduit couplings are visible, appropriate colour bands are required to identify the conduit function.
- .8 All junction boxes installed in areas with drop ceilings shall have the panel and circuit numbers contained with-in, identified on the exterior of the cover plate.
- .9 All junction boxes installed in areas without drop ceilings (exposed structure) shall have the panel and circuit numbers contained with-in, identified on the interior of the cover plate.
- .10 All wiring installed under this contract shall be identified through the use of self-laminating labels.
- .11 All receptacles installed under this contract shall be identified through the use of Lamicoid plates.
- .12 All voice, data outlets installed under this contract shall be identified through the use of Lamicoid plates.
- .13 Permanently identify voice and data horizontal cabling at each end. The identification must be mechanically generated, not hand written. Indicate the originating Telecommunications Room (TR) and the consecutively numbered jack for voice and data. This labeling is to be identical on the originating end and in the outlet box. This same information is to appear on the patch panel and outlet jack location.
- .14 All control panels and time clocks shall be identified through the use of Lamicoid plates.
- .15 All emergency lighting battery packs shall be identified through the use of Lamicoid plates.
- .16 All Exit signs shall be identified through the use of Lamicoid plates.
- .17 All addressable fire alarm system devices shall be identified through the use of Lamicoid plates.
- .18 All electrical devices (receptacles, communication outlets, multi-media outlets, relay panels and electrical equipment in concealed ceiling spaces shall be identified with two (2) Lamicoid plates, one on the device, junction box and equipment and one on the ceiling below.
- .19 Each bonding and grounding conductor requires a lamicoid identification plate attached with a tye wrap at each termination point at all ground bars. Identification plate to indicate the equipment that it is connected to (ie; TX3150) or Communication Room 2020.

2 Products

2.1 IDENTIFICATION NAMEPLATES

- .1 Lamicoid identification plates.
 - .1 Lamicoid 1.5 mm thick plastic engraving sheet for all electrical systems, complete with rounded upper corners. Lamicoid characteristics are to be as follows, unless noted otherwise:
 - .1 Fire alarm systems to have red face with white core Lamicoid plates.
 - .2 Electrical equipment enclosures to have black face with white core Lamicoid plates.
 - .3 Receptacles to have white face with black core Lamicoid plates.
 - .4 Information outlets to have white face with black core Lamicoid plates.
 - .5 All ceiling mounted plates to have white face with black core.

.2 NAMEPLATE SIZES

Size 1	10 mm x 50 mm (3/8" x 2")	1 line	5 mm (0.2") high letters
Size 2	13 mm x 75 mm (1/2" x 3")	1 line	6 mm (0.25") high letters
Size 3	16 mm x 75 mm (3/4" x 3")	2 line	5 mm (0.2") high letters
Size 4	19 mm x 90 mm (3/4" x 3.5")	1 line	10 mm (3/8") high letters
Size 5	38 mm x 90 mm (1.5" x 3.5")	2 line	13 mm (1/2") high letters
Size 6	25 mm x 100 mm (1" x 4")	1 line	13 mm (1/2") high letters
Size 7	25 mm x 100 mm (1" x 4")	2 line	6 mm (1/4") high letters
Size 8	50 mm x 150 mm (2" x 6")	2 line	13 mm (1/2") high letters
Size 9	75 mm x 150 mm (3" x 6")	3 line	13 mm (1/2") high letters

- .3 Identification to be in English.

2.2 COLOUR CODING OF ELECTRICAL BOXES

- .1 The colour coding of splitters, junction boxes, pull boxes and outlet boxes will follow the schedule as listed:

System	Primary Colour	Secondary Colour
0volts to 50volts	VIOLET	-
51 volts to 240 volts	YELLOW	-
Fire Alarm	RED	-
Telephone	BLACK	-
P/A and Intercom	BLUE	
Security Systems	BROWN	
Ground or Bond	GREEN	
DC	YELLOW	BLACK
Energy Management	RED	WHITE
Data	BLUE	WHITE

- .2 All various systems junction and/or pull boxes etc., where located above grid system, shall have location identified on underside or room side of t-bar spline, with (19 mm) or (6 mm on 19 mm) self adhering colour coded circular shaped discs, affixed directly to spline in close proximity to where concealed box is located. The same type of discs to be installed on ceiling or wall access cover plates.

- .1 6 mm (1/4") discs are all white in colour.
 - .2 19 mm (3/4") discs are coloured as indicated.
 - .3 6 mm (1/4") to be affixed to center or middle of 19 mm (3/4") discs as system colours dictates.
- .3 All junction boxes and/or pull boxes, conduit fittings (and respective covers), complete with their respective cover plates as per the following:
 - .1 Inside and out where one colour is required, with cover plate painted completely.
 - .2 Inside where two colours are required, with cover plate painted diagonally with both colours.
 - .4 All junction boxes and/or pull boxes, where not concealed, are to have discs fastened to the outside of the box when architectural painting is complete.

2.3 WIRING IDENTIFICATION

- .1 Wiring Labels:
 - .1 Write on self-laminating labels.
 - .2 Panduit No's PLD-1, PLD-2.

3 Execution

3.1 EQUIPMENT IDENTIFICATION

- .1 Submit description of proposed equipment identification plates for engineer's approval.
- .2 Do not manufacture Lamicaid plates prior to receiving written approval from the engineer.
- .3 Lamicaid nameplates shall be applied to all electrical equipment including but not limited to the following:
 - .1 All electrical equipment enclosures for starters, disconnect switches, relay panels, panelboards, splitter troughs, transformers, thermal overload switches, etc.
- .4 Lamicaid nameplate fastening method shall be as follows:
 - .1 Concrete or concrete block.
 - .1 Contact type cement (Note: Peel off type not acceptable).
 - .2 Plasterboard.
 - .1 Contact type cement (Note: Peel off type not acceptable).
 - .3 Equipment enclosures.
 - .1 Pop rivets. (Note: Screws not acceptable).
 - .4 Ceiling and T-Bar spline.
 - .1 Contact type cement (Note: Peel off type not acceptable).

- .5 Identify equipment as follows:
- .1 Lamicoid nameplates installed on distribution panelboards, splitter troughs, shall indicate the following:
 - .1 Designated name of equipment.
 - .2 Amperage of overcurrent protection device.
 - .3 Voltages, number of phases and wires.
 - .4 Designation of power source.
 - .5 Size 9.

EXAMPLE:

***PANEL 1101 - 150 AMPS
120/208V - 3PH - 4W
FED FROM DISTRIBUTION PANEL DP1150***

- .6 Lamicoid nameplates installed on combination starters, magnetic starters, manual starter and all various systems controls, control panels, disconnect switches, shall contain the following information:
- .1 Designated name of equipment.
 - .2 Designated name of power source.
 - .3 Branch circuit breaker number(s) where possible.
 - .4 Voltage(s).
 - .5 Size 8

Example:

***EXHAUST FAN NO. 5
PANEL 1101 - CCT. NO. 17
120V - 1 PH***

- .7 Lamicoid nameplates installed on fusible type disconnect switches are to also indicate maximum fuse size, where sized smaller than actual rated switch size.
- .8 Lamicoid nameplates are to be installed on all junction and/or pull boxes sized 150 mm x 150 mm (6" x 6") and larger indicating name of system, designated panel name and electrical characteristics where applicable.
- .9 Lamicoid nameplates are to be installed adjacent to each overcurrent device located in switchboards, CDP panels, etc. They need only indicate designated name and/or number of equipment they feed. Each unused or spare overcurrent device is to be identified with a Lamicoid plate indicating it as being a spare. Size #5.

3.2 RECEPTACLE IDENTIFICATION

- .1 Submit description of proposed equipment identification plates for engineer's approval.
- .2 Do not manufacture Lamicoid plates prior to receiving written approval from the engineer.
- .3 Lamicoid nameplates are to be installed above all types of receptacles and abutted directly to tops of their respective device plates. Plates are to be the same width as the finish device plate.

- .4 Identification is to indicate respective panel source c/w associated circuit breaker number(s) as per the following:

EXAMPLE:

1101 - 20

- .5 Lamicoid nameplates installed above 120 volt receptacles protected by GFCI circuit breakers, or GFCI type receptacles (where their use is permitted) are to be identified as per the following:

EXAMPLE:

GFCI PROTECTED

1101 - 22

3.3 TELLECOMMUNICATIONS EQUIPMENT RACKS

- .1 Submit description of proposed equipment identification plates for engineer's approval.
- .2 Do not manufacture Lamicoid plates prior to receiving written approval from the engineer.
- .3 Lamicoid nameplate for equipment racks shall be installed on the top of each rack. Information is to include telecommunication room number and rack position, as per the following:

EXAMPLE:

TR-234 RACK 1

- .4 Provide identification to meet the N S Government Structured Cabling Guidelines.

3.4 INFORMATION OUTLET (VOICE/DATA) IDENTIFICATION

- .1 Submit description of proposed equipment identification plates for engineer's approval.
- .2 Do not manufacture Lamicoid plates prior to receiving written approval from the engineer.
- .3 Lamicoid nameplate for Information (Voice/Data) outlets shall be installed above and abutted directly to top of their respective device plates. Plates are to be the same width as the finish device plate. Information is to include telecommunication closet number or room number and consecutively numbered voice and data jacks, as per the following:

EXAMPLE:

TC310-V22, D12, D13

- .4 Provide identification to meet the N S Government Structured Cabling Guidelines.

3.5 EMERGENCY LIGHTING BATTERY PACK AND EXIT SIGN IDENTIFICATION

- .1 Submit description of proposed equipment identification plates for engineer's approval.
- .2 Do not manufacture Lamicoid plates prior to receiving written approval from the engineer.
- .3 Lamicoid nameplate for each emergency lighting battery pack and Exit sign shall be installed adjacent each unit. Identification is to indicate panel number and circuit number, as per the following:

EXAMPLE:

1101 - 20

3.6 FIRE ALARM SYSTEM IDENTIFICATION

- .1 Submit description of proposed equipment identification plates for engineer's approval.
- .2 Do not manufacture Lamicoid plates prior to receiving written approval from the engineer.
- .3 Lamicoid nameplate for Fire Alarm system addressable devices shall be installed above and abutted directly to top of their respective device where possible. For devices not mounted on walls or ceilings (sprinkler devices, etc), lamicoid plates are to be installed with a short length of chain supported by the conduit feeding the device. Identification is to indicate panel number, addressable loop number and device address.

EXAMPLE: *01-02-125*

3.7 ELECTRIFIED HARDWARE

- .1 Lamicoid nameplate for each item of electrified hardware shall be installed on, or adjacent to each unit. Identification is to indicate panel number and circuit number, as per the following:

EXAMPLE: *1101 – 20*

3.8 GROUND/BOND CONDUCTORS

- .1 Lamicoid nameplate for each bonding and grounding conductor attached with a tie wrap at each termination point at all ground bars. Indicate the equipment that it is connected to or where it terminates, as per the following:

EXAMPLE: *Communication Room 2020*

3.9 MECHANICAL EQUIPMENT CONNECTED TO THE ELECTRICAL DISTRIBUTION SYSTEM

- .1 Lamicoid nameplate for each item of mechanical equipment (speed drives, humidifiers, trap primers, fans, pumps, etc.) fed from the electrical distribution system, shall contain the following information:
 - .1 Designated name of equipment.
 - .2 Designated name of power source.
 - .3 Branch circuit breaker number(s) where possible.
 - .4 Voltage(s).
 - .5 Size 8

Example:
TRAP PRIMER
PANEL 1101 - CCT. NO. 17
120V - 1 PH

3.10 IDENTIFICATION OF JUNCTION BOXES, PULL BOXES, SPLITTER TROUGHS AND OUTLET BOXES

- .1 Colour Coding
 - .1 Identification of electrical junction boxes, pull boxes, splitter troughs.
 - .1 Colour code as per 2.2.
 - .2 Apply colour coding prior to pulling conductors into boxes.
 - .3 Where primary colour only is indicated:
 - .1 Colour inside and outside of box.
 - .2 Colour all cover plates.
 - .4 Where primary and secondary colours are indicated:
 - .1 Paint inside and outside of box with the primary colour.
 - .2 Diagonally apply to each half of the cover plate the primary and secondary colours.
 - .3 Provide a legend of colour coding used under Plexiglas.
Locate in main electrical room.
 - .2 Voltage and Originating Source Identification
 - .1 Identification of electrical junction boxes, pull boxes, splitter troughs: smaller than 150 mm x 150 mm.
 - .1 Identify on the coverplate, using permanent indelible black marker the panel and circuit numbers contained with.
 - .2 Group phase conductors with associated neutral conductor.
 - .2 Identification of electrical junction boxes, pull boxes, splitter troughs: 150 mm x 150 mm and larger.
 - .1 Provide Lamicaid plate fastened to coverplate, indicating:
 - .1 Voltage and phase.
 - .2 Originating panel.
 - .3 Size 6.
 - .4 Example: "120/208 v, 3Ø, 4w, panel 'A'."
 - .2 Using permanent indelible black marker, identify the circuits contained within.

3.11 IDENTIFICATION OF SYSTEM CONTROL PANELS

- .1 Provide Lamicaid plate fastened to equipment enclosure indicating:
 - .1 System name.
 - .2 Size 6.
 - .3 Example: "Fire Alarm Control Panel".

3.12 IDENTIFICATION OF WIRING

- .1 Identification of wiring:
 - .1 Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.

- .2 Label each neutral conductor to indicate its associated phase conductors in each panelboard, distribution panel, pillbox and junction box it appears in. These labels are to be installed in a 'flagged' manner.
- .3 All circuit conductors are to be individually tie wrapped to their corresponding labeled neutral conductor in all panelboards, pull boxes and junction boxes. Each neutral conductor is to be identified to indicate its corresponding phase conductors.
- .4 Labeling of all branch circuit wiring including phase conductors, neutral, ground and/or bonding conductors to be done on both ends of all circuit wires plus in any junction and/or pull boxes located in between using approved product (refer to 2.3). These labels are to be installed in a 'flagged' manner around individual conductors.
- .5 Indicate panel and circuit number i.e.: Panel '1101', cct. #10.

END OF SECTION

.1 General

1.1 REFERENCE STANDARDS

- .1 In accordance with Section 26 05 00.

1.2 DEFINITIONS

- .1 Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in fire rated wall and floor assemblies.

1.3 GENERAL DESCRIPTION OF THE WORK OF THIS SECTION

- .1 Only tested firestop systems shall be used for penetrations for the passage of cables, conduit and other electrical equipment through the following:
- .1 Fire-rated vertical barriers (walls and partitions)
 - .2 Horizontal barriers (floor/ceiling assemblies)
 - .3 Vertical service shaft walls and partitions.
- .2 Refer to Architectural drawings for location of rated assemblies.

1.4 RELATED WORK BY OTHERS

- .1 Coordinate work of this section with work of others as required to properly execute the work and as necessary to maintain satisfactory progress of the work of other sections, including:
- .1 Concrete
 - .2 Masonry
 - .3 Finishes
 - .4 Special Construction
 - .5 Other sections of Mechanical and Electrical contract documents.

1.5 REFERENCES

- .1 Test Requirements: ULC-S115-M or CAN4-S115-M, "Standard Method of Fire Tests of Through Penetration Fire Stops".
- .2 Underwriters Laboratories of Canada (ULC) of Scarborough runs CAN4-S115-M under their designation of ULC-S115-M and publishes the results in their "FIRE RESISTANCE RATINGS DIRECTORY" that is updated annually.
- .3 Underwriters Laboratories (UL) of Northbrook, IL runs ASTM E-814 under their designation of UL 1479 and publishes the results in their "FIRE RESISTANCE DIRECTORY" that is updated annually. UL tests that meet the requirements of ULC-S115-M are given a cUL listing and are published by UL in their "Products Certified for Canada (cUL) Directory.

- .4 International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments.
- .5 CAN/ULC-S102-M, Standard Test Method for Surface Burning Characteristics of Building Materials.
- .6 National Building Code of Canada.
- .7 CSA C22.1-15, Canadian Electrical Code..

1.6 QUALITY ASSURANCE

- .1 A manufacturer's direct representative (not distributor or agent) to be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.
- .2 Firestop System installation must meet requirements of CAN4-S115-M or ULC S-115-M tested assemblies that provide a fire rating as shown in Section 2. "Penetrations through a Fire Separation Wall" and "Penetrations through a Fire Wall or Horizontal Fire Separation" below.
- .3 Proposed firestop materials and methods shall conform to applicable governing codes having local jurisdiction.
- .4 Firestop Systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load bearing assembly.
- .5 For those firestop applications that exist for which no ULC or cUL tested system is available through a manufacturer, a manufacturer's engineering judgment derived from similar ULC or cUL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineer judgment drawings must follow requirements set forth by the International Firestop Council.

1.7 SUBMITTALS

- .1 Submit Product Data: Manufacturer's specifications and technical data for each material including the composition and limitations, documentation of ULC or cUL firestop systems to be used and manufacturer's installation instructions to comply with Division One (1).
- .2 Manufacturer's engineering judgment identification number and drawing details when no ULC or cUL system is available for an application. Engineer judgment must include both project name and contractor's name who will install firestop system as described in drawing.
- .3 Submit material safety data sheets provided with product delivered to job-site.

1.8 INSTALLER QUALIFICATIONS

- .1 Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer's products per specified requirements. A manufacturer's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

1.9 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and ULC or cUL label where applicable.
- .2 Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.
- .3 Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements.
- .4 Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.
- .5 Do not use damaged or expired materials.

1.10 PROJECT CONDITIONS

- .1 Do not use materials that contain flammable solvents.
- .2 Scheduling
 - .1 Schedule installation of CAST IN PLACE firestop devices after completion of floor formwork, metal form deck, or composite deck but before placement of concrete.
 - .2 Schedule installation of other firestopping materials after completion of penetrating item installation but prior to covering or concealing of openings.
- .3 Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.
- .4 Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.
- .5 During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

2 Products

2.1 FIRESTOPPING, GENERAL

- .1 Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.
- .2 Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.
- .3 Fire stopping and smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal.
- .4 Primers: to manufacturer's recommendation for specific material, substrate, and end use.
- .5 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.

2.2 ACCEPTABLE MANUFACTURERS

- .1 Subject to compliance with through penetration firestop systems listed in U.L.C Fire Resistance Directory – Volume III or UL Products Certified for Canada (cUL) Directory, provide products of the following manufacturers as identified below:
 - .1 Hilti (Canada) Limited, Mississauga, Ontario 1-800-363-4458
 - .2 Other manufacturers listed in the U.L.C Fire Resistance Directory – Volume III or UL Products Certified for Canada (cUL) Directory.

2.3 MATERIALS

- .1 Use only firestop products that have been ULC or cUL tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.
- .2 Cast-in place firestop devices are installed prior to concrete placement for use with non-combustible and combustible plastic pipe (closed and open piping systems), or electrical cable bundles, penetrating concrete floors, the following products are acceptable:
 - .1 Hilti CP 680 Cast-In Place Firestop Device
 - .2 Equivalent products listed in the U.L.C Fire Resistance Directory – Volume III or UL Products Certified for Canada (cUL) Directory.

- .3 Sealants or caulking materials for use with non-combustible items including rigid steel conduit and electrical metallic tubing (EMT), the following products are acceptable:
 - .1 Hilti FS-ONE Intumescent Firestop Sealant
 - .2 Hilti CP 620 Fire Foam
 - .3 Equivalent products listed in the U.L.C Fire Resistance Directory – Volume III or UL Products Certified for Canada (cUL) Directory.

- .4 Intumescent sealants or caulking materials for use with combustible items (penetrants consumed by high heat and flame) including PVC jacketed, flexible cable or cable bundles and plastic pipe, the following products are acceptable:
 - .1 Hilti FS-ONE Intumescent Firestop Sealant
 - .2 Hilti CP 620 Fire Foam
 - .3 Equivalent products listed in the U.L.C Fire Resistance Directory – Volume III or UL Products Certified for Canada (cUL) Directory

- .5 Intumescent sealants, caulking or putty materials for use with flexible cable or cable bundles, the following products are acceptable:
 - .1 Hilti FS-ONE Intumescent Firestop Sealant
 - .2 Hilti CP 618 Firestop Putty Stick
 - .3 Hilti CP 620 Fire Foam
 - .4 Equivalent products listed in the U.L.C Fire Resistance Directory – Volume III or UL Products Certified for Canada (cUL) Directory

- .6 Non curing, re-penetrable intumescent sealants, caulking or putty materials for use with flexible cable or cable bundles, the following products are acceptable:
 - .1 Hilti CP 618 Firestop Putty Stick
 - .2 Equivalent products listed in the U.L.C Fire Resistance Directory – Volume III or UL Products Certified for Canada (cUL) Directory

- .7 Wall opening protective materials for use with U.L.C. listed metallic and specified nonmetallic outlet boxes, the following products are acceptable:
 - .1 Hilti CP 617 Firestop Putty Pad
 - .2 Equivalent products listed in the U.L.C Fire Resistance Directory – Volume III or UL Products Certified for Canada (cUL) Directory

- .8 Materials used for large size/complex penetrations made to accommodate cable trays, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:
 - .1 Hilti FS 635 Trowelable Firestop Compound
 - .2 Hilti FS 657 FIRE BLOCK
 - .3 Hilti CP 620 Fire Foam
 - .4 Equivalent products listed in the U.L.C Fire Resistance Directory – Volume III or UL Products Certified for Canada (cUL) Directory .

- .9 Non curing, re-penetrable materials used for large size/complex penetrations made to accommodate cable trough, multiple steel and copper pipes, electrical busways in raceways, the following products are acceptable:
- .1 Hilti FS 657 FIRE BLOCK
 - .2 Equivalent products listed in the U.L.C Fire Resistance Directory – Volume III or UL Products Certified for Canada (cUL) Directory.

2.4 PENETRATIONS THROUGH A FIRE SEPARATION WALL

- .1 For penetrations through a Fire Separation wall provide a firestop system with a "F" Rating as determined by ULC or cUL as indicated below:

Fire Resistance Rating of Separation	Required ULC or cUL "F" Rating of Firestopping Assembly
30 minutes	20 minutes
45 minutes	45 minutes
1 hour	45 minutes
1.5 hours	1 hour
2 hours	1.5 hours
3 hours	2 hours
4 hours	3 hours

- .2 For combustible pipe penetrations through a Fire Separation provide a firestop system with a "F" Rating as determined by ULC or cUL which is equal to the fire resistance rating of the construction being penetrated.

2.5 PENETRATIONS THROUGH A FIRE WALL OR HORIZONTAL FIRE SEPARATION

- .1 For penetrations through a Fire Wall or horizontal Fire Separation provide a firestop system with a "FT" Rating as determined by ULC or cUL which is equal to the fire resistance rating of the construction being penetrated.

3 Execution

3.1 PREPARATION

- .1 Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
- .1 Verify penetrations are properly sized and in suitable condition for application of materials.
 - .2 Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.
 - .3 Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
 - .4 Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.
 - .5 Do not proceed until unsatisfactory conditions have been corrected.

3.2 COORDINATION

- .1 Coordinate location and proper selection of cast-in-place Firestop Devices. Ensure device is installed before placement of concrete.
- .2 Provide adequate spacing of field run pipes to allow for installation of cast-in-place firestop devices without interferences.

3.3 INSTALLATION

- .1 Regulatory Requirements: Install firestop materials in accordance with ULC Fire Resistance Directory or UL Products Certified for Canada (cUL) Directory.
- .2 Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration joint materials.
 - .1 Seal all holes or voids made by penetrations to ensure an air and water resistant seal.
 - .2 Protect materials from damage on surfaces subjected to traffic.

3.4 FIELD QUALITY CONTROL

- .1 Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.
- .2 Keep areas of work accessible until inspection by applicable code authorities.
- .3 Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.
- .4 Install a warning card that is clearly visible adjacent to all large and medium openings that may be re-penetrated. This card should contain the following information:
 - .1 Warning that the opening has being fire stop protected
 - .2 Indicate the fire stop system used (ULC or cUL)
 - .3 F rating or FT rating
 - .4 Fire stop product(s) used
 - .5 Person to contact and phone number in case of modification or new penetration of fire stop system.

3.5 ADJUSTING AND CLEANING

- .1 Remove equipment, materials and debris, leaving area in undamaged, clean condition.
- .2 Remove temporary dams after initial set of fire stopping and smoke seal materials.
- .3 Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.

*****END OF SECTION 26 05 04*****

1 General

1.1 GENERAL

- .1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section. The Executed Agreement including General Conditions and Supplementary Conditions (Section 00 73 00), applicable sections of Division 0 and Division 1, Section 26 05 00 Common Work Results for Electrical, Section 26 05 01 Electrical Submittals and Section 26 05 02 Electrical Contract Closeout, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 REFERENCES

- .1 C22.2 No.65-13 Wire Connectors.

2 Products

2.1 MATERIALS

- .1 Spring type pressure type connectors for all branch circuit wiring sized #8 AWG and smaller. Current carrying parts are to be made of copper or copper alloy and be complete with an appropriate size insulating cap. Cap is to completely fit, or cover all enclosed conductors as required, with current carrying parts of sized to fit conductors as required.

3 Execution

3.1 INSTALLATION

- .1 Remove insulation carefully from ends of conductors.
- .2 All wire connectors are to be "plier-tightened". Finger tight is not acceptable.
- .3 Installation shall meet secureness tests in accordance with CSA C22.2 No.65.

*****END OF SECTION *****

.1 General

1.1 GENERAL

- .1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section. The Executed Agreement including General Conditions and Supplementary Conditions (Section 00 73 00), applicable sections of Division 0 and Division 1, Section 26 05 00 Common Work Results for Electrical, Section 26 05 01 Electrical Submittals and Section 26 05 02 Electrical Contract Closeout, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 PRODUCT DATA

- .1 Submit product data in accordance with Division 1.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility.

2 Products

2.1 BUILDING WIRES

- .1 Unless indicated conductors (phase, neutral, bond, isolated ground) installed on this project shall be stranded, soft drawn copper, with RW90 XLPE insulation rated for a minimum of 600 VAC. The minimum wire size will be #12 AWG.
- .2 Grounding and bonding conductors to have green coloured RW90 X-link insulation.
- .3 Unless noted otherwise, phase colour coding as per C.E.C. rule 4-036, will apply.
- .4 All phase conductors sized from #12 AWG up to and including #2 AWG to have appropriate coloured insulation (red, black & blue).
- .5 All neutral, grounds and/or bond conductors sized #12 AWG up to and including #3/0 AWG to have appropriate coloured insulation (white or green).
- .6 Isolated ground conductors to have green coloured insulation c/w yellow stripe.

- .7 Where three and four way switches are indicated, the associated travelers are to have yellow coloured insulation.
- .8 Coloured tape may only be utilized when phase conductors sized larger than noted in item 4 are used.
- .9 Coloured tape may only be utilized when neutral, grounds or bond conductors sized larger than noted in item 5 are used.
- .10 Multi-conductor AC-90 cables containing a single white coloured conductor are not to be used where more than one neutral conductor is required.

2.2 ARMORED CABLE

- .1 Conductor: copper, size as indicated.
- .2 Type AC-90.
- .3 Insulated bonding conductor sized to CEC Table 16, minimum #12, unless noted otherwise.
- .4 AC-90 cable connectors shall be as follows:
 - .1 Two-screw, steel-type similar to T & B #3301, 3312.

3 Execution

3.1 INSTALLATION OF BUILDING WIRES

- .1 Install wiring as follows:
 - .1 In conduit systems in accordance with Section 26 05 34.
 - .2 Ensure conduit systems are completely dry prior to pulling in conductors.
 - .3 All stranded conductors, (neutrals, bonds and phase conductors) prior to terminating under device bolts i.e., circuit breakers, light switches receptacles etc., to be twisted together so as to form a single conductor.
 - .4 All branch circuit phase conductors feeding light fixtures via junction and/or outlet boxes are to be complete with "pigtail" type leads to ensure minimal disruption of lighting circuits if fixtures are removed for future maintenance.
 - .5 Each line voltage switch is to be wired with the neutral conductor extended to the device box.
 - .6 The bonding conductor shall be terminated on the bonding screw in each junction box prior to connecting to other bonding conductors.
 - .7 All branch circuit phase conductors feeding receptacles via junction and/or outlet boxes are to be complete with "pigtail" type leads to ensure minimal disruption of receptacle circuits if receptacles are removed for future maintenance.
 - .8 All branch circuit wiring feeding light fixtures will be installed complete with a separate neutral conductor for each circuit.

- .9 Where the application of coloured tape has been approved, apply as follows:
 - .1 Both ends of the conductor must be taped for all installed segments.
 - .2 Each location where the conductor is visible, i.e.; all junction and pull boxes.
 - .3 A minimum of 305 mm (12") of tape to be applied for all phase conductors.
 - .4 All neutral, grounds and/or bond conductors must be taped for their entire visible length in all enclosures.

- .2 Use of AC-90 Cable.
 - .1 The use of AC-90 cable is acceptable for this project as a general wiring method with several exceptions. Refer to Section 26 05 34, Item 3.1.7 where conduit requirements are defined.
 - .2 AC-90 cable is to be installed as per the following guidelines:
 - .1 All types of armoured cables are to be installed concealed, parallel and perpendicular to building lines and shall be adequately secured to the building structure at not less than 1.5M (5 foot) intervals or as otherwise indicated, in such manner as to ensure they are protected from potential mechanical damage. Install independent supports for cabling in ceiling spaces, and do not use those of other trades. Do not secure cables to mechanical systems piping or ducts, suspended ceiling support wires. The laying of cables directly atop ceiling grid system is strictly prohibited.
 - .2 Where possible, always install and secure cables directly to underside of metal decking and/or ceiling slabs where located in concealed ceiling spaces. Install supports to firmly secure AC90 to metal decking midway between OWSJ and when any change in direction occurs.
 - .3 The grouping together of AC-90 cables to form a "bundle" for securing purposes is acceptable providing the following procedures are adhered:
 - .1 In addition to securing type AC-90 cables at 1.5 M(5 foot) intervals to structure, multiple or bundled groups of armoured cables shall be tye-wrapped together at mid-point between each structure support and are to be secured together (between each structure support).
 - .2 Grouping of AC-90 cables shall be limited to a maximum of eight (8) current carrying conductors, including associated oversized neutral conductors where phase sharing occurs.
 - .4 The following examples incorporate uses of both, common and dedicated (separate) branch circuit neutral conductors:
 - .1 Maximum of two runs of #12/4 conductor cables, including common (oversized) branch circuit neutral in each.
 - .2 Maximum of two runs of #12/3 conductor cables, including (oversized) branch circuit neutrals (if not 3 phase, 3 wire), plus one run of #12/2 cable.
 - .3 Maximum of four runs of #12/2 conductor cables, each including a separate, dedicated branch circuit neutral conductor.

- .5 Where dedicated or separate branch circuit neutral conductors are non phase sharing, they need not be sized larger than phase conductors they accompany unless specifically indicated otherwise.
- .6 All AC-90 fixture feeds shall originate from the sides of outlet boxes and not from the box cover. Where 3 and/or 4 fixture drops extend from any one outlet box, the box shall not be sized smaller than 120 mm (4- 11/16") square.
- .7 Fixture drop is defined as that portion of AC-90 cable or flexible conduit being used to make final connection between accessible type junction or outlet box located in ceiling space (above T-Bar ceiling only) and its respective light fixture.
 - .1 Fixture drops are not to exceed 4.5 M (15 feet) in total length unless specifically indicated otherwise.
 - .2 There shall be not more than 4 drops permitted to be fed from any one box regardless of its size. All AC-90 cables used for fixture drops are to be secured within 300 mm (12 in.) of the junction box and the light fixture connection point. Each light fixture is to be complete with its own separate fixture drop originating from a junction box located within the ceiling of the same room as the fixture.
 - .3 With the exception of where “modular” type wiring has been approved for a particular application, within a T-Bar ceiling space, each light fixture shall be wired with a separate whip emanating from an overhead junction box.
- .8 Separate pig-tail type leads shall be provided in each light fixture junction/outlet box for final connections to fixture drops. These pig-tail leads are to be only connected to light fixture returns and associated neutral conductors.
- .9 Wire hospital grade receptacles with an AC90 cable incorporating an insulated green minimum #12 copper bonding conductor in addition to the bare bonding conductor.
- .3 The use of AC-90 cable for branch circuit home runs is not acceptable.
 - .1 A home run is defined as that portion of the branch circuit wiring that runs between the applicable panelboard and the room or area in which it terminates, and makes its first splice, for drop off, to the applicable branch circuit device.
 - .2 Where the branch circuit has multiple splices and/or drop offs to multiple rooms, the use of AC90 for the drop off is permitted, however, the home run conduit shall be continued until the final room destination or drop off is reached.
 - .3 The use of AC-90 cable between rooms is not permitted.
 - .4 AC90 cables are not permitted to enter panelboards under any circumstances.

- .3 Conductor Tie-wrapping:
 - .1 All circuit conductors are to be individually tie wrapped to their corresponding labeled neutral conductor in all panelboards, pullboxes and junction boxes. Suitable slack conductor length should be left to enable the ability to clamp the ground detector around the individually tie-wrapped circuit conductor and its corresponding labeled neutral. This wiring method is to be neat and of good workmanship quality.
 - .2 The tie-wrapping of the neutral with its respective phase conductors is to be made at the closest point of entry into panelboards, pullboxes and junction boxes.
 - .3 The main switchboard, CDP's, panelboards, MCC's etc. are to have their respective feeder phase and neutral conductors tie-wrapped together and enough slack conductor length to enable the ability to clamp the ground detector around each set of feeders. This wiring method is to be neat and of good workmanship quality.
- .4 Final connection to receptacles and light fixtures:
 - .1 Separate pig-tail type leads shall be provided in each receptacle outlet box for final connections to receptacles and in each light fixture outlet box for final connection to the light fixture. These pig-tail leads are to be only connected to the phase and associated neutral conductors.
- .5 Final connection to motors:
 - .1 The conductor phase colour coding as per C.E.C. rule 4-036 will carry through from the incoming service point to the motor starter and to the final connection to each motor. In the instance that a three phase motor requires transposition of phase conductors to achieve proper rotation, the change is to take place at the motor terminal box. Changing the motor feeder phase conductors at any other point in the distribution system (for example at the starter) will not be acceptable.
- .6 Testing:
 - .1 Perform testing in conformance with NSP Electrical Inspection Bulletin B-2-132 and CEC Rule 2-136. Contractors are to verify by testing that all interior wiring is; free from shorts, broken, open, or incorrect connections, proper polarity, and that neutrals are free from connections to ground beyond the supply side of the consumer's service box except as permitted in section 10 of the Canadian Electrical Code Part 1. (CEC).
 - .2 Prior to testing, ensure that all feeders or branch circuits which do not have neutral conductors are to have their respective phase conductors tie-wrapped together in accordance to the methods described previously.
 - .3 Prior to testing, ensure that voltage-sensitive devices such as ground fault circuit interrupters, arc-fault circuit interrupters, electronic ballasts, Surge Protective Devices (SPD) and other electronic equipment are not subjected to voltages that will damage the device.
 - .4 Megger testing is to be performed on all branch circuit wiring on the load side of a consumer's main overcurrent device, including main feeders and sub-feeders. Contractors shall record their results for all testing performed and shall have the testing results available for viewing by the inspection department upon request at the time of inspection.

3.2 VOLTAGE DROP

- .1 It is the intent of this specification that each branch circuit will be strategically planned and installed to ensure that when tested, the voltage drop will not exceed 5% of the line voltage. The contractor will account for distance and routing for each branch circuit and that appropriate wire sizes will be employed to allow an acceptable voltage drop test to be carried out during commissioning. When testing for voltage drop, each branch circuit fed from a 15 amp circuit breaker will be subjected to a 12 ampere load, and branch circuit fed from a 20 amp circuit breaker will be subjected to a 16 ampere load.
- .2 The following table is to include both vertical and horizontal lengths of conductor runs. Minimum size of branch circuit neutral where phase sharing occurs shall not be smaller than #10 AWG. Minimum size of branch circuit neutral where dedicated to its own branch circuit phase conductor shall be not be less than #12 AWG. Note that minimum size #10 AWG bond conductors to accompany #8 branch circuit conductors.
- .3 AS A MINIMUM, THE FOLLOWING TABLE SHALL BE ADHERED TO:

Branch Circuit Length of Run Mm (feet)	Phase Wire Size	Dedicated Neutral	Shared Neutral	Bond Wire Size
Up to 24,384 (80)	#12	#12	#10	#12
Up to 38,100 (125)	#10	#10	#8	#12
Up to 56,390 (185)	#8	#8	#6	#10
- .4 Oversized #10 AWG branch circuit wiring conductors to be extended to outlet box of device they feed (including switch legs). Oversized #8 AWG branch circuit wiring conductors to be extended from panelboard to junction box located on wall or ceiling directly above wall light switches and/or receptacles. #8 AWG wire to be reduced to #10 AWG for vertical portion of drop only.

*****END OF SECTION*****

1 General

1.1 GENERAL

- .1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section. The Executed Agreement including General Conditions and Supplementary Conditions (Section 00 73 00), applicable sections of Division 0 and Division 1, Section 26 05 00 Common Work Results for Electrical, Section 26 05 01 Electrical Submittals and Section 26 05 02 Electrical Contract Closeout, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 REFERENCES

- .1 CSA 22.2 No. 41.
- .2 J-STD-607A Commercial Building Grounding and Bonding Requirements for Telecommunications.

2 Products

2.1 EQUIPMENT

- .1 Insulated grounding conductors: green, insulation to Section 26 05 21 Wires and Cables 0-1000 V.
- .2 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
 - .1 Grounding and bonding bushings.
 - .2 Protective type clamps.
 - .3 Bolted type conductor connectors.
 - .4 Bonding jumpers, straps.
 - .5 Pressure wire connectors.

2.2 GROUND BARS

- .1 Ground Busbars: 6 mm electro-tin plated copper, complete with insulators, stainless steel brackets and fasteners.
- .2 Minimum acceptable dimensions, unless noted otherwise:
 - .1 6 mm thick by 100 mm wide.
 - .2 736 mm in length.
- .3 Complete with 41 pairs of 8 mm diameter and 5 pairs of 11 mm pre-drilled holes.

- .4 Standard of Acceptance:
 - .1 Erico # TMGB-A29L41PT.
- .5 Acceptable manufactures:
 - .1 Cooper B-Line
 - .2 Burndy.

2.3 MECHANICAL PASS THROUGH CONNECTORS FOR GROUND BARS

- .1 Mechanical pass through type, high strength copper alloy, two bolt type.
- .2 Standard of Acceptance:
 - .1 Burndy KVS28.
- .3 Acceptable manufactures:
 - .1 Blackburn THS 2B40.
 - .2 Hubbell K3

2.4 CONDUCTOR IDENTIFICATION

- .1 Provide identification for each conductor in accordance with 26 05 03.

3 Execution

3.1 INSTALLATION GENERAL

- .1 Install complete permanent, continuous bonding system including, conductors, connectors, accessories. Where EMT is used, install bonding conductor in each and every conduit.
- .2 Install connectors in accordance with manufacturer's instructions.
- .3 Protect exposed grounding conductors from mechanical injury.
- .4 Use mechanical connectors for grounding connections to equipment provided with lugs.
- .5 Soldered joints not permitted.
- .6 All metal raceways shall be bonded to ground including communications conduits.
- .7 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw.
- .8 Make grounding connections in radial configuration only. Avoid loop connections.
- .9 Every metal conduit used to house a system ground conductor must be bonded to ground at each end.

3.2 EQUIPMENT BONDING

- .1 Install bonding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, frames of motors, motor control centres, starters, control panels.
- .2 Bond all metallic back boxes and metal enclosures to ground that are installed in ceiling spaces or in partitions in conformance with CEC Rule 10-404, including, but not limited to :
 - .1 Public address speaker back boxes.
 - .2 Occupancy sensor back boxes.
 - .3 Communications systems device back boxes and conduit sleeves.

3.3 GROUNDING BARS

- .1 Install copper grounding busbars, mounted on insulated supports where indicated.
- .2 Bond items as indicated to ground bus, using long barrel, copper, two bolt compression connectors.
- .3 Where a pass through connector bolted to the ground busbar is required, use a mechanical, pass through, high strength copper alloy, two bolt type.

3.4 COMMUNICATION SYSTEMS

- .1 Install a bonding and grounding system extending to all communications rooms in conformance with J-STD-607A and BICSI TDMM (12th edition).
- .2 All Information Transport System bonding and grounding conductors are to be run as directly as possible following building lines. Minimize the number of bends in the conductor and secure to meet CEC requirements. The minimum bend radius of any Information Transport System bonding conductor not run in conduit shall be 230 mm (9 inches).

*****END OF SECTION *****

1 General

1.1 GENERAL

- .1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section. The Executed Agreement including General Conditions and Supplementary Conditions (Section 00 73 00), applicable sections of Division 0 and Division 1, Section 26 05 00 Common Work Results for Electrical, Section 26 05 01 Electrical Submittals and Section 26 05 02 Electrical Contract Closeout, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility.

2 Product

2.1 SUPPORT CHANNELS

- .1 U shape, size 45 mm X 45 mm, 3 mm thick, surface mounted as required.

2.2 BEAM CLAMPS

- .1 Beam clamp for 10 mm threaded rod.
- .2 cUL listed.
- .3 Malleable iron, complete with hardened steel cup point set screw.
- .4 Rated for a minimum of 227 Kg (400 pounds).
- .5 Taylor Pipe Support, Wide Mouth Top Beam Clamp #407, or equal.
- .6 Push-on type conduit clips are not to be used on this project.

3 Execution

3.1 INSTALLATION

- .1 Secure equipment to hollow and solid masonry, tile and plaster surfaces with lead anchors.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 Support equipment, conduit or cables using clips, spring-loaded bolts, cable clamps designed as accessories to basic channel members.
- .4 Fasten exposed conduit or cables to building construction or support system using straps.
 - .1 One-hole steel straps to secure surface conduits and cables 35 mm (1-1/4 inch) and smaller.
 - .2 Two-hole steel straps for conduits and cables 41 mm (1-1/2 inch) and larger.
 - .3 Beam clamps to secure conduit to exposed steelwork.
- .5 Suspended supports systems.
 - .1 Support single or multiple cables or conduits on a common steel support channel system supported by 10 mm (3/8") diameter threaded rod hangers, washers and nuts where direct fastening to building construction is impractical. Channel is to be sandwiched between nuts and washers located on both upper and underside portions of channels.
 - .2 Do not support a single conduit using a threaded rod and a beam clamp. This is not an acceptable means of installation as no lateral support is provided.
- .6 For surface mounting of single and multiple conduits use channels. Channels are to be securely attached to hangers with the maximum spacing not greater than:
 - .1 Conduits of one size only:

.1	16 mm to 21 mm (1/2" to 3/4") conduit	1524 mm (60")
.2	27 mm & 35 mm (1" to 1 1/4") conduit	1980 mm (78")
.3	41 mm (1 1/2") & larger conduit	3050 mm (120")
 - .2 Conduits of mixed size:
 - .1 Arrange supports so that maximum spacing of supports conforms to above, based on smallest conduit diameter.
- .7 All suspended types of junction and pull boxes are to be supported using a minimum of 10 mm (3/8") threaded rod c/w nuts and flat washers. Secure threaded rods to boxes using one flat washer and nut installed on both sides of box. Provide as follows:
 - .1 One rod required for all types of boxes sized 150 X 150 mm (6 X 6 inches) or smaller.
 - .2 Two rods required for all types of boxes larger than 150 X 150 mm (6 X 6 inches) but less than 304 X 304 mm (12 X 12 inches)
 - .3 Four rods required for all types of boxes 304 X 304 mm (12 X 12 inches) and larger.

- .8 All excess threaded rod is to be cut-off within 13 mm (1/2") of channel bottom.
- .9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .11 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .12 **Do not use supports or equipment installed by other trade contractors for conduit or cable support except with permission of other trade and approval of Engineer.**
- .13 **Do not attach electrical conduit and cable to supports installed as part of a suspended ceiling installation (gypsum board or T-Bar for example).**
- .14 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

*****END OF SECTION*****

1 General

1.1 GENERAL

- .1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section. The Executed Agreement including General Conditions and Supplementary Conditions (Section 00 73 00), applicable sections of Division 0 and Division 1, Section 26 05 00 Common Work Results for Electrical, Section 26 05 01 Electrical Submittals and Section 26 05 02 Electrical Contract Closeout, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data for cabinets in accordance with Division 1.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility.

2 Products

2.1 SPLITTERS

- .1 Sheet metal enclosure, minimum 14 gauge with continuously welded corner seams, and formed hinged cover suitable for locking in closed position. Suitable for exterior and/or interior use. Heat fused powder paint applied to enclosure.
- .2 Splitter opening to have curled lip around all sides with poured in place gasket.
- .3 Concealed hinges with captive pins. Quarter turn mechanisms to ensure positive closing.
- .4 Bus bars for power distribution, neutral and ground. Tin plated copper material, drilled and tapped at 150 mm intervals, mounted on slanted insulators mounted on an interior panel.
- .5 Main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.
- .6 Complete with a bonding terminal strip for individual bonding conductor connections for each feeder.

2.2 JUNCTION AND PULL BOXES

- .1 Welded steel construction with screw-on flat covers for surface mounting.
- .2 Covers with 25 mm (1 inch) minimum extension all around, for flush-mounted pull and junction boxes.
- .3 Junction boxes larger than 120 mm (4 11/16) to have a bonding terminal strip installed.

2.3 CABINETS

- .1 Type D: 1.6 mm steel cabinet, built for surface or flush mounting. Flush cover lip 25 mm all around. Finish - ASA-61 grey enamel. Complete with screw on cover. Complete with bonding terminal strip.
- .2 Type E: 1.6 mm steel cabinet, surface mount. Formed steel hinge with pull ring catch. Finish ASA-61 grey enamel. Complete with bonding terminal strip.
- .3 Type T: 1.6 mm steel cabinet, 1.9 mm cover, latch lock, 2 keys. Finish - ASA - 61 grey enamel. Complete with bonding terminal strip.

3 Execution

3.1 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

- .1 Install all raceways in conformance with CEC, Section 12.
- .2 Install pull boxes in inconspicuous but accessible locations. Box cover to be hinged on the side. **Do not install boxes with hinge on top.**
- .3 Install pull boxes so as not to exceed 27 m (90 feet) of conduit run between pull boxes. Each run of raceway shall not have more than the equivalent of four 90 degree bends installed, including the bends located at an outlet or fitting. Pull boxes are to be sized in accordance with CEC Rule 12-3036.
- .4 Terminate all bonding conductors on bonding terminal strip installed inside junction box.
- .5 Where junction and or pull boxes are required to be 150 mm X 150 mm (6 inch X 6 inch) or larger Type E cabinets (hinged cover) shall be used. **Do not use splitter troughs in lieu of pull boxes.**
- .6 Type T cabinets shall be used when equipment is required to be housed in a lockable enclosure.
- .7 Where construction consists of metal Q deck and steel joists (Roof deck only), conduit boxes are to be installed in such a manner that the nearest outside surface of the electrical box is not less than 38 mm (1.5 inch) from the nearest surface of the metal roof deck.

- .8 Location of junctions and/or pull boxes in suspended ceiling spaces, i.e., gyp-rock, T-bar, etc., are not to be greater than 760 mm (30 inch) above finish ceiling.
- .9 All suspended types of junction and pull boxes are to be supported using a minimum of 10 mm (3/8 inch) threaded rod c/w nuts and flat washers. Secure threaded rods to boxes using one flat washer and nut installed on both sides of box. Provide as follows:
- .1 One rod required for all types of boxes sized 150 X 150 mm (6 X 6 inches) or smaller.
 - .2 Two rods required for all types of boxes larger than 150 X 150 mm (6 X 6 inches) but less than 304 X 304 mm (12 X 12 inches).
 - .3 Four rods required for all types of boxes 304 X 304 mm (12 X 12 inches) and larger.
- .10 Where junction boxes and pull boxes are secured to building structural components, they shall be mounted and secured in such a manner so as not to be “cantilevered” (ie, only supported on one side of the box). In rare instances where site constraints dictate the installation of a “cantilevered” box, threaded rods shall be installed to provide additional support on the opposite end.
- .11 Colour Coding: Refer to 26 05 31. All electrical junction, pull boxes splitters and cabinets shall be colour coded inside and out with appropriate coloured paint. **All paint is to be applied prior to installation and not with-in the confines of the building.**

*****END OF SECTION*****

1 General

1.1 GENERAL

- .1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section. The Executed Agreement including General Conditions and Supplementary Conditions (Section 00 73 00), applicable sections of Division 0 and Division 1, Section 26 05 00 Common Work Results for Electrical, Section 26 05 01 Electrical Submittals and Section 26 05 02 Electrical Contract Closeout, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 RELATED WORK:

- .1 Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.
- .2 Section 27 05 28 – Pathways for Communication Systems.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility.

2 Products

2.1 OUTLET AND CONDUIT BOXES GENERAL

- .1 Size boxes in accordance with CSA C22.1-15.
- .2 100-mm (4 inch) square or larger outlet boxes as required for special devices.
- .3 Multi-Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.
- .5 Combination boxes with barriers where outlets for more than one system or voltage are grouped.

- .6 Where tile rings are installed on this project, they must be the welded type with square corners (Rounded corners will not be acceptable). For single device installations use Iberville BC52-C-49XX. For two device installations use Iberville # 52-C-52-XX. Select appropriate depth of tile ring to suit application.
- .7 Adjustable type tile rings such as Iberville # 52C-ADJ are not permitted on this project.

2.2 SHEET STEEL DEVICE BOXES

- .1 One or Two Device, Flush Installation, Suitable for Armoured Cable and Conduit Entry:
 - .1 Electro-galvanized steel single, flush device boxes for use in dry flush installation, shall be pressed steel, minimum size 100 mm (4 inch) square x 54 mm (2.125 inch) deep, minimum volume of 490 cubic centimetres (30 cu.in.), (similar to Iberville # 52171-K). Provide single device square cornered tile cover (similar to Iberville # BC52-C-49XX) or two device square cornered tile covers (similar to Iberville # 52-C-52-XX).
- .2 Provide an outlet box for all communications outlets, c/w single gang, square, welded tile ring and stainless steel cover plate, unless noted otherwise. Minimum dimensions as follows: 118 mm (4-11/16 inch) x 118 mm (4-11/16 inch) x 38 mm (1.5 inch) deep, minimum volume of 490 cubic centimetres (30 cu.in.), (similar to Iberville # 72151-K), complete with a 38 mm (1.5 inch) box extension ring for a total depth of 76 mm (3.0 inches).
- .3 Provide the following for each multi-media outlet:
 - .1 A 118 mm (4-11/16 inch) x 118 mm (4-11/16 inch) x 38 mm (1.5 inch) deep, complete with a 38 mm (1.5 inch) box extension ring and a single gang, square, welded tile ring, located where indicated.
- .4 100-mm square outlet boxes for lighting fixture outlets.

2.3 MASONRY BOXES

- .1 Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls, minimum volume of 343 cubic centimetres (21 cu.in), 89 mm (3.5 in.) deep, (similar to Iberville # MBD).

2.4 SURFACE MOUNT CONDUIT BOXES

- .1 Cast FS aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacles.
- .2 Metal type "FS" device plates to be used on all type "FS" boxes unless noted otherwise.

2.5 MOUNTING BRACKETS

- .1 Provide box mounting brackets for the installation of multiple boxes for drywall partitions, c/w tile rings.
- .2 Acceptable material: Caddy RBS Type (16 or 24 as required), or equal.

2.6 FITTINGS - GENERAL

- .1 Knock-out fillers to prevent entry of foreign materials.
- .2 Double locknuts and insulated bushings on sheet metal boxes.

2.7 COLOUR CODING

- .1 Colour coding of system as per 26 05 03.

3 Execution

3.1 INSTALLATION

- .1 Support boxes independently of connecting conduits.
- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of construction material.
- .3 Install multiple box mounting brackets and mount boxes.
- .4 For flush installations mount outlets flush with finished wall using tile rings to permit wall finish to come within 6 mm (1/4") of opening.
- .5 The front edges of boxes, cabinets and fittings installed in noncombustible walls or ceilings shall not be set in more than 6 mm (1/4").
- .6 The front edges of boxes, cabinets and fittings installed in combustible walls (ie, millwork) shall be flush with surface. Application of non-conductive box extenders, similar to Arlington BE Series can be employed where no other practical solution exists.
- .7 Provide correct size of openings in boxes for conduit, mineral insulated and armored cable connections. Reducing washers not to be used.
- .8 Install multi-gang boxes where more than one device is required. Sectional (gangable) boxes are not to be used on this project.

*****END OF SECTION 26 05 32*****

1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA-C22.2 No. 62-93/R1999, Surface Raceway Systems.

1.2 PRODUCT DATA

- .1 Submit product data in accordance with Division 1.
- .2 Indicate types of raceways with terminology similar to that used in this Section.

2 Products

2.1 SURFACE RACEWAY SYSTEM

- .1 Steel: to CSA C22.2 No. 62, one piece, free of sharp edges.
- .2 Corners, pull boxes, elbows, tees, two piece assembly to facilitate site wiring.
- .3 Finish: Powder coat, Ivory.
- .4 Necessary receptacle, communications and extension boxes, adapters and utility fittings required for complete installation.
- .5 Capable of housing cables and conductors as indicated.
- .6 The following Series are required:
 - .1 Series 500 single channel.
 - .2 Series 2400D dual channel (1/3 power, 2/3 data).
 - .3 Series 3000 single channel.
 - .4 Series 4000 dual channel.
- .7 Refer to floor plans for types and locations of raceways.

2.2 FITTINGS

- .1 Elbows, tees, couplings and hanger fittings: to CSA C22.2 No. 62, manufactured as accessories to raceway supplied.

2.3 STANDARD OF ACCEPTANCE

- .1 Wiremold Series Surface Metal Raceway, c/w
 - .1 Elbows, ground clamps, entrance fittings, supporting clips, etc.
 - .2 Single and double gang device boxes.

2.4 ACCEPTABLE MANUFACTURER

- .1 Hubbell

3 Execution

3.1 INSTALLATION

- .1 Install Surface Metal Raceway only where fishing existing partitions is not possible.
- .2 Device locations are approximate only. Coordinate with other services, millwork, etc. Provide supports, elbows, tees, connectors, fittings, bushings, adaptors as required to accommodate final location of devices in conjunction with existing conditions.
- .3 Install Surface Metal Raceways before installation of wiring. Install covers for raceways and fittings after installation or wiring.
- .4 Install supports, elbows, tees, connectors, fittings, bushings, adaptors as required.
- .5 Keep number of elbows, offsets, connections to minimum.

*****END OF SECTION*****

1 General

1.1 GENERAL

- .1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section. The Executed Agreement including General Conditions and Supplementary Conditions (Section 00 73 00), applicable sections of Division 0 and Division 1, Section 26 05 00 Common Work Results for Electrical, Section 26 05 01 Electrical Submittals and Section 26 05 02 Electrical Contract Closeout, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 LOCATION OF CONDUIT

- .1 Drawings do not show all conduits. Those shown are in diagrammatic form only.

1.3 REFERENCES

- .1 Canadian Standards Association
 - .1 CAN/CSA C22.2 No. 18-98 (R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
 - .2 CSA C22.2 No. 45-M1981 (R2003), Rigid Metal Conduit.
 - .3 CSA C22.2 No. 56-04, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .4 CSA C22.2 No. 83-M1985 (R2003), Electrical Metallic Tubing.
 - .5 CSA C22.2 No. 211.2-M1984 (R2003), Rigid PVC (Unplasticized) Conduit.
 - .6 CAN/CSA C22.2 No. 227.3-05, Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada (February 2006).

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility.

2 Products

2.1 CONDUITS

- .1 Rigid galvanized steel threaded conduit: size as indicated.

- .2 Electrical metallic tubing (EMT): with couplings, size as indicated.
- .3 Rigid PVC conduit: size as indicated.
- .4 Liquid-tight flexible metal conduit: size as indicated.
- .5 Metal flexible conduit: size as indicated.
- .6 Corrugated Innerduct:
 - .1 HDPE (High Density Polyethylene).
 - .2 Orange in colour.
 - .3 FT-6 rated, c UL listed.
- .7 ENT conduit is not permitted for use on this project.

2.2 CONDUIT FASTENINGS

- .1 Fasten conduit to building construction or support system using straps, as follows:
 - .1 One-hole steel straps to secure surface conduits and cables 35 mm (1-1/4 inch) and smaller.
 - .2 Two hole steel straps for conduits and cables 41 mm (1-1/2 inch) and larger.
- .2 Beam clamps to secure conduits to exposed steelwork.
- .3 Channel type supports for one or more conduits.
- .4 10-mm (3/8 inch) diameter threaded rods to support suspended channels.

2.3 CONDUIT FITTINGS

- .1 Fittings: manufactured for use with conduit specified. Coating same as conduit.
- .2 Couplings for thinwall type EMT conduits shall be set screw, galvanized steel, unless noted otherwise.
- .3 Conduits exiting equipment enclosures equipped with sprinkler hoods shall be installed with rain tight EMT connectors. These connectors will be equipped with a rubber "O" Ring gasket. In addition, any conduit couplings in the vertical portion of the conduit run over equipment enclosures equipped with sprinkler hoods shall be rain tight.
- .4 Connectors for thinwall type EMT conduits shall be set screw, galvanized steel, c/w case hardened steel locknuts. Insulated throats are to be provided on connectors up to and including 27 mm (1 inch). Metal thread on bushings to be installed on all EMT connectors sized 35 mm (1 1/4 inch) or larger.

- .5 Armoured cable connectors shall be two-screw, steel type similar to T & B #3301, 3312. The use of “snap-in” type connectors is not permitted. Provide insulating bushings (anti-shorts) for armoured cable connectors.
- .6 Flexible metal conduit connectors shall be nylon insulated, steel or malleable iron type similar to T & B Tite-Bite #3115 thru 3124. Provide insulating bushings (anti-shorts) for flexible metal conduit connectors. Plastic thread on bushings to be installed on all flexible metal conduit connectors sized 35 mm (1 1/4 inch) or larger.
- .7 Liquid-tight flexible metal conduit fittings:
 - .1 Specifically listed for liquid tight flexible metal conduit.
 - .2 Steel type, to match conduit size.
 - .3 Fittings must incorporate a threaded grounding cone, a steel or plastic compression ring, and a gland for tightening.
 - .4 Safe edge ground type.
 - .5 Connectors shall have insulated throats.
 - .6 T & B #5300 series or equal.

2.4 EXPANSION FITTINGS FOR RIGID PVC CONDUIT

- .1 Provide expansion joints to the requirements of CEC Rule 12-1118 and the requirements of the manufacturer.
- .2 Calculate the expansion of the conduit based on the maximum probable change in temperature during and after installation.

2.5 FISH CORD

- .1 Polypropylene.

3 Execution

3.1 INSTALLATION

- .1 The minimum acceptable conduit size used for the installation of Category 6 cables is 27 mm (1 inch). (Refer to Section 27 05 28 Pathways for Communications Systems)
- .2 Unless noted otherwise, conduits are to be installed as high as possible to conserve headroom, to reduce interference with other trades and cause minimum interference in spaces through which they pass.
- .3 Conceal conduits except in mechanical and electrical service rooms and in unfinished areas.

- .4 Where construction consists of metal Q deck and steel joists, conduits are to be installed as follows:
 - .1 Between the top flange of a steel support structure and the Q-deck, where size of conduit permits.
 - .2 Where conduit sizes preclude this, install as high as possible in the space to conserve headroom.
- .5 Use rigid galvanized steel threaded conduit where subject to injury.
- .6 Use electrical metallic tubing (EMT) for the following:
 - .1 Communication outlets between device box and accessible ceiling space in all walls and partitions. (Refer to 27 05 28 for definition of Communication System Wiring).
 - .2 Sleeves for communication wiring (Refer to 27 05 28 for definition of Communication System Wiring).
 - .3 All Fire alarm system wiring.
 - .4 All Intrusion Detection system wiring.
 - .5 All Access Control system wiring.
 - .6 All wiring within electrical rooms and mechanical rooms.
 - .7 All panel feeders.
 - .8 Structured wiring system copper backbone cable.
 - .9 Structured wiring fibre backbone cable.
 - .10 All exposed wiring.
 - .11 Home runs to panelboards for all branch circuit wiring. A home run is defined as that portion of the branch circuit wiring that runs between the applicable panelboard, and the room or area in which it terminates, and/or makes its first splice, for drop off, to the applicable branch circuit device. AC90 will not be acceptable for this application. Where the branch circuit has multiple splices and/or drop offs to multiple rooms, the use of AC90 for the drop off is permitted, however, the home run conduit shall be continued until the final room destination or drop off is reached.
 - .12 Where noted elsewhere in the contract documents.
- .7 EMT shall be installed as a complete system and shall be securely fastened in place within 1 metre (39 inches) of each outlet box, junction box, cabinet, couplings, fittings and changes in direction and the spacing between supports as follows:
 - .1 Not greater than 1500 mm (five feet) for 16 mm (1/2 inch) and 21 mm (3/4 inch) EMT
 - .2 Not greater than 1800 mm (six feet) for 27 mm (1 inch) and 35 mm (1-1/4 inch) EMT
 - .3 Not greater than 3050 mm (ten feet) for 41 mm (1-1/2 inch) EMT or larger.
- .8 Install supports to firmly secure conduits to metal decking when any change in direction occurs.

- .9 All conduit runs shall be a maximum of 30 meters (100 feet) in length with a maximum of four (4) 90 degree bends between pull points. A pull box shall be placed in conduit runs where the sum of the bends exceeds 360 degrees, where the overall run exceeds 30 meters (100 feet) or there is a reverse bend in the run.
- .10 Pull boxes shall be placed in straight sections of conduit run and shall not be used in lieu of a bend. Conduit fittings shall not be used in place of pull boxes or bends. The use of C, LB, LL, LR and T type fittings are prohibited on this project unless written permission is provided by the Engineer.
- .11 Pull boxes are to be sized in conformance with CEC Rule 12-3036, unless noted otherwise. Do not use splitter troughs for pull boxes.
- .12 The use of corner pulling ELLs or corner pulling elbows is not permitted.
- .13 Conduits shall be installed in a neat and ordered manner. When installed in a group, conduits shall be parallel and evenly spaced apart.
- .14 Liquid tight metal flexible conduit is not to be used as a general purpose raceway. Use liquid tight flexible metal conduit (maximum length permitted to be 1.5 M) and liquid tight conduit fittings for:
 - .1 Final connection to all mechanical equipment (fans, pumps, terminal units, etc.) and all vibrating equipment.
 - .2 Final connection to **all** sprinkler system equipment (flow switches, supervised valves, alarm pressure switches, etc).
- .15 Metal flexible conduit may be used for short runs for final connections (For example to fire alarm and security device boxes in suspended ceilings), unless noted otherwise. It must be securely fastened in place within 300 mm (12 inch) of each junction box, cabinet and device. Install specified connectors and bushings. Where supports are required, do not derive support from ceiling support wires on supports of other trades. Do not use liquid tight metal flexible conduit in lieu of metal flexible conduit unless specifically approved by the Engineer for that application.
- .16 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .17 Mechanically bend steel conduit over 19-mm (3/4 inch) diameter.
- .18 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .19 Install fish cord in empty conduits.
- .20 Run 2 – 27 mm (1 inch) spare conduits up to nearest accessible ceiling space from each flush panel. Terminate these conduits in one 150-mm X 150 mm X 100 mm (6 inch X 6 inch X 4 inch) junction box in nearest accessible ceiling space or in case of an exposed concrete slab, terminate conduits in a flush concrete type box.

- .21 Where conduits become blocked, remove and replace blocked section.
- .22 Dry conduits out before installing wire.
- .23 The installation of conduits above the structure, directly below roof insulation is strictly prohibited.
- .24 All conduits to be complete with minimum #12 green insulated bond conductor.
- .25 Install fibre optic backbone cable in EMT conduit as indicated.
- .26 Ensure all metal raceways are bonded to ground, including those used for communication systems, fire alarm systems. Where a separate bonding conductor is run to a bonding bushing on an open end of a metal raceway, a #6 green RW90 shall be used.

3.2 SURFACE AND CONCEALED CONDUITS

- .1 Run parallel or perpendicular to building lines. When installed in a wall cavity, conduit is to be installed vertically from outlet box to ceiling space, not run in an angled manner through the studs.
- .2 Run conduits in flanged portion of structural steel, where possible.
- .3 Group conduits wherever possible.
- .4 Do not pass conduits through structural members except as indicated.
- .5 Do not locate conduits closer than 75-mm (3 inch) parallel to hot water lines with a minimum of 25 mm (1 inch) at crossovers.
- .6 Support of electrical systems raceway shall be independent of any type of suspended ceiling support rods, wires, etc. Toggle bolts shall not be used in Gypsum board construction.

3.3 CONCEALED CONDUITS

- .1 Do not install horizontal runs in masonry walls.
- .2 Do not install conduits in terrazzo or concrete toppings.

*****END OF SECTION*****

1 General

1.1 GENERAL

- .1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section. The Executed Agreement including General Conditions and Supplementary Conditions (Section 00 73 00), applicable sections of Division 0 and Division 1, Section 26 05 00 Common Work Results for Electrical, Section 26 05 01 Electrical Submittals and Section 26 05 02 Electrical Contract Closeout, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 RELATED WORK:

- .1 Electrical Contractor will provide all plywood backboards required for mounting electrical equipment.

1.3 RELATED SECTIONS:

- .1 Section 26 05 00- Common Work Results Electrical.
- .2 Section 26 05 03 - Electrical Identification.
- .3 Section 26 28 21- Moulded Case Circuit Breakers.

1.4 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Division 1.
- .2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

2 Products

2.1 LIGHTING & BRANCH CIRCUIT PANELBOARDS

- .1 Panelboards: as indicated on drawings.
- .2 Short Circuit Current Ratings:
 - .1 All panelboard bus structures must be designed to withstand the magnetic forces generated by fault current passing through them at the installed location in the distribution system.
 - .2 The minimum acceptable withstand rating for panelboard bus structures is 50 KAIC (RMS symmetrical).

- .3 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.
- .4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.
- .5 Two keys for each panelboard and key panelboards alike.
- .6 Bus Bars:
 - .1 Lugs to be rated for CU/AL.
 - .2 Tin-plated copper.
 - .3 Neutral to have same ampacity rating as main bus, unless noted otherwise.
- .7 Mains: suitable for bolt-on breakers.
- .8 All feeder conductors (phase, neutral and bonds) are to be terminated in factory provided multi-barrel lugs (Each conductor is to be provided with an individual, suitably sized connection point) with a single connection point to the bus bar. Multiple conductor type connection lugs under one screw are not acceptable (For example CMC-LA- 750 (2) style).
- .9 Provide trim and doors on all panelboards.
- .10 Provide drip hoods on all surface mounted panelboards.
- .11 Trim and door finish: grey enamel.
- .12 All panelboards to have factory installed bonding terminal strip.
- .13 Panel tubs to be a minimum of 508 mm (20 in.) wide, 146 mm (6 in.) deep for ampacity up to 225 amperes, unless noted otherwise.
- .14 Panelboards are to be complete with the following:
 - .1 Minimum of 10% spare 15 amp single pole circuit breakers.
 - .2 Minimum of 10% spare spaces for single pole circuit breakers.
 - .3 Minimum of 10% breaker lock-on devices, based upon total number of circuit breakers that panel can accept.

2.2 BREAKERS

- .1 Breakers: to Section 26 28 16.02.
- .2 Breakers with thermal magnetic tripping in panelboards, unless noted otherwise.

2.3 EQUIPMENT IDENTIFICATION AND PANEL DIRECTORY

- .1 Provide lamicoid identification plates for all Panelboards in accordance with Section 26 05 03.
- .2 Provide a complete circuit directory with typewritten legend indicating location and load of each circuit. All branch circuits such as lighting, receptacle, etc. to be identified by the room they terminate in. Panel directory is to be formatted so that odd numbered circuits appear on left of card; even numbered circuits appear on right. Identify all spare breakers. Panel directory is to include the number of breaker positions available in that particular panel, 72 circuit panel will require a single directory with a total of 72 spaces.
- .3 Provide lamicoid identification plates for each breaker in each Distribution Panelboard.

2.4 STANDARD OF ACCEPTANCE

- .1 Lighting and branch circuit panelboards:
 - .1 Cutler- Hammer
 - .1 POW-R-LINE 1 & 2
 - .2 POW- R-LINE 3a

2.5 ACCEPTABLE MANUFACTURERS TO THE REQUIREMENTS ABOVE:

- .1 Square D
- .2 Siemens.

3 Execution

3.1 INSTALLATION

- .1 Locate panelboards as indicated and mount securely, plumb true and square, to adjoining surfaces. If plywood backboards are utilized to mount panelboards, the electrical contractor is responsible to supply and install the backboards.
- .2 Mount panelboards to height specified in Section 26 05 00 or as indicated. Ensure that the operating handle of the top mounted device is with-in two metres of the finished floor.
- .3 Raceways entering into wall mounted panelboards shall be mechanically secured to the tub, and shall be mechanically continuous throughout the run. Where panelboards are designated as free standing units, other methods for raceway entry will be considered on a case by case basis only. Requests for a variance must be submitted in writing to the consultant.
- .4 Connect loads to circuits as indicated.

- .5 Connect neutral conductors to common neutral bus.
- .6 Connect bonding conductors to common bonding bar.
- .7 Provide separate neutral conductors for all circuits feeding lighting equipment from panelboards.
- .8 Provide a wire nut on each unused GFCI circuit breaker neutral conductor.
- .9 AC-90 cables are not permitted to enter panelboards under any circumstances.
- .10 Provide Arc Flash and Shock Hazard warning label on each panelboard, to suit the requirements of the Inspection Authority.

3.2 PANELBOARD START-UP, VERIFICATION AND PERFORMANCE TESTING

- .1 Start-Up
 - .1 Perform start-up checks paying particular attention to:
 - .1 Name plate complete.
 - .2 Proper grounding.
 - .3 Drip hood in place.
 - .4 Clean equipment.
 - .5 Condition of insulation and insulators.
 - .6 Evidence of moisture damage.
 - .7 Cable lugs torqued to manufacturer's recommendation.
 - .8 Bus bolts torqued to manufacturer's recommendation.
 - .9 Doors and covers in place.
 - .10 Code required clearances around equipment.
 - .11 Exterior and paint finish.
 - .12 Insulation Megger tests.
- .2 Verification
 - .1 Perform verification checks paying particular attention to:
 - .1 Manufacturer
 - .2 Voltage
 - .3 Main Bus Rating
 - .4 Copper Busing
 - .5 Copper Ground Bus
 - .6 Phase Rotation Test
 - .7 Feeder Breakers
- .3 Performance
 - .1 Carry out performance checks:
 - .1 Test Feeder Breakers and Trip Units.

3.3 COMMISSIONING

- .1 Commission the system in accordance with 26 91 13.

*****END OF SECTION*****

1 General

1.1 RELATED SECTIONS

- .1 Section 26 05 33.01- Surface Raceways.
- .2 Section 26 27 26- Wiring Devices.
- .3 Section 27 10 05- Structured Cabling for Communications.

1.2 PRODUCT DATA

- .1 Submit product data in accordance with Section Division 1
- .2 Indicate type of outlet assemblies with similar terminology to these documents.
- .3 Finish: Powder coat, ivory.

2 Products

2.1 WIRING DEVICES

- .1 Receptacle: as indicated, to Section 26 27 26- Wiring Devices.
- .2 Communications outlets: as indicated, to Section 27 10 05- Structured Cabling for Communications.

2.2 BONDING

- .1 Bond system to ground system through separate insulated conductor.

2.3 FITTINGS

- .1 Elbows, tees, couplings, hanger fittings and other fittings providing directional or dimensional changes manufactured as accessories to product line supplied.

2.4 STANDARD OF ACCEPTANCE:

- .1 Wiremold

2.5 ACCEPTABLE MANUFACTURER

- .1 Hubbell.

3 Execution

- .1 All wiring is to be concealed unless noted otherwise. Where this is not possible due to existing construction, metal surface mounted raceways are to be used.
- .2 Install wiring as indicated.
- .3 Install receptacles and communications outlets where indicated.
- .4 Make connections to power and communications systems.

*****END OF SECTION*****

1 General

1.1 GENERAL

- .1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section. The Executed Agreement including General Conditions and Supplementary Conditions (Section 00 73 00), applicable sections of Division 0 and Division 1, Section 26 05 00 Common Work Results for Electrical, Section 26 05 01 Electrical Submittals and Section 26 05 02 Electrical Contract Closeout, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Submittal Procedures.

1.3 RELATED SECTIONS:

- .1 Submittal Procedures.
- .2 Section 26 05 00 - Common Work Results Electrical.
- .3 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

1.4 REFERENCES:

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-C22.2 No.42-99 (R2002), General Use Receptacles, Attachment Plugs and Similar Devices.
 - .2 CSA-C22.2 No.42.1-00, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
 - .3 CSA-C22.2 No.55-M1986 (July 2001), Special Use Switches.
 - .4 CSA-C22.2 No.111-00, General-Use Snap Switches (Bi-national standard, with UL 20, twelfth edition).

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility.

2 Products

2.1 SWITCHES

- .1 20 A, 120 V single pole, three-way, four-way switches as indicated.
- .2 Manually-operated general purpose AC switches, industrial, specification grade, toggle type, as indicated and with the following features:
 - .1 Terminal holes approved for No. 10 AWG wire.
 - .2 Silver alloy contacts.
 - .3 Urea or melamine molding for parts subject to carbon tracking.
 - .4 Suitable for back and side wiring.
 - .5 White toggle.
- .3 Maximum continuous current: 20 Amps.
- .4 Switches of one manufacturer throughout project.
- .5 Acceptable manufacturers: Hubbell, Leviton, Pass & Seymour.

2.2 RECEPTACLES

- .1 Unless specified otherwise, duplex receptacles, CSA type 5-15 R, 125V, 15 A, U ground, specification grade, with the following features:
 - .1 Reinforced thermoplastic base and deep nylon body.
 - .2 Impact resistant nylon face, complete with finder grooves.
 - .3 One piece brass mounting strap with integral ground contacts.
 - .4 Suitable for No. 10 AWG for back and side wiring.
 - .5 Break-off links for use as split receptacles.
 - .6 Eight back wired entrances, four side wiring screws.
 - .7 Double wipe contacts.
 - .8 White in color.
 - .9 Standard of Acceptance: Hubbell No. HBL5252WCN
 - .10 Acceptable Manufacturers:
 - .1 Leviton #5262.
 - .2 Pass and Seymour #PS5262
 - .3 Cooper Wiring Device #AH5262W.
- .2 Duplex receptacles where indicated: CSA 5-20R, 125V, 20A U ground as above, except Hubbell No. HBL5352 WCN.
- .3 Duplex receptacles, ground fault where indicated: CSA 5-15R, 125V, 15A U ground as above, except Hubbell No. GF5262 WCN.
- .4 Two pole, three wire grounding receptacle where indicated: CSA 5-30R, 30 amp, single phase, 125 VAC, heavy duty, specification grade, Hubbell # HBL9308.

- .5 Three pole, thirty amp, four wire grounding receptacle where indicated: CSA 14-30R, 30 amp, single phase, 125/250 VAC, heavy duty, specification grade, Hubbell # HBL9430A.
- .6 Three pole, fifty amp, four wire grounding receptacle where indicated: CSA 14-50R, 50 amp, single phase, 125/250 VAC, heavy duty, specification grade, Hubbell # HBL9450A.
- .7 Three pole, sixty amp, four wire grounding receptacle where indicated: CSA 15-60R, 60 amp, three phase, 250 VAC, heavy duty, specification grade, Hubbell # HBL8460A.
- .8 Receptacles of one manufacturer throughout project.
- .9 Acceptable manufacturers: Leviton, Pass & Seymour.

2.3 COVER PLATES

- .1 Cover plates are required for all wiring devices.
- .2 Cover plates from one manufacturer throughout project.
- .3 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.
- .4 Stainless steel, vertically brushed, 1 mm thick cover plates for wiring devices mounted in flush-mounted outlet box.
- .5 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes, complete with four screws.
- .6 For four inch square boxes in above ceiling applications, 3/8 inch (9.5 mm) raised surface covers as follows:
 - .1 One duplex receptacle: Iberville Cat# BC-8365.
 - .2 One toggle switch: Iberville Cat# BC-8361.
- .7 Exterior receptacles shall be equipped with cover plates which are marked "Extra Duty" in compliance with CEC Rule 26-702 (2).

2.4 EXTERIOR RECEPTACLES

- .1 Locate in flush weatherproof enclosure incorporating a recessed backbox.
- .2 Cast aluminum cover plate.
- .3 Acceptable Manufacturer: Hubbell #WP826.

3 Execution

3.1 INSTALLATION

- .1 Switches:
 - .1 Install single throw switches with handle in "UP" position when switch closed.
 - .2 Install switches in gang type outlet box when more than one switch is required in one location.
 - .3 Mount toggle switches at height specified in Section 26 05 00 or as indicated.
 - .4 **Each line voltage switch is to be wired with the neutral conductor extended to the device box.**

- .2 Interior Receptacles:
 - .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
 - .2 Mount receptacles at height specified.
 - .3 All receptacles to be polarity tested.
 - .4 Install with U-ground up.
 - .5 Receptacles shall project a minimum of 3 mm (.125 in) from metal face plates.
 - .6 All receptacles to be mounted level and plumb.
 - .7 For above ceiling applications, outlet box is to be 100 mm (4 inch) square, c/w with raised surface covers.

- .3 Exterior Receptacles:
 - .1 Mount back box, recessed in wall at height specified in Section 26 05 00 or as indicated, to permit the receptacle to be installed flush with wall.
 - .2 Wire and connect device and install with U-ground up.
 - .3 Apply caulking compound to back of cover to provide waterproof seal.
 - .4 All receptacles to be polarity tested.
 - .5 For roof mounted receptacles, refer to details on drawings.

- .4 Cover plates:
 - .1 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.
 - .2 Install suitable common cover plates where wiring devices are grouped.
 - .3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.
 - .4 Use "FS" coverplates for all "FS" boxes.
 - .5 Exterior cover plates to be cast aluminum, c/w lockable feature.

- .5 Identification:
 - .1 Identify all receptacles as per 26 05 03.

3.2 COMMISSIONING

- .1 Commission the system in accordance with 26 91 13.

*****END OF SECTION*****

1 General

1.1 GENERAL

- .1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section. The Executed Agreement including General Conditions and Supplementary Conditions (Section 00 73 00), applicable sections of Division 0 and Division 1, Section 26 05 00 Common Work Results for Electrical, Section 26 05 01 Electrical Submittals and Section 26 05 02 Electrical Contract Closeout, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Division 1.

1.3 DELIVERY AND STORAGE

- .1 Ship fuses in original containers.
- .2 Store fuses in original containers.

2 Products

2.1 FUSES GENERAL

- .1 Low voltage, current limiting, HRC fuses, types as specified below and shall be CSA certified.
- .2 Fuses shall meet the following parameters:
 - .1 Fast Acting
 - .1 Rating: 1 – 600 amps.
 - .1 CSA certified to Standard C22.2 No. 248.8.
 - .2 200 KAIR.
 - .3 Class J.
 - .4 Ferraz Shawmut A4J.
 - .2 Time Delay
 - .1 Rating: 1 – 600 amps.
 - .1 CSA certified to Standard C22.2 No. 248.8.
 - .2 200 KAIR.
 - .3 Class J.
 - .4 Ferraz Shawmut AJT.
 - .3 Fuses shall be so selected as to provide a fully coordinated system for both overload and short circuit fault conditions.

2.2 STANDARD OF ACCEPTANCE

- .1 Ferraz Shawmut

2.3 ACCEPTABLE MANUFACTURERS

- .1 Bussmann.
- .2 English Electric.

3 Execution

3.1 INSTALLATION

- .1 Install fast acting or time delay fuses, as indicated.
- .2 Install fuses in mounting devices immediately before energizing circuit.
- .3 All fusible equipment rated 600 amps or less shall be supplied with fuse clips to accept Class J fuses.
- .4 Ensure correct fuses are fitted to physically matched mounting devices.
- .5 Ensure correct fuses fitted to assigned electrical circuit.

*****END OF SECTION*****

.1 General

1.1 GENERAL

- .1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section. The Executed Agreement including General Conditions and Supplementary Conditions (Section 00 73 00), applicable sections of Division 0 and Division 1, Section 26 05 00 Common Work Results for Electrical, Section 26 05 01 Electrical Submittals and Section 26 05 02 Electrical Contract Closeout, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 RELATED SECTIONS

- .1 Submittal Procedures.
- .2 Construction/Demolition Waste Management and Disposal.
- .3 Section 26 05 00 – Common Work Results for Electrical.
- .4 Section 26 24 16.01 - Panelboards Breaker Type

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials..
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal packaging material for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility.

1.4 REFERENCES

- .1 Canadian Standards Association (CSA International).
 - .1 CSA-C22.2 No. 5-02, Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the second edition of NMX-J-266-ANCE).

1.5 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Include time-current characteristic curves for breakers.

2 Products

2.1 BREAKER GENERAL

- .1 Bolt-on molded case circuit breaker, quick make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees Celsius ambient.
- .2 Plug-in molded case circuit breakers, not accepted.
- .3 Common-trip breakers with single handle for multipole applications.
- .4 Magnetic instantaneous trip elements in circuit breakers, to operate only when the value of current reaches setting.
- .5 Short Circuit Interrupting Ratings:
 - .1 All circuit breakers must be fully rated to withstand the voltage and available fault current at their terminals at the installed location in the distribution system.
 - .2 Series rated combinations (Integrated Equipment Rating) of circuit breakers, as per CEC, Rule 14-014 is not acceptable and cannot be applied to this project.
 - .3 Unless otherwise noted, all circuit breakers are to be fully rated for a symmetrical short circuit fault current of not less than 10 KA @ 240 volts..
- .6 All circuit breakers sized greater than 225 amps are to be supplied with extension handles.

2.2 THERMAL MAGNETIC BREAKERS

- .1 Molded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping. Under overload conditions and instantaneous tripping for short circuit protection.
- .2 All circuit breakers rated 150 amps and above are to be supplied with adjustable magnetic trip units, unless noted otherwise.

2.3 MAGNETIC BREAKERS

- .1 Molded case circuit breakers to operate automatically by means of adjustable magnetic devices for motor circuit protection.

2.4 BREAKER TYPE GROUND FAULT CIRCUIT INTERRUPTER

- .1 Single pole, Class A, ground fault circuit interrupter for 15 or 20 amp, as indicated, 120 VAC, single phase circuit, C/W test and reset facilities.

2.5 STANDARD OF ACCEPTANCE

- .1 Cutler-Hammer.

2.6 ACCEPTABLE MANUFACTURERS

- .1 Square D.
- .2 Siemens.

3 Execution

3.1 INSTALLATION

- .1 Install circuit breakers as indicated.

3.2 COMMISSIONING

- .1 Carry out the commissioning in conformance with Section 26 91 13.

*****END OF SECTION*****

1 General

1.1 GENERAL

- .1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section. The Executed Agreement including General Conditions and Supplementary Conditions (Section 00 73 00), applicable sections of Division 0 and Division 1, Section 26 05 00 Common Work Results for Electrical, Section 26 05 01 Electrical Submittals and Section 26 05 02 Electrical Contract Closeout, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 PRODUCT DATA

- .1 Submit product data in accordance with Division 1.

2 Products

2.1 DISCONNECT SWITCHES

- .1 Non-fusible and fusible disconnect switch in CSA Enclosure as indicated.
- .2 Provision for padlocking in on-off switch position.
- .3 Mechanically interlocked door to prevent opening when handle in ON position.
- .4 Quick-make, quick-break action.
- .5 ON-OFF switch position indication on switch enclosure cover.
- .6 Fuse clips to accommodate Class J only.
- .7 Supply HRC-I-J fuses for all fused disconnect switches, unless indicated otherwise.

2.2 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 03.

2.3 MANUFACTURERS

- .1 Standard of Acceptance:
 - .1 Cutler-Hammer.
- .2 Acceptable Manufacturer:
 - .1 Square D.
 - .2 Siemens.

3 Execution

3.1 INSTALLATION

- .1 Install disconnect switches as indicated.
- .2 Install fuses in disconnect switches where indicated.

*****END OF SECTION*****

1 General

1.1 GENERAL

- .1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section. The Executed Agreement including General Conditions and Supplementary Conditions (Section 00 73 00), applicable sections of Division 0 and Division 1, Section 26 05 00 Common Work Results for Electrical, Section 26 05 01 Electrical Submittals and Section 26 05 02 Electrical Contract Closeout, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Division 1.
- .2 Indicate:
 - .1 Mounting method and dimensions.
 - .2 Starter size and type.
 - .3 Layout of identified internal and front panel components.
 - .4 Enclosure types.
 - .5 Wiring diagram for each type of starter.
 - .6 Interconnection diagrams.
 - .7 Equipment being controlled, making reference to the Motor Starter and Control list.
- .3 Project Specific Wiring Diagrams:
 - .1 Refer to the mechanical control drawings for individual motor starter control wiring diagrams and sequences of operation.
 - .2 Submit with each starter a project specific wiring diagram indicating all interconnections.
 - .3 Each starter shop drawing will indicate the equipment being controlled (For example- Supply fan #1).

1.3 OPERATION AND MAINTENANCE DATA

- .1 Provide data for incorporation into maintenance manual specified in Division 1.
- .2 Include operation and maintenance data for each type and style of starter.

2 Products

2.1 MATERIALS

- .1 All individual starters and motor control centre starters are to be of the same manufacturer.

- .2 Starters: EEMAC E14-1.
 - .1 Half size starters not acceptable.

2.2 SUPPLY CHARACTERISTICS

- .1 Refer to individual starter description in the contract documents for voltage, phase and KW.

2.3 MANUAL MOTOR STARTERS

- .1 Single phase manual motor starters of size, type, rating, and enclosure type as indicated, with components as follows:
 - .1 Switching mechanism, quick make and break.
 - .2 One overload heater, manual reset, trip indicating handle.
- .2 Accessories:
 - .1 Toggle switch: standard labeled as indicated.
 - .2 Indicating light: LED type and colour as indicated.
 - .3 Locking tab to permit padlocking in "ON" or "OFF" position.
 - .4 Recessed backbox to allow for flush mounting, unless noted otherwise.

2.4 FULL VOLTAGE MAGNETIC STARTERS

- .1 Combination magnetic starters of size, type, rating and enclosure type as indicated with components as follows:
 - .1 Contactor solenoid operated rapid action type.
 - .2 Motor solid state overload protective device in each phase ambient compensated, manually reset from outside enclosure, c/w
 - .1 One current sensor in each phase.
 - .2 Dial selectable overload protection.
 - .3 Phase loss protection.
 - .3 Power and control terminals.
 - .4 Project specific wiring and schematic diagram inside starter enclosure in visible location.
 - .5 Identify each wire and terminal for external connections, within starter, with permanent number marking identical to diagram.
- .2 Combination type starters to include magnetic only circuit breaker (MCP), where indicated with operating lever on outside of enclosure to control circuit breaker, and provision for:
 - .1 Locking in "OFF" position with up to 3 padlocks.
 - .2 Locking in "ON" position.
 - .3 Independent locking of enclosure door.
 - .4 Provision for adjustable trip settings of 700 - 1300 % of motor FLA.

- .3 Accessories:
 - .1 Selector switches: labeled as indicated.
 - .2 Indicating lights: LED type and colour as indicated.
 - .3 1-N/O and 1-N/C spare auxiliary contacts unless otherwise indicated.
 - .4 Manual overload reset button on enclosure exterior.
 - .5 Control transformer, voltage as indicated, minimum 100 VA.
- .4 Wiring Diagrams:
 - .1 Each starter will be supplied with a project specific wiring diagram located inside the cover in a plastic sleeve.

2.5 BUILDING AUTOMATION SYSTEM CONTROL COMPONENTS

- .1 The electrical contractor must coordinate the requirements for current sensing switches and start/stop relays with the mechanical contractor.
- .2 Provide solid core AC current sensors in each starter enclosure. Wire all connections to a factory installed terminal strip.
 - .1 Acceptable material: Greystone Model CS-450-1.
- .3 Provide mechanical relay and relay base in each and every starter enclosure. Unit to be DPDT and have 12 VDC coil and 120 VAC, 6 Amp contacts to switch motor control circuit. Wire all connections to a factory installed terminal strip.
 - .1 Acceptable material: Eaton Model # XRR2D12 and plug-in base.
- .4 All components and entire assembly to be CSA approved.

2.6 BUILDING CONTROL SYSTEM COMPONENT CONNECTIONS

- .1 Obtain the mechanical control system drawings and review the wiring diagram and sequence of operation associated with each motor. Provide internal starter wiring as required. Wire all connections to a factory installed terminal strip for field termination by the mechanical contractor.
- .2 All components and entire assembly to be CSA approved.

2.7 ENCLOSURE

- .1 Provide EEMAC 1 enclosures for all starters unless indicated otherwise.

2.8 WIRING IDENTIFICATION

- .1 Provide wiring identification in accordance with Section 26 05 03.

2.9 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 03.

2.10 COORDINATION

- .1 Coordinate with mechanical contractor.

2.11 STANDARD OF ACCEPTANCE

- .1 Cutler-Hammer MS Series manual motor starters.
- .2 Cutler-Hammer – Freedom NEMA c/w CEP7 solid state overload relay.

2.12 ACCEPTABLE MANUFACTURERS

- .1 Acceptable manufacturer: Furnas, Square D, Allen Bradley, Siemens.

3 Execution

3.1 INSTALLATION OF STARTERS

- .1 Install starters, connect power and control as indicated.
- .2 All manual motor starters are to be installed in a recessed backbox unless the starter is installed in a mechanical or an electrical room.
- .3 Make field power and control connections as indicated. Refer to Motor Starter and Control drawings for division of responsibility.
- .4 Final connection to motors:
 - .1 The conductor phase colour coding as per C.E.C. rule 4-038 will carry through from the incoming service point to the motor starter and to the final connection to each motor. In the instance that a three phase motor requires transposition of phase conductors to achieve proper rotation, the change is to take place at the motor terminal box. Changing the motor feeder phase conductors at any other point in the distribution system (for example at the starter) will not be acceptable.
- .5 Before energizing the starter, conduct a thorough inspection to make certain that all foreign materials, scraps of wire and other debris are removed from the enclosure. Remove any accumulation of dust and dirt with a vacuum cleaner.
- .6 Check all devices for damage. Make all necessary repairs or replacements, prior to energizing.
- .7 Ensure that Motor Circuit Protectors (MCPs) adjustable current trip mechanisms match the full-load current shown on the nameplate of each motor and the manufacturer's setpoint table.

- .8 Ensure that solid-state overload relays are installed and adjusted to match the full-load current shown on the nameplate of each motor and comply with CEC, Rule 28-306 and set to trip at no more than the following:
 - .1 125% of the FLA rating of a motor having a service factor of 1.15 or greater.
 - .2 115% of the FLA rating of a motor having a service factor that is unmarked or less than 1.15.
- .9 Provide Arc Flash and Shock Hazard warning label on each panelboard, to suit the requirements of the Inspection Authority.

3.2 MOTOR STARTER START-UP, VERIFICATION AND PERFORMANCE TESTING

- .1 Start-Up
 - .1 Perform start-up checks paying particular attention to:
 - .1 Name plate complete.
 - .2 Proper grounding.
 - .3 Clean equipment.
 - .4 Evidence of moisture damage.
 - .5 Cable lugs torqued to manufacturer's recommendation.
 - .6 Doors and covers in place.
 - .7 Wiring diagram is inside each starter.
 - .8 Code required clearances around equipment.
 - .9 Exterior and paint finish.
- .2 Verification
 - .1 Perform verification checks paying particular attention to:
 - .1 Manufacturer
 - .2 Voltage
 - .3 Phase Rotation Test
 - .4 Breakers (MCP and Thermal/magnetic type)
- .3 Performance
 - .1 Carry out performance checks:
 - .1 Test overcurrent devices.
 - .2 Test overload Trip Units.

3.3 TESTS

- .1 Operate switches to verify correct functioning.
- .2 Perform starting and stopping.
- .3 Check that starters operate as indicated and to requirements of the mechanical contractor.

3.4 RECORDS

- .1 Obtain and record the following information for each motor.
 - .1 Motor horsepower
 - .2 Motor voltage
 - .3 Motor full load amps - (both nameplate and site measured values).
 - .4 Installed overload units.
 - .5 Installed over current protection. (Trip Unit)
 - .6 MCP adjustments. (In Amperes).
- .2 Submit chart to Engineer for approval and make changes where instructed.
- .3 Incorporate in maintenance manuals.

3.5 COMMISSIONING

- .1 Commission the system in accordance with 26 91 13.

*******END OF SECTION *******

1 General

1.1 GENERAL

- .1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section. The Executed Agreement including General Conditions and Supplementary Conditions, applicable sections of Division 0 and Division 1, Section 26 05 00 Common Work Results for Electrical, Section 26 05 01 Electrical Submittals and Section 26 05 02 Electrical Contract Closeout, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 REFERENCES

- .1 ANSI C82.1-04, Lamp Ballasts-Line Frequency Fluorescent Lamp Ballast.
- .2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
 - .1 ANSI/IEEE C62.41-1991, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
- .3 Canadian Standards Association (CSA International)
- .4 Underwriters' Laboratories of Canada (ULC).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Provide complete photometric data prepared by independent testing laboratory for luminaires where specified.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .2 Packaging Waste Management: remove for reuse.
- .3 Divert unused metal materials from landfill to metal recycling facility.
- .4 Disposal and recycling of fluorescent lamps as per local regulations.

1.5 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit complete photometric data prepared by independent testing laboratory for luminaires specified, for review by Consultant. Include disc containing IES formatted photometric data.

1.6 SPARE PARTS

- .1 Provide spare parts as per 26 05 01.

2 Products

2.1 LUMINAIRES

- .1 Fluorescent luminaire:
 - .1 Refer to light fixture schedule.

3 Execution

3.1 INSTALLATION

- .1 Locate and install luminaires as indicated.

3.2 WIRING

- .1 Connect luminaries to lighting circuits.
- .2 Install separate #12 RW90 bonding conductor in fixture raceways when fixtures are continuously mounted in rows.
- .3 Provide a separate neutral conductor for all lighting circuits.

3.3 LUMINAIRE SUPPORT

- .1 For suspended ceiling installations support luminaires from ceiling grid. Additional ceiling suspension hangers are to be supplied and installed by Division 9. Hangers are to be installed within 150 mm of each corner of the fixture.
- .2 Luminaires weighing more than 11.4 kg shall be supported independently of the outlet box.

3.4 LUMINAIRE ALIGNMENT

- .1 Align luminaires mounted in continuous rows to form straight uninterrupted line.
- .2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

3.5 COMMISSIONING

- .1 Carry out the commissioning in conformance with Section 26 91 13.

*****END OF SECTION*****

1 General

1.1 GENERAL

- .1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section. The Executed Agreement including General Conditions and Supplementary Conditions (Section 00 73 00), applicable sections of Division 0 and Division 1, Section 26 05 00 Common Work Results for Electrical, Section 26 05 01 Electrical Submittals and Section 26 05 02 Electrical Contract Closeout, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 PRODUCT DATA

- .1 Submit product data in accordance with Division 1.
- .2 Data to indicate system components, mounting method, source of power and special attachments.
- .3 Units shall comply with CSA C22.2 No. 141.

1.3 WARRANTY

- .1 For batteries, the 12 months warranty period is extended to 10 years.

1.4 SPARE PARTS

- .1 Provide spare parts as per 26 05 01.

2 Products

2.1 EQUIPMENT

- .1 Supply voltage: 120 VAC.
- .2 Output voltage: 12 VDC.
- .3 Operating time as indicated, but in no case less than 30 min.
- .4 Battery: sealed, lead acid, maintenance free.
- .5 Charger: solid state, multi-rate, voltage/current regulated, inverse temperature compensated, short circuit protected with regulated output of plus or minus 0.01 V for plus or minus 10% input variations.
- .6 Solid state transfer circuit.

- .7 Low voltage disconnect: solid state, modular, operates at 80% battery output voltage.
- .8 Signal lights: solid state, for 'AC Power ON'.
- .9 Lamp Type: 4 Watt LED.
- .10 Heavy duty steel housing, c/w corrosion resistant undercoating.
- .11 Automatic self-diagnostic circuitry and test feature, c/w the following features:
 - .1 Microprocessor based.
 - .2 Monitors lamps, battery and circuitry.
 - .3 Internally simulated weekly functionality test.
 - .4 Multicolour LED visual display (Red, Yellow & Green).
- .12 Auxiliary equipment:
 - .1 Test switch.
- .13 Remote heads to be 12 volt, 4 Watt LED, unless indicated otherwise.

2.2 WIRING OF REMOTE HEADS

- .1 Conductors: RW90 type to Section 26 05 21 - Wires and Cables 0-1000 V.
- .2 Conduit: type EMT, to Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

2.3 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 03

2.4 STANDARD OF ACCEPTANCE

- .1 Lumacell Q-BIC-AT Series for surface mount units, RGS-TB-AT Series for T-Bar mount, c/w 4 Watt LED lamps and wire guards where indicated.
- .2 Lumacell MQM2NX-2LED-12V-4W NEMA 4X C/W two 4 Watt LED Lamps for remote heads.

2.5 ACCEPTABLE MANUFACTURERS TO THE REQUIREMENTS ABOVE

- .1 Emergilite
- .2 Stanpro
- .3 Beghelli

3 Execution

3.1 INSTALLATION

- .1 Ceiling mount units where indicated.
- .2 Provide individual fixture chain supports on both ends of each ceiling mounted battery unit. The weight of each battery unit is not to be supported by the ceiling grid.
- .3 Install remote heads in suspended ceilings using bar hangers, similar to B-Line BA50F RediMount. Install Kwik-Wire cable kit and attach to deck. Secure bracket to T-bar using self-tapping screws. Refer to Detail 9, Drawing ES501.
- .4 Install unit equipment and remote mounted fixtures.
- .5 Connect each emergency battery unit in such a manner that it will automatically be actuated upon failure of the power supply to the normal lighting in the area covered by that equipment.
- .6 Direct heads.
- .7 Install wire guards on units in gymnasium and where indicated.
- .8 Where multiple DC feeds originate from a battery pack, install one feed from the battery pack to a suitably sized junction box. Feed multiple feeds from the junction box.
- .9 Provide and post instructions for the operation and care of the emergency battery units and testing interval, in conformance with CEC Rule 46-102.
- .10 Provide identification as per 26 05 03.

3.2 COMMISSIONING

- .1 Commission the system in accordance with 26 91 13 and the Commissioning Agent.

*****END OF SECTION*****

1 General

1.1 GENERAL

- .1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section. The Executed Agreement including General Conditions and Supplementary Conditions (Section 00 73 00), applicable sections of Division 0 and Division 1, Section 26 05 00 Common Work Results for Electrical, Section 26 05 01 Electrical Submittals and Section 26 05 02 Electrical Contract Closeout, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 PRODUCT DATA

- .1 Submit product data in accordance with Division 1.

1.3 WARRANTY

- .1 For Exit lights, the 12 months warranty period is extended to 10 years.

1.4 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 03

1.5 SPARE PARTS

- .1 Provide spare parts as per 26 05 01.

2 Products

2.1 FEATURES:

- .1 Pictogram style Exit sign, green and white.
- .2 Extruded aluminum housing.
- .3 Tamper proof screws.
- .4 Universal mount – Wall, ceiling or end mount.
- .5 Long life white LED light source as follows:
 - .1 Less than 3 Watt.
 - .2 25 year life.
- .6 Each faceplate to have two legend films for pictogram and direction selection.

- .7 120 VAC, two wire feed plus bond.
- .8 Meet or exceed CSA 22.2 No, 141-10 standard.
- .9 Self-powered with sealed Nickel-Cadmium battery with a minimum of two hours operation on AC failure.

2.2 STANDARD OF ACCEPTANCE

- .1 Lumacell LA-X-A-U-SP-TP.

2.3 ACCEPTABLE MANUFACTURERS

- .1 Emergilite
- .2 Dual Lite
- .3 Stanpro
- .4 Aimlite
- .5 Beghelli

3 Execution

3.1 INSTALLATION

- .1 Install exit lights.
- .2 Where exit lights are installed in suspended ceilings use bar hangers, similar to Arlington # FBRS420SC. Install wire grabber kit and attach to deck. Provide additional support such that the exit lights are rigidly held in place and cannot be moved or turned.
- .3 Connect fixtures to exit light circuits.
- .4 Provide circuit breaker lock-on devices for all circuits feeding exit lights.
- .5 Provide identification as per 26 05 03.

3.2 COMMISSIONING

- .1 Commission the system in accordance with 26 91 13.

*****END OF SECTION*****

1 General

1.1 GENERAL

- .1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section. The Executed Agreement including General Conditions and Supplementary Conditions (Section 00 73 00), applicable sections of Division 0 and Division 1, Section 26 05 00 Common Work Results for Electrical, Section 26 05 01 Electrical Submittals and Section 26 05 02 Electrical Contract Closeout, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 RELATED WORK

- .1 General requirements: Division 1.
- .2 Common Work Results for Electrical - Section 26 05 00.

1.3 GENERAL

- .1 The verification of all electrical systems installed on this project is the responsibility of the Electrical Contractor. Manufactured systems or components shall be commissioned by factory trained technicians representing the manufacturer, in the presence of the Owner's designated representatives, and under the direction of the electrical contractor.
- .2 The electrical contractor will provide assistance to the Owner's representatives and ensure that the manufacturer's representative is on site during functional performance testing (FPT).
- .3 Tests shall be performed by qualified electricians or technicians as required by the nature and complexity of the test.
- .4 The correction of all electrical deficiencies identified throughout the project associated with this work shall be a condition of Substantial Performance and shall be corrected prior to achieving Substantial Performance.

1.4 SCOPE

- .1 Systems verification are called for throughout the individual specifications, however, this does not relieve this section from providing all testing and verification necessary to ensure that systems and equipment operate as required and that they interface with other systems and equipment as required.
- .2 Provide labour tools and supervision to conduct functional testing as described/specified herein and in related sections including but not limited to the following equipment and systems:
 - .1 Lighting and Controls.

- .2 Panelboards.
- .3 Structured Cabling.
- .4 Fire Alarm System.
- .5 Building Security and Access Control Systems.
- .6 Motors and Motor Controls.
- .7 Emergency and Exit lighting system.

1.5 QUALITY ASSURANCE

- .1 The Electrical Contractor is responsible for quality assurance and whenever necessary, to ensure compliance with operating requirements, CSA, these contract documents, the Authority having Jurisdiction and other requirements and codes as applicable.

1.6 CONTRACTOR'S RESPONSIBILITIES

- .1 Prepare each system for testing and verification.
- .2 Co-ordinate the efforts of testing and verification.
- .3 Provide personnel, operate systems at designated times, and under conditions required for proper testing and adjusting.
- .4 Provide all necessary test and calibration equipment, temporary facilities, meters, sensors, load banks, etc. necessary to simulate and verify correct operating conditions.
- .5 Co-ordinate and pay for all costs associated with testing and verification, including but not limited to costs for: travel, labour, equipment, testing agencies, manufacturers, testing and any other costs incurred to test and verify equipment and systems.
- .6 Make test instruments available to Engineer to facilitate spot checks during testing.
- .7 Retain possession of test instruments and remove at completion of services.
- .8 Verify system installation is complete and in continuous operation.
- .9 Where systems or equipment do not operate as required, make the necessary corrections or modifications, re-test and re-commission.

1.7 SUBMITTALS

- .1 The Contractor shall submit the following documentation prior to FPT:
 - .1 Record drawings.
 - .2 Operations and maintenance manuals.
 - .3 A letter of acceptance from the local inspection authority. A copy is to be included in the operations and maintenance manuals.

- .4 A letter of guarantee. A copy is to be included in the operations and maintenance manuals.
- .5 Copies of the following test results (A copy is to be included in the operations and maintenance manuals):
 - .1 Insulation/megger tests.
 - .2 Load tests on all electric motors.
 - .3 Structured cabling system link tests.
 - .4 Fire alarm system.
 - .5 Building Security and Access Control Systems.
 - .6 Public Address and Mass Notification System.
- .2 A Commissioning and/or Certification Report from the manufacturer for the following systems (A copy is to be included in the operations and maintenance manuals):
 - .1 Intrusion Detection system.
 - .2 Fire alarm system.
 - .3 Public Address and Mass Notification System.
 - .4 Structured wiring system.
- .3 Written verification from the end user that demonstrations have been performed for the following (A copy is to be included in the operations and maintenance manuals):
 - .1 Fire alarm system.
 - .2 Building Security and Access Control Systems.
 - .3 Public Address and Mass Notification System.
- .4 Completed verification forms included with this section. When there are multiples of referenced equipment, devices or systems, electrical contractor is responsible for obtaining a suitable number of forms to complete the verification process for the entire project.

1.8 INSTRUCTION OF OWNER'S STAFF

- .1 Provide the following:
 - .1 Necessary instruction of equipment and systems operation to Owner's staff.
 - .1 At least 72 hours advance notifications in writing.
 - .2 Provision of factory trained technicians where necessary.
 - .3 Provision of presentation with the use of as-built drawings and data books required in other sections of these specifications.
- .2 Conduct presentation on project premises.

1.9 FUNCTIONAL PERFORMANCE TESTING (FPT)

- .1 The Owner will commence a Functional Performance Testing Program independent of other processes specified, upon receipt of written verification from the General Contractor that:
 - .1 All systems are complete and operational in all respects.

- .2 All specified reports and documents have been submitted and approved.
 - .3 All tests, commissioning and start-up processes described elsewhere in the specification are complete.
 - .4 All demonstrations have been completed and documented.
 - .5 All defects and deficiencies identified during the commissioning of all electrical systems have been corrected.
-
- .2 During this program, a department FPT team will verify the operation of all systems. The FPT process may involve real or simulated conditions to determine the systems full operational capabilities. Copies of all specified reports and documents are to be made available to the site during the period.
 - .3 During the FPT process, the Electrical Contractor will provide within 48 hours notice, the following:
 - .1 An onsite representative familiar with all aspects of the work to assist with coordination of trades during FPT as needed.
 - .2 A full time onsite senior electrical or technical representative for each building system to assist with the FPT of systems and equipment.
 - .3 Equipment manufacturer's technical representatives shall be available for onsite and telephone consultation from time to time as required throughout the FPT.
 - .4 All tools and test equipment required to operate the systems in real or simulated mode.
 - .4 FPT shall be performed on all electrical systems referenced in the contract documents which may include, but not be limited to, the following:
 - .1 Life Safety Systems:
 - .1 Emergency Lighting.
 - .2 Exit Signs.
 - .3 Fire Alarm System.
 - .2 Lighting System.
 - .3 Power Distribution System.
 - .4 Structured Cabling System.
 - .5 Building Security and Access Control Systems.
 - .6 Public Address and Mass Notification System.
 - .5 An FPT schedule will be produced with time allotted to the following major equipment. The electrical contractor is to include the time allowance in his tender price.
 - .1 Fire Alarm System (Life Safety)
(Electrician & Manufacturer's Rep. Required)
 - .2 Exit and Emergency Lighting (Life Safety)
(Electrician Required)- **FPT to be performed after sunset.**
 - .3 Lighting System – Fixtures and Controls
(Electrician & Manufacturer's Rep. Required **-FPT to be performed after sunset.**
 - .4 Power Distribution System – Panelboards
(Electrician Required)

- .5 Power Distribution System – Contactors/Loose Starters/Disconnects
(Electrician Required)
 - .6 Power Distribution System – Receptacles
(Electrician Required)
 - .7 Voice/Data – Structured Cabling System
(Electrician & Manufacturer’s Rep c/w Cable Tester Required)
 - .8 Public Address and Mass Notification System.
(Electrician & Manufacturer’s Rep Required)
 - .9 Intrusion Detection System
(Electrician & Manufacturer’s Rep Required)
 - .10 Security System- Access Control.
(Electrician & Manufacturer’s Rep Required)
- .6 Deficiencies or discrepancies discovered during the FPT process are to be immediately rectified by the Electrical Contractor. A condition of Substantial Performance shall be the correction of all electrical deficiencies identified throughout the project associated with this work. The Electrical Contractor shall also provide exceptional arrangements for labor and materials required to correct deficiencies which prevent the satisfactory completion of the FPT process.
- .7 This section specifies the functional testing requirements for electrical systems and equipment. The functional testing process, requirements and test method definitions are described in Sections 01 91 01 and the Commissioning Plan.
- .8 Prerequisites for functional testing are as follows:
- .1 All equipment, components and devices applicable to the test must be started and this start up must be documented. This includes completion of the checklists, testing of equipment, switchgear, main distribution panels, generators, sub-panels, etc., completed labelling and identification, etc.
 - .2 All A/E punch list items for this equipment corrected.
 - .3 These functional test procedures reviewed and approved by installing contractor.

1.10 FINAL REPORT

- .1 Assemble all testing data and verification reports and submit them to the Engineer.
- .2 Each form shall bear signature of recorder, date of test, and all relevant information in clear and legible form.
- .3 Identify each instrument used, and latest date of calibration of each.
- .4 Include written confirmation by Owner's representatives that all verification, testing, instruction and demonstrations have been completed to the Owner's satisfaction.

1.11 TEST EQUIPMENT

- .1 All test equipment necessary to fulfill the testing requirements of this section and/or as required in the electrical specifications including the Commissioning Plan shall be provided as part of the work of this section.

2 Products N/A

3 Execution

3.1 INSULATION RESISTANCE TESTING

- .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument, up to 600 volts with a 1000 V unit.
- .2 Check resistance to ground before terminating cables and wires.

3.2 PANELBOARD PHASE CURRENT MEASUREMENT

- .1 Energize all possible loads.
- .2 Measure each phase and record voltage and current.

3.3 MOTOR INFORMATION FORM

- .1 Record all pertinent motor information for each motor installed.
- .2 Measure each motor full load amps, after the Balancing Technician has completed his final adjustments.
- .3 Set and record the installed overload and overcurrent data.

3.4 OTHER TESTS

- .1 Perform other tests, not mentioned in this section, but specified in individual specification sections, to the approval of the Engineer.
- .2 Pay specific attention to:
 - .1 Fire alarm system verification.
 - .2 Intrusion Detection system verification.
 - .3 Public Address and Mass Notification system verification.
 - .4 Structured Wiring System Cabling Testing.

3.5 VERIFICATION TESTS AND FORMS.

- .1 Perform tests as required to properly complete the verification forms included in this section.
- .2 Deficiencies or discrepancies discovered during this process are to be immediately rectified by the Electrical Contractor. The Electrical Contractor shall provide exceptional arrangements for labor and materials as may be required to correct these deficiencies.

Form V-26 53 00- Exit Lights

EQUIPMENT DETAILS: (Identification)		
Manufacturer: _____	Model: _____	Serial #: _____
Room #: _____	Designation: _____	Capacity: _____

Item	Yes	No	Comments
Nameplate label	<input type="checkbox"/>	<input type="checkbox"/>	
Lamicaid identification plate.....	<input type="checkbox"/>	<input type="checkbox"/>	
Connected to dedicated Exit light circuit.....	<input type="checkbox"/>	<input type="checkbox"/>	
Breaker lock on device	<input type="checkbox"/>	<input type="checkbox"/>	

FIELD MEASUREMENTS: AC supply voltage _____ Exit light operating time (not less than 30 min)____	
---	--

SIGN OFF: Electrical Contractor: _____ Signature: _____ Date: _____
--

Form V-26 29 10-Motor Starters

EQUIPMENT DETAILS: (Identification)

Manufacturer: _____ Model: _____ Serial #: _____

Room #: _____ Designation: _____ Bus Rating: _____

Item	Yes	No	Comments
Nameplate label	<input type="checkbox"/>	<input type="checkbox"/>	
Cable phase identified correctly.	<input type="checkbox"/>	<input type="checkbox"/>	
Clearance from adjacent surfaces	<input type="checkbox"/>	<input type="checkbox"/>	
Properly grounded.....	<input type="checkbox"/>	<input type="checkbox"/>	
Cleaned.....	<input type="checkbox"/>	<input type="checkbox"/>	
Cable lugs torqued.....	<input type="checkbox"/>	<input type="checkbox"/>	
Lamicoid identification plate.....	<input type="checkbox"/>	<input type="checkbox"/>	
Auxiliary contacts	<input type="checkbox"/>	<input type="checkbox"/>	
BAS components installed	<input type="checkbox"/>	<input type="checkbox"/>	
MCP field adjustments	<input type="checkbox"/>	<input type="checkbox"/>	
Overloads field adjusted	<input type="checkbox"/>	<input type="checkbox"/>	
Control wiring diagrams.....	<input type="checkbox"/>	<input type="checkbox"/>	
Ground installed.....	<input type="checkbox"/>	<input type="checkbox"/>	
Control transformer	<input type="checkbox"/>	<input type="checkbox"/>	

FIELD MEASUREMENTS:

Voltage
 L1-L2 _____
 L2-L3 _____
 L3-L1 _____

Current
 L1 _____
 L2 _____
 L3 _____

SIGN OFF:
Electrical
 Contractor: _____ Signature: _____ Date: _____

Form V-26 27 26-Wiring Devices

EQUIPMENT DETAILS: (Identification)

Manufacturer: _____ Part Number _____ Amp Rating _____

Room #: _____

Item	Yes	No	Comments
Receptacle Polarity tested.	<input type="checkbox"/>	<input type="checkbox"/>	
Receptacle properly grounded	<input type="checkbox"/>	<input type="checkbox"/>	
Lamicoid identification plate.....	<input type="checkbox"/>	<input type="checkbox"/>	
Cover plate installed	<input type="checkbox"/>	<input type="checkbox"/>	
GFCI tested	<input type="checkbox"/>	<input type="checkbox"/>	
Voltage drop tested within tolerance	<input type="checkbox"/>	<input type="checkbox"/>	
Installed plumb and level	<input type="checkbox"/>	<input type="checkbox"/>	
Protrudes min of 0.4 mm through plate	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/>	<input type="checkbox"/>	

FIELD MEASUREMENTS:

Voltage
 L1-N _____

SIGN OFF:
Electrical
Contractor: _____ **Signature:** _____ **Date:** _____

Form V-26 24 16.01-Panelboards

EQUIPMENT DETAILS: (Identification)

Manufacturer: _____ Model: _____ Serial #: _____

Room #: _____ Designation: _____ Bus Rating: _____

Item	Yes	No	Comments
Nameplate label	<input type="checkbox"/>	<input type="checkbox"/>	
Filler pieces in place	<input type="checkbox"/>	<input type="checkbox"/>	
Cable phase identified correctly	<input type="checkbox"/>	<input type="checkbox"/>	
Cable lugs bolted to MRT	<input type="checkbox"/>	<input type="checkbox"/>	
Bus bolts torqued to MRT	<input type="checkbox"/>	<input type="checkbox"/>	
Properly grounded	<input type="checkbox"/>	<input type="checkbox"/>	
Interior and exterior Cleaned	<input type="checkbox"/>	<input type="checkbox"/>	
Insulation resistance measured	<input type="checkbox"/>	<input type="checkbox"/>	
Spare breakers installed	<input type="checkbox"/>	<input type="checkbox"/>	
Lamicoid identification plate	<input type="checkbox"/>	<input type="checkbox"/>	
Panel directory typed and complete	<input type="checkbox"/>	<input type="checkbox"/>	
Hinged door and front cover installed	<input type="checkbox"/>	<input type="checkbox"/>	
Branch circuit breaker operation checked.	<input type="checkbox"/>	<input type="checkbox"/>	
Breaker lock on devices installed	<input type="checkbox"/>	<input type="checkbox"/>	
Breaker bolts torqued to MRT	<input type="checkbox"/>	<input type="checkbox"/>	
All tools removed, doors covers replaced...	<input type="checkbox"/>	<input type="checkbox"/>	

FIELD MEASUREMENTS:	Current
	L1 _____
	L2 _____
	L3 _____
	N _____
Voltage	
L1-L2 _____	
L2-L3 _____	
L3-L1 _____	

SIGN OFF:

Electrical

Contractor: _____ Signature: _____ Date: _____

*****END OF SECTION*****

1 General

1.1 GENERAL

- .1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section. The Executed Agreement including General Conditions and Supplementary Conditions (Section 00 73 00), applicable sections of Division 0 and Division 1, Section 26 05 00 Common Work Results for Electrical, Section 26 05 01 Electrical Submittals and Section 26 05 02 Electrical Contract Closeout, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 SYSTEM DESCRIPTION

- .1 Communication systems consist of, but may not be limited to, structured wiring system (voice and data), Public Address system and building control system.
- .2 Communications system wiring refers to all wiring associated with the systems indicated above.
- .3 Related Work By Electrical Contractor:
 - .1 26 05 31 Splitter, Junction, Pull Boxes and Cabinets
 - .2 26 05 32 Outlet Boxes, Conduit Boxes and Fittings
 - .3 26 05 34 Conduits, Conduit Fastenings and Conduit Fittings
 - .4 27 10 05 Structured Cabling for Communications Systems
 - .5 27 51 16 Public Address Systems and Mass Notification Systems
- .4 Related Work By Mechanical Contractor:
 - .1 Building Control System.

2 Products

2.1 COMMUNICATION SYSTEMS WIRE AND CABLE.

- .1 Low Voltage Cable:
 - .1 Cable jacket:
 - .1 Labeled with the following information, as a minimum:
 - .1 Cable type.
 - .2 FT rating.
 - .3 Temperature rating.
 - .4 CSA number.
 - .5 Rated voltage.
 - .6 Gauge and number of conductors.
 - .2 Cable not identified as above will not be permitted to be installed on this project.

.3 Coloured as follows:

System Description	Jacket Colour
Voice	Blue
Data	White
Building Control System and Multi-media	Yellow
Public Address	Grey

3 Execution

3.1 WIRING METHODS.

- .1 EMT type conduit wall-stub c/w flush installed device box are required in all partitions, regardless of construction material. Stubs shall be turned out into accessible ceiling space within the same room as the outlet box, c/w nylon insulated throat, Arlington bushing or threaded type bushing. Minimum size to be 27 mm (1 inch).
- .2 Ensure that both the device box and accompanying conduit sleeve are bonded to ground, as follows:
 - .1 Outlet box installed in partition utilizing metal studs, adjacent to receptacle box:
 - .1 Provide a #12 green insulated RW90 bonding conductor between receptacle device box and communication outlet device box. Provide a push-on non-metallic insulated bushing on the end of the conduit stub, similar to Arlington Series EMT*** (T&B Insuliner sleeves not acceptable).
 - .2 Outlet box not otherwise bonded to ground:
 - .1 Where bonding connection is available from an overhead source (junction box, cable tray, etc), provide a #12 green insulated RW90 bonding conductor from the bonding connection, through the conduit sleeve to the device box. Terminate bond wire at the device box. Provide a push-on non-metallic insulated bushing on the end of the conduit stub similar to Arlington Series EMT*** (T&B Insuliner sleeves not acceptable).
- .3 When cables are required to pass through a partition separating a corridor from a room, or between rooms, EMT type conduit sleeves are required, sized in accordance with the information contained in this section. Sleeves shall be installed into accessible ceiling space, c/w nylon insulated throats or threaded type bushings. Provide a bonding bushing for all conduit sleeves. Seal the ends of all conduits after installation of cables. Firestop where required to maintain a fire resistance rating. Smoke seal where required.
- .4 The electrical contractor is to supply and install a suitably sized electrical junction box for all wiring supplied by the electrical contractor, regardless of system voltage. This electrical box will contain all electrical connections associated with wiring for all electrical systems.
- .5 Where grouping of various systems outlets or multiple type outlets in drywall type

construction is required, the use of box mounting brackets as manufactured by Caddy #RBS16 or #RBS24 or approved equal, are to be installed between, and secured to both metal studs. Secure brackets to metal studs using low profile sheet metal screws. Install suitable sized 102 mm (4") square and/or 119 mm (4 11/16") boxes c/w single gang raised tile rings.

- .6 All surface wiring installed in rooms and/or other areas not having any hung, or drop type ceilings, or where otherwise installed on, or to wall surfaces etc., are to always be contained or sleeved in EMT type conduits.
- .7 All non-concealed, surface type wiring installed on either ceilings and/or walls, is to also be sleeved in EMT type conduit.
- .8 All concealed wiring routed through rooms with drywall or other inaccessible ceiling types are to be installed in a conduit system. The installation of access doors or recessed light fixtures in these areas does not change these types of ceilings from inaccessible to accessible.
- .9 Provide suitably sized EMT conduit sleeves for communications system cables which pass through common walls between classrooms, workrooms, etc. Bond all sleeves to ground.
- .10 Pull boxes are to be sized in conformance with CEC Rule 12-3036, unless noted otherwise. In addition, pull boxes installed on conduits used for the installation of communication systems for straight pulls, shall conform to the following minimum requirements:
 1. Minimum size of pull box: 150 X 150 X 100 (6 x 6 x 4 inch)
 2. 35 mm (1-1/4 in): 150 wide X 510 long X 100 deep (6 x 20 x 4 inch).
 3. 41 mm (1-1/2 in): 200 wide X 686 long X 100 deep (8 x 27 x 4 inch).
 4. 50 mm (2 in): 200 wide X 914 long X 150 deep (8 x 36 x 4 inch).
 5. 75 mm (3 in): 300 wide X 1220 long X 100 deep (12 x 48 x 6 inch).
 6. 100 mm (4 in): 375 wide X 1525 long X 200 deep (15 x 60 x 8 inch).
- .11 All communications systems wiring installed within millwork is to be installed in a conduit system. Flexible metal conduit is permitted between outlet box and pull box. Where liquid tight metal flexible conduit is used for this purpose, matching liquid tight connectors are required. Increase one trade size.
- .12 All communications system wiring (with the exception of Building Control System cables) installed within accessible type ceiling spaces and not contained in conduits, are to be secured directly to the structure via the use of wide base, beveled edge supports approved, equal to, or better than those as manufactured by Caddy, CableCat cable type supports, Catalog # CAT16HP for up to 7 cables , Catalog # CAT32HP for up to 25 cables, Catalog # CAT48HP for up to 60 cables. Support of low voltage cables to the structure is not to be greater than 1200 mm (48 inch) intervals. In addition, cables are to be bundled together at midpoint between each support via the use of Velcro Softcinch wire management. Do not use nylon tie wraps for this purpose.

- .13 Install all fibre optic backbone cables in EMT conduit. Connect corrugated Innerduct to EMT using an approved adaptor fitting in the Communications rooms. Provide Innerduct for the slack loop and extend innerduct to the rack containing the fibre patch panels.
- .14 Building control cables installed within accessible ceiling spaces and not installed in a conduit system are to be secured directly to the steel deck, above the support structure. Provide supports at 1200 mm (48") intervals.
- .15 All cable supports used for communications system wiring with the exception of Building Control System control cables are to be installed no more than 760 mm (30 inches) above a finished ceiling, to permit ready access for future additions.
- .16 In addition to the above requirements, Building Control System control circuit wiring **50 volts and less** is to be installed as follows:
- .1 EMT conduits are to be extended to within 760 mm (30 inches) of all various control devices associated with the operation of any given piece of mechanical equipment or device they might feed.
 - .2 Unless specifically indicated otherwise, liquid tight metal type conduit c/w matching liquid tight type connectors are to be used for final connection between end of EMT conduit and applicable control device.
 - .3 Bonding conductors are not required in flexible metal conduits where the conduit terminates in a non-metallic electrical box.
- .17 Maximum Conduit Fill for Voice and Data Wiring. Note that the minimum acceptable conduit size for communications pathways shall be 27 mm (1 inch), unless noted otherwise:
- .1 27 (1) Up to 3 Cat 6 cables
 - .2 35 (1 1/4) 4 to 8 Cat 6 cables
 - .3 41 (1 1/2) 9 to 10 Cat 6 cables
 - .4 53 (2) 11 to 17 Cat 6 cables
 - .5 63 (2 1/2) 18 to 24 Cat 6 cables
 - .6 78 (3) 25 to 37 Cat 6 cables
 - .7 103 (4) 38 to 64 Cat 6 cables

*****END OF SECTION*****

1 General

1.1 GENERAL

- .1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section. The Executed Agreement including General Conditions and Supplementary Conditions (Section 00 73 00), applicable sections of Division 0 and Division 1, Section 26 05 00 Common Work Results for Electrical, Section 26 05 01 Electrical Submittals and Section 26 05 02 Electrical Contract Closeout, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 RELATED SECTIONS

- .1 26 05 00 Common Work Results for Electrical
- .2 26 05 03 Electrical Identification
- .3 26 91 13 Electrical Systems Testing and Verification
- .4 27 05 28 Pathways for Communications Systems
- .5 27 10 05 Structured Cabling for Communications Systems
- .6 26 05 34 Conduits, Conduit Fastenings and Conduit Fittings

1.3 REFERENCE STANDARDS

- .1 CAN/CSA Standards
 - .1 CAN/CSA T527-94 (Reaffirmed 1999) Grounding & Bonding for Telecommunications in Commercial Buildings.
 - .2 CAN/CSA T528-93 (Reaffirmed 1997) Design Guidelines for Administration of Telecommunications Infrastructure in Commercial Buildings.
 - .3 CAN/CSA T529-95 (Reaffirmed 2000) Telecommunications Cabling Systems in Commercial Buildings.
 - .1 CAN/CSA T530-99. Commercial Building Standard for Telecommunications Pathways and Spaces.
 - .4 Nova Scotia Government Structured Cabling Standards.
 - .5 C22-1-15 Canadian Electrical Code
- .2 ANSI/TIA/EIA Standards
 - .1 ANSI/TIA/EIA-568-C.2 – Commercial Building Telecommunications Cabling, Part 2.
 - .2 ANSI/TIA/EIA-568-B.2.1 – Transmission Performance Specifications for 4-Pair 100 Ohm Category 6 Cabling.

- .3 ANSI/TIA/EIA-569-A – Commercial Building Standard for Telecommunications Pathways and Spaces.
 - .4 ANSI/TIA/EIA-606 – The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.
 - .5 J-STD-607A Commercial Building Grounding and Bonding Requirements for Telecommunications.
 - .6 ANSI/TIA/EIA TSB-67 – Transmission Performance Specifications for Field Testing of Unshielded Twisted-Pair Cabling Systems.
Open Offices.
 - .7 ANSI/TIA/EIA-568-B.3. Optical Fiber Cabling Components Standard.
 - .8 ANSI/TIA/EIA-568-B.3-1. Optical Fiber Cabling Components Standard, Additional Transmission Performance Specifications for 50/125µm Optical Fiber Cables
- .3 BICSI Standards
 - .1 BICSI/TDMM – Telecommunications Distribution Methods Manual. (12th. Edition)
 - .2 Information Transport Systems Installation Methods Manual (6th. Edition).

1.4 SCOPE OF WORK

- .1 Provide a complete structured cabling system to carry voice and data, as indicated on the drawings. System components include but may not be limited to the following:
 - .1 Wall mounted equipment rack.
 - .2 Category 6 Modular Patch Panels.
 - .3 Category 6 Patch cords.
 - .4 Category 6 UTP wiring.
 - .5 Horizontal and vertical cable management.
 - .6 Information outlets and faceplates.
 - .7 Cable and connectors for multimedia system.
 - .8 IDC connectors and mounts.
 - .9 Backbone copper voice cable.
 - .10 Backbone copper data cable.
 - .11 Backbone fibre cable OM4.
 - .12 12/24 port (1U) SC fibre patch panels.
 - .13 Conduit system.
 - .14 Innerduct and fittings.
 - .15 Grounding and bonding system.
 - .16 Identification of all network components, terminations, information outlets, etc.
 - .17 Complete project documentation and as built drawings.

1.5 STRUCTURED WIRING SYSTEM CONTRACTOR QUALIFICATIONS.

- .1 The Structured Wiring System installation contractor must be an authorized installation agent for that particular manufacturer's solution and provide that manufacturer's system warranty upon project completion.

- .2 The Structured Wiring System installation contractor shall be a current member of BICSI "Building Industry Consulting Services International" and must provide an RCDD "Registered Communications Distribution Designer" as Communications System Project Manager for the duration of the project.

2 Products

2.1 GENERAL

- .1 All products installed in this system must be part of a complete end to end solution by a single manufacturer. Approved cable partners for that particular solution will be acceptable provided appropriate documentation is submitted at the time of shop drawing submittal and a warranty level is provided in conformance with this specification.

2.2 COPPER VOICE BACKBONE SYSTEM

- .1 Cable
 - .1 Category 3, 24AWG voice riser cable, pairs as indicated.
 - .2 CMP (FT-6 Rated).
 - .3 Belden IBDN D-Inside multipair type.
- .2 Patch Panels
 - .1 24 port (1U)/48 port (2U) 8 position modular patch panels, 2 pair per port.
 - .2 EIA-310-D 482 mm (19") Mount Compliant.
 - .3 Wiring Configuration T568A.
 - .4 Terminated 2 pair per port.
 - .5 Belden IBDN QPBIX PS6+ series.
 - .6 CSA T529-95 Category 6 Compliant.
- .3 Distribution Connectors
 - .1 25 pair IDC punch down connector with 5 pair marking.
 - .2 Category 5e Compliant.
 - .3 Belden IBDN QCBIXIA connector.
- .4 Distribution Mounts
 - .1 250 pair capacity capable of accepting ten (10) distribution connectors.
 - .2 2 D-rings to be included for each mount.
 - .3 Belden IBDN QMBIX10A.

2.3 FIBRE OPTIC DATA BACKBONE SYSTEM

- .1 Cable
 - .1 6 strand 50/125 micron, OM4, fibre optic cable.
 - .2 Aqua colored Outer Jacket
 - .3 CSA T529-95 Compliant
 - .4 Belden IBDN Distribution Series or equivalent.
 - .5 12/24 port (1U) SC patch panels

- .6 EIA-310-D 482 mm (19") Rack Mount Compliant
- .7 Complete with 568-SC adapter plates
- .8 Complete with Plexiglas Front Cover
- .9 Belden IBDN Fibre Express Series panels or equivalent.

.2 Connectors

- .1 568-SC Type Connector with ceramic ferrule
- .2 CSA T529-95 Compliant
- .3 Belden IBDN Optimax or equivalent.

2.4 COPPER DATA BACKBONE SYSTEM

.1 Cable

- .1 24 AWG 4 pair Category 6 cable.
- .2 CMP (FT-6 Rated).
- .3 Blue Outer Jacket for voice, White Outer Jacket for data.
- .4 CSA T529-95 Category 6 Compliant.
- .5 Belden IBDN GigaFlex 2400 series.

.2 Patch Panels

- .1 24 port (1U)/48 port (2U) 8 position modular patch panels.
- .2 E1A-310-D 482 mm (19") Mount Compliant.
- .3 Wiring Configuration T568A (ISDN).
- .4 Belden IBDN QPBIX PS6+ series.
- .5 Category 6 Compliant.

2.5 HORIZONTAL CABLING SYSTEM

.1 Cable

- .1 24 AWG 4 pair Category 6 cable.
- .2 CMP (FT-6 Rated).
- .3 Blue Outer Jacket for voice, White Outer Jacket for data.
- .4 CSA T529-95 Category 6 Compliant.
- .5 Belden IBDN GigaFlex 2400 series.

.2 Patch Panels

- .1 24 port (1U)/48 port (2U) 8 position modular patch panels.
- .2 E1A-310-D 482 mm (19") Mount Compliant.
- .3 Wiring Configuration T568A (ISDN).
- .4 Belden IBDN QPBIX PS6+ series.
- .5 Category 6 Compliant.

- .3 Information Outlet
 - .1 Outlet Boxes
 - .1 Provide an outlet box for all communications outlets, c/w single gang raised tile ring, unless noted otherwise. Minimum dimensions as follows: 100mm (4 inch) x 100mm (4 inch) x 53mm (2.125 inch) deep, minimum volume of 490 cubic centimetres (30 cu.in.), (similar to Iberville # 52171-K).
 - .2 Outlet boxes in common walls shall not be installed back to back and must provide a minimum 103mm (4 inch) lateral clearance.
 - .1 Grounding and bonding provided as per Section 27 05 28.
 - .3 Faceplate
 - .1 Single Gang faceplate.
 - .2 Brushed stainless steel, punched to accept flush mount keystone style insert in all non-resident areas.
 - .3 Four ports per plate.
 - .4 Blank to be supplied for unused ports.
 - .5 Belden/CDT #AX102011.
 - .4 Inserts
 - .1 8 position UTP category 6 module.
 - .2 IDC-type connection.
 - .3 Category 6 Compliant.
 - .4 Blue in colour for voice.
 - .5 Grey in colour for data.
 - .6 Wiring Configuration T568A (ISDN).
 - .7 Nordex GigaFlex PS6+ Module, Keystone.

2.6 MULTI-MEDIA OUTLET BOXES, CABLES AND CONNECTORS

- .1 Provide cables and connectors as indicated on the drawings, including:
 - .1 A 118 mm (4-11/16 inch) x 118 mm (4-11/16 inch) x 38 mm (1.5 inch) deep wall box, with a 38 mm (1.5 inch) extension ring and a single gang, square, welded tile ring, located where indicated.
 - .2 A 100 mm (4-inch) square x 54 mm (2.125 inch) deep wall box, with a 3/8 raised coverplate (BC#8371), located where indicated in ceiling space.
 - .3 A 27 mm conduit sleeve from the wall box to the ceiling box.
 - .4 Two (2) Category 6 FT6 cables with yellow outer jacket and one 2C #18 LVT cable between wall box and ceiling mounted outlet box.
 - .5 Category 6, yellow, 8P8C male connectors at the wall outlet box.
 - .6 Category 6, yellow, 8P8C female connectors at the above ceiling outlet box.
 - .7 Yellow lamicoid identification plates at multi-media wall box and ceiling box. One outlet to be labeled as "Active" and one outlet to be labeled as "Spare". Provide blanks in unused ceiling plate openings.
 - .8 All cables are to be terminated and tested.

- .2 The wall plates for the HDMI to Cat 6 converters will be supplied, installed and connected by others.

2.7 RACK AND CABLE MANAGEMENT SYSTEMS

- .1 Rack
 - .1 Wall mounted, open swing frame, 14 gauge steel, black powder coat relay rack, C/W mounting hardware and screws.
 - .2 Forty-four inch (1113 mm) useable height.
 - .3 Standard of Acceptance shall be Middle Atlantic Products #SFR-25-24.
 - .4 Acceptable Manufacturer: B Line, Hoffman, R F Mote.
- .2 Horizontal Cable Management
 - .1 E1A-310-D 482 mm (19") Mount Complaint.
 - .2 2 U (rack unit)
- .3 Vertical Cable Management
 - .1 Minimum dimensions of 100 mm x 150 mm.
 - .2 Hinged Front Door.
 - .3 Two per rack.
 - .4 Middle Atlantic Products #CK-45 or equivalent.

2.8 PATCH CORDS

Patch cords must be the same manufacturer type as the warranty solution being provided.

- .1 Telecommunications Rooms
 - .1 Copper Patch Cords for Structured Wiring Racks
 - .1 4 pair, 24 AWG Stranded Wire, 8MOD-8MOD
 - .2 Category 6 Compliant.
 - .3 Wiring Configuration T568A (ISDN).
 - .4 Blue in Colour.
 - .5 1m (3 foot) , 2m (6 foot), 3m (10 foot) in length for green field to blue field. (Provide 1/3 quantity of each).
 - .6 1m (3 foot) , 2m (6 foot), 3m (10 foot) in length for silver field to hubs. (Provide 1/3 quantity of each).
 - .7 Provide quantity of patch cords to meet immediate requirement plus 20%.
 - .8 Belden IBDN PS6 Modular Patch Cords.
 - .2 Fibre Patch Cords
 - .1 Patch Panel to Patch Panel
 - .1 Duplex SC-SC 50/125 laser optimized OM3.
 - .2 3m in length
 - .3 CSA T529-95 Compliant.
 - .4 Provide quantity of six (6) for optical backbone interconnection.
 - .5 Belden IBDN Optical Fibre Patch Cords.

- .2 Patch Panel to Active Components
 - .1 Duplex SC-MT-RJ 50/125 micron multi-mode fibre patch cable OM3.
 - .2 3m in length
 - .3 CSA T529-95 Compliant.
 - .4 Provide quantity of 12 patch cords.
 - .5 Belden IBDN Optical Fibre Patch Cords.
- .2 Work Area
 - .1 Copper Patch Cords
 - .1 4 pair, 24 AWG Stranded Wire, 8MOD-8MOD
 - .2 Category 6 Compliant.
 - .3 Wiring Configuration T568A (ISDN).
 - .4 White in colour.
 - .5 3m (10 foot) in length.
 - .6 Provide quantity of patch cords to meet immediate requirement plus 20%.
 - .7 Belden IBDN PS6 Modular Patch Cords.

2.9 STANDARD OF ACCEPTANCE

- .1 Belden IBDN with a **25 year warranty on parts and labour.**

2.10 ACCEPTABLE MANUFACTURES, TO THE REQUIREMENTS ABOVE:

- .1 Commscope Systimax with a **25 year warranty on parts and labour.**
- .2 Panduit Pan-Net with a **25 year warranty on parts and labour.**
- .3 Hubbell Premise Wiring with a **25 year warranty on parts and labour.**
- .4 Leviton

2.11 COVER PLATES

- .1 Stainless steel, vertically brushed, 1 mm (0.04 in.) thick cover plates for all devices.

3 Execution

3.1 INSTALLATION

- .1 The structured wiring system contractor must retain the services of at least one Registered Communication Distribution Designer (RCDD) for the duration of the project. The RCDD must be identified prior to the submittal of structured wiring system shop drawings. Provide a copy of the RCDD certificate and proof of membership in BICSI upon award of contract.

- .2 The RCDD shall be responsible for the following:
 - .1 Review the structured wiring system including the multi-media system and all related components proposed for this project. Review the size and locations of all proposed communications rooms. Notify the Engineer of any concerns relating to component location and length of horizontal cables.
 - .2 Review the size and locations of all proposed communications rooms. Review the proposed equipment rack location and configuration within all communications rooms. Prepare a 1 to 50 (1/4 scale) scale drawing of each communication room illustrating equipment rack configuration and placement. This floor plan is to include proposed cable tray installation. Submit this drawing for Engineer's approval. Do not initiate equipment installation prior to Engineer's approval.
 - .3 Prepare a front elevation drawing for each equipment rack detailing the number and location of all equipment mounted in that rack.
 - .4 Attend project construction job meetings, on a regular basis, or upon request of Engineer.
 - .5 Ensure installation practices and procedures comply with all applicable industry standards and specifications.
 - .6 Provide regular project status reports and updates to the Engineer.
 - .7 Observe testing procedures and approve manufacturer's certification and warranties.
 - .8 Prepare As-built documentation, certifications and drawings and provide current RCDD seal on all.
- .3 The structured wiring system contractor, in conjunction with the RCDD shall provide a set of floor plans indicating the routing of the longest run of structured wiring from each communications room. The length of the longest run of horizontal cable cannot exceed 90 metres (295 feet). The structured wiring system contractor, in conjunction with the RCDD will notify the Engineer, in writing, if any proposed horizontal cable run exceeds this length, so that corrective action can be taken. This notification is to be submitted prior to installation. It is the Contractor's responsibility to ensure that all installed runs of horizontal cable are installed in compliance with published standards.
- .4 The minimum warranty requirement will be 25 years for the network passive components. Upon completion of the project, a certification certificate stating the warranty of the system must be supplied to the end user.
- .5 Provide a complete structured cabling system for voice, data, and multi-media services, including all components and wiring as indicated.
- .6 Install Category 6 multi-media cables, modular outlets and 8P8C modular jacks. Connection by others to future LCD projector.

- .7 Install horizontal cabling in conformance with 27 05 28 Pathways for Communications Systems.
- .8 Install grounding and bonding system extending to all communications rooms, in conformance to J-STD-607A.
- .9 Provide identification as per 26 05 03 Electrical Identification.
- .10 Provide a slack loop of three (3) meters within each telecommunication room for all installed cables. The purpose of this service loop is to allow any future re-configuration and / or upgrade of these telecommunications rooms.
- .11 Provide a 1.5 meter slack loop above each structured cabling outlet in the accessible ceiling space. The slack loop is to be stored in a "Figure 8" configuration with each loop of the figure 8 (minimum diameter 200 mm (8 inch)) supported on separate J-hooks.
- .12 Install copper backbone cable in a conduit system.
- .13 Install fiber backbone cable in EMT raceway. At communications rooms provide adaptors and transition to Innerduct between EMT and cable tray. Provide 3M slack loop in tray.
- .14 Permanently identify voice and data horizontal cabling at each end. The identification must be mechanically generated, not hand written. Indicate the originating Telecommunications Room (TR) and the consecutively numbered jack for voice and data. This labeling is to be identical on the originating end and in the outlet box. This same information is to appear on the patch panel and outlet jack location.
- .15 Provide 19 mm (3/4 inch) void free plywood backboards, painted with a flame-retardant finish (two coats on all surfaces) in all TR where wall mounted equipment is to be installed.
- .16 Provide equipment racks, mounting hardware, patch panels, etc. where indicated on drawings.
- .18 Provide a record drawing of each floor plan detailing all structured wiring cables and jacks.
- .19 Perform a Permanent Link test of each installed cable. Submit test results for review. All cords tested must meet or exceed the minimum transmission requirements as per Category 6 requirements.
- .20 Provide complete system documentation at completion of the work, c/w a hard copy of the following:
 - .1 Cable test reports.
 - .2 Record floor plan drawings in AutoCad format, indicating all communications racks, information outlet location and numerical identification.
 - .3 Record drawings of the front elevation of each communication rack, detailing the location, size and description of all equipment.

- .21 The AutoCad floor plan drawings indicating all communications racks, information outlet location and numerical identification are to be laminated and wall mounted in each telecommunications room.

3.2 COMMISSIONING

- .1 Commission the system in accordance with 26 91 13.

*****END OF SECTION*****

1 General

1.1 GENERAL

- .1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section. The Executed Agreement including General Conditions and Supplementary Conditions (Section 00 73 00), applicable sections of Division 0 and Division 1, Section 26 05 00 Common Work Results for Electrical, Section 26 05 01 Electrical Submittals and Section 26 05 02 Electrical Contract Closeout, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 SUMMARY

- .1 All bids shall be based on the equipment herein.

1.3 RELATED WORK

- .1 26 05 00 Common Work Results for Electrical.
- .2 26 05 03 Electrical Identification.
- .3 27 05 28 Pathways for Communications Systems
- .4 27 10 05 Structured Cabling for Communications Systems

1.4 CARE, OPERATION AND START-UP

- .1 Provide instructions in accordance with Section 26 05 00.
- .2 Manufacturer's factory service engineer to instruct:
 - .1 Maintenance personnel in the maintenance of system.
 - .2 Operating personnel in the use of system.

1.5 PRODUCT DATA AND SHOP DRAWINGS

- .1 Submit product data and shop drawings in accordance with Division 1.
- .2 Include riser diagram, block diagram of complete public address system.

1.6 MAINTENANCE AND OPERATION DATA

- .1 Provide data for incorporation into maintenance manual specified in Division 1.
- .2 Include description of system operation.
- .3 Include parts list, using component identification numbers standard to electronics industry.

2 Products

2.1 PUBLIC ADDRESS, INTERCOM AND ASSISTIVE LISTENING SYSTEMS

- .1 Furnish and install all equipment, accessories and materials in accordance with the specifications and drawings to provide a complete and operating Public Address and Mass Notification system as outlined below:
 - .1 Intercom
 - .1 Complete intercom system for offices and classrooms complete with the following features:
 - .1 Individual Classroom Intercom Speakers.
 - .2 Public Address System
 - .1 Complete Public Address System for offices and classrooms complete with the following features:
 - .1 All Call announcements.
 - .2 Emergency Announcements.
 - .3 Automatic Page.
 - .4 911 Page.
 - .5 Urgent Call-In Page.
 - .6 Off Hook Call-In Page.
 - .7 Audio Program Distribution.
 - .8 Zone Paging.
 - .9 Monitor Areas of the building during a crisis from the rescue team or on site security officer.
 - .10 Page areas of the building during a crisis from the rescue team or on site security officer.
 - .2 Flush mounted ceiling loud speakers c/w back box in corridors and washrooms for general announcements.
 - .3 Exterior weatherproof horns for signaling of class dismissal c/w wire guards.
 - .4 Interior horns/speaker for signaling in mechanical rooms and Tech Production.
 - .5 Desk mounted administrative master consoles (ACC) with the following capabilities:
 - .1 Individual room selection.
 - .2 Hold.
 - .3 All page.
 - .4 Cancel.
 - .5 Display calls.
 - .6 Time function.
 - .7 Program function.
 - .6 An AM/FM tuner, MP3 and compact disk player (AS).
 - .7 Time control and event scheduler complete with the following:
 - .1 Eight (8) schedules of class change signals.
 - .2 Eight (8) zones of class change signals.

- .3 512 class change signal events.
- .4 Weekly system event scheduler
- .5 114 weekly events.
- .8 The system shall consist of, but not be limited to, the following:
 - .1 XL basic unit.
 - .2 Central processor unit.
 - .3 ABU audio control card.
 - .4 IOP intercom station card.
 - .5 PBI-6 interface card.
 - .6 RS232-I/O interface card.
 - .7 TM-2X25 terminal block.
 - .8 Master clock and clock.
 - .9 Audio amplifier.
 - .10 AC-15 power bar.
 - .11 Caller Identification Single Line Console circuit board to allow a caller to remotely access the P/A system using an access code (CID-SLCB).
 - .12 Equipment rack for the above components.
 - .13 MCC-300 administrative control consoles. (ACC)
 - .14 Audio source rack c/w
 - .1 Panasonic SC-AK18 mini compact AM/FM receiver, MP3 and compact disk player.
 - .2 Antenna as required to boost signal.
 - .15 IC-1PC Intercom stations, complete with pull cord as indicated.
 - .16 McBride 821-11-70, 8" cone loud speaker with transformer and baffle.
 - .17 McBride MC10E backbox.
 - .18 TOA TC-154ST weatherproof horn loud speaker and stainless steel guard.
- .3 Assistive Listening System
 - .1 Portable Assistive Listening complete with the following:
 - .1 Portable, FM style, assistive listening system.
 - .2 PE 300T portable transmitter (1).
 - .3 Dynamic lapel microphone (1).
 - .4 LIT-P Wall plaque (2).
 - .5 Assistive Listening Receiver Sets complete with the following:
 - .1 For use by the gym assistive listening system and the portable assistive listening system complete with:
 - .1 PE 300FSR six channel receivers (6 units)
 - .2 AT 541 headsets (6 units)
 - .3 PE 300C multiple charger case (1 unit)
 - .4 AT0665 rechargeable battery packs (6 units).

2.2 COVER PLATES

- .1 Stainless steel, vertically brushed, 1 mm thick cover plates.

2.3 ACCEPTABLE MANUFACTURERS:

- .1 Public Address/ Intercom System
 - .1 Standard of Acceptance
 - .1 Telecor XL.
 - .2 Acceptable manufacturers (To the requirements above):
 - .1 Care Hawk
 - .2 All wiring is to be installed as per manufacturer's recommendations. The system is designed based on a Telecor system. All manufacturers listed as "Acceptable Manufacturers" to include in their bid any additional equipment and wire required to install a complete system. No extra will be considered for wiring changes required to accommodate an Acceptable Manufacturer.
- .2 Assistive Listening System
 - .1 Standard of Acceptance
 - .1 Phonic Ear
 - .2 Acceptable manufacturers (To the requirements above):
 - .1 Williams Sound.

3 Execution

3.1 INSTALLATION

- .1 Install equipment in accordance with manufacturer's instructions.
- .2 Install equipment as indicated on drawings.
- .3 Provide cable and connectors to manufacture's requirements. Provide public address system wiring in a "home run" configuration back to head end equipment.
- .4 Install emergency intercom stations in assistive care washrooms. Install a separately zoned ceiling mounted speaker in each room where emergency intercom stations are installed. Connect to P/A system.
- .5 Install and connect Audio Source Rack (AS) in Reception 112.
- .6 Install antenna for audio source rack.
- .7 Connect P/A systems to power supply as indicated.
- .8 Install relays, conduit and wire and P/A system to fire alarm systems to mute P/A system in a fire alarm condition.
- .9 Install all wiring in conformance with 27 05 28 Pathways for Communications Systems.

3.2 TESTS

- .1 Carry out an intelligibility test for each area served by the P/A system. This test is to include each space or room capable of two way communication. Verify that an individual with average hearing is able to understand the messages transmitted into the space and that messages transmitted from the space are received in an acceptable manner. Provide a separate written verification report including room number.

*****END OF SECTION*****

1. General

1.1 GENERAL

- .1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section. The Executed Agreement including General Conditions and Supplementary Conditions (Section 00 73 00), applicable sections of Division 0 and Division 1, Section 26 05 00 Common Work Results for Electrical, Section 26 05 01 Electrical Submittals and Section 26 05 02 Electrical Contract Closeout, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 DESCRIPTION OF SYSTEM

- .1 The Access Control System (ACS) to consist of components, hardware, controls, software, firmware, wire and conduits for a complete operating system to provide monitoring and control of access points.
- .2 The ACS shall be microprocessor based, fully scalable and shall support Ethernet communications via TCP/IP protocols. ACS shall use a fully distributed architecture. Key access decisions, event/action processing shall take place within the door control modules, allowing off line operations where the application software is not communicating with the door control modules.
- .3 Monitored points will be supervised for such conditions as alarm, short circuit, ground, open and normal conditions. Each of the door controllers shall be supplied with its own AC power supply. Step-down transformer(s) shall be CSA approved. Each of the stand alone controllers will control / supply power for all electrically operated door locking hardware.
- .4 Must be compatible with Kantech EntraPass Global Edition Access Control and Security Management Software, V5.0. already in place at the Halifax Regional School Board (HRSB) head office.
- .5 System to include the following:
 - .1 Door access control panels (Existing, located in Server Room).
 - .2 Request to Exit (REX) devices
 - .3 Proximity card readers.
 - .4 Proximity tags.
 - .5 Security management and reporting software.
 - .6 Power supplies associated with the Access Control System (Supplied by Division 8).
 - .7 Door position switches (Supplied by Division 8).
 - .8 Electrically operated door locking hardware (Supplied by Division 8).
 - .9 Door holders/closures (Supplied by Division 8).
 - .10 Power transfer hinges (Supplied by Division 8).
 - .11 Electromagnetic door hold open devices (Supplied by Division 8).

- .12 Wiring and conduit for a complete operating system.
- .6 This contractor shall configure and program the access control system to function as per the requirements of this specification. The Halifax Regional School Board (HRSB) will provide the contractor with access to their server. It is the contractor's responsibility to deliver a fully functioning access control system.

1.3 RELATED SECTIONS

- .1 Related Sections:
 - .1 08 71 10 Door Hardware General.
 - .2 26 05 31 Splitter, Junction, Pull Boxes and Cabinets.
 - .3 26 05 32 Outlet Boxes, Conduit Boxes and Fittings.
 - .4 26 05 34 Conduits, Conduit Fastenings and Conduit Fittings.
 - .5 26 91 13 Electrical Systems Testing and Verification.

1.4 SHOP DRAWINGS

- .1 Submit shop drawings of product and data before the supply of equipment. All equipment is to be CSA approved.
- .2 Include:
 - .1 Layout of equipment.
 - .2 Complete **PROJECT SPECIFIC** Wiring Diagrams.
 - .3 Provide 3 copies of an operational and maintenance manual for all product being supplied.

2 Products

2.1 ACCESS CONTROL CABLE

- .1 Composite cable bundle with PVC jacket.
- .2 Three shielded multi-conductor cables plus one shielded multi-pair cable.
- .3 Riser rated.
- .4 Colour coded and application printed jackets.
- .5 Belden Access Control Banana Peel Composite Cable.

2.2 DOOR ACCESS CONTROL PANEL

- .1 Existing KT-400 unit on site in Server room.

2.3 DOOR CONTACTS

- .1 Door contacts: vandal resistant, tamper proof, suitable for flush mounting on door.
- .2 Rare earth magnet.
- .3 Double pole, double throw.
- .4 Hermetically sealed magnetic reed switch.

2.4 PROXIMITY CARD READERS

- .1 Single gang electrical box mounting.
- .2 Operating Range: -35 to +35 degrees C.
- .3 LED red and green indicators and Piezo buzzer.
- .4 Format: XSF.
- .5 20 cm read range.
- .6 Weatherproof design.

2.5 SELF ADHESIVE IO PROX PROXIMITY TAG

- .1 2.5 centimetre (1 inch) diameter.
- .2 Self-adhesive tag.
- .3 Kantech XSF format.

2.6 ENABLED NETWORK COMMUNICATION CONTROLLER (NCC)

- .1 Onboard TCP/IP.
- .2 Manages communication between EntraPass software and door controllers.
- .3 Seven (7) LED modes.
- .4 Mounting enclosure and power supply.

2.7 STANDARD OF ACCEPTANCE

- .1 Access control system components as follows:
 - .1 Kantech EntraPass Global Edition Integrated Access Control System, c/w:
 - .2 Existing KT-400 Ethernet Ready Door Controllers and Enclosures.
 - .3 Power supplies, battery back-up, etc.
 - .4 P225XSF IoProx Reader.
 - .5 P50TAG Self Adhesive Round Tag (Provide 100 tags with system delivery).
 - .6 GE #(R) 1076D magnetic door contacts for steel doors.
 - .7 KT-NCC-EU Network Communication Controller.

3 Execution

3.1 INSTALLATION

- .1 Supply and install an access control system with all required components and wiring for a complete and fully functional system. The equipment manufacturer's certified representative will supply and install all the equipment, devices, and make all the connections.
- .2 Verify wire type and gauge with manufacturer prior to installation. All access control system wiring will be installed in a conduit system.
- .3 Locate all components as indicated on drawings.
- .4 Wire and connect to electrically operated door locking hardware supplied by Division 8. Confirm location of each device requiring a backbox or pathway prior to installation.
- .5 Wire and connect to Electromagnetic door hold open devices supplied by Division 8. Confirm location of each device requiring a backbox or pathway prior to installation. Connect to fire alarm relays where indicated.
- .6 Wire and connect door position switches supplied by Division 8. Confirm location of each device requiring a backbox or pathway prior to installation.
- .7 Connect wiring to existing door controllers. Install and connect proximity readers where indicated.
- .8 Install door contacts, power supplies where indicated.
- .9 Install the Network Communication Controller and connect power supply. Connect to the KT-400 door controller.
- .10 Connect the Network Communication Controller to the nearest Telecommunications Room using a Category 6 cable.

- .11 Wire exit device to release as per NBC requirements.
- .12 Provide all documentation associated with the access control system alarm panel to the Owner, **including all programming/contractor codes required for future modifications to the system.**
- .13 This contractor shall configure and program the access control system to function as per the requirements of this specification. The Halifax Regional School Board (HRSB) will provide the contractor with access to their server. It is the contractor's responsibility to deliver a fully functioning access control system.

3.2 TESTS

- .1 A written report shall be prepared detailing the access control system verification and submitted to the Engineer.

3.3 PROGRAMMING AND TRAINING

- .1 Provide the initial programming, customizing and data entry.
- .2 Provide Demonstration, Operating and Maintenance Instructions as per Section 26 05 02.
- .3 Provide an initial five (5) hours of training to the Owner's designated representative.
- .4 Visit site 30 days following substantial performance and provide an additional eight (8) hours of training. Visit site 60 days following substantial performance and provide an additional four (4) hours of training.

***** END OF SECTION *****

1. General

1.1 GENERAL

- .1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section. The Executed Agreement including General Conditions and Supplementary Conditions (Section 00 73 00), applicable sections of Division 0 and Division 1, Section 26 05 00 Common Work Results for Electrical, Section 26 05 01 Electrical Submittals and Section 26 05 02 Electrical Contract Closeout, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 DESCRIPTION OF SYSTEM

- .1 Connection to existing intrusion alarm panel located in the Bungalow boiler room and includes zone expander modules, door contacts, digital key pads, motion detectors, power supplies, sirens, battery back-up, wire and conduits for a complete operating system.
- .2 The system will forward alarm and trouble conditions to the fire alarm panel for remote annunciation. Remote monitoring must comply with the requirements of CAN/ULC-S524-06.5.15 and CAN/ULC-S561 and use two separate technologies.
- .3 Related Work:
 - .1 26 05 31 Splitter, Junction, Pull Boxes and Cabinets.
 - .2 26 05 32 Outlet Boxes, Conduit Boxes and Fittings.
 - .3 26 05 34 Conduits, Conduit Fastenings and Conduit Fittings.
 - .4 26 91 13 Electrical Systems Testing and Verification.

1.3 RELATED WORK BY OTHER DIVISIONS

- .1 Door Hardware.

1.4 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Division 1.

2 Products

2.1 INTRUSION DETECTION SYSTEM

- .1 The Intrusion Detection system consists of the following major components:
 - .1 Alarm Control Panel is existing (DSC PC1864).
 - .2 Zone expander modules (Eight (8) hardware zone capacity).
 - .3 Power supplies
 - .1 Fully supervised for AC failure, low battery.
 - .2 Four programmable, high current voltage outputs.
 - .3 Provides up to 1 amp at 12 VDC.

- .4 Key Pads
 - .1 Two line, 32 character LCD screen
 - .2 Built-in buzzer for key beeps.
 - .3 Liquid crystal display, adjustable keypad back light and buzzer.
 - .4 Provide vandal resistant Plexiglas enclosure c/w lockable cover.
- .5 Door Contacts
 - .1 Door contacts: vandal resistant, tamper proof, suitable for flush mounting on door.
- .6 Motion Detectors
 - .1 Ceiling-mount motion detector with Fresnel lens in conjunction with a quad-element PIR to provide 360° coverage. PIR element provides accurate detection regardless of the direction of motion. The detector coverage can range from 24, 30 and 40 ft in diameter depending on the mounting height (8, 10 and 12 feet respectively). The unit uses MLSP (patented Multi-Level Signal Processing) to analyze the amplitude and duration of each pulse instead of simply counting them as in other, simpler pulse-count detectors. The unit includes digital temperature compensation to minimize shrinkage in the coverage pattern and critical temperatures (86-88° F).
- .7 Interior Siren
 - .1 Surface mount, 15 watt.
 - .2 SPL*(dB)Â 105 Tone Yelp & Steady.
- .2 System Operation
 - .1 Intrusion Detection
 - .1 System will be armed by the keypads. At the time the ARM command is received, and the system is about to become armed, it will sound a distinctive warning, alerting anyone still inside the building. Following a programmed delay, the system shall become armed.
 - .2 When the system is armed, motion detectors and/or door contacts will initiate an alarm condition when a violation is detected. At this time a signal will be forwarded to the fire alarm panel and the fire alarm system will initiate a call to a monitoring agency via an existing communication circuit.
 - .3 System will revert to normal operation when control panel is reset.

2.2 STANDARD OF ACCEPTANCE

- .1 DSC Security Products complete with the following components:
 - .1 DSC PC1864 (existing, to be expanded as indicated).
 - .2 DSC PC5108 Expander boards, c/w CSA-1 lockable enclosure.
 - .3 DSC PC5204 power supply, c/w CSA-1 lockable enclosure.
 - .4 DSC PK5500 keypads.
 - .5 DSC BV500 motion detectors.
 - .6 Sentrol 1078H door contacts for steel doors.
 - .7 DSC 15W-ULF Siren.

3 Execution

3.1 INSTALLATION

- .1 Supply and install the Intrusion Detection system with all required components and wiring for a complete and fully functional system. The equipment manufacturer's certified representative will supply all the equipment and devices, and make all final connections.
- .2 Verify wire type and gauge with manufacturer prior to installation.
- .3 Make connection to existing Intrusion detection panel in boiler room.
- .4 Locate all components as indicated on drawings. Do not locate a motion detector within one meter of a supply air diffuser.
- .5 Motion sensors located in a suspended ceiling are to be installed using a 100 mm (4 inch) square electrical box, complete with a raised 13 mm (1/2 inch) ring cover. Support of electrical box is to be independent from ceiling. Install heavy duty steel T-Grid box hangers for T-Bar suspended ceilings, similar to Caddy.
- .6 Install key pads in lockable Plexiglas enclosures.
- .7 Make connection to the telephone BIX blocks for remote monitoring.
- .8 Connect existing Network Interface Card and make connection to building data network.
- .9 Make connection to the fire alarm panel for remote monitoring of fire alarm system.
- .10 All security system wiring is to incorporate a "RED" coloured jacket and be installed in a conduit system.
- .11 Provide all documentation associated with the security system alarm panel to the Owner, **including all programming/contractor codes required for future modifications to the system.**

3.2 REMOTE MONITORING OF INTRUSION DETECTION SYSTEM.

- .1 The Intrusion Detection system is currently remotely monitored. The fire alarm system is to be connected to the Intrusion Detection panel to provide remote monitoring for the fire alarm panel.
- .2 The security system will remotely monitor the security system and the fire alarm system. The remote monitoring function is to be tested and verified prior to Substantial Performance of the project. Provide a written verification report detailing satisfactory operation of the remote monitoring system, including:
 - .1 Security system alarm.

- .2 Security system trouble.
- .3 Fire Alarm system alarm.
- .4 Fire Alarm system trouble.
- .5 Fire Alarm system supervisory.

3.3 TESTS

- .1 A written report shall be prepared detailing the Intrusion detection system verification and submitted to the Engineer.

***** END OF SECTION *****

1 General

1.1 GENERAL

- .1 The General Conditions of the contract as well as provisions of Division 1 are part of and to be read in conjunction with this Section. The Executed Agreement including General Conditions and Supplementary Conditions (Section 00 73 00), applicable sections of Division 0 and Division 1, Section 26 05 00 Common Work Results for Electrical, Section 26 05 01 Electrical Submittals and Section 26 05 02 Electrical Contract Closeout, applicable drawings and amendments are part of and to be read in conjunction with this Section.

1.2 RELATED WORK

- .1 Door Hardware.
- .2 26 05 21 Wires and Cables 0-1000V.
- .3 26 05 34 Conduits, Conduit Fastenings and Conduit Fittings.
- .4 26 91 13 Electrical Systems Testing and Verification.

1.3 REFERENCES

- .1 CAN/ULC-S524-M01, Installation of Fire Alarm Systems.
- .2 ULC-S525-1978, Audible Signal Appliances for Fire Alarm.
- .3 ULC-S526, Visual Signal Appliance for Fire Alarm Systems.
- .4 CAN/ULC-S527-M99, Control Units, Fire Alarm.
- .5 CAN/ULC-S528-M91, Manual Pull Stations.
- .6 CAN/ULC-S529-M87, Smoke Detectors, Fire Alarm.
- .7 CAN/ULC-S530-M91, Heat Actuated Fire Detectors, Fire Alarm.
- .8 CAN/ULC-S536-M97, Inspection and Testing of Fire Alarm Systems.
- .9 CAN/ULC-S537-M97, Verification of Fire Alarm Systems.
- .10 National Building Code of Canada, 2010.
- .11 Nova Scotia Building Code, 2016.
- .12 Canadian Electrical Code C22.1-15, Section 32.

1.4 SYSTEM DESCRIPTION

- .1 System includes:
 - .1 Connection to existing, single stage, fire alarm control panel to carry out fire alarm and protection functions including receiving alarm signals, initiating general alarm, supervision system continuously, actuating zone annunciators, and initiating trouble signals.
 - .2 Manual alarm stations.
 - .3 Automatic alarm initiating devices.
 - .4 Audible signal devices.
 - .5 End-of-line devices.
 - .6 Ancillary devices.
- .2 Operation of any alarm initiating device to:
 - .1 Cause signal devices to operate throughout building.
 - .2 Transmit signal to fire department via automatic dialer.
 - .3 Cause origin of alarm to be indicated on control panel and remote annunciators.
 - .4 Cause fire doors to release.
 - .5 Cause shunt trip breakers to operate where indicated.
 - .6 Cause air handling systems to shut down, where indicated.

1.5 REQUIREMENTS OF REGULATORY AGENCIES

- .1 System components: listed by ULC and comply with applicable provisions of National Building Code, Provincial Building Code, and meet requirements of local authority having jurisdiction.

1.6 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Division 1.
- .2 Include:
 - .1 Detail assembly and internal wiring diagrams for control unit.
 - .2 Overall system riser wiring diagram identifying control equipment initiating zones signaling circuits; identifying terminations, terminal numbers, conductors and raceways.
 - .3 Details for devices.
 - .4 Details and performance specifications for control, annunciation and peripherals with item by item cross reference to specification for compliance.

1.7 OPERATION AND MAINTENANCE DATA

- .1 Provide operation and maintenance data for fire alarm system for incorporation into manual specified in Division 1.

- .2 Include:
 - .1 Instructions for complete fire alarm system to permit effective operation and maintenance.
 - .2 Technical data - illustrated parts lists with parts catalogue numbers.
 - .3 Copy of approved shop drawings with corrections completed and marks removed except review stamps.

1.8 MAINTENANCE

- .1 Provide one year's maintenance with two inspections by manufacturer during warranty period. Carry out first test six months after Substantial Performance. Carry out second test twelve months after Substantial Performance Inspection tests to conform to CAN/ULC-S536-97, Standard for The Inspection and Testing of Fire Alarm Systems. Each Inspection shall conform to the test procedures as stipulated under Section 6, Periodic Inspections and Tests-Yearly. Contractor is to complete forms as contained in Appendix E3 on each inspection. Submit inspection report to Engineer. Include all associated costs in this tender.

1.9 TRAINING

- .1 Provide on-site lectures and demonstration by fire alarm equipment manufacturer to train operational personnel in use and maintenance of fire alarm system.

2 Product

2.1 MATERIALS

- .1 Equipment and devices: ULC listed and labeled and supplied by single manufacturer.

2.2 SYSTEM OPERATION: SINGLE STAGE - SIGNALS ONLY

- .1 Actuation of any alarm initiating device to:
 - .1 Cause electronic latch to lock-in alarm state at central control unit.
 - .2 Indicate zone of alarm at central control unit and at Remote Annunciator.
 - .3 Cause audible signaling devices to sound continuously throughout building and at central control unit.
 - .4 Cause strobe lights to flash.
 - .5 Transmit signal to fire department or ULC approved monitoring agency.
 - .6 Cause closer/holders to release causing fire doors to close automatically.
 - .7 Cause electrified hardware to release where indicated.
 - .8 Cause automatic shutdown of any air handling systems, where indicated.
 - .9 Cause shunt trip breakers to operate where indicated.
- .2 Acknowledging alarm: indicated at central control unit.

- .3 Possible to silence signals by "alarm silence" switch at control unit, after 60 s period of operation.
- .4 Subsequent alarm, received after previous alarm has been silenced, to re-activate signals.
- .5 Actuation of supervisory devices to:
 - .1 Cause electronic latch to lock-in supervisory state at central control unit.
 - .2 Indicate respective supervisory zone at central control unit.
 - .3 Cause audible signal at central control unit to sound.
 - .4 Activate common supervisory sequence.
 - .5 Transmit signal to fire department or ULC approved monitoring agency.
- .6 Alarm and supervisory device not to return system indications/functions back to normal until control unit has been reset.
- .7 Trouble on system to:
 - .1 Indicate circuit in trouble at central control unit.
 - .2 Activate "system trouble" indication, buzzer and common trouble sequence. Acknowledging trouble condition to silence audible indication; whereas visual indication to remain until trouble is cleared and system is back to normal.
 - .3 Transmit signal to fire department or ULC approved monitoring agency.
- .8 Trouble on system: suppressed during course of alarm.
- .9 Trouble condition on any circuit in system not to initiate alarm conditions.

2.3 CONTROL PANEL

- .1 Control Panel is existing (Notifier).

2.4 WIRING

- .1 Twisted copper conductors: rated at not less than 300V (per CEC).
- .2 To initiating circuits: 18 AWG minimum, "Red" coloured jacket and in accordance with manufacturer's requirements.
- .3 To Notification Appliance Circuits (NACs): 14 AWG minimum, solid conductor (DO NOT USE STRANDED CONDUCTORS) and in accordance with manufacturer's requirements. Conductor insulation colour to "Red (Pos); "Black" (Neg). Clearly identify conductors with wire identification tags, as incoming and outgoing in each device box.
- .4 To control circuits: 14 AWG minimum, and in accordance with manufacturer's requirements.

- .5 All conduits used for the installation of the fire alarm system are to contain a #12 RW90 green bonding conductor. The use of the shield component of a system cable is not an acceptable bonding method.
- .6 Install all fire alarm wiring in a conduit system.

2.5 MANUAL ALARM STATIONS

- .1 Addressable manual pull station.
 - .1 Pull lever, semi-flush wall mounted type, single action, single stage, electronics to communicate station's status to addressable module/transponder over 2 wires and to supply power to station. Station address to be set on station in field.
 - .2 Provide Polycarbonate vandal resistant cover over stations where indicated.

2.6 AUTOMATIC ALARM INITIATING DEVICES

- .1 Addressable thermal fire detectors, combination fixed temperature and rate of rise, fixed temperature 57⁰C (135⁰F) Rate of rise 57⁰C (135⁰F) and 8.3⁰C (15⁰F) /minute.
 - .1 Electronics to communicate detector's status to addressable module/transponder.
 - .2 Detector address to be set on detector in field.
 - .3 92⁰C (200⁰F) devices as described above shall be conventional 2 wire N.O. interfaced to the addressable system via an addressable interface module.
- .2 Addressable Multisensor Detectors.
 - .1 Photo/Heat sensors.
 - .2 Electronics to communicate detector's status to addressable module/transponder.
 - .3 Detector address to be set on detector in field.
 - .4 Sensitivity settings: settings determined and operated by control panel. No shifting in detector sensitivity due to atmospheric conditions (dust, dirt) within certain parameters.
 - .5 Ability to annunciate minimum of 4 levels of detector contamination automatically with trouble condition at control panel.
 - .6 Duct mounted where indicated.
- .3 Addressable Interface Modules.
 - .1 Provide addressable interface modules (AIM) as required for each digital normally open contact that may require an address (or zone) interfaced to addressable loop controller.
 - .2 Addressable interface module address to be set in the field.
- .4 Addressable Relay:
 - .1 Addressable relays to perform control of magnetic door holders, solenoid valves, fan shutdown, elevator recall and other control functions as indicated.
 - .2 Ability to be programmed as required by system sequence of operation with "and" and "and/or" functions as required.

- .3 Electronics to provide ability to communicate status and control commands over 2 wire addressable loop.
- .4 Address to be set in the field.

2.7 SIGNAL DEVICES

- .1 Temporal electronic/combo strobe electronic signals.
 - .1 White, semi-flush mounted.
 - .2 Temporal horn output, as defined in the National Building Code.
 - .3 Synchronized tone.
 - .4 Field configurable horn (high or low), strobe (15, 30, 75, 110 cd)
 - .5 Synchronized integral 15 cd strobe.
 - .6 Weatherproof, where indicated.
- .2 Strobes.
 - .1 Semi-flush mounted.
 - .2 Synchronized operation.
 - .3 15 cd intensity.
- .3 Provide wire guard over combination horn/strobe and strobe lights where indicated on the drawings.

2.8 END-OF-LINE DEVICES

- .1 End-of-line devices to control supervisory current in signaling circuits, sized to ensure correct supervisory current for each circuit. Open short or ground fault in any circuit will alter supervisory current in that circuit, producing audible and visible alarm at main control panel.

2.9 REMOTE ANNUNCIATOR

- .1 Solid state components.
- .2 High intensity, colour programmable LEDs.
- .3 Forty-eight annunciation and control points.
- .4 Surface mounted with trim.
- .5 Lockable hinged door.
- .6 Complete with controls to allow alarm initiating and cancellation capability.
- .7 Ensure that any Annunciator operating controls are not more than 1200 mm (48 inches) AFF.
- .8 Modular construction.
- .9 Complete with wall box and trim.

2.10 POLYCARBONATE SHIELD WITH WARNING HORN

- .1 Tamper-proof clear Lexan polycarbonate shield.
- .2 Warning tone emitted when lifted.
- .3 9 volt alkaline battery.
- .4 Mounting frame.

2.11 STANDARD OF ACCEPTANCE

- .1 Alarm initiating and signal appliances to match existing.
- .2 Notifier #ACM-48AT, c/w backbox and trim.
- .3 STI Series Stopper II polycarbonate shield, c/w battery.

3 Execution

3.1 INSTALLATION

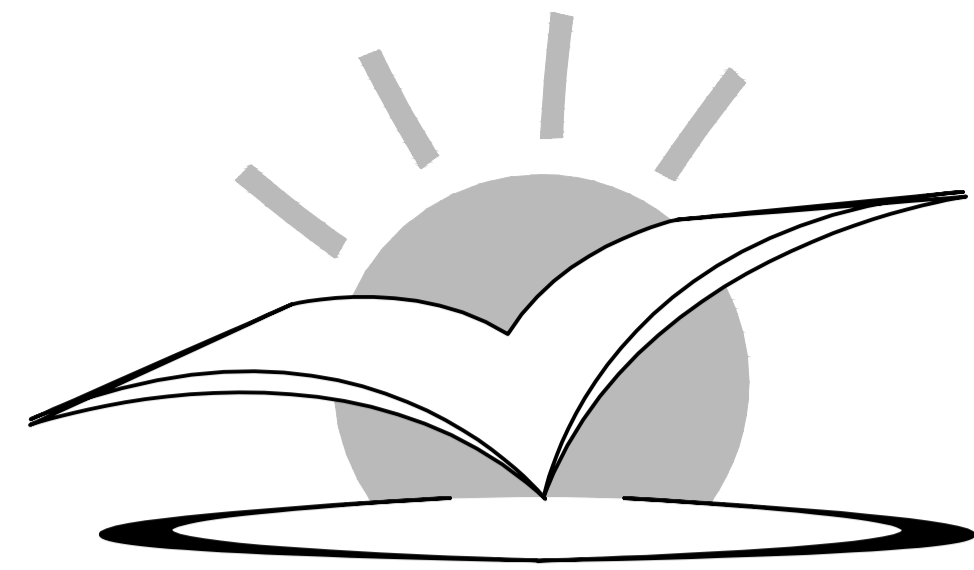
- .1 The Fire Alarm Control Panel (FACP) is existing (Notifier).
- .2 All fire alarm system wiring is to be in a conduit system. Flexible metal conduit may be used for the final connection of devices located in suspended ceilings, provided a junction box is installed within 1.5 meters (5 feet) of the device and a single flexible conduit is extended to the device box. Do not T-tap for initiating device wiring. Wire the addressable loop to the device input terminals and continue the addressable loop from the device output terminals.
- .3 Install manual alarm stations and connect to addressable loop wiring.
- .4 Locate and install detectors and connect to addressable loop wiring. Do not mount detectors within 914 mm (36 inches) of air outlets. Maintain at least 610 mm (24 inches) radius clear space on ceiling, below and around detectors.
- .5 Disconnect and remove existing conventional fire alarm panel in the Bungalow. Extend addressable system trunk from existing fire alarm control panel in main building to a new enclosure installed in the Bungalow. Provide interface modules to connect existing conventional fire alarm system initiating devices to addressable system loop.
- .6 Replace existing signal appliances in the Bungalow building with new horn/strobes to match existing. Provide booster power supply and connect to existing fire alarm system NAC. Provide new EOLs as required to suit.
- .7 Maintain a minimum of 1200 mm (48 inches) clearance between every signaling appliance and lockdown annunciation signaling appliances.

- .8 Maintain a minimum of 600 mm (24 inches) clearance between every addressable device and electronic ballasts.
- .9 Connect alarm circuits to main control panel.
- .10 Install electronic signals and strobe signals and connect to signal circuits.
- .11 Install remote booster power supplies as required. Connect to local 120 VAC circuit. Provide a circuit breaker lock-on device for the branch circuit feeding the BPS.
- .12 Connect signal circuits to main control panel.
- .13 Install polycarbonate shield with warning horn on all pull stations, (existing and new). Install batteries in each shield.
- .14 Install end-of-line devices at end of signal circuits.
- .15 Provide addressable relays and connect to door hardware closer/holders to signal door hardware to release on a fire alarm condition. Door hardware closer/holders by Division 08.
- .16 Provide addressable relays and connect to door hardware magnetic locks to signal them to release on a fire alarm condition. Door hardware magnetic locks by Division 08.
- .17 Install remote relay units to provide control function.
- .18 Splices are not permitted for fire alarm system wiring.
- .19 Provide necessary raceways, cable and wiring to make interconnections to terminal boxes, Annunciator equipment and CCU, as required by equipment manufacturer.
- .20 Ensure that wiring is free of opens, shorts or grounds, before system testing and handing over.
- .21 Identify circuits and other related wiring at central control unit, annunciators, and terminal boxes.
- .22 Connect to Intrusion Detection Panel to remotely annunciate supervisory, trouble and alarm conditions.
- .23 Install weather proof exterior horn/strobes complete with guards and connect to a dedicated signaling circuit.
- .24 Provide lamicoid identification plates for all addressable devices.

3.2 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 – Common Work Results for Electrical and CAN/ULC-S537.
- .2 Fire alarm system:
 - .1 Test each device and alarm circuit to ensure manual stations, thermal and smoke detectors, transmit alarm to control panel and actuate general alarm.
 - .2 Check Annunciator panels to ensure zones are shown correctly.
 - .3 Simulate grounds and breaks on alarm and signaling circuits to ensure proper operation of systems.
 - .4 Addressable circuits system style DCLB:
 - .1 Test each conductor on all DCLB addressable links for capability of providing 3 or more subsequent alarm signals on line side of single open-circuit fault condition imposed near electrically most remote device on each link. Operate Acknowledge/Silence switch after reception of each of the 3 signals. Correct imposed fault after completion of each series of tests.
 - .2 Test each conductor on all DCLB addressable links for capability of providing 3 or more subsequent alarm signals during ground-fault condition imposed near electrically most remote device on each link. Operate Acknowledge/Silence switch after reception of each of the 3 signals. Correct imposed fault after completion of each series of tests.
- .3 Provide final PROM program re-burn for system incorporating program changes made during construction.
- .4 Perform remote monitoring test and confirm that all three conditions (supervisory, trouble and alarm) have been transmitted and received at the remote site. Provide written verification of this procedure.
- .5 Perform a sound level pressure test in all areas of each building. Notify consultant of any area or room where sound pressure levels are not satisfactory. Provide a building floor plan indicating measured sound levels.
- .6 Provide written fire alarm system verification report and certificate following testing of system.

***** END OF SECTION *****



Halifax Regional School Board

PROJECT TITLE:

BEAUFORT SCHOOL RENOVATION

LOCATION

HALIFAX, NOVA SCOTIA

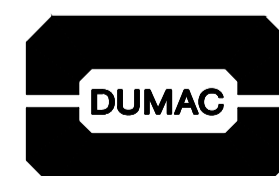
TENDER NUMBER: HRSB #3820

DATE: APRIL 08, 2016

ISSUED FOR TENDER



Fowler Bauld & Mitchell Ltd.
PO Box 514, Suite HS-1
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CONTACT:

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CONTACT:

MECHANICAL: ERNE SLAUNWHITE
ELECTRICAL: JEFF ZEGRAY

LIST OF DRAWINGS:

ARCHITECTURAL

A-1	EXISTING CONDITIONS & DEMOLITION
A-2	NEW CONDITIONS
A-3	ANNEX LEVEL 0 & 1
A-4	LEVEL 1
A-5	LEVEL 2
A-6	RCP LEVEL 1
A-7	RCP LEVEL 2
A-8	CASEWORK ELEVATIONS
A-9	MISC DETAILS
A-10	SCREENS, FRAMES, DOORS, SCHEDULES, AND JAMBS

MECHANICAL

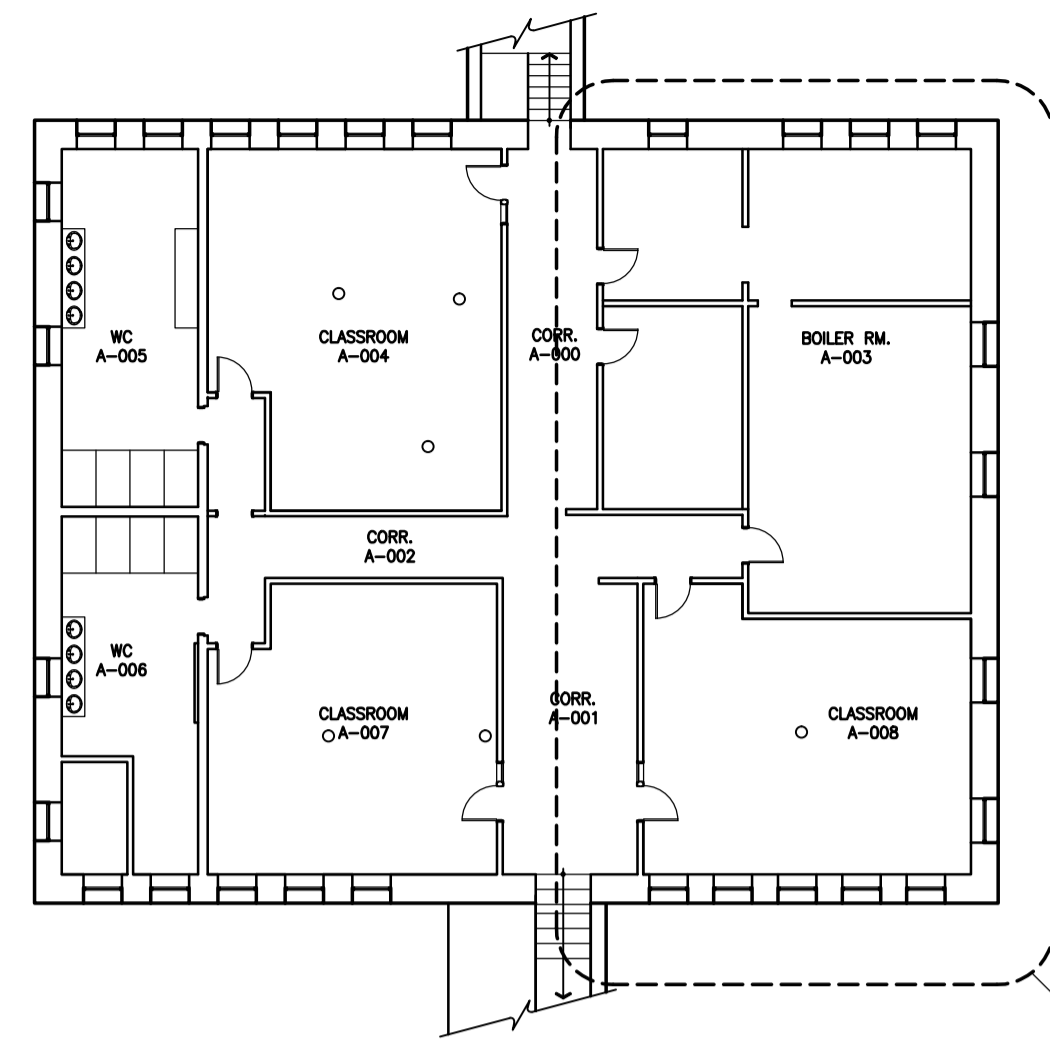
MD-101	LEVEL 1 MECHANICAL DEMOLITION
MD-102	LEVEL 2 MECHANICAL DEMOLITION
M-101	LEVEL 1 MECHANICAL
M-102	LEVEL 2 MECHANICAL
M-103	HEATING DETAILS
M-104	AIR DISTRIBUTION DETAILS

FIRE PROTECTION

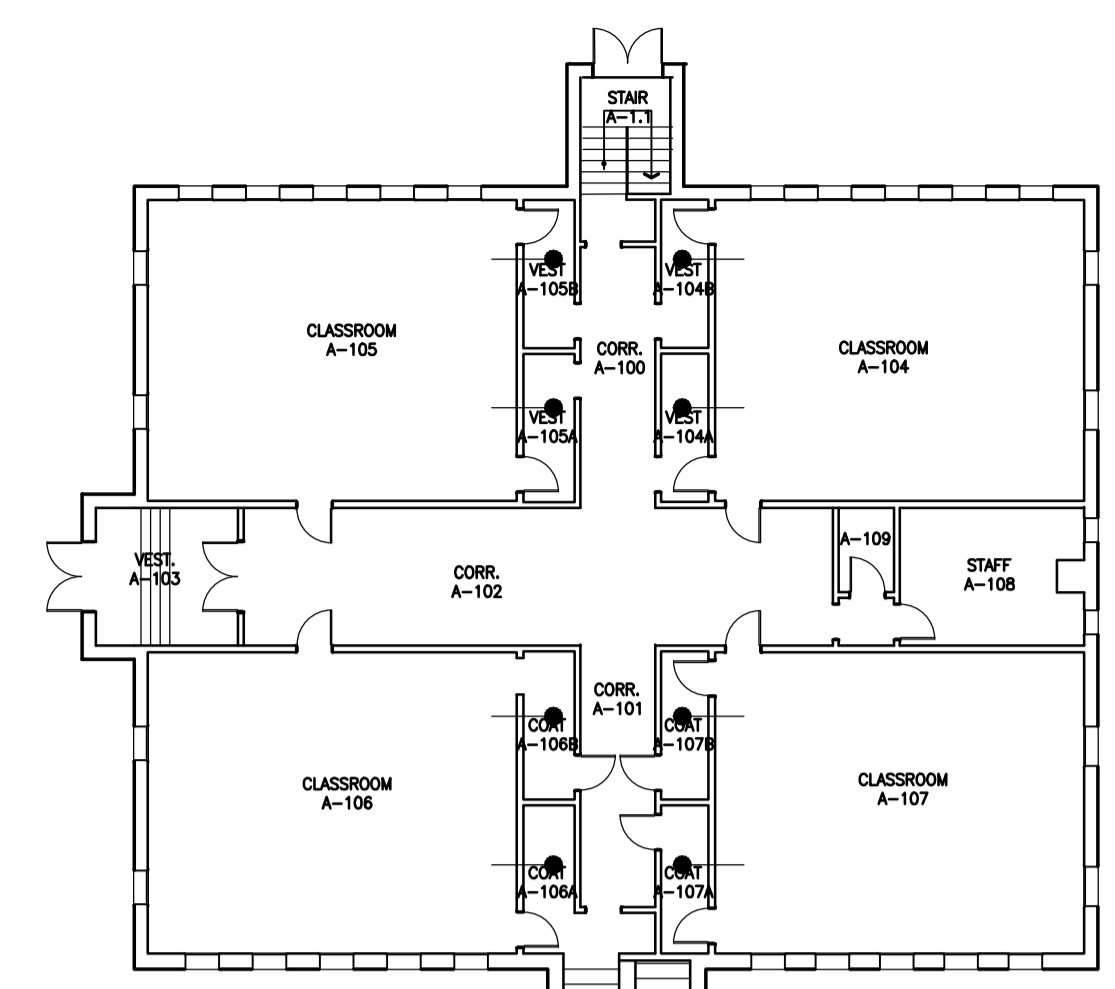
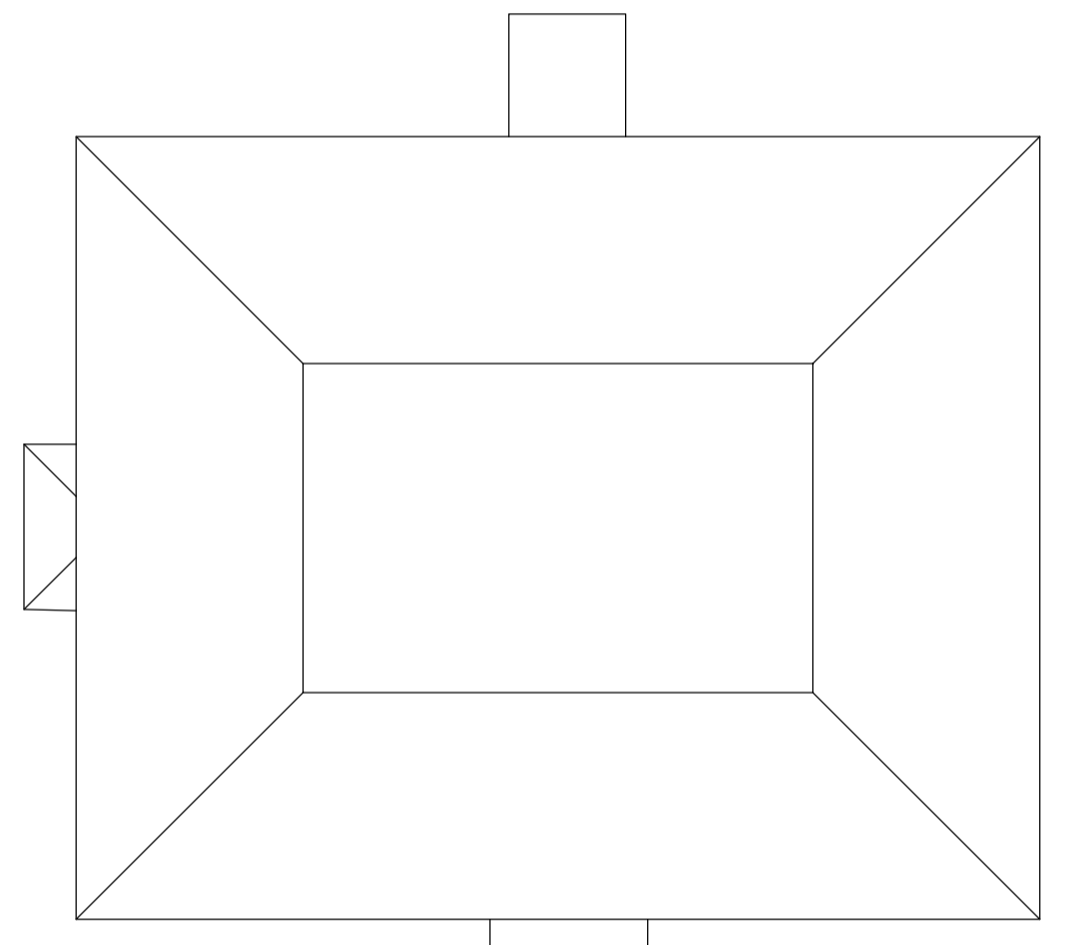
FP-101	LEVEL 1 - FIRE PROTECTION
FP-102	LEVEL 2 - FIRE PROTECTION

ELECTRICAL

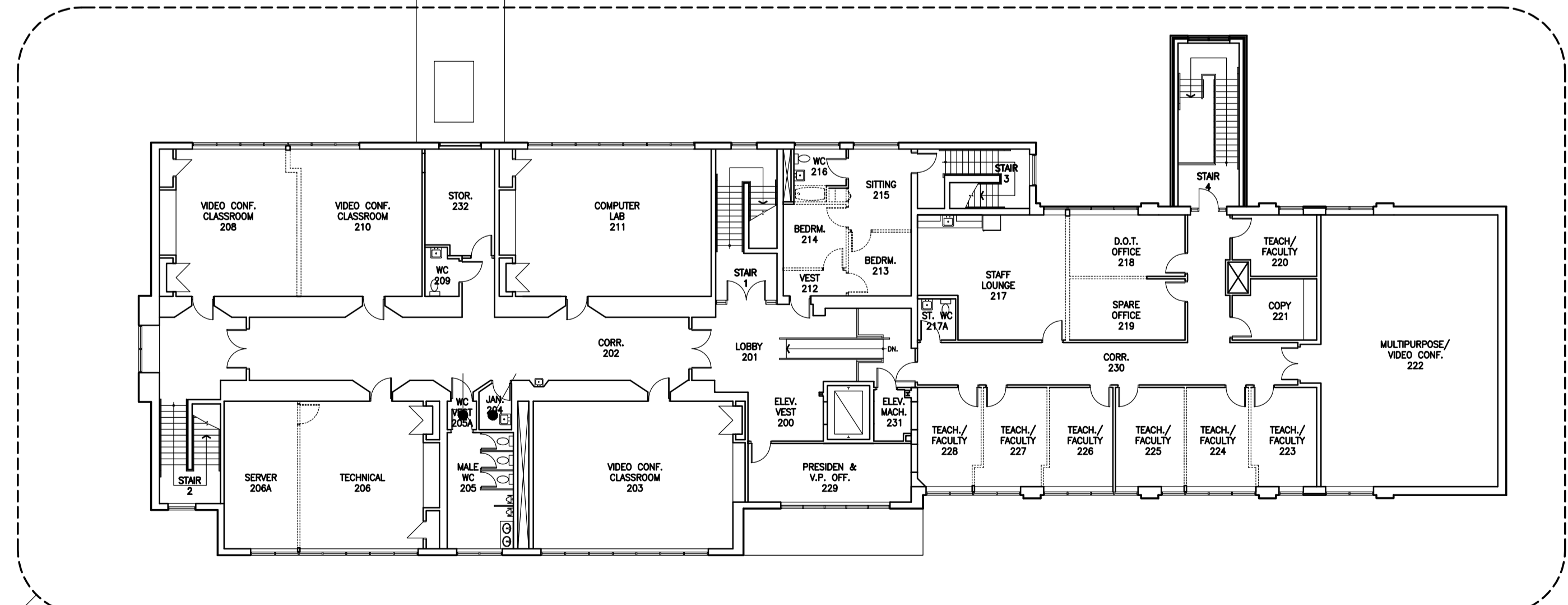
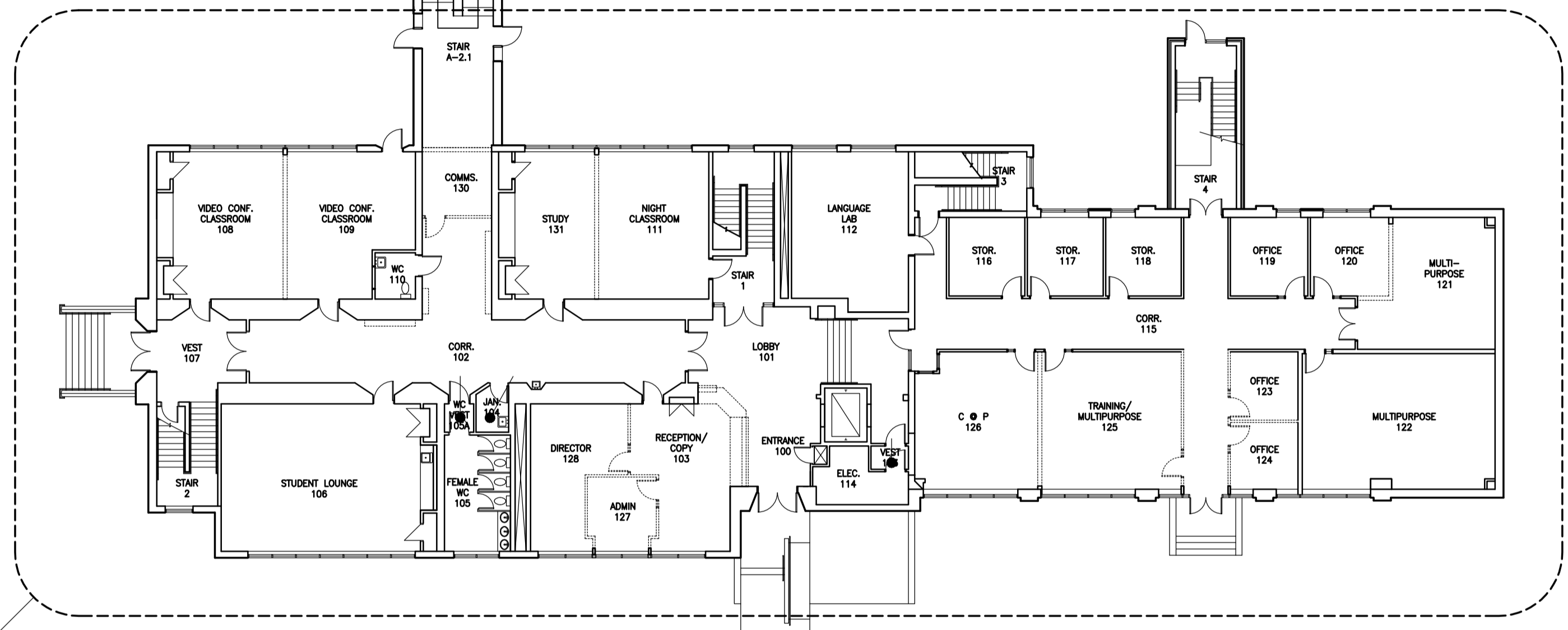
E-001	ELECTRICAL LEGEND
ED-101	LEVEL 1 ELECTRICAL DEMOLITION
ED-102	LEVEL 2 ELECTRICAL DEMOLITION
EL-101	LEVEL 1 LIGHTING
EL-102	LEVEL 2 LIGHTING
EP-101	LEVEL 1 POWER
EP-102	LEVEL 2 POWER
EP-601	PARTIAL POWER RISER DIAGRAM
EP-701	PANEL SCHEDULES
EP-702	PANEL SCHEDULES, MOTOR STARTER CONTROL LIST
ES-101	LEVEL 1 SYSTEMS
ES-102	LEVEL 2 SYSTEMS
ES-501	STRUCTURED WIRING RISER DIAGRAM
ES-502	INTRUSION ALARM AND ACCESS CONTROL DETAIL
ES-503	PUBLIC ADDRESS RISER DIAGRAM
ES-504	FIRE ALARM SYSTEM RISER DIAGRAM
ES-505	SYSTEM DETAILS



1
A-1
FLOOR PLAN
BASEMENT LEVEL - EXISTING & DEMO
SCALE: 1:200



2
A-1
FLOOR PLAN
LEVEL 1 - EXISTING & DEMO
SCALE: 1:200



3
A-1
FLOOR PLAN
LEVEL 2 - EXISTING & DEMO
SCALE: 1:200

GENERAL NOTES:

- CONTRACTOR TO MAKE GOOD ALL EXISTING SURFACES AND FINISHES AFFECTED BY THE DEMOLITION AND RENOVATION AS DETAILED AND /OR IMPLIED BY THE DRAWINGS. WHERE NECESSARY TO REPAIR TO MATCH ADJACENT MATERIALS AND FINISHES, EXTEND PATCH TO NEAREST NATURAL BREAK POINT I.E. INSIDE CORNER, EXIST. JOINT OR LOCATION APPROVED BY THE ARCHITECT.
- CONTRACTOR TO CUT, PATCH, AND MAKE GOOD EXISTING FLOORS, WALLS AND CEILINGS AS REQUIRED BY THE WORK OF OTHER TRADES WHETHER NOTED ON THE DRAWINGS OR NOT. CONTRACTOR TO COORDINATE WITH MECHANICAL AND ELECTRICAL TRADES
- CONTRACTOR TO PROTECT AND MAINTAIN THE INTEGRITY OF EXISTING FINISHES IN ALL AREAS NOT SCHEDULED FOR DEMOLITION WORK. ANY DAMAGE DUE TO DEMOLITION AND/OR NEW CONSTRUCTION TO BE REPAIRED AND MADE GOOD.
- CONTRACTOR TO REPAIR ANY FIREPROOFING ON STRUCTURAL ELEMENTS AND FIRE-RATED ASSEMBLIES DAMAGED DURING CONSTRUCTION.
- CONTRACTOR TO ACOUSTICALLY SEAL ALL NEW PENETRATIONS, BOTH SIDES OF PARTITION.
- DO NOT ALLOW ANY ADHESIVE ODOURS AND OTHER FUMES FROM CONSTRUCTION ACTIVITIES TO ENTER MECHANICAL SYSTEMS.
- CONTRACTOR TO REMOVE AND LAWFULLY DISPOSE OFF SITE ALL RUBBISH AND DEBRIS RESULTING FROM CONSTRUCTION. KEEP PROJECT AREA BROOMCLEAN. WHENEVER APPLICABLE, ALL DEMOLITION DEBRIS TO BE SORTED AND TAKEN TO APPROPRIATE FACILITIES FOR RECYCLING.
- CONTRACTOR TO SEAL AND REPAIR CUT-OUTS FOR MECHANICAL AND ELECTRICAL PENETRATIONS IN FLOOR, WALLS, AND CEILINGS. PROVIDE FINISHES TO MATCH EXISTING UNLESS OTHERWISE SPECIFIED.
- CONTRACTOR TO REPAIR AND MAKE GOOD ALL EXISTING FLOORS, WALLS, AND CEILINGS THAT ARE TO REMAIN AFTER DEMOLITION AND PREPARE SURFACES TO RECEIVE NEW FINISHES.
- REMOVE ALL EXISTING TEL./ELECT. OUTLETS, THERMOSTATS, SWITCHES, CABLING, ETC. FROM WALLS TO BE DEMOLISHED. ALL SERVICES TO BE REMOVED ARE TO BE PULLED BACK TO SOURCE.
- ALLOW FOR PROPER VENTILATION OF THE PREMISES DURING AND AFTER COMPLETION OF DEMOLITION.
- REFER TO MECHANICAL, FIRE PROTECTION, AND ELECTRICAL DRAWINGS FOR ANY ADDITIONAL DEMOLITION NOTES APPLICABLE TO THOSE DISCIPLINES.
- CONTRACTOR IS RESPONSIBLE FOR THE DESIGN, COORDINATION AND EXECUTION OF CONSTRUCTION METHODS, PROCEDURES AND SCHEDULES. THE OPERATIONAL PROCEDURES AND METHODS ARE THE RESPONSIBILITY OF THE CONTRACTOR INsofar AS THEY DO NOT PRESENT HAZARDS TO PERSONNEL OR PROPERTY OR INFRINGE ON WORK SCHEDULES FOR NORMAL SITE ACTIVITY.
- REPORT ANY HAZARDOUS MATERIALS FOUND ON SITE TO HRSB PROJECT MANAGER.

GRAPHIC SCALE

08 APR 2016	ISSUED FOR TENDER
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DATE:	08 APR 2016

PROJECT
**BEAUFORT SCHOOL
RENOVATION**

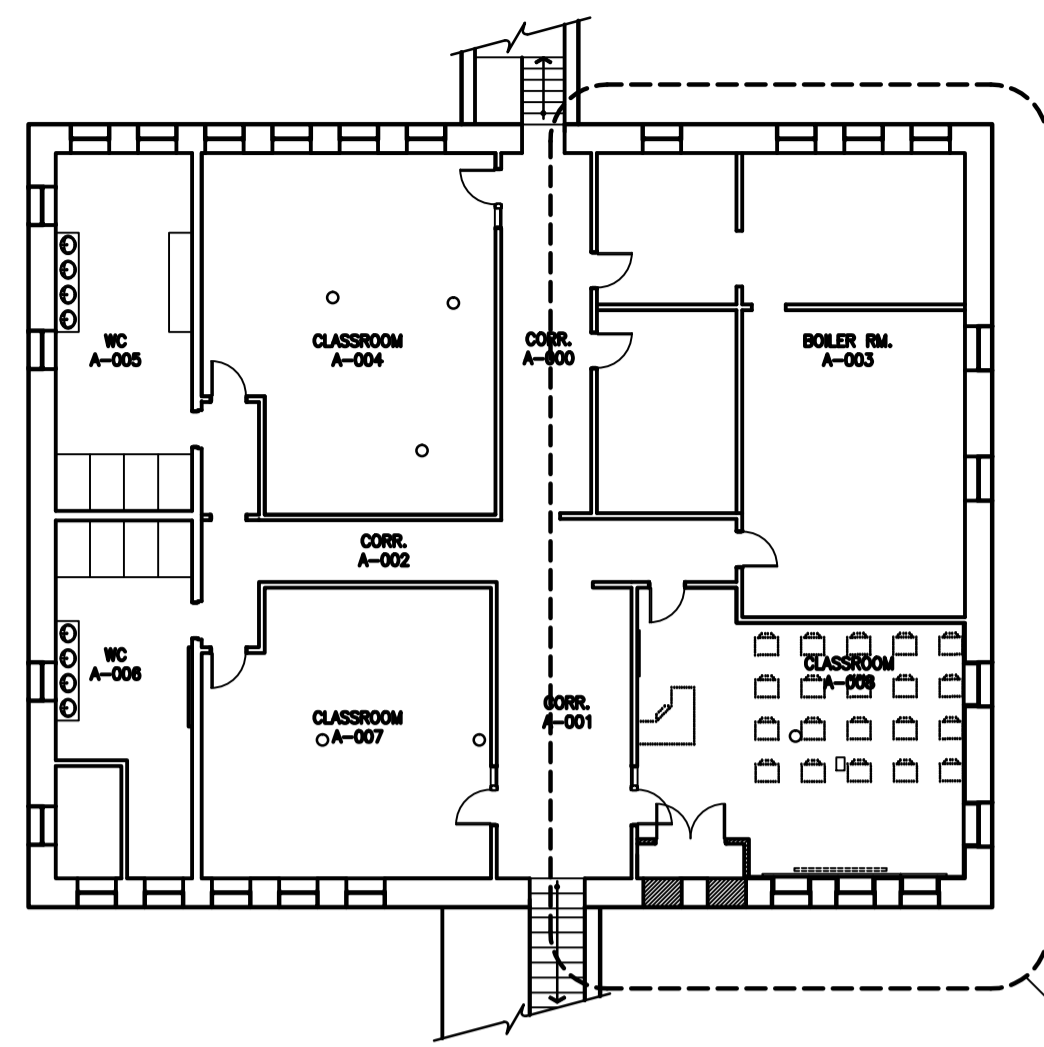
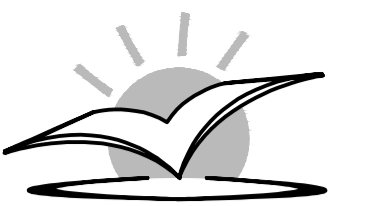
HALIFAX, NOVA SCOTIA
PROJECT NO.: HRSB #3820

SHEET TITLE
**EXISTING CONDITIONS
AND DEMOLITION**

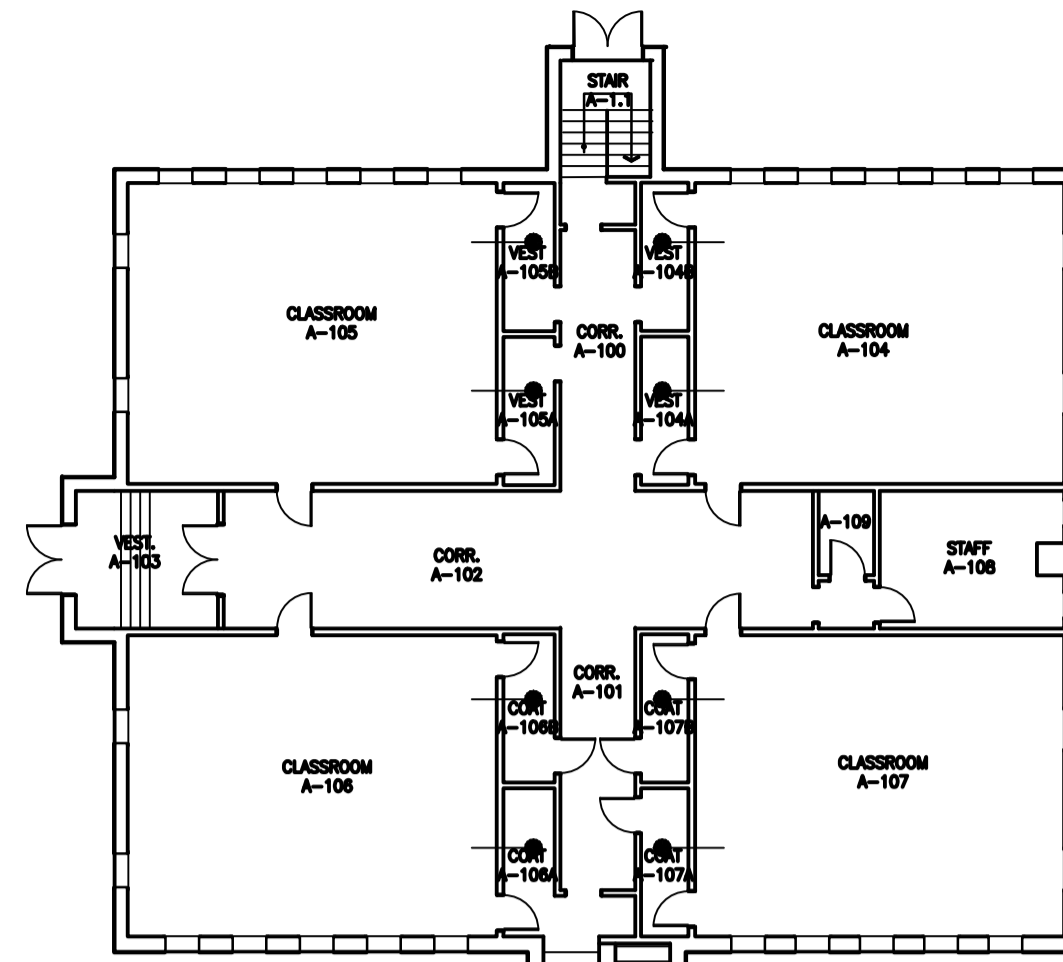
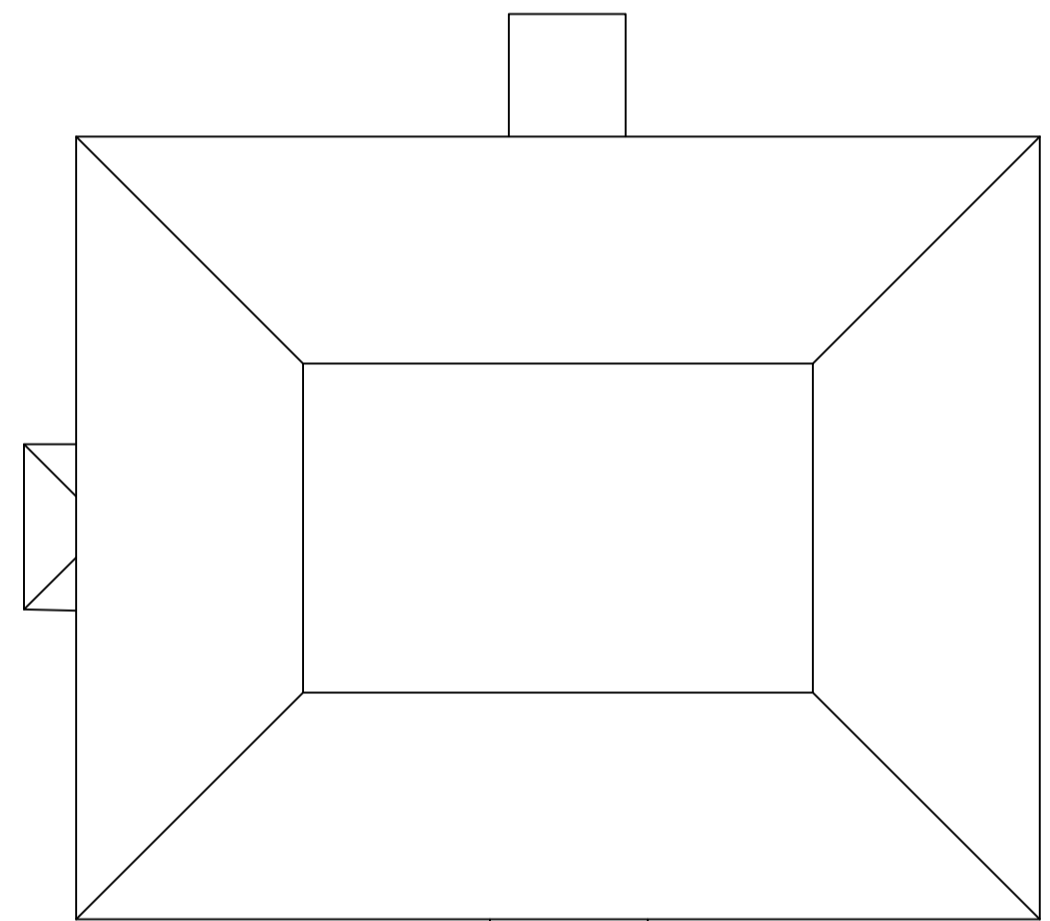
INTERNAL NO.: 2015-120

A-1

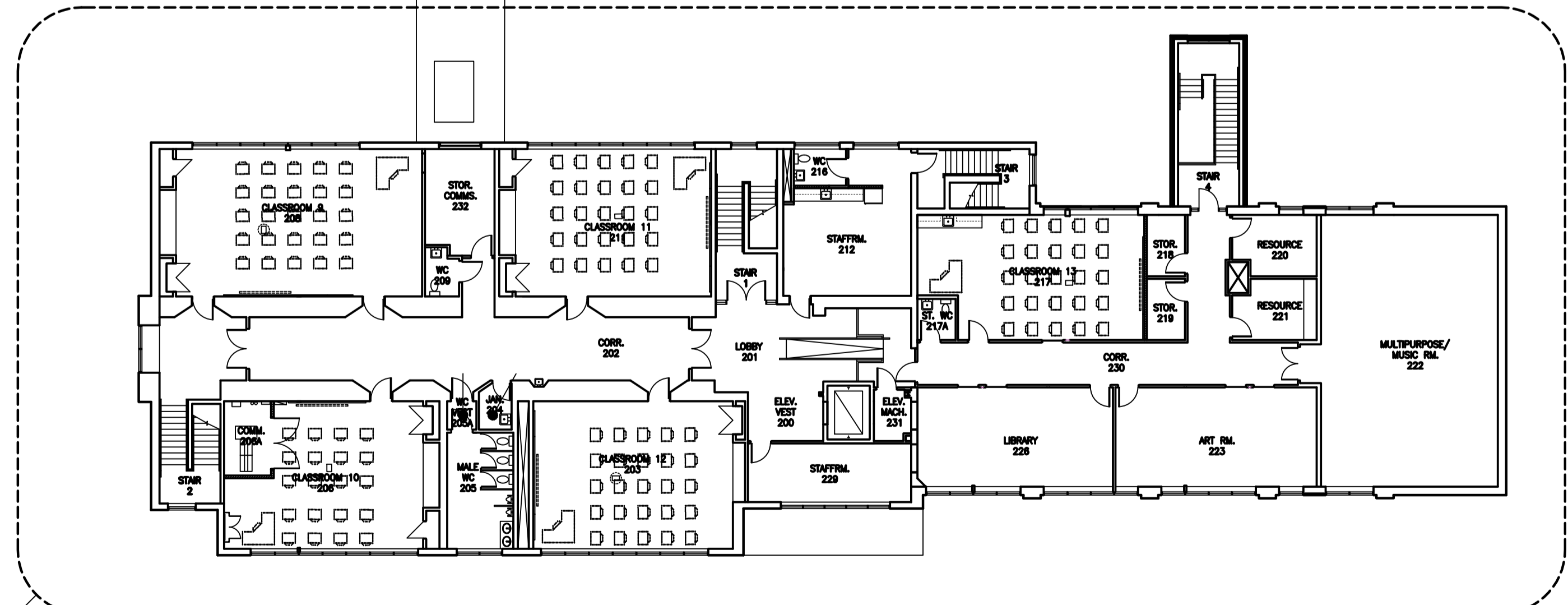
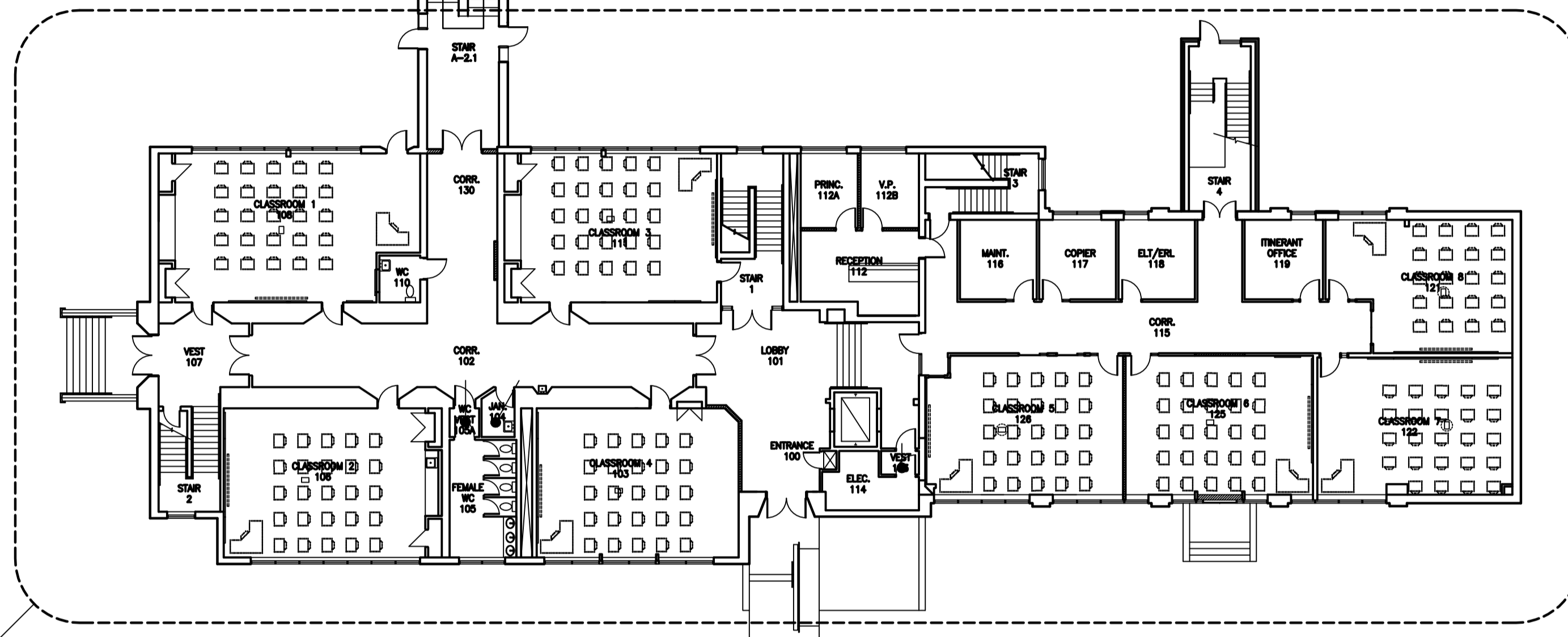
SHEET - OF -



1 FLOOR PLAN BASEMENT LEVEL - NEW CONDITIONS
SCALE: 1:200



2 FLOOR PLAN LEVEL 1 - NEW CONDITIONS
SCALE: 1:200



3 FLOOR PLAN LEVEL 2 - NEW CONDITIONS
SCALE: 1:200

GENERAL NOTES:

- 1. CONTRACTOR TO MAKE GOOD ALL EXISTING SURFACES AND FINISHES AFFECTED BY THE DEMOLITION AND RENOVATION AS DETAILED AND /OR IMPLIED BY THE DRAWINGS. WHERE NECESSARY TO REPAIR TO MATCH ADJACENT MATERIALS AND FINISHES, EXTEND PATCH TO NEAREST NATURAL BREAK POINT I.E. INSIDE CORNER, EXIST. JOINT OR LOCATION APPROVED BY THE ARCHITECT.
2. CONTRACTOR TO CUT, PATCH, AND MAKE GOOD EXISTING FLOORS, WALLS AND CEILINGS AS REQUIRED BY THE WORK OF OTHER TRADES WHETHER NOTED ON THE DRAWINGS OR NOT. CONTRACTOR TO COORDINATE WITH MECHANICAL AND ELECTRICAL TRADES.
3. CONTRACTOR TO PROTECT AND MAINTAIN THE INTEGRITY OF EXISTING FINISHES IN ALL AREAS NOT SCHEDULED FOR DEMOLITION AND/OR NEW CONSTRUCTION TO BE REPAIRED AND MADE GOOD.
4. CONTRACTOR TO REPAIR ANY FIREPROOFING ON STRUCTURAL ELEMENTS AND FIRE-RATED ASSEMBLIES DAMAGED DURING CONSTRUCTION.
5. CONTRACTOR TO ACOUSTICALLY SEAL ALL NEW PENETRATIONS, BOTH SIDES OF PARTITION.
6. DO NOT ALLOW ANY ADHESIVE ODOURS AND OTHER FUMES FROM CONSTRUCTION ACTIVITIES TO ENTER MECHANICAL SYSTEMS.
7. CONTRACTOR TO REMOVE AND LAWFULLY DISPOSE OFF SITE ALL RUBBISH AND DEBRIS RESULTING FROM CONSTRUCTION. KEEP PROJECT AREA BROOMCLEAN. WHENEVER APPLICABLE, ALL DEMOLITION DEBRIS TO BE SORTED AND TAKEN TO APPROPRIATE FACILITIES FOR RECYCLING.
8. CONTRACTOR TO SEAL AND REPAIR CUT-OUTS FOR MECHANICAL AND ELECTRICAL PENETRATIONS IN FLOOR, WALLS, AND CEILINGS. PROVIDE FINISHES TO MATCH EXISTING UNLESS OTHERWISE SPECIFIED.
9. CONTRACTOR TO REPAIR AND MAKE GOOD ALL EXISTING FLOORS, WALLS, AND CEILINGS THAT ARE TO REMAIN AFTER DEMOLITION AND PREPARE SURFACES TO RECEIVE NEW FINISHES.
10. REMOVE ALL EXISTING TEL/ELECT. OUTLETS, THERMOSTATS, SWITCHES, CABLING, ETC. FROM WALLS TO BE DEMOLISHED. ALL SERVICES TO BE REMOVED ARE TO BE PULLED BACK TO SOURCE.
11. ALLOW FOR PROPER VENTILATION OF THE PREMISES DURING AND AFTER COMPLETION OF DEMOLITION.
12. REFER TO MECHANICAL, FIRE PROTECTION, AND ELECTRICAL DRAWINGS FOR ANY ADDITIONAL DEMOLITION NOTES APPLICABLE TO THOSE DISCIPLINES.
13. CONTRACTOR IS RESPONSIBLE FOR THE DESIGN, COORDINATION AND EXECUTION OF CONSTRUCTION METHODS, PROCEDURES AND SCHEDULES. THE OPERATIONAL PROCEDURES AND METHODS ARE THE RESPONSIBILITY OF THE CONTRACTOR INsofar AS THEY DO NOT PRESENT HAZARDS TO PERSONNEL OR PROPERTY OR INFRINGE ON WORK SCHEDULES FOR NORMAL SITE ACTIVITY.
14. REPORT ANY HAZARDOUS MATERIALS FOUND ON SITE TO HRSB PROJECT MANAGER.

GRAPHIC SCALE

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PROJECT BEAUFORT SCHOOL RENOVATION

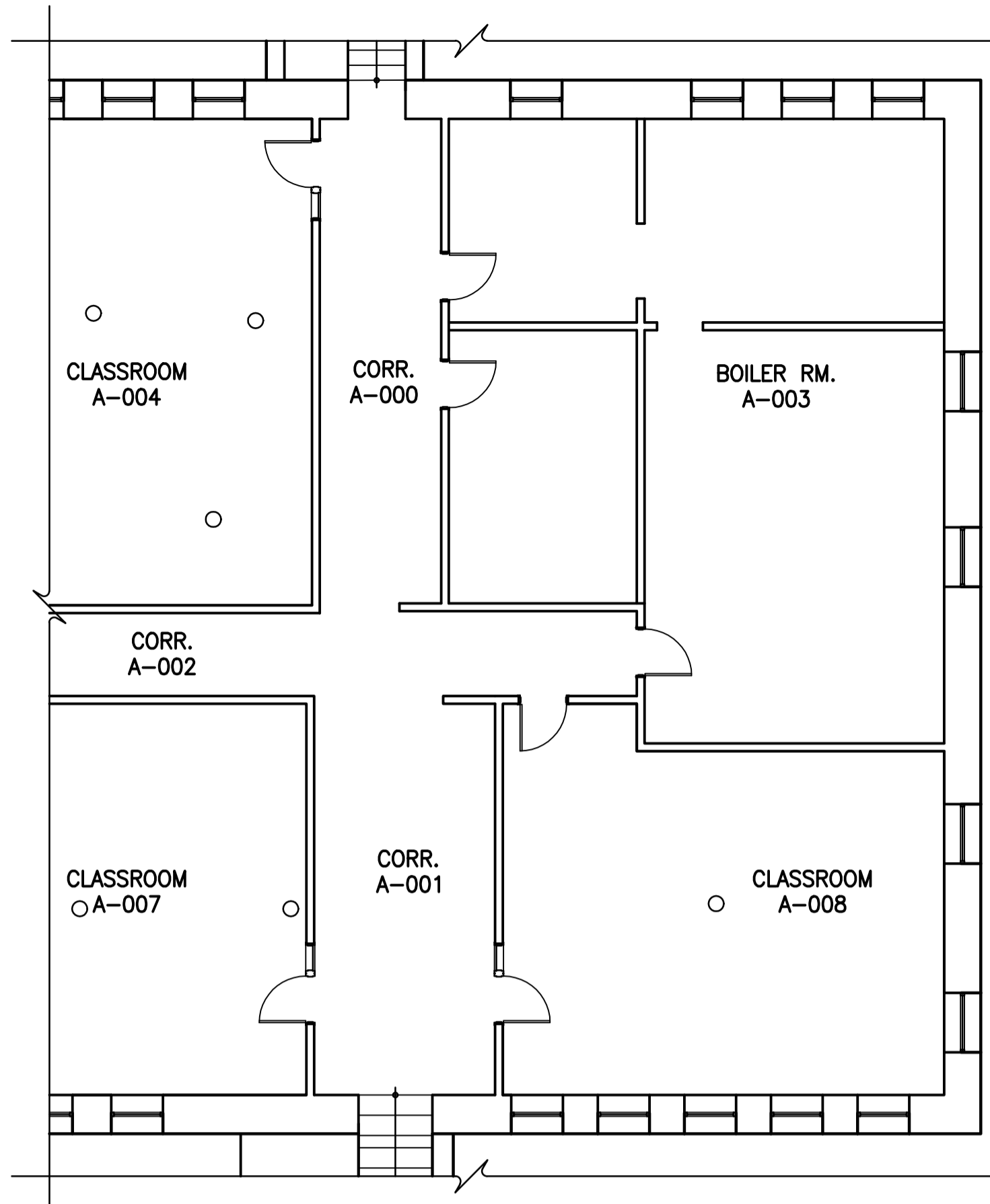
HALIFAX, NOVA SCOTIA
PROJECT NO.: HRSB #3820

SHEET TITLE NEW CONDITIONS

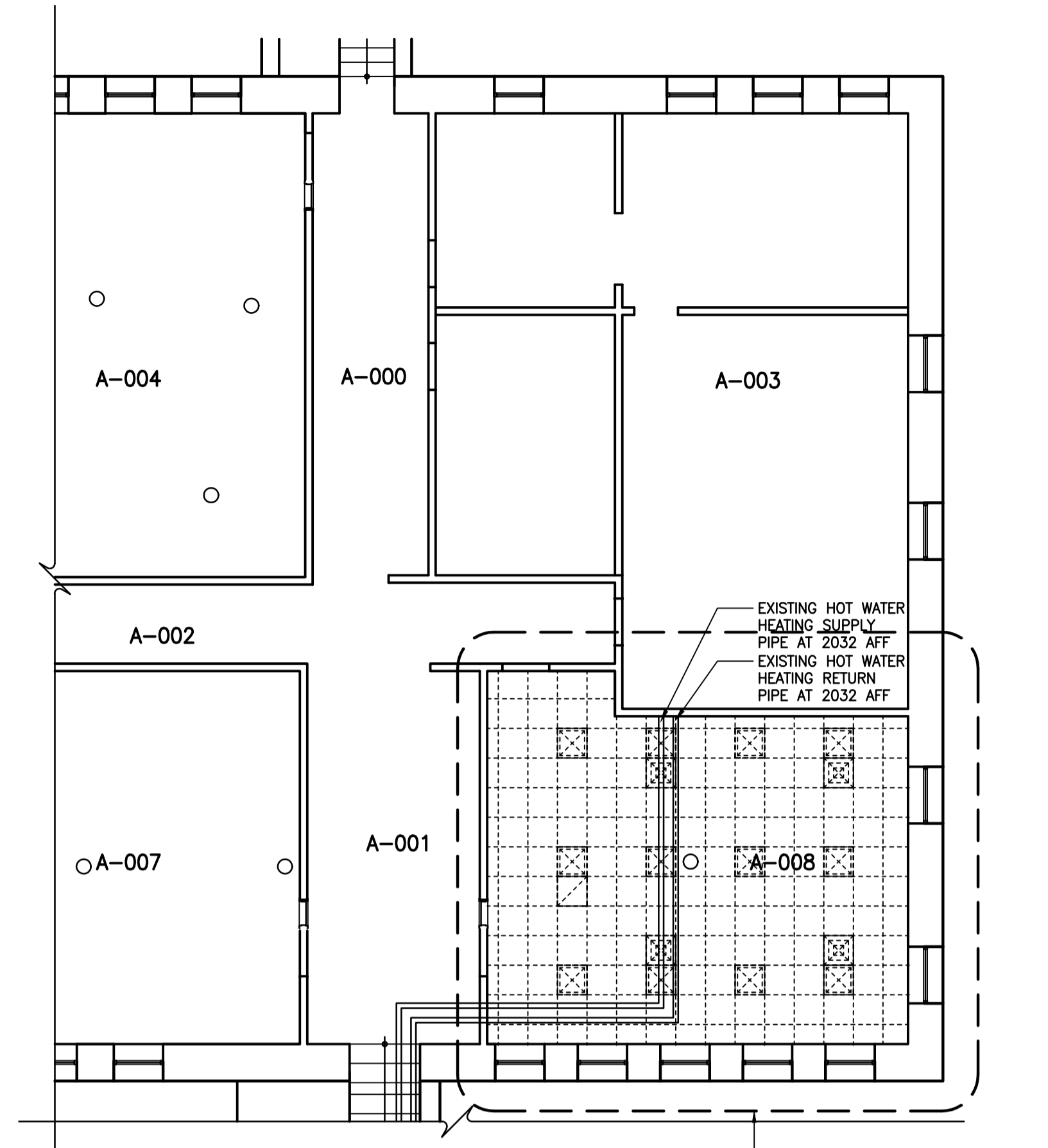
INTERNAL NO.: 2015-120

A-2

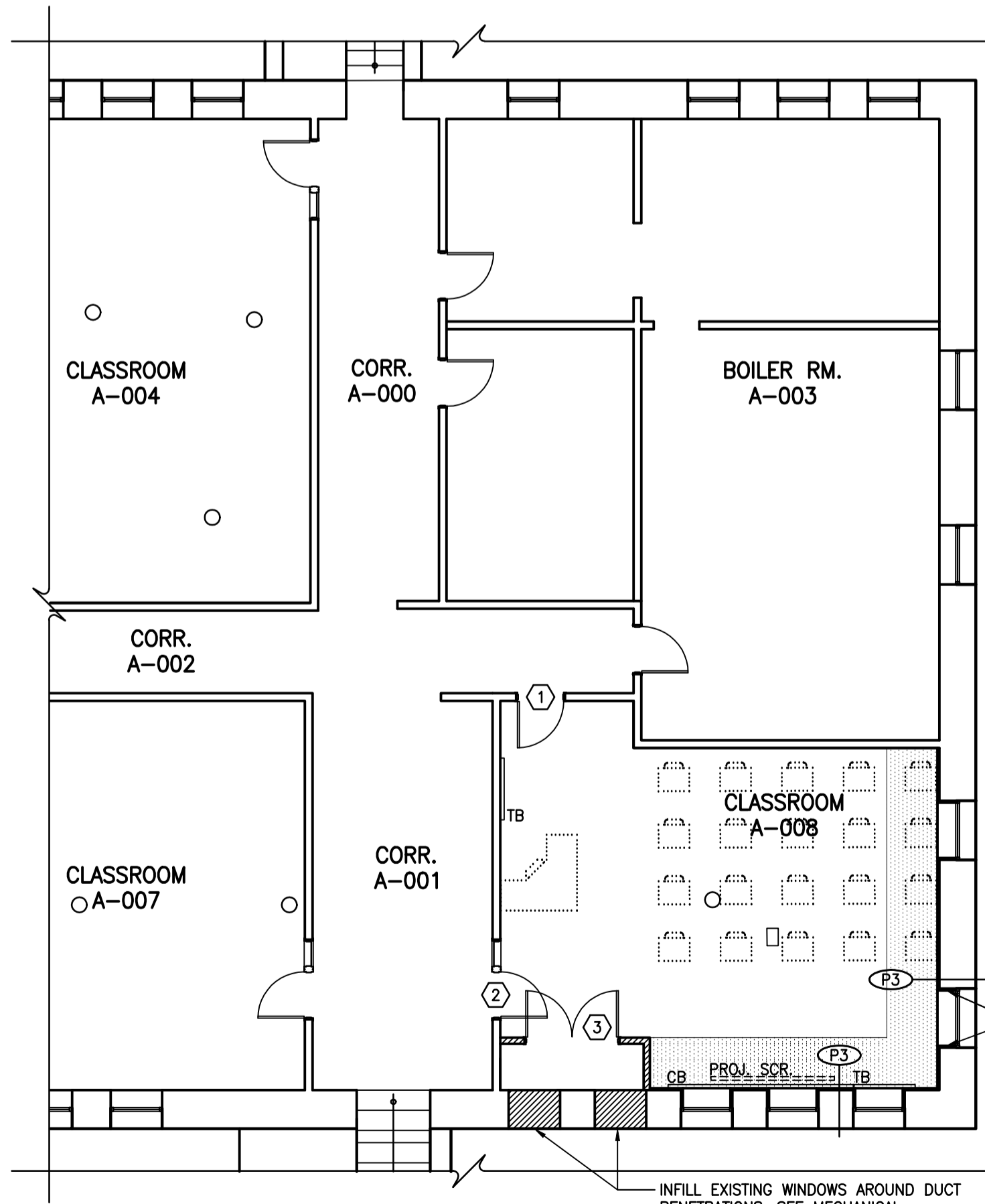
SHEET - OF -



1
A-3
FLOOR PLAN
ANNEX L0 CLASSROOM - EXISTING & DEMO
SCALE: 1:100



3
A-3
REFLECTED CEILING PLAN
ANNEX L0 CLASSROOM - EXISTING & DEMO
SCALE: 1:100



2
A-3
FLOOR PLAN
ANNEX L0 CLASSROOM - NEW CONDITIONS
SCALE: 1:100

PARTITION LEGEND

- (P1) 16mm TYPE X GWB
92mm STEEL STUDS AT 410mm o/c
SOUND BATT INSUL TO SUIT
16mm TYPE X GWB
- (P3) 16mm MOISTURE RESISTANT GWB
64mm STEEL STUDS

- NOTES:**
1. ALL GWB PARTITIONS AND BULKHEADS IN ROOM A-008 TO USE MOISTURE RESISTANT BOARD (SEE SPEC).
 2. ALL GWB TO BE HELD OFF 13mm FROM FINISH FLOOR.
 3. ALL PARTITIONS TO u/s OF DECK UNLESS NOTED OTHERWISE. PROVIDE ACOUSTIC SEAL AT PERIMETER UNLESS IN A RATED PARTITIONS, THEN USE FIRE STOPPING MATERIALS.

NEW PLAN LEGEND

- NEW PARTITIONS
- EXISTING FLOORING TO BE PATCHED USING THE SAME MATERIAL; COLOUR TO MATCH AS CLOSELY AS POSSIBLE.

COMMUNICATION/TACK BOARDS

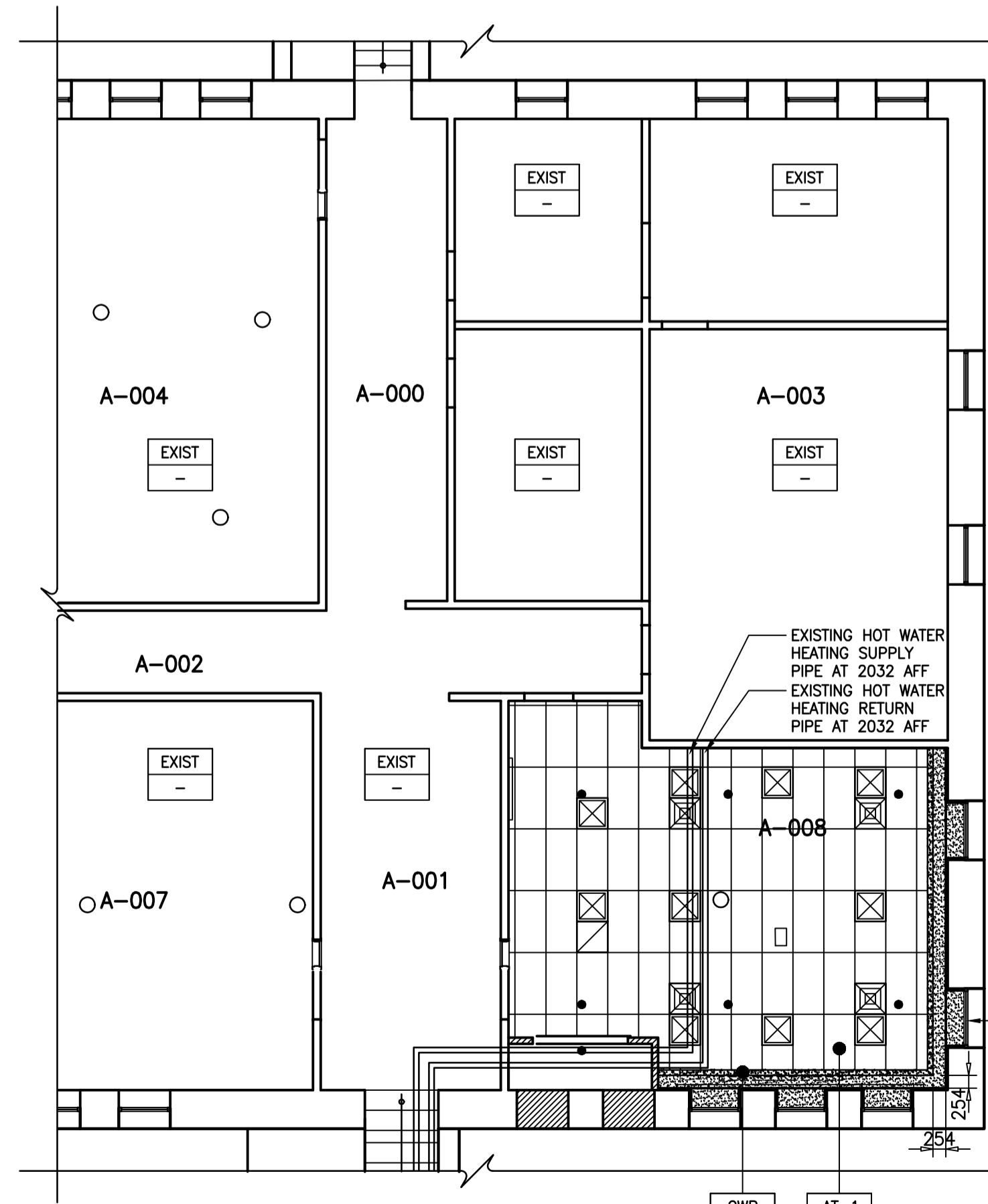
- CB COMMUNICATION BOARD 12'-0"W x 4'-0"H
- TB TACK BOARD 4'-0"W x 4'-0"H

RETURN GWB FINISH AT WINDOW JAMBS AND SILL FOR ALL WINDOWS IN P3 WALL ASSEMBLY TYP.

INFILL EXISTING WINDOWS AROUND DUCT PENETRATIONS. SEE MECHANICAL.

CEILING LEGEND

- AT-1 ACOUSTICAL CEILING TILE SEE SPECIFICATION
- LIGHTING FIXTURES SEE ELECTRICAL DRAWINGS
- OVERHEAD PROJECTOR SCREEN SEE ELECTRICAL
- SUPPLY DIFFUSERS SEE MECHANICAL DRAWINGS
- RETURN GRILLES SEE MECHANICAL
- SPRINKLER HEAD SEE FIRE PROTECTION DRAWINGS



4
A-3
REFLECTED CEILING PLAN
ANNEX L0 CLASSROOM - NEW CONDITIONS
SCALE: 1:100



KEY PLAN

LOGO



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PROJECT

BEAUFORT SCHOOL RENOVATION

HALIFAX, NOVA SCOTIA

PROJECT NO.: HRSB #3820

SHEET TITLE

FLOOR PLAN

ANNEX LEVEL 0 & 1

EXISTING, DEMO & NEW CONDITIONS

INTERNAL NO.: 2015-120

A-3

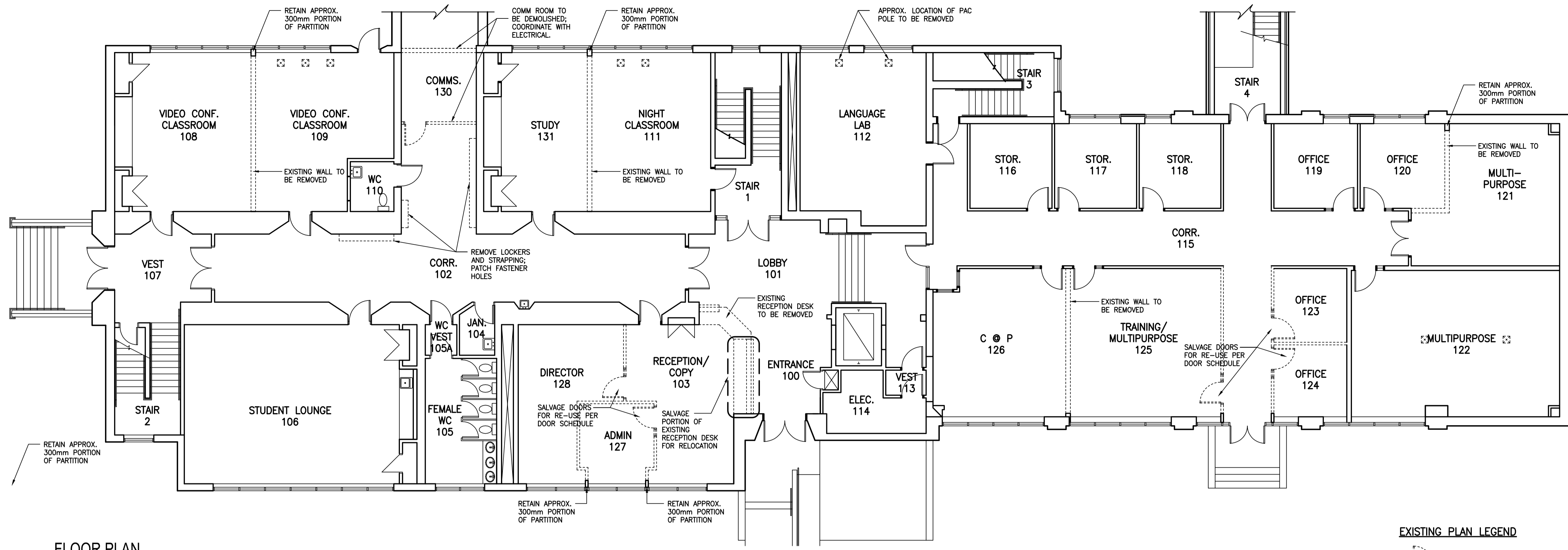
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KEY PLAN

LOGO

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1
FLOOR PLAN
LEVEL 1 - EXISTING CONDITION & DEMO

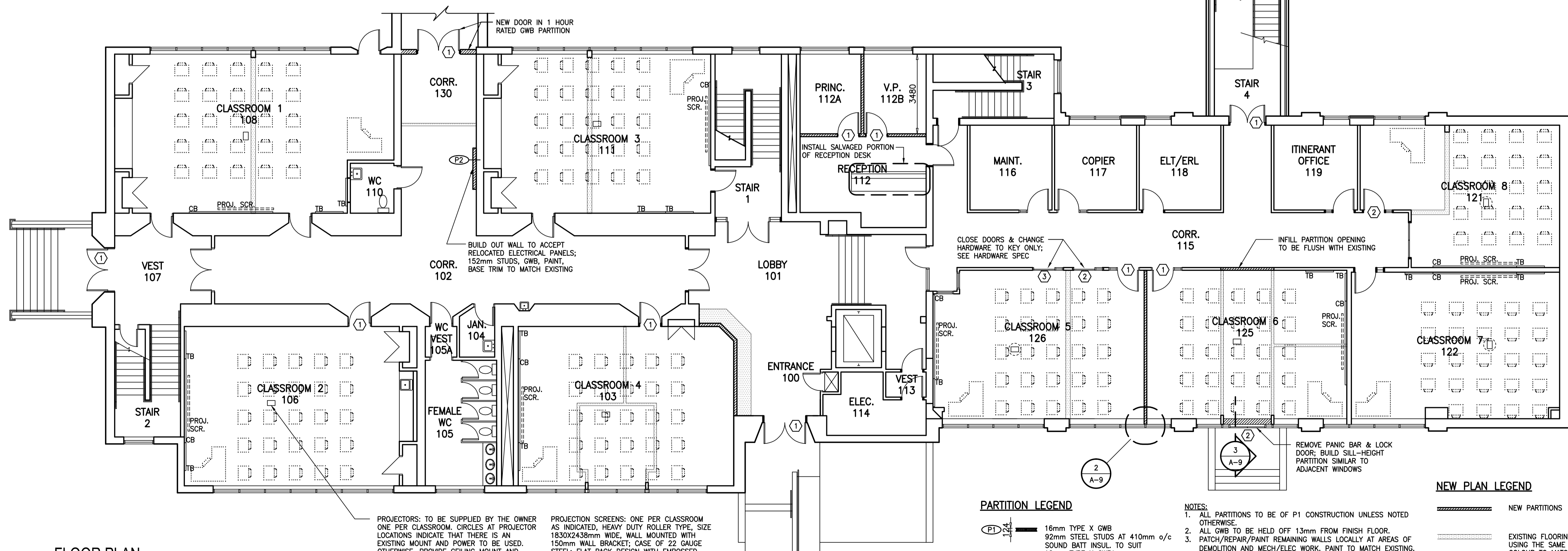
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EXISTING PLAN LEGEND

--- INDICATES WALLS, DOORS, GLAZING, AND EXISTING ELEMENTS TO BE REMOVED. SALVAGE ELEMENTS TO BE RE-USE AS NOTED

⊗ EXISTING POWER/COMM PAC POLES TO BE REMOVED. COORDINATE WITH ELECTRICAL

1
A-4



2
FLOOR PLAN
LEVEL 1 - NEW CONDITIONS

SCALE: 1:100

PARTITION LEGEND

P1 16mm TYPE X GWB
92mm STEEL STUDS AT 410mm o/c
SOUND BATT INSUL. TO SUIT
16mm TYPE X GWB*

P2 16mm TYPE X GWB
152mm STEEL STUDS

NOTES:

- ALL PARTITIONS TO BE OF P1 CONSTRUCTION UNLESS NOTED OTHERWISE.
- ALL GWB TO BE HELD OFF 13mm FROM FINISH FLOOR.
- PATCH/REPAIR/PAINT REMAINING WALLS LOCALLY AT AREAS OF DEMOLITION AND MECH/ELEC WORK. PAINT TO MATCH EXISTING.

ALL PARTITIONS TO u/s OF DECK UNLESS NOTED OTHERWISE. PROVIDE ACOUSTIC SEAL AT PERIMETER UNLESS IN A RATED PARTITIONS, THEN USE FIRE STOPPING MATERIALS.

NEW PLAN LEGEND

--- NEW PARTITIONS

--- EXISTING FLOORING TO BE PATCHED USING THE SAME MATERIAL; COLOUR TO MATCH AS CLOSELY AS POSSIBLE.

COMMUNICATION/TACK BOARDS

CB COMMUNICATION BOARD 12'-0"W x 4'-0"H
TB TACK BOARD 4'-0"W x 4'-0"H

GRAPHIC SCALE

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DATE: 08 APR 2016

PROJECT
BEAUFORT SCHOOL RENOVATION

HALIFAX, NOVA SCOTIA
PROJECT NO.: HRSB #3820

SHEET TITLE
FLOOR PLAN LEVEL 1 EXISTING, DEMO & NEW CONDITIONS

INTERNAL NO.: 2015-120

A-4

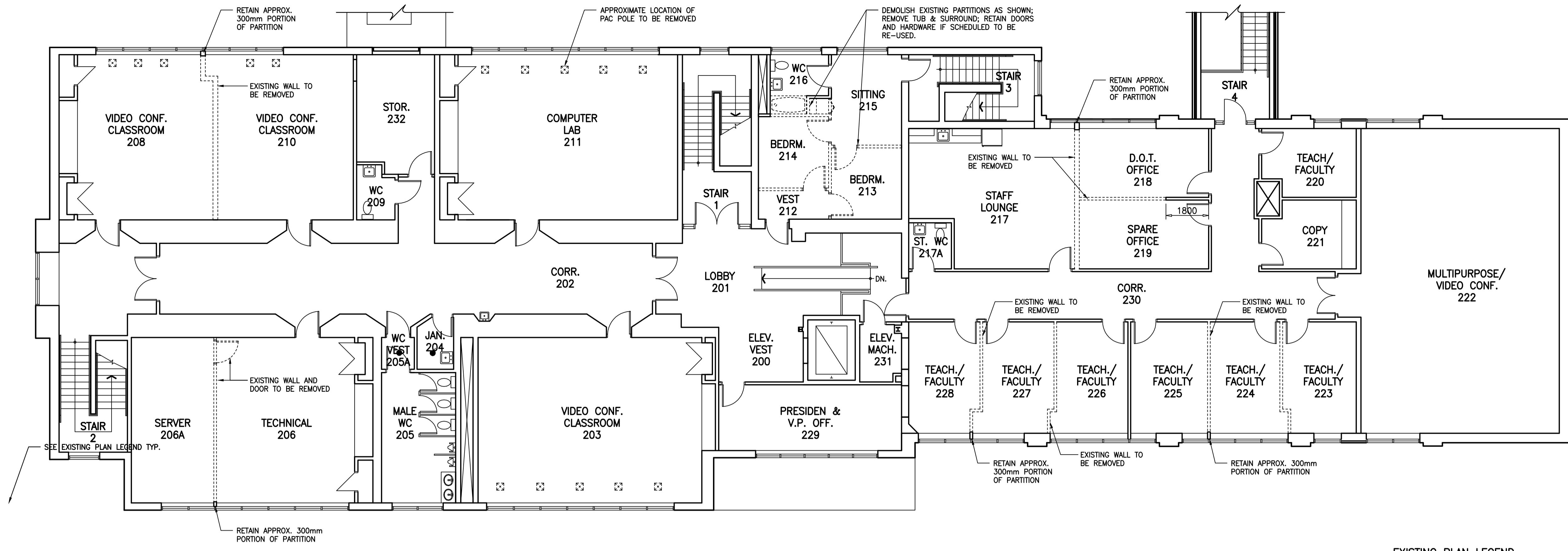
SHEET - OF -

KEY PLAN

LOGO

FOWLER BAULD & MITCHELL
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1
A-5

FLOOR PLAN LEVEL 2 - EXISTING CONDITION & DEMO

SCALE: 1:100

EXISTING PLAN LEGEND

- INDICATES WALLS, DOORS, GLAZING, AND EXISTING ELEMENTS TO BE REMOVED. SALVAGE DOORS FOR RE-USE AS NOTED
- EXISTING POWER/COMM PACK POLES TO BE REMOVED. COORDINATE WITH ELECTRICAL

GRAPHIC SCALE

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PROJECT
BEAUFORT SCHOOL RENOVATION

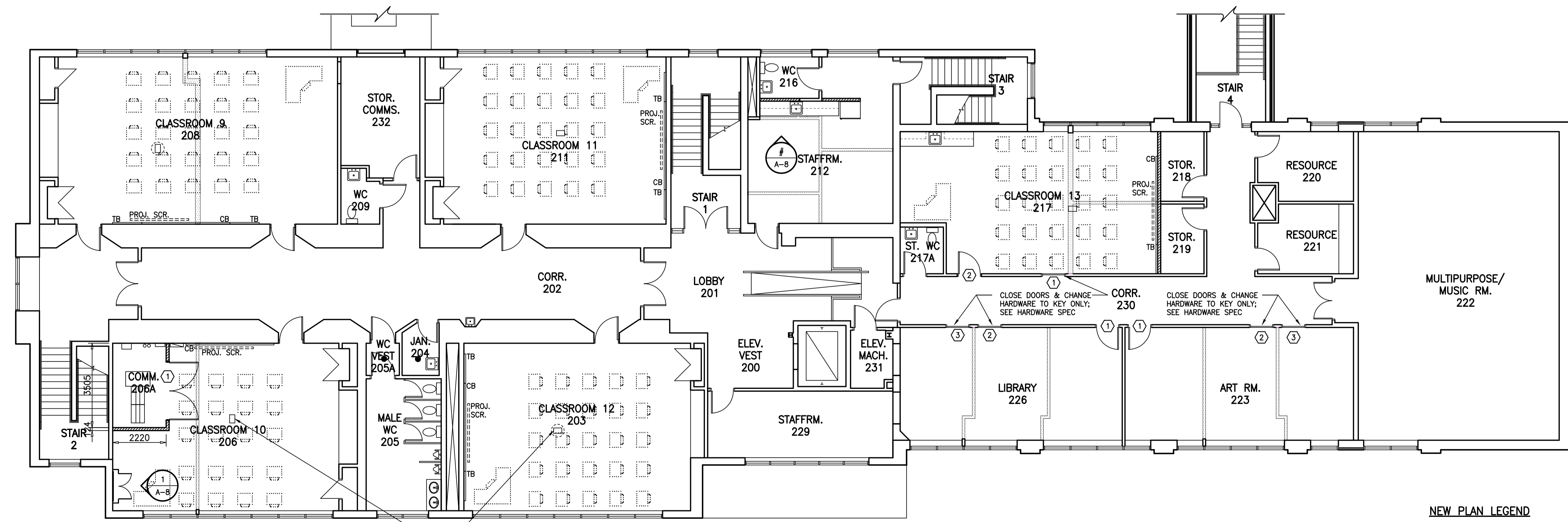
HALIFAX, NOVA SCOTIA
PROJECT NO.: HRSB #3820

SHEET TITLE
FLOOR PLAN LEVEL 2 EXISTING, DEMO & NEW CONDITIONS

INTERNAL NO.: 2015-120

A-5

SHEET - OF -



2
A-5

FLOOR PLAN LEVEL 2 - NEW CONDITIONS

SCALE: 1:100

PARTITION LEGEND

- 16mm TYPE X GWB
92mm STEEL STUDS AT 410mm o/c
SOUND BATT INSUL. TO SUIT
16mm TYPE X GWB*
- 16mm TYPE X GWB
152mm STEEL STUDS

- NOTES:**
- ALL PARTITIONS TO BE OF P1 CONSTRUCTION UNLESS NOTED OTHERWISE.
 - ALL GWB TO BE HELD OFF 13mm FROM FINISH FLOOR.
 - PATCH/REPAIR/PAINT REMAINING WALLS LOCALLY AT AREAS OF DEMOLITION AND MECH/ELEC WORK. PAINT TO MATCH EXISTING.
 - ALL PARTITIONS TO u/s OF DECK UNLESS NOTED OTHERWISE. PROVIDE ACOUSTIC SEAL AT PERIMETER UNLESS IN A RATED PARTITION, THEN USE FIRE STOPPING MATERIALS.

NEW PLAN LEGEND

- NEW PARTITIONS
- EXISTING FLOORING TO BE PATCHED USING THE SAME MATERIAL; COLOUR TO MATCH AS CLOSELY AS POSSIBLE.

COMMUNICATION/TACK BOARDS

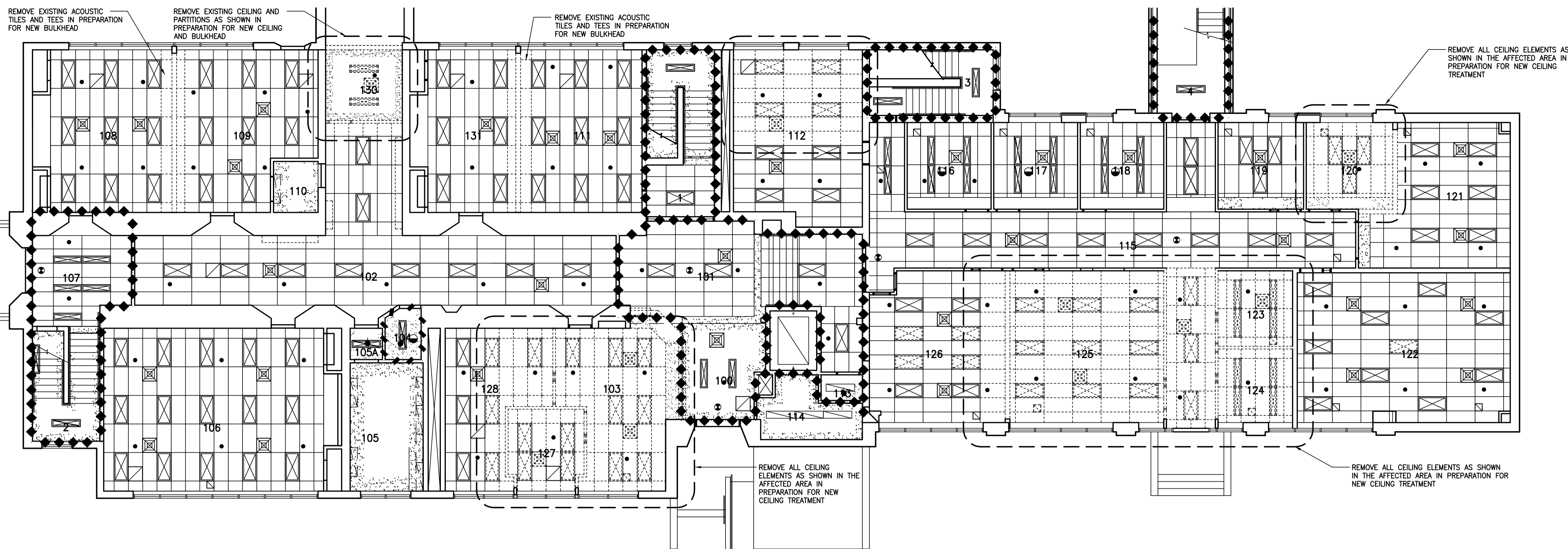
- CB COMMUNICATION BOARD 12'-0"W x 4'-0"H
- TB TACK BOARD 4'-0"W x 4'-0"H

PROJECTORS: TO BE SUPPLIED BY THE OWNER ONE PER CLASSROOM. CIRCLES AT PROJECTOR LOCATIONS INDICATE THAT THERE IS AN EXISTING MOUNT AND POWER TO BE USED. OTHERWISE, PROVIDE CEILING MOUNT AND POWER/DATA AT EACH LOCATION AS INDICATED ON ELECTRICAL PLANS

PROJECTION SCREENS: ONE PER CLASSROOM AS INDICATED. HEAVY DUTY ROLLER TYPE. SIZE 1830X2438mm WIDE. WALL MOUNTED WITH 150mm WALL BRACKET; CASE OF 22 GAUGE STEEL; FLAT BACK DESIGN WITH EMBOSSED, BAKED ON PLASTISOL FINISH IN GREY. FRICTION FREE CLOSURE; VIEWING SURFACE FLAME AND MILDEW RESISTANT. MOUNTING HEIGHT TO TOP OF CLOSURE, 2640mm UNLESS OTHERWISE NOTED

CLOSE DOORS & CHANGE HARDWARE TO KEY ONLY; SEE HARDWARE SPEC

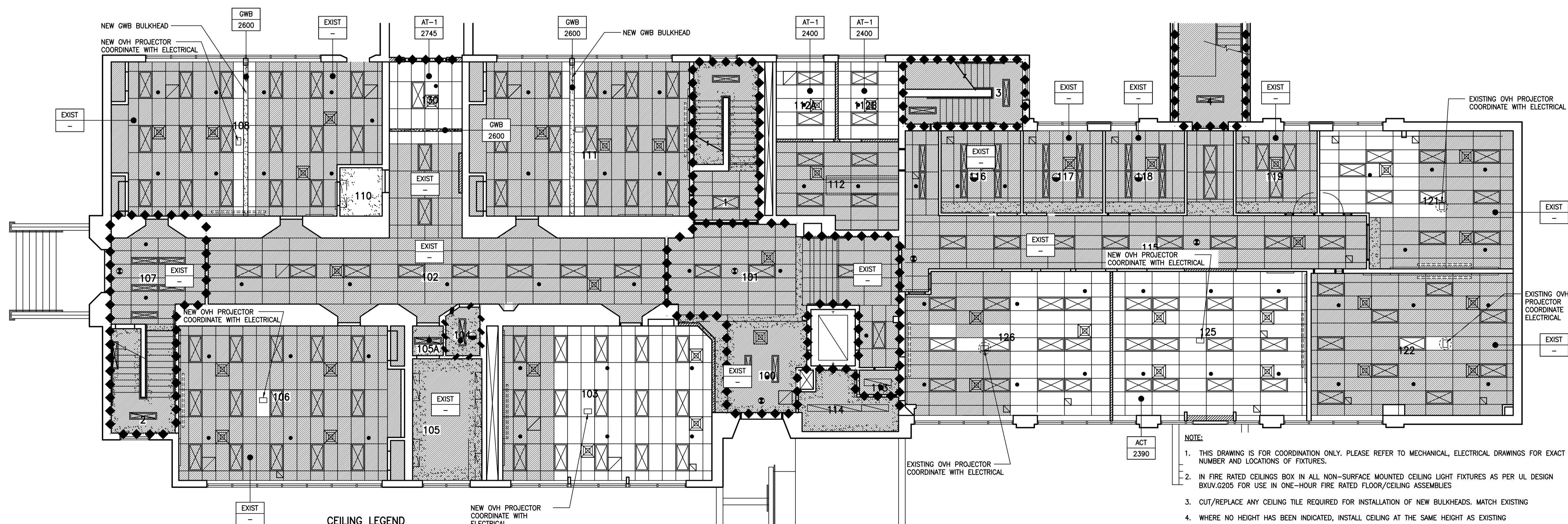
CLOSE DOORS & CHANGE HARDWARE TO KEY ONLY; SEE HARDWARE SPEC



1
REFLECTED CEILING PLAN
LEVEL 1 - EXISTING CONDITION & DEMO

A-6

SCALE: 1:100

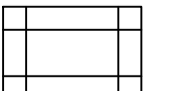



2
REFLECTED CEILING PLAN
LEVEL 1 - NEW CONDITIONS

A-6

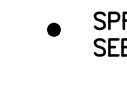
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CEILING LEGEND

-  AT-1 ACOUSTICAL CEILING TILE SEE SPECIFICATION
-  GWB GWB CEILING SEE SPECIFICATION

-  LIGHTING FIXTURES SEE ELECTRICAL DRAWINGS
-  OVERHEAD PROJECTOR SCREEN SEE ELECTRICAL



-  SUPPLY DIFFUSERS SEE MECHANICAL DRAWINGS
-  RETURN GRILLES SEE MECHANICAL

-  SPRINKLER HEAD SEE FIRE PROTECTION DRAWINGS

NOTE:

1. THIS DRAWING IS FOR COORDINATION ONLY. PLEASE REFER TO MECHANICAL, ELECTRICAL DRAWINGS FOR EXACT NUMBER AND LOCATIONS OF FIXTURES.
2. IN FIRE RATED CEILING BOX IN ALL NON-SURFACE MOUNTED CEILING LIGHT FIXTURES AS PER UL DESIGN BXUV.G205 FOR USE IN ONE-HOUR FIRE RATED FLOOR/CEILING ASSEMBLIES
3. CUT/REPLACE ANY CEILING TILE REQUIRED FOR INSTALLATION OF NEW BULKHEADS. MATCH EXISTING
4. WHERE NO HEIGHT HAS BEEN INDICATED, INSTALL CEILING AT THE SAME HEIGHT AS EXISTING
5. CONTRACTOR TO ENSURE CEILING IS PROPERLY SUPPORTED FOR THE ADDITION OF NEW LIGHTING FIXTURES, ETC

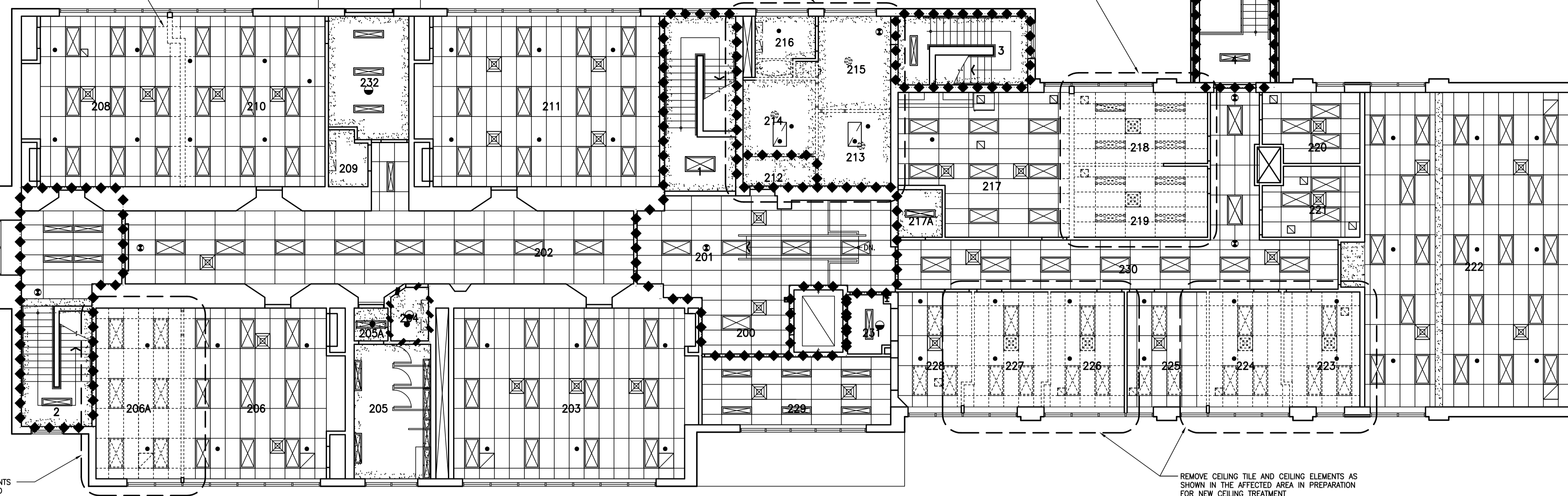
FIRE SEPARATION LEGEND

-  FIRE SEPARATION WITHOUT A RATING
-  1 HOUR FIRE SEPARATION

REMOVE EXISTING ACOUSTIC TILES AND TEES AS SHOWN WHERE WALL IS TO BE REMOVED IN PREPARATION FOR PATCHING

REMOVE EXISTING CEILING AS SHOWN WHERE WALLS ARE TO BE REMOVED IN PREPARATION FOR NEW CEILING TREATMENT

REMOVE CEILING AND ELEMENTS AS SHOWN IN THE AFFECTED AREA IN PREPARATION FOR NEW CEILING TREATMENT



REMOVE ALL CEILING ELEMENTS AS SHOWN IN THE AFFECTED AREA IN PREPARATION FOR NEW CEILING TREATMENT

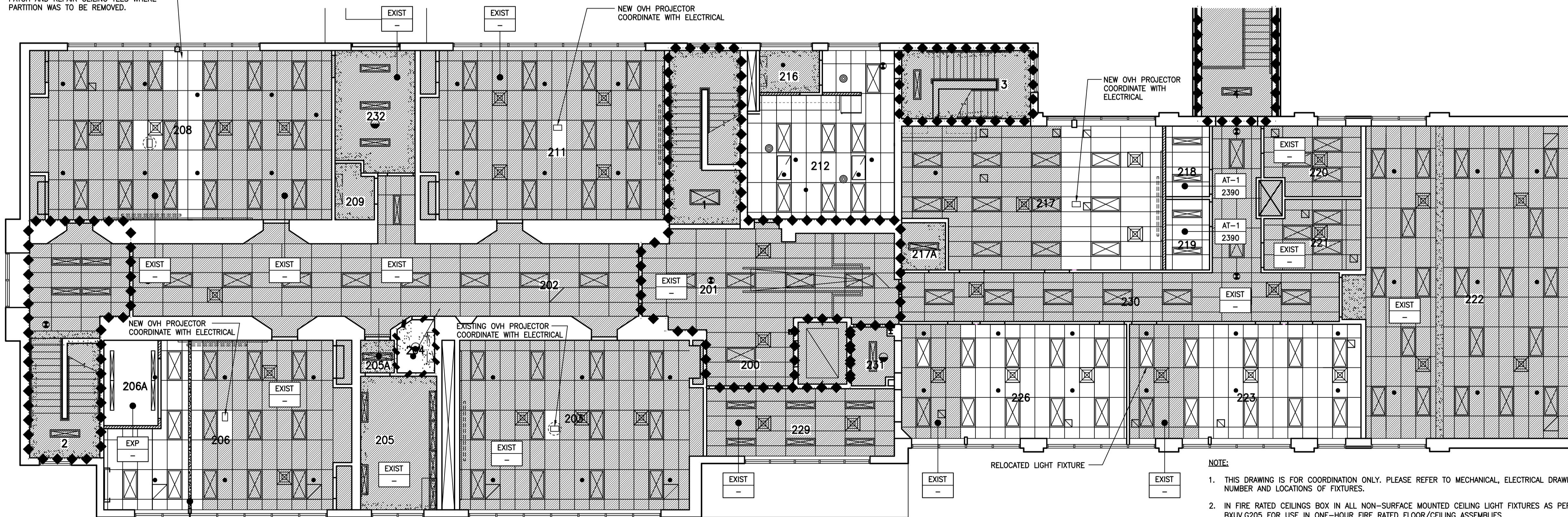
REMOVE CEILING TILE AND CEILING ELEMENTS AS SHOWN IN THE AFFECTED AREA IN PREPARATION FOR NEW CEILING TREATMENT

**REFLECTED CEILING PLAN
LEVEL 2 - EXISTING CONDITION & DEMO**

1
A-7

SCALE: 1:100

PATCH AND REPAIR CEILING TEES WHERE PARTITION WAS TO BE REMOVED.



GWB
2600

CEILING LEGEND

AT-1 ACOUSTICAL CEILING TILE
SEE SPECIFICATION

LIGHTING FIXTURES
SEE ELECTRICAL DRAWINGS

SUPPLY DIFFUSERS
SEE MECHANICAL DRAWINGS

SPRINKLER HEAD
SEE FIRE PROTECTION DRAWINGS

GWB
GWB CEILING
SEE SPECIFICATION

OVERHEAD PROJECTOR SCREEN
SEE ELECTRICAL

RETURN GRILLES
SEE MECHANICAL

NOTE:

1. THIS DRAWING IS FOR COORDINATION ONLY. PLEASE REFER TO MECHANICAL, ELECTRICAL DRAWINGS FOR EXACT NUMBER AND LOCATIONS OF FIXTURES.
2. IN FIRE RATED CEILINGS BOX IN ALL NON-SURFACE MOUNTED CEILING LIGHT FIXTURES AS PER UL DESIGN BXUV.G205 FOR USE IN ONE-HOUR FIRE RATED FLOOR/CEILING ASSEMBLIES
3. CUT/REPLACE ANY CEILING TILE REQUIRED FOR INSTALLATION OF NEW BULKHEADS. MATCH EXISTING
4. WHERE NO HEIGHT HAS BEEN INDICATED, INSTALL CEILING AT THE SAME HEIGHT AS EXISTING
5. CONTRACTOR TO ENSURE CEILING IS PROPERLY SUPPORTED FOR THE ADDITION OF NEW LIGHTING FIXTURES, ETC

FIRE SEPARATION LEGEND

- ◆◆◆◆ FIRE SEPARATION WITHOUT A RATING
- ◆◆◆◆ 1 HOUR FIRE SEPARATION

**REFLECTED CEILING PLAN
LEVEL 2 - NEW CONDITIONS**

2
A-7

SCALE: 1:100



**Halifax Regional
School Board**

KEY PLAN

LOGO

**FOWLER
BAULD &
MITCHELL**
architecture

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architects@fbm.ca
www.fbm.ca

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PROJECT
**BEAUFORT SCHOOL
RENOVATION**

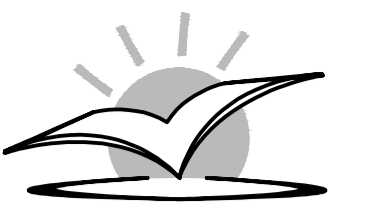
HALIFAX, NOVA SCOTIA
PROJECT NO.: HRSB #3820

SHEET TITLE
**REFLECT. CEILING PLAN
LEVEL 2
EXISTING, DEMO &
NEW CONDITIONS**

INTERNAL NO.: 2015-120

A-7

SHEET - OF -



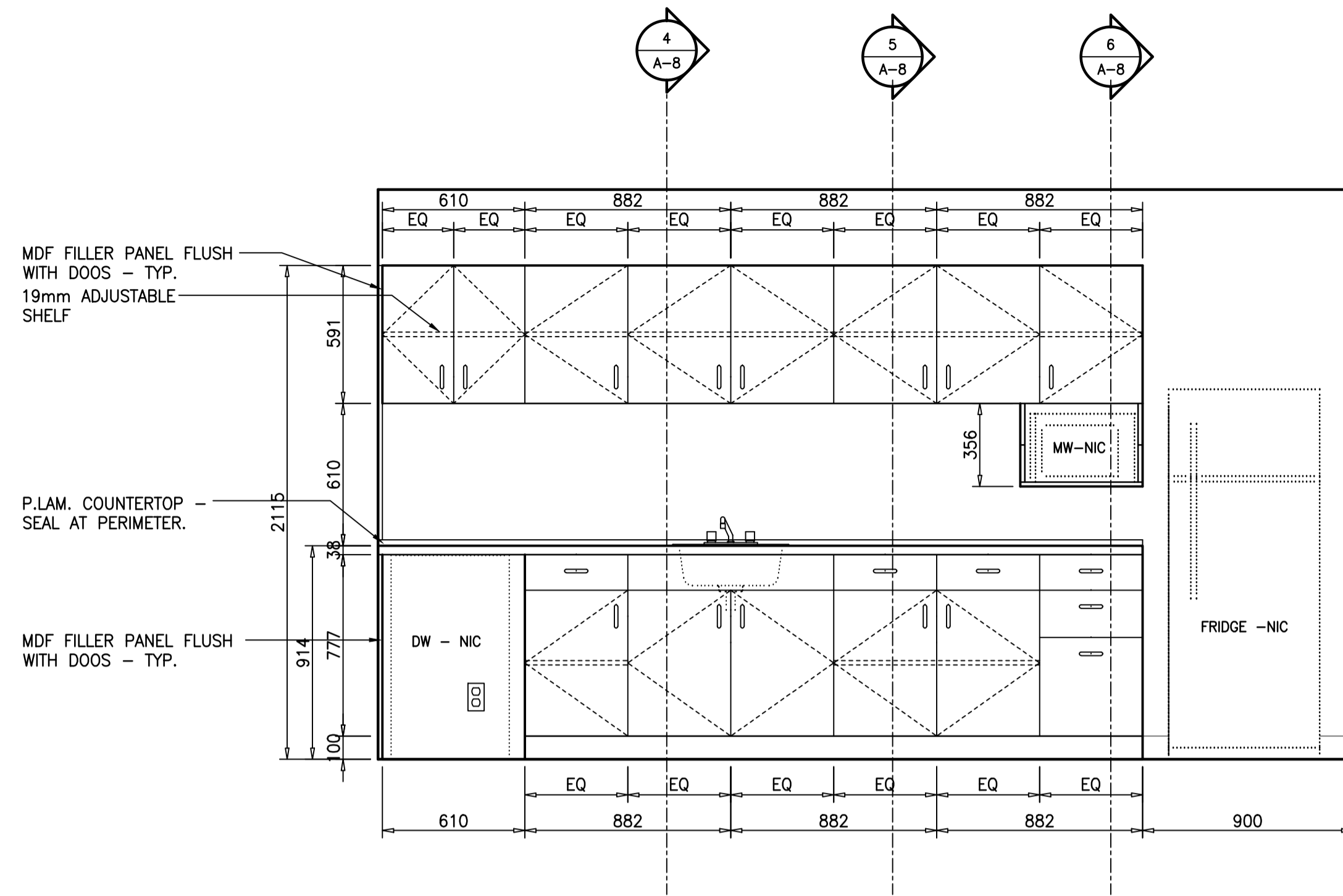
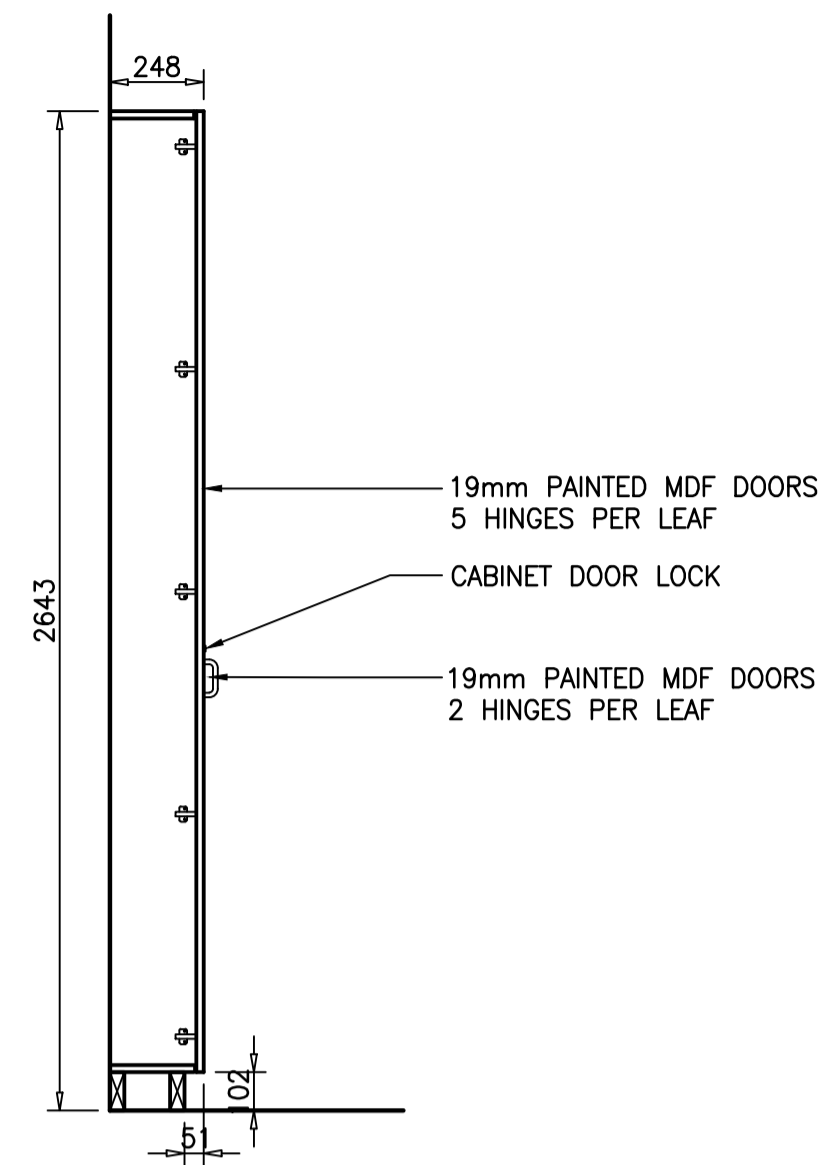
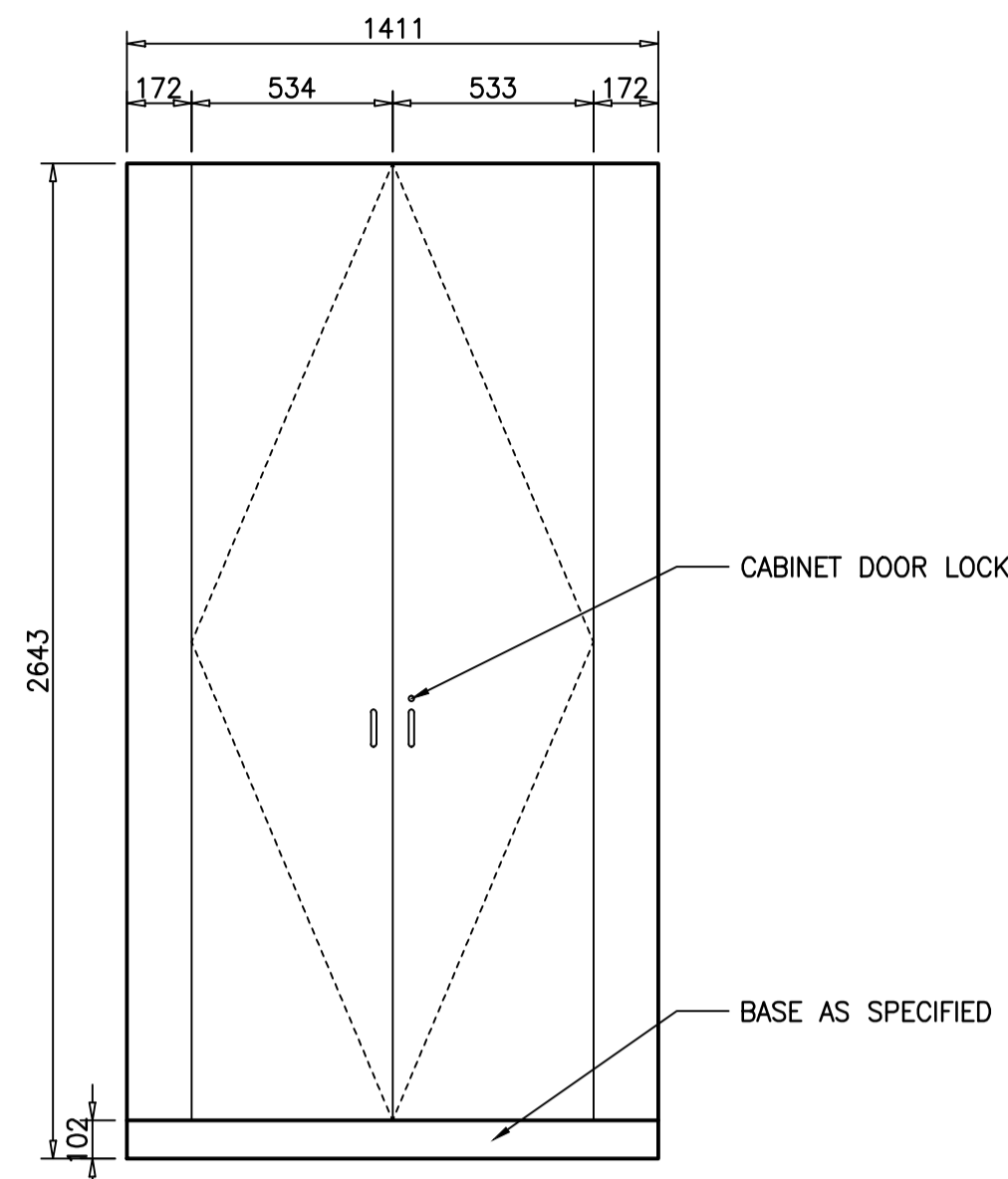
Halifax Regional School Board

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1 ELEVATION
ELEVATION - TELECOM CABINET ROOM 206
A-8 SCALE: 1:20

2 SECTION
SECTION - TELECOM CABINET ROOM 206
A-8 SCALE: 1:20

2 ELEVATION
ELEVATION - STAFFRM. 212
A-8 SCALE: 1:20

GRAPHIC SCALE

08 APR 2016 DATE MARK ISSUED FOR TENDER

DATE MARK ISSUE

STAMP

SCALE 1:20
DRAWN BY: SAC
CHECKED BY: SMM
REVIEWED BY:
APPROVED BY:
AS-BUILT CHECK
DATE: 08 APR 2016

PROJECT
BEAUFORT SCHOOL RENOVATION

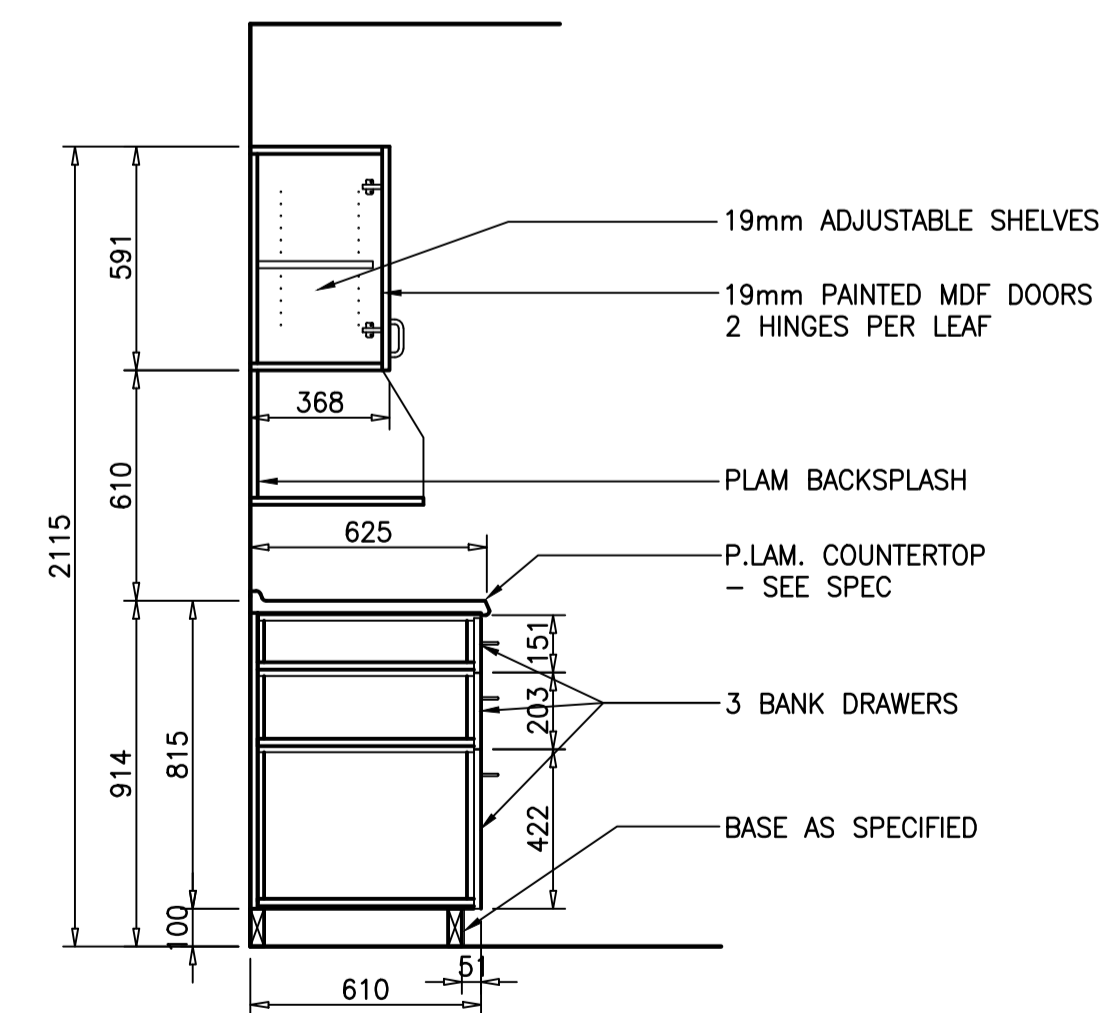
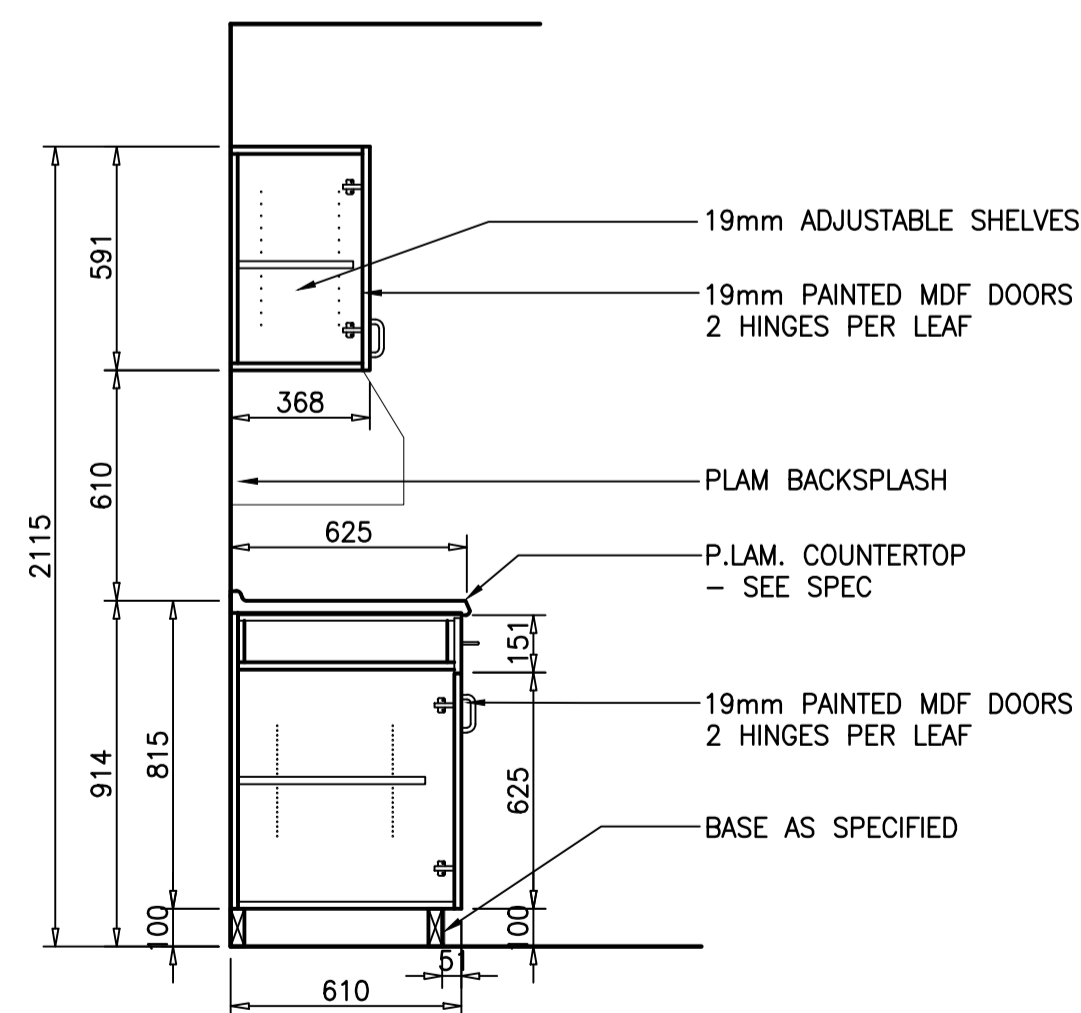
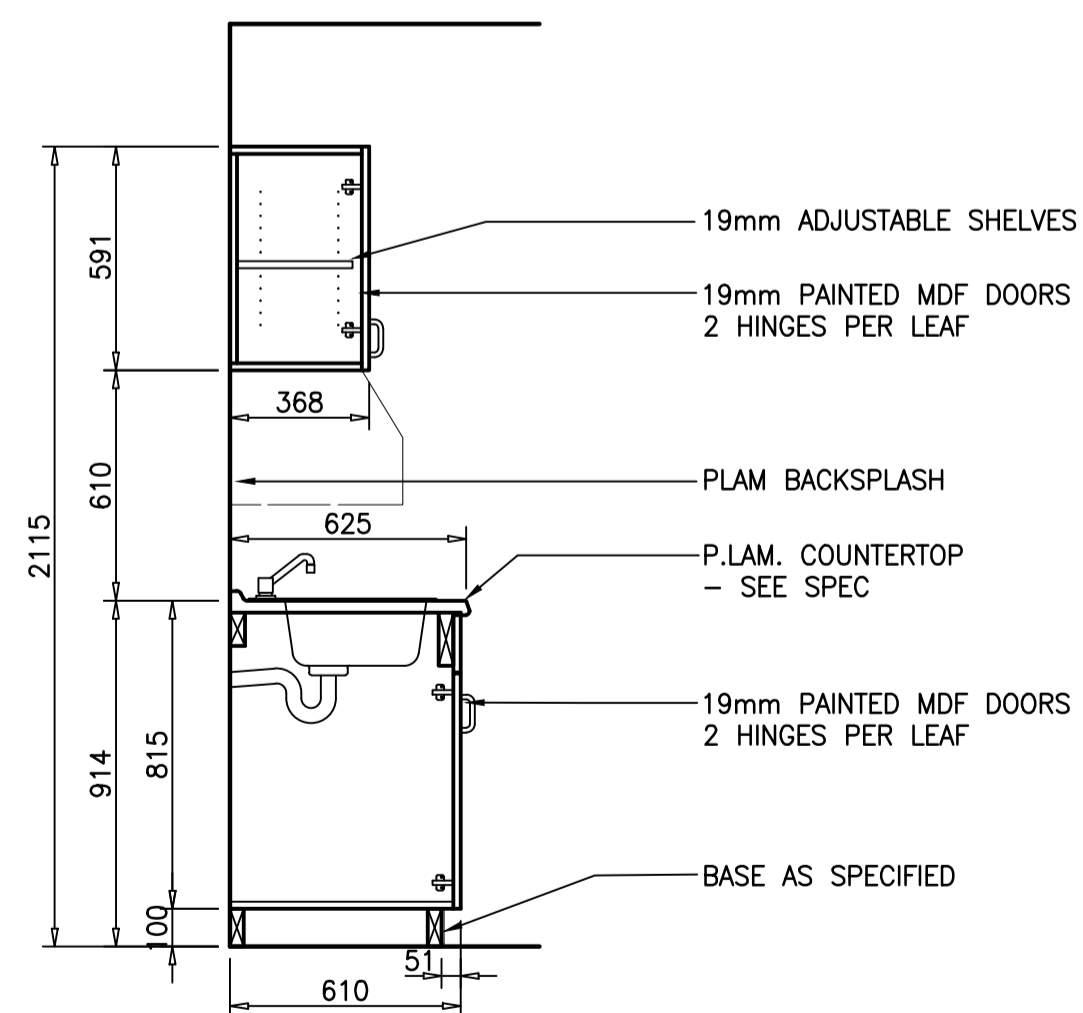
HALIFAX, NOVA SCOTIA
PROJECT NO.: HRSB #3820

SHEET TITLE
CASEWORK DETAILS

INTERNAL NO.: 2015-120

A-8

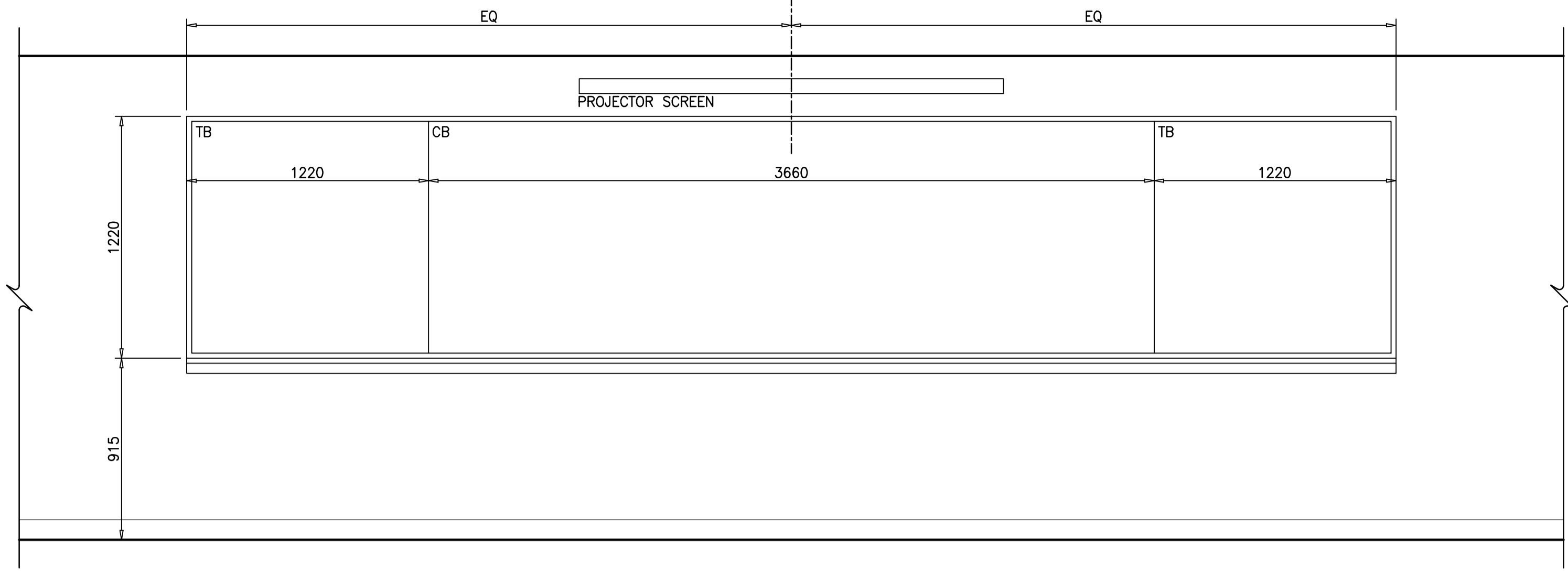
SHEET - OF -



4 SECTION - SINK CABINET STAFFRM. 212
A-8 SCALE: 1:20

5 SECTION - TYPICAL CABINET AND DRAWER STAFFRM. 212
A-8 SCALE: 1:20

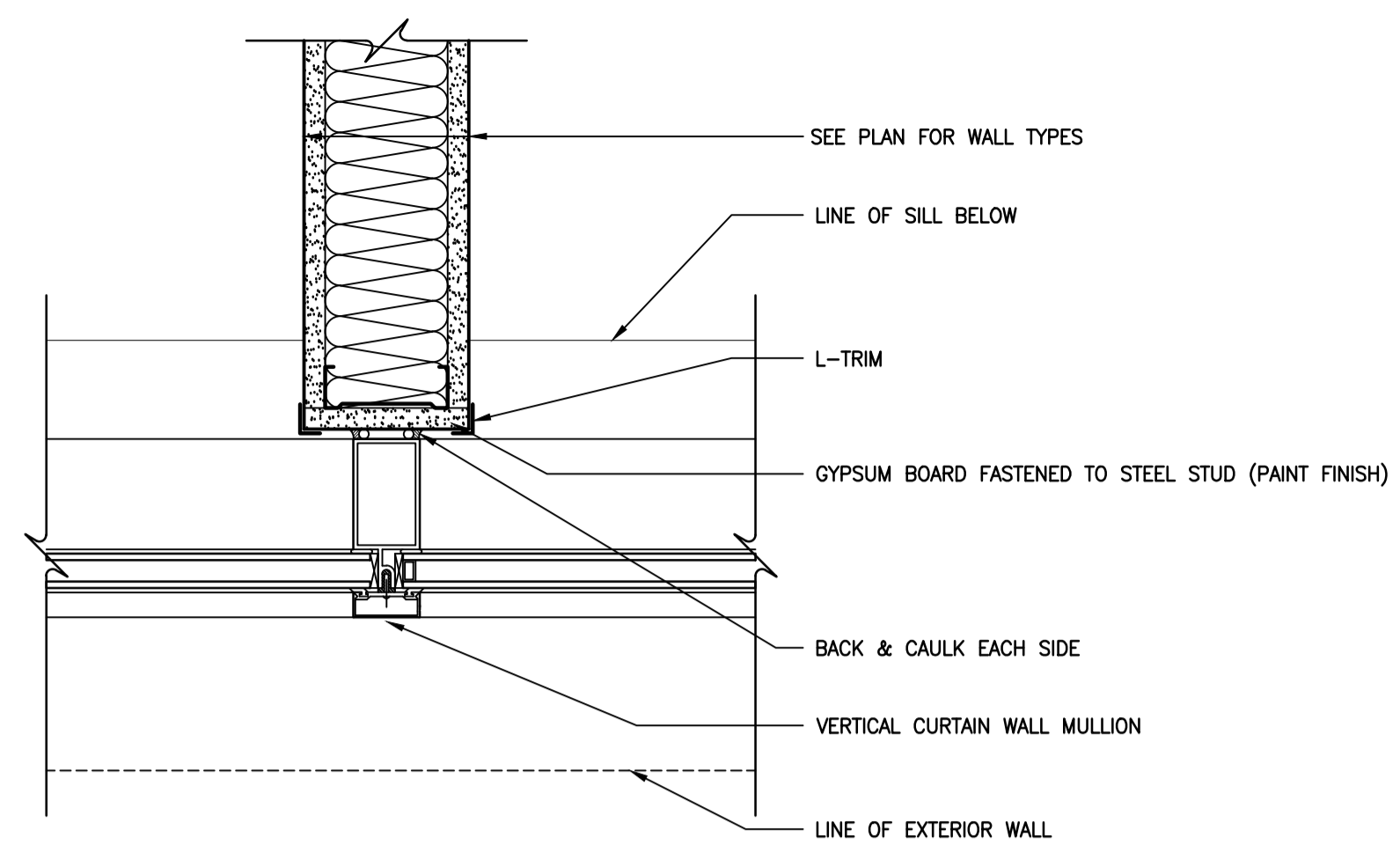
6 SECTION - BANK DRAWERS STAFFRM. 212
A-8 SCALE: 1:20



1
ELEVATION
TYPICAL CLASSROOM FRONT ELEVATION

1
A-9

SCALE: 1:20



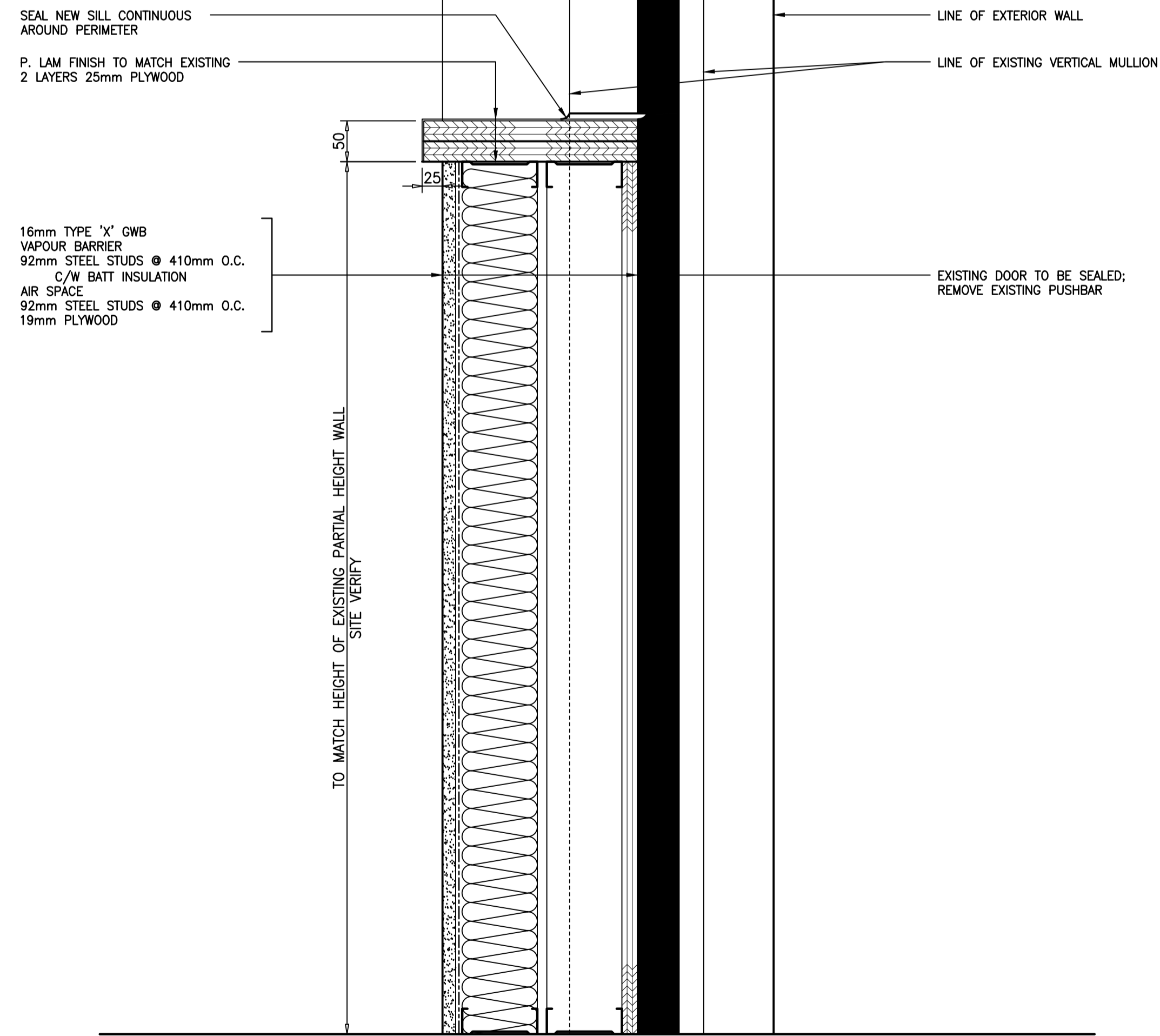
2
PLAN DETAIL
PARTITION AT EXISTING MULLION

2
A-9

SCALE: 1:5

COMMUNICATION/TACK BOARDS

CB COMMUNICATION BOARD 12'-0"W x 4'-0"H
TB TACK BOARD 4'-0"W x 4'-0"H



3
SECTION DETAIL
PARTIAL HEIGHT WALL AT EXISTING DOOR

3
A-9

SCALE: 1:5

KEY PLAN

LOGO

F B FOWLER
BAULD &
MITCHELL
architecture

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GRAPHIC SCALE

08 APR 2016	ISSUED FOR TENDER
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SCALE	1:5
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APPROVED BY:	
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DATE:	08 APR 2016

PROJECT
BEAUFORT SCHOOL
RENOVATION

HALIFAX, NOVA SCOTIA
PROJECT NO.: HRSB #3820

SHEET TITLE
MISCELLANEOUS
DETAILS

INTERNAL NO.: 2015-120

A-9

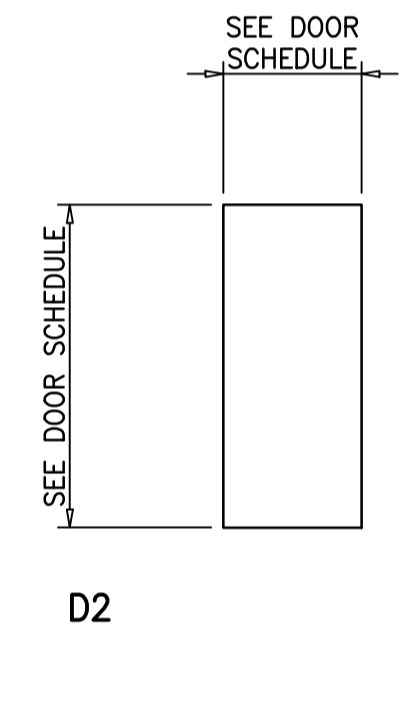
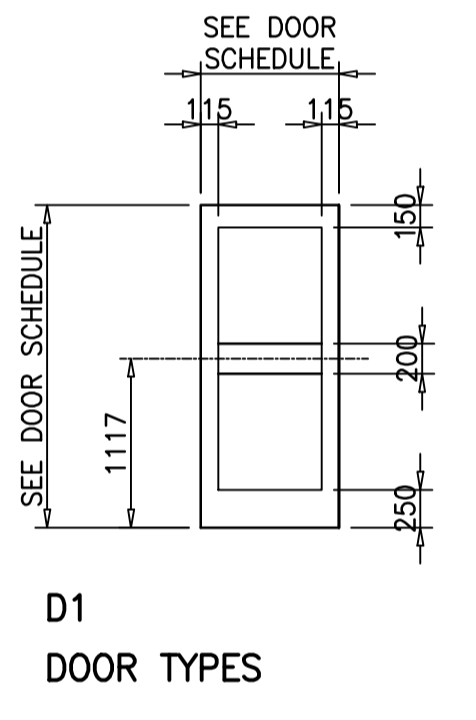
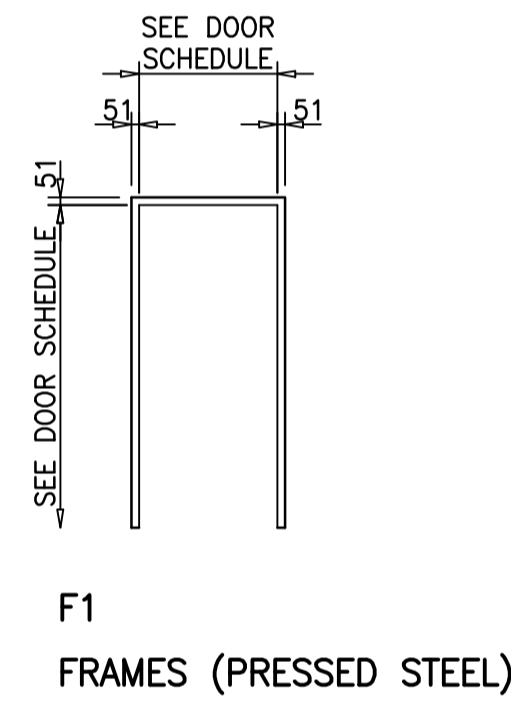
SHEET - OF -

No.	Size	Door			Frame				Fire Rating	Glass	Schedule Notes	Hardware Set
		Type	Mat'l	Finish	Type	Mat'l	Finish	Throat				
A-008.3	2x915	D2(2)	HM	P	1	PS	P			NEW DOOR AND HARDWARE	H-1	
103.1	Existing									Existing Door - New Hardware	H-2	
106.1	Existing									Existing Door - New Hardware	H-2	
112A.1	Existing									Use Salvaged Door & Hardware (Office 123)	H-3	
112B.1	Existing									Use Salvaged Door & Hardware (Office 124)	H-3	
125.1	Existing									Use Salvaged Door & Hardware (Admin 127)	H-3	
125.2	Existing									This door is being decommissioned		
126.1	Existing									Use Salvaged Door & Hardware (Training 125)	H-3	
126.2	Existing									Replace Hardware (key only)	H-4	
126.3	Existing									Replace Hardware (key only)	H-4	
130.1	2x915	D1(2)	HM	P	1	PS	P		45	NEW DOOR AND HARDWARE	H-5	
206A.1	2x1200	D2(2)	HM	P	1	PS	P			NEW DOOR AND HARDWARE	H-6	
217.1	Existing									Replace Hardware (key only)	H-4	
217.2	Existing									Use salvaged Hardware (Director 128)	H-3	
223.2	Existing									Replace Hardware (key only)	H-4	
223.3	Existing									Replace Hardware (key only)	H-4	
226.2	Existing									Replace Hardware (key only)	H-4	
226.3	Existing									Replace Hardware (key only)	H-4	

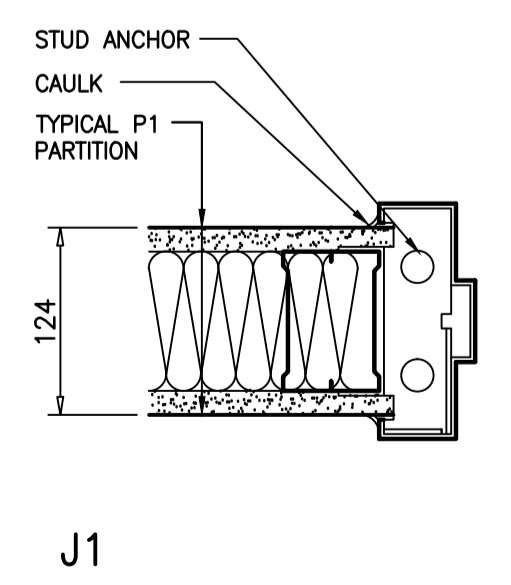
1 DOOR SCHEDULE
A-10 SCALE: 1:1

DOOR SCHEDULE LEGEND

DOOR MATERIALS HM HOLLOW METAL	DOOR FINISHS P PAINTED	FRAME MATERIALS PS PRESSED STEEL	FRAME FINISHS P PAINTED	GLAZING TYPES TG TEMPERED GLASS
--	----------------------------------	--	-----------------------------------	---



2 DOORS AND FRAMES
A-10 SCALE: 1:50



3 JAMB DETAILS
A-10 SCALE: 1:5



KEY PLAN

LOGO



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GRAPHIC SCALE

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PROJECT
BEAUFORT SCHOOL
RENOVATION

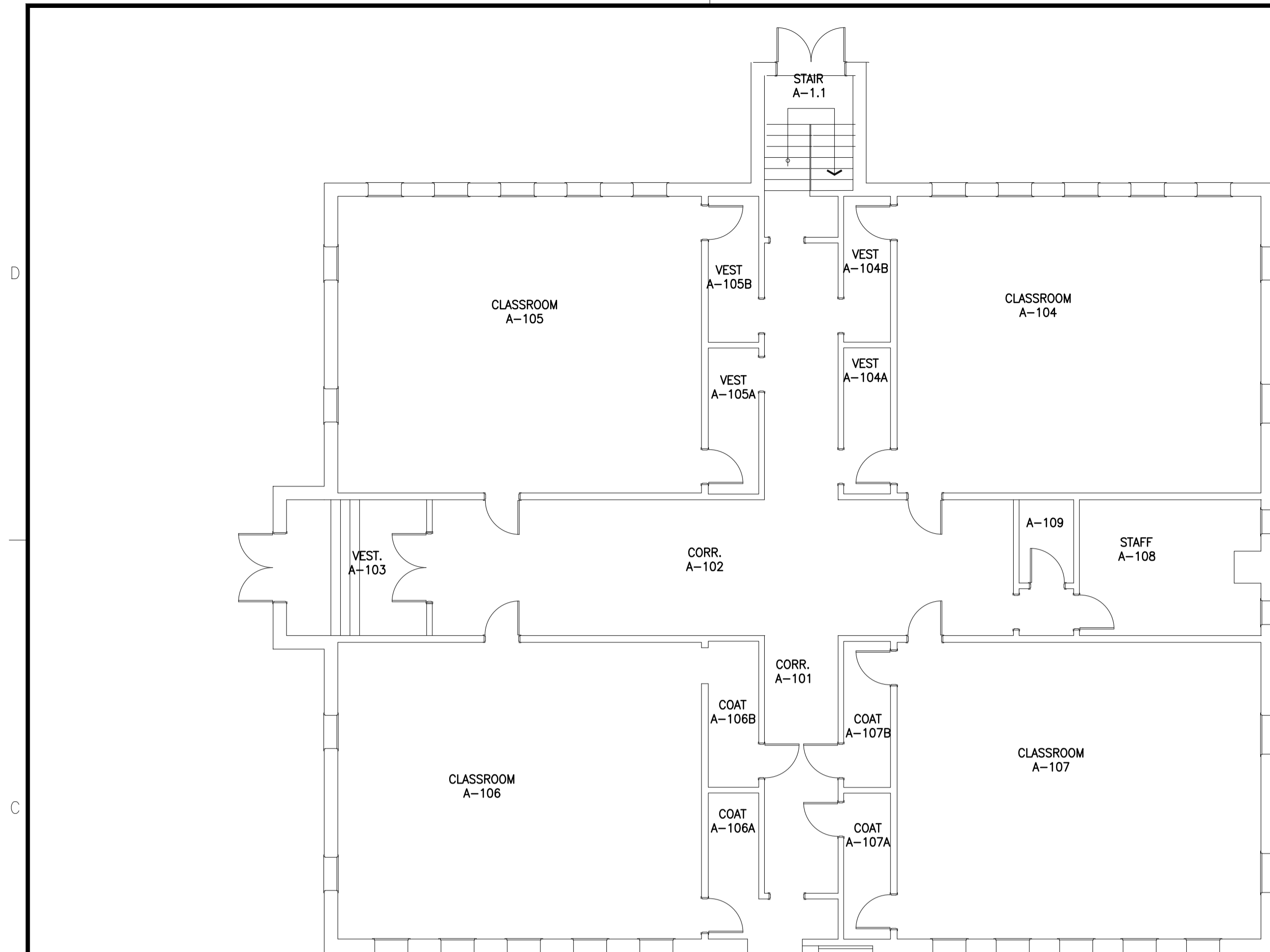
HALIFAX, NOVA SCOTIA
PROJECT NO.: HRSB #3820

SHEET TITLE
SCREENS, FRAMES,
DOORS, SCHEDULES,
AND JAMBS

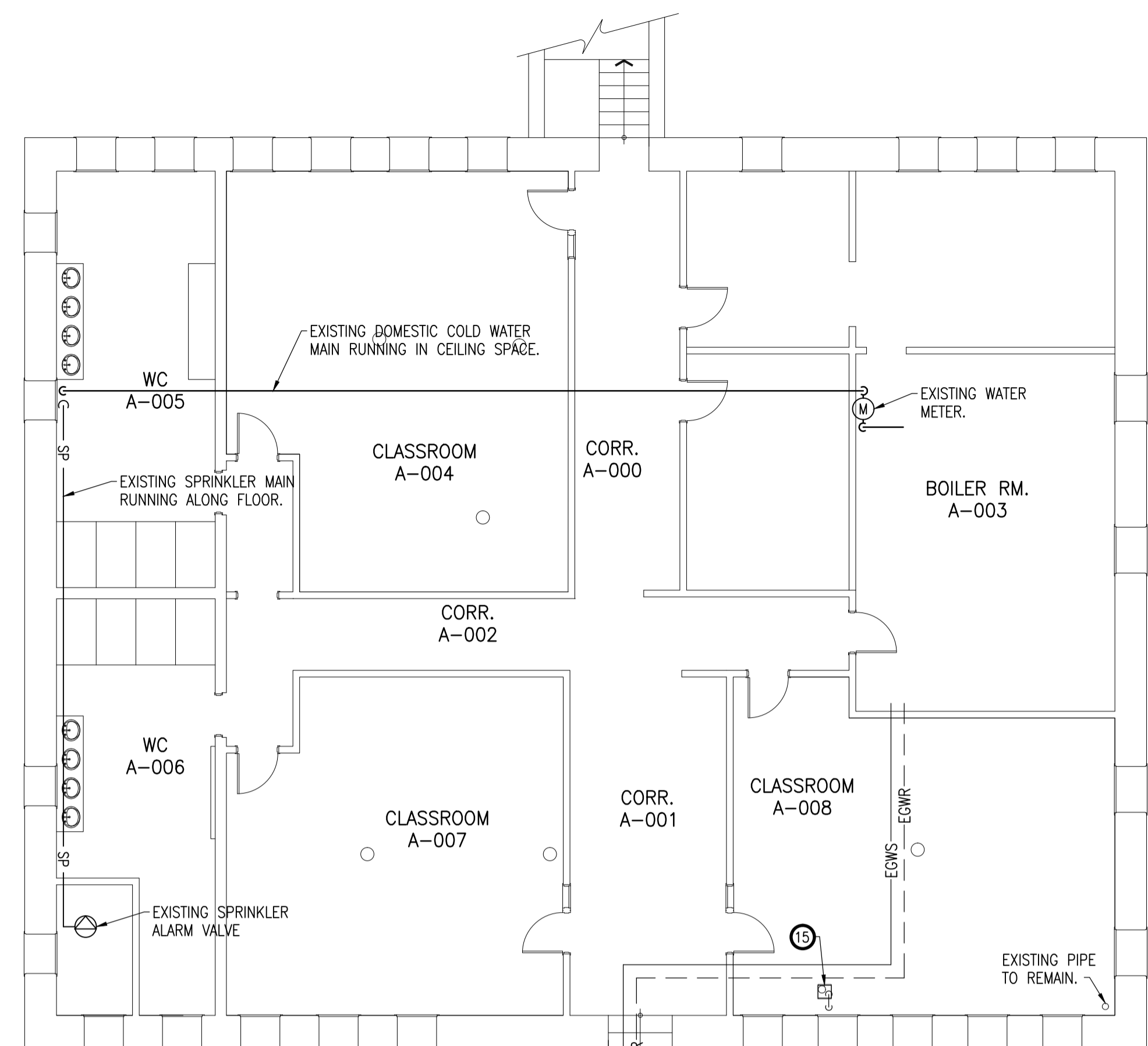
INTERNAL NO.: 2015-120

A-10

SHEET - OF -

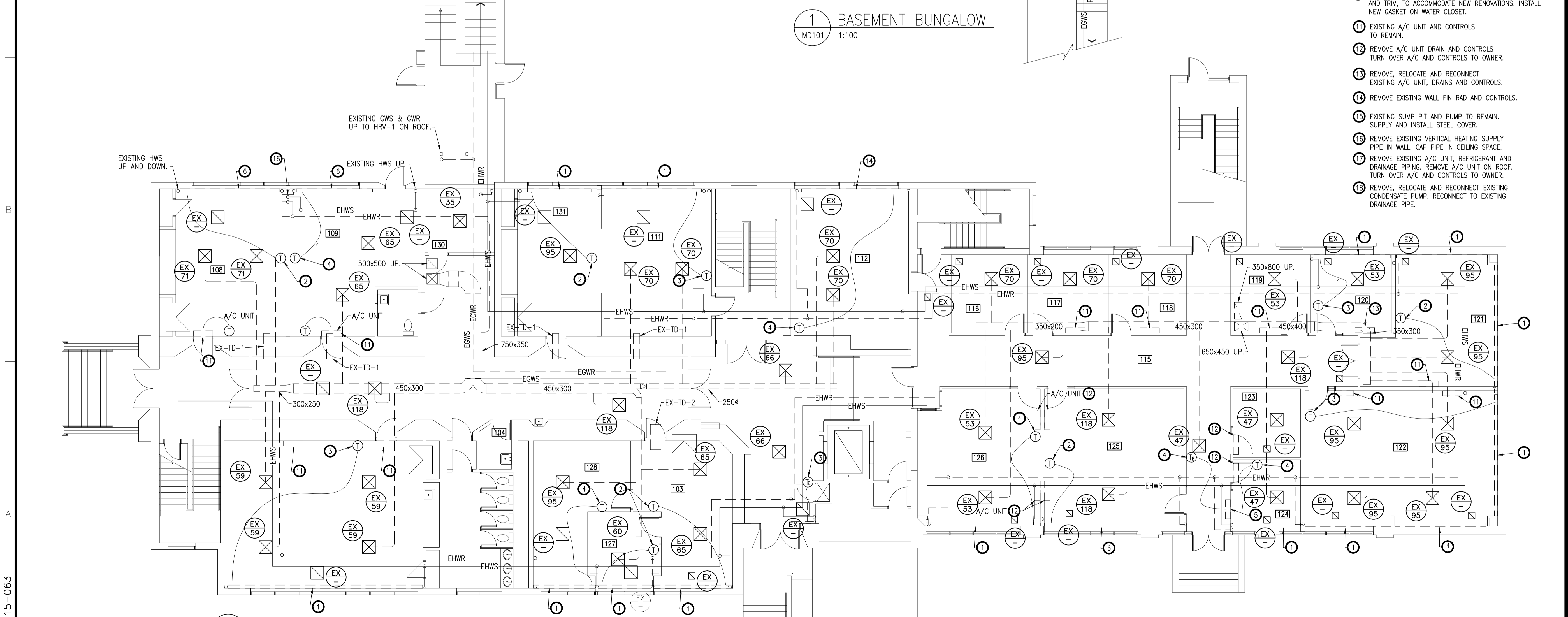


1 BASEMENT BUNGALOW
MD101 1:100



- DEMOLITION LEGEND
- EHWS — EXISTING HOT WATER HEATING SUPPLY
 - EHWR — EXISTING HOT WATER HEATING RETURN
 - EGWS — EXISTING GLYCOL WATER HEATING SUPPLY
 - EGWR — EXISTING GLYCOL WATER HEATING RETURN
 - — EXISTING DOMESTIC COLD WATER PIPE
 - — EXISTING WALL FIN RAD TO REMAIN UNLESS OTHERWISE NOTED.
 - 350x200 — EXISTING DUCTWORK TO REMAIN UNLESS OTHERWISE NOTED.
 - ⊗ EX 70 — EXISTING DIFFUSER/GRILLE TO REMAIN UNLESS OTHERWISE NOTED.
 - ⊗ REM 70 — REMOVE EXISTING DIFFUSER/GRILLE CAP DUCT AT MAIN.
 - ⊗ REL 70 — REMOVE, RELOCATE AND RECONNECT EXISTING DIFFUSER/GRILLE. EXTEND DUCT TO NEW LOCATION.
 - ⊕ — EXISTING THERMOSTAT
 - ⊕ — EXISTING ELECTRIC THERMOSTAT
 - EX-TD-2 — TRANSFER DUCT
 - RH — REHEAT COIL
 - HRV — HEAT RECOVERY VENTILATOR
 - MD — MOTORIZED DAMPER BY MECH. CONTRACTOR
 - HRV-T — DAMPER ACTUATOR BY CONTROLS CONTRACTOR
 - HEAT RECOVERY THERMOSTAT

- DEMOLITION NOTES:
- 1 EXISTING WALL FIN RADIATION, AND ALL ASSOCIATED PIPING TO REMAIN.
 - 2 REMOVE EXISTING CONTROL THERMOSTAT. EXTEND CONTROL WIRING AS REQUIRED. SEE DRAWING M-101 FOR NEW T'STAT LOCATION.
 - 3 EXISTING CONTROL THERMOSTAT TO REMAIN. SEE DRAWING M-101.
 - 4 REMOVE, RELOCATE AND RECONNECT EXISTING THERMOSTAT.
 - 5 REMOVE, RELOCATE AND RECONNECT EXISTING CABINET HEATER.
 - 6 MODIFY EXISTING HEATING ELEMENT AND ENCLOSURE TO SUIT NEW LAYOUT.
 - 7 REMOVE EXISTING PLUMBING FIXTURE AND TRIM. SEE NOTES 8 AND 9.
 - 8 REMOVE EXISTING DOMESTIC WATER PIPES. CAP AT EXISTING MAINS.
 - 9 REMOVE EXISTING SANITARY AND VENT PIPES. CAP AT EXISTING MAINS.
 - 10 REMOVE, AND REINSTALL EXISTING PLUMBING FIXTURE AND TRIM, TO ACCOMMODATE NEW RENOVATIONS. INSTALL NEW GASKET ON WATER CLOSET.
 - 11 EXISTING A/C UNIT AND CONTROLS TO REMAIN.
 - 12 REMOVE A/C UNIT DRAIN AND CONTROLS. TURN OVER A/C AND CONTROLS TO OWNER.
 - 13 REMOVE, RELOCATE AND RECONNECT EXISTING A/C UNIT, DRAINS AND CONTROLS.
 - 14 REMOVE EXISTING WALL FIN RAD AND CONTROLS.
 - 15 EXISTING SUMP PIT AND PUMP TO REMAIN. SUPPLY AND INSTALL STEEL COVER.
 - 16 REMOVE EXISTING VERTICAL HEATING SUPPLY PIPE IN WALL. CAP PIPE IN CEILING SPACE.
 - 17 REMOVE EXISTING A/C UNIT, REFRIGERANT AND DRAINAGE PIPING. REMOVE A/C UNIT ON ROOF. TURN OVER A/C AND CONTROLS TO OWNER.
 - 18 REMOVE, RELOCATE AND RECONNECT EXISTING CONDENSATE PUMP. RECONNECT TO EXISTING DRAINAGE PIPE.



1 LEVEL 1 FLOOR PLAN—MECHANICAL DEMOLITION
MD101 1:100



KEY PLAN

LOGO

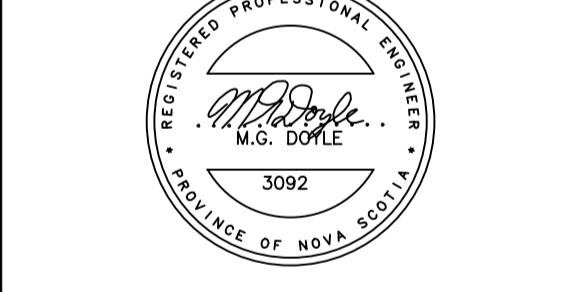


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GRAPHIC SCALE

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AS-BUILT CHECK

DATE: 08 APR 2016

PROJECT

BEAUFORT SCHOOL RENOVATION

HALIFAX, NOVA SCOTIA

PROJECT NO.: HRSB #3820

SHEET TITLE

LEVEL 1 — MECHANICAL DEMOLITION

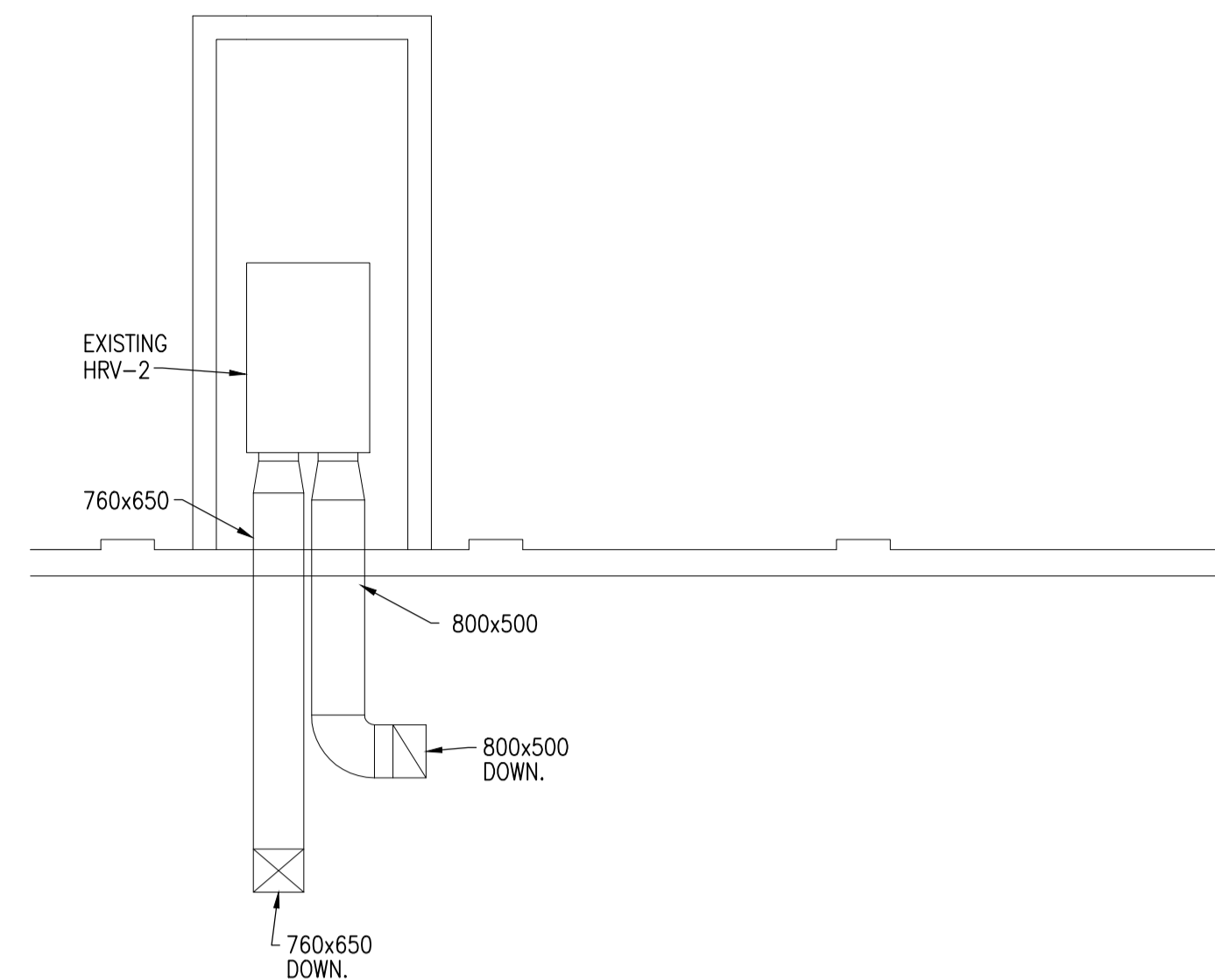
INTERNAL NO.:

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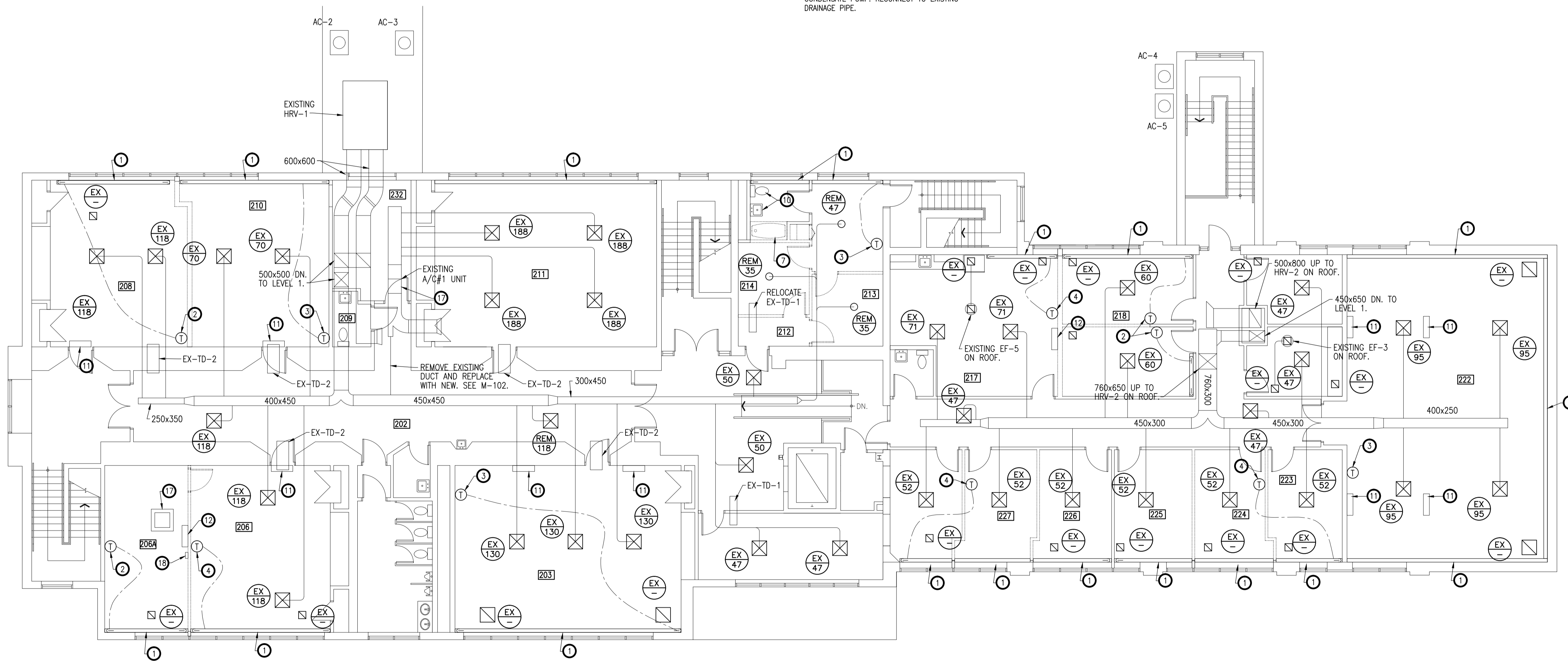
SHEET — OF —

DUMAC #15-063

- DEMOLITION NOTES:**
- 1 EXISTING WALL FIN RADIATION, AND ALL ASSOCIATED PIPING TO REMAIN.
 - 2 REMOVE EXISTING CONTROL THERMOSTAT. EXTEND CONTROL WIRING AS REQUIRED. SEE DRAWING M-101 FOR NEW T'STAT LOCATION.
 - 3 EXISTING CONTROL THERMOSTAT TO REMAIN. SEE DRAWING M-101.
 - 4 REMOVE, RELOCATE AND RECONNECT EXISTING THERMOSTAT.
 - 5 REMOVE, RELOCATE AND RECONNECT EXISTING CABINET HEATER.
 - 6 MODIFY EXISTING HEATING ELEMENT AND ENCLOSURE TO SUIT NEW LAYOUT.
 - 7 REMOVE EXISTING PLUMBING FIXTURE AND TRIM. SEE NOTES 8 AND 9.
 - 8 REMOVE EXISTING DOMESTIC WATER PIPES. CAP AT EXISTING MAINS.
 - 9 REMOVE EXISTING SANITARY AND VENT PIPES. CAP AT EXISTING MAINS.
 - 10 REMOVE, AND REINSTALL EXISTING PLUMBING FIXTURE AND TRIM, TO ACCOMMODATE NEW RENOVATIONS. INSTALL NEW GASKET ON WATER CLOSET.
 - 11 EXISTING A/C UNIT AND CONTROLS TO REMAIN.
 - 12 REMOVE A/C UNIT DRAIN AND CONTROLS. TURN OVER A/C AND CONTROLS TO OWNER.
 - 13 REMOVE, RELOCATE AND RECONNECT EXISTING A/C UNIT, DRAINS AND CONTROLS.
 - 14 REMOVE EXISTING WALL FIN RAD AND CONTROLS.
 - 15 EXISTING SUMP PIT AND PUMP TO REMAIN. SUPPLY AND INSTALL STEEL COVER.
 - 16 REMOVE EXISTING VERTICAL HEATING SUPPLY PIPE IN WALL. CAP PIPE IN CEILING SPACE.
 - 17 REMOVE EXISTING A/C UNIT, REFRIGERANT AND DRAINAGE PIPING. REMOVE A/C UNIT ON ROOF.
 - 18 REMOVE, RELOCATE AND RECONNECT EXISTING CONDENSATE PUMP. RECONNECT TO EXISTING DRAINAGE PIPE.



2 PARTIAL ROOF PLAN-MECHANICAL
MD102 1:100



1 LEVEL 2 FLOOR PLAN-MECHANICAL
MD102 1:100

GRAPHIC SCALE

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PROJECT
BEAUFORT SCHOOL
RENOVATION

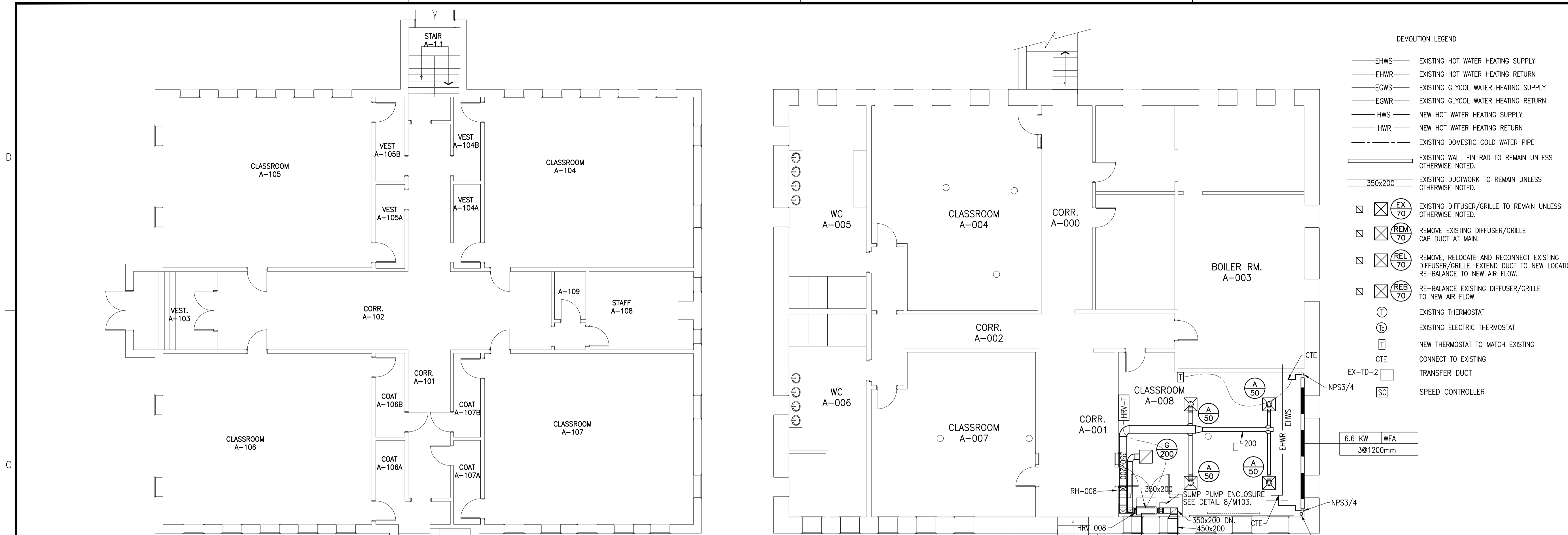
HALIFAX, NOVA SCOTIA
PROJECT NO.: HRSB #3820

SHEET TITLE
LEVEL 2 -
MECHANICAL
DEMOLITION

INTERNAL NO.:

MD102

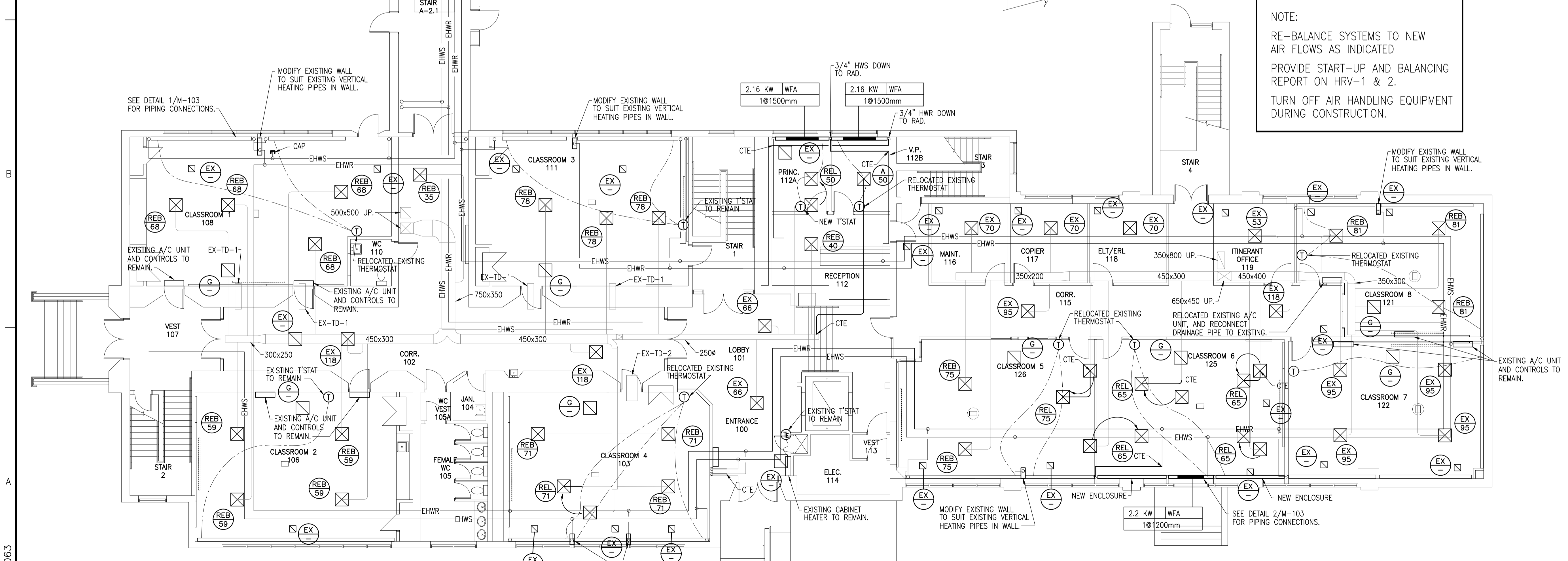
SHEET - OF -



2 BASEMENT BUNGALOW
M101 1:100

- DEMOLITION LEGEND
- EHWS — EXISTING HOT WATER HEATING SUPPLY
 - EHWR — EXISTING HOT WATER HEATING RETURN
 - EGWS — EXISTING GLYCOL WATER HEATING SUPPLY
 - EGWR — EXISTING GLYCOL WATER HEATING RETURN
 - HWS — NEW HOT WATER HEATING SUPPLY
 - HWR — NEW HOT WATER HEATING RETURN
 - — — EXISTING DOMESTIC COLD WATER PIPE
 - — — EXISTING WALL FIN RAD TO REMAIN UNLESS OTHERWISE NOTED.
 - 350x200 — EXISTING DUCTWORK TO REMAIN UNLESS OTHERWISE NOTED.
 - ⊗ EX 70 — EXISTING DIFFUSER/GRILLE TO REMAIN UNLESS OTHERWISE NOTED.
 - ⊗ REM 70 — REMOVE EXISTING DIFFUSER/GRILLE CAP DUCT AT MAIN.
 - ⊗ REL 70 — REMOVE, RELOCATE AND RECONNECT EXISTING DIFFUSER/GRILLE. EXTEND DUCT TO NEW LOCATION. RE-BALANCE TO NEW AIR FLOW.
 - ⊗ REB 70 — RE-BALANCE EXISTING DIFFUSER/GRILLE TO NEW AIR FLOW.
 - ⊕ — EXISTING THERMOSTAT
 - ⊕ — EXISTING ELECTRIC THERMOSTAT
 - ⊕ — NEW THERMOSTAT TO MATCH EXISTING
 - CTE — CONNECT TO EXISTING
 - EX-TD-2 — TRANSFER DUCT
 - SC — SPEED CONTROLLER

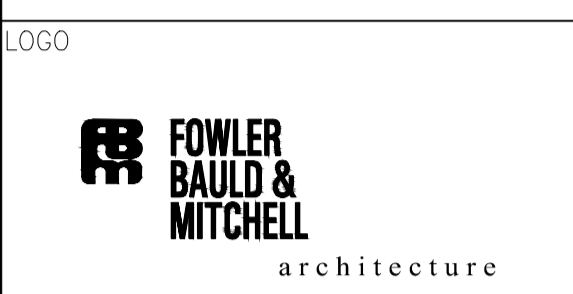
NOTE:
RE-BALANCE SYSTEMS TO NEW AIR FLOWS AS INDICATED
PROVIDE START-UP AND BALANCING REPORT ON HRV-1 & 2.
TURN OFF AIR HANDLING EQUIPMENT DURING CONSTRUCTION.



1 LEVEL 1 FLOOR PLAN-MECHANICAL
M101 1:100



KEY PLAN



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PROJECT
BEAUFORT SCHOOL
RENOVATION

HALIFAX, NOVA SCOTIA
PROJECT NO.: HRSB #3820

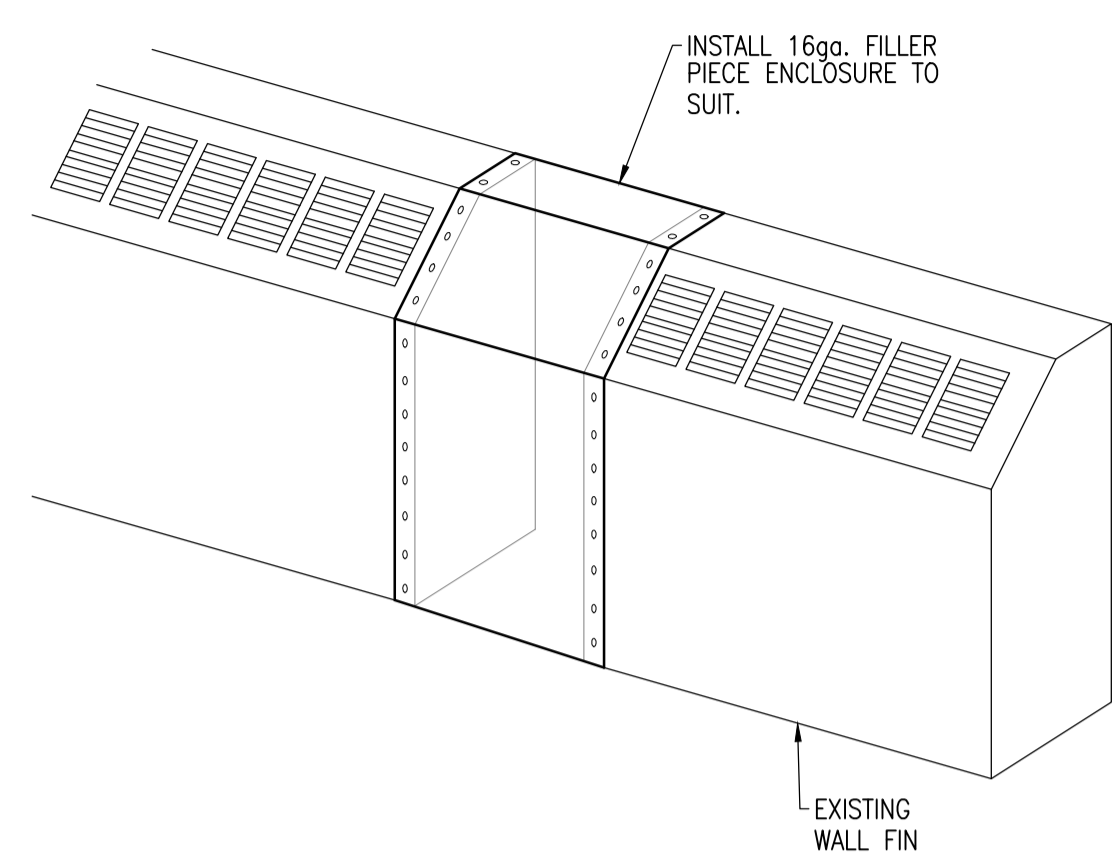
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LEVEL 1 -
MECHANICAL

INTERNAL NO.:

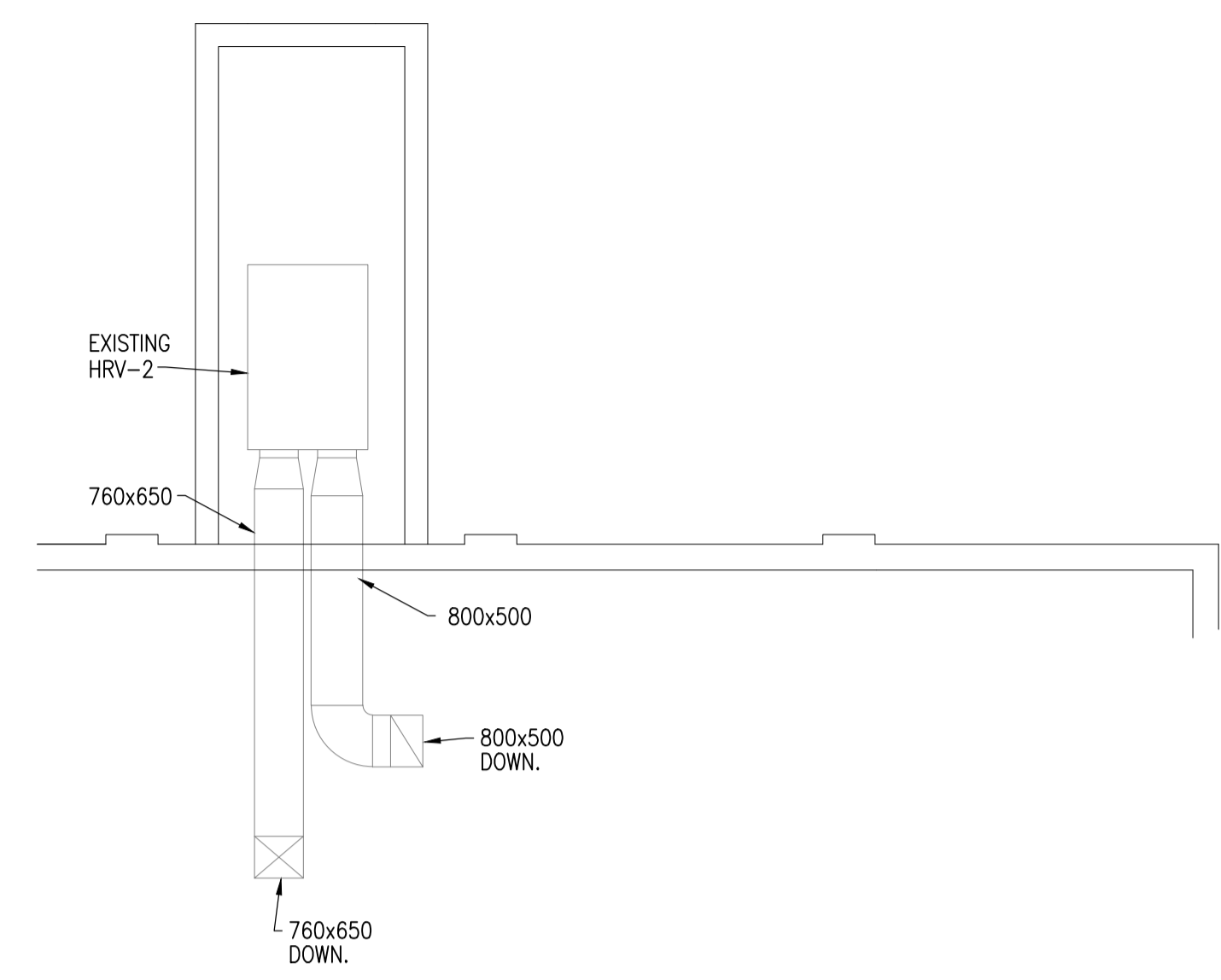
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SHEET - OF -

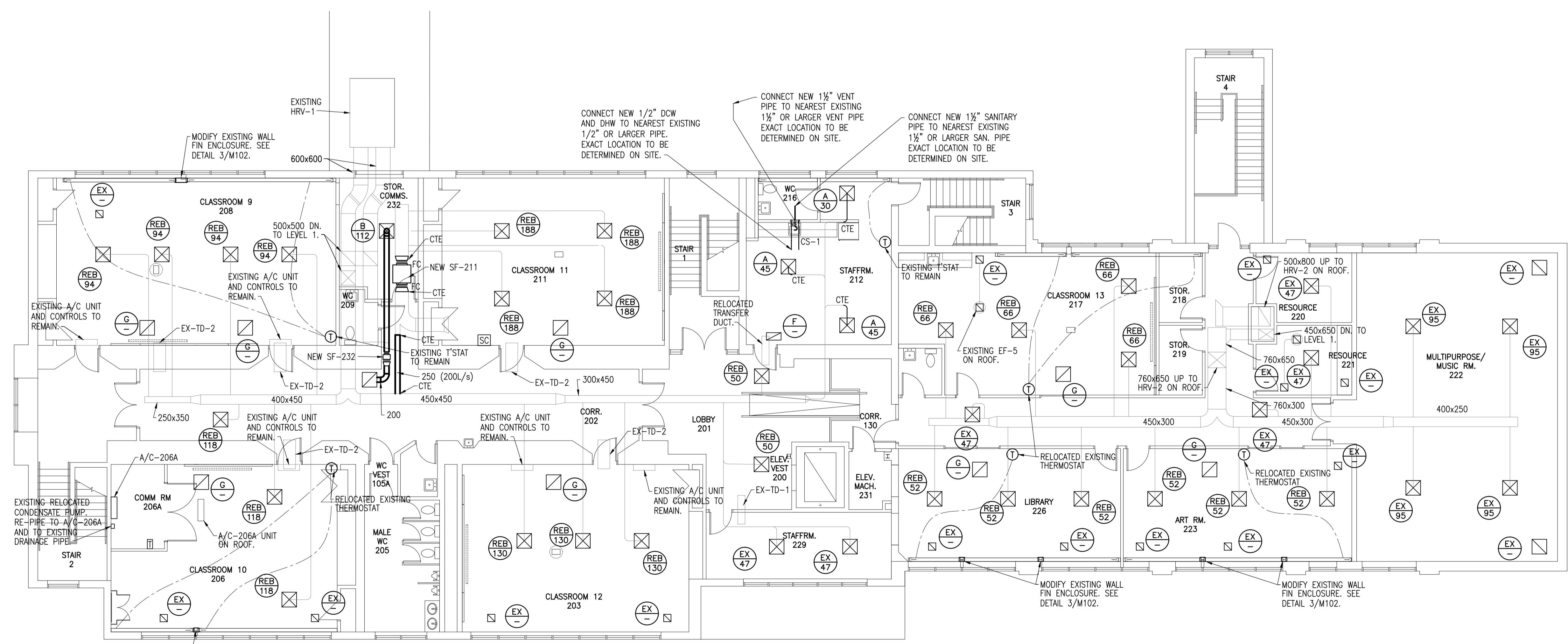
DUMAC #15-063



3 HEATING ENCLOSURE DETAIL
M102 NTS



2 PARTIAL ROOF PLAN-MECHANICAL
M102 1:100

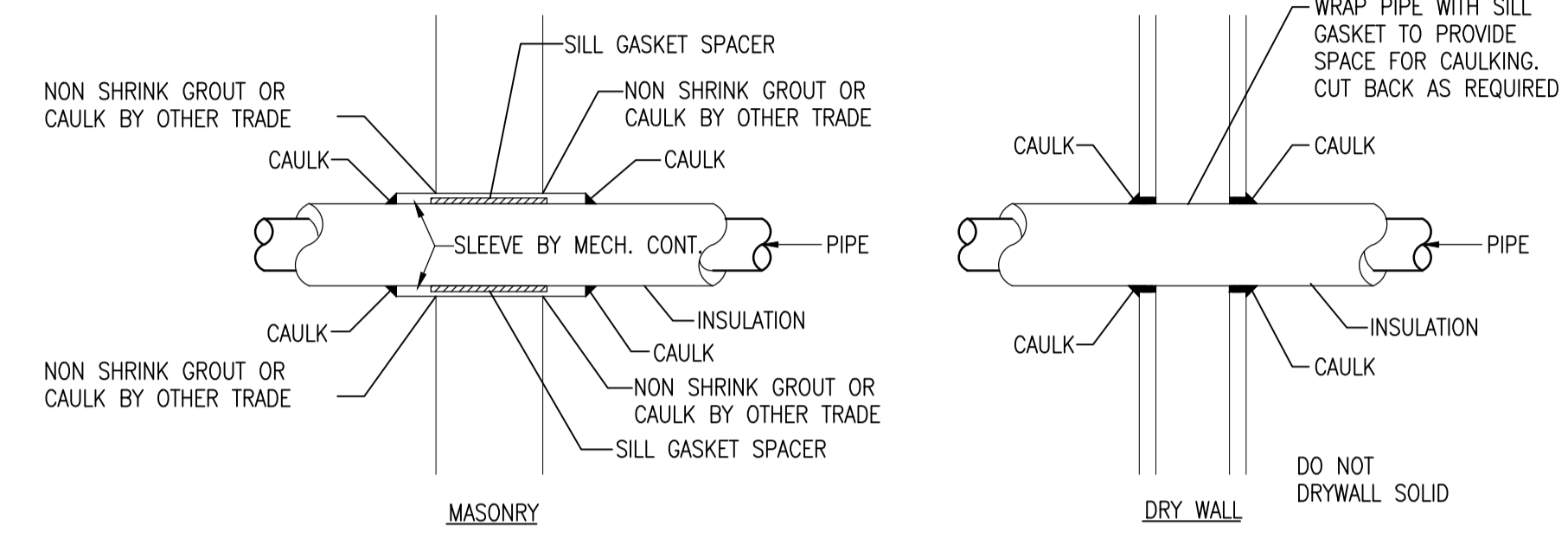


1 LEVEL 2 FLOOR PLAN-MECHANICAL
M102 1:100

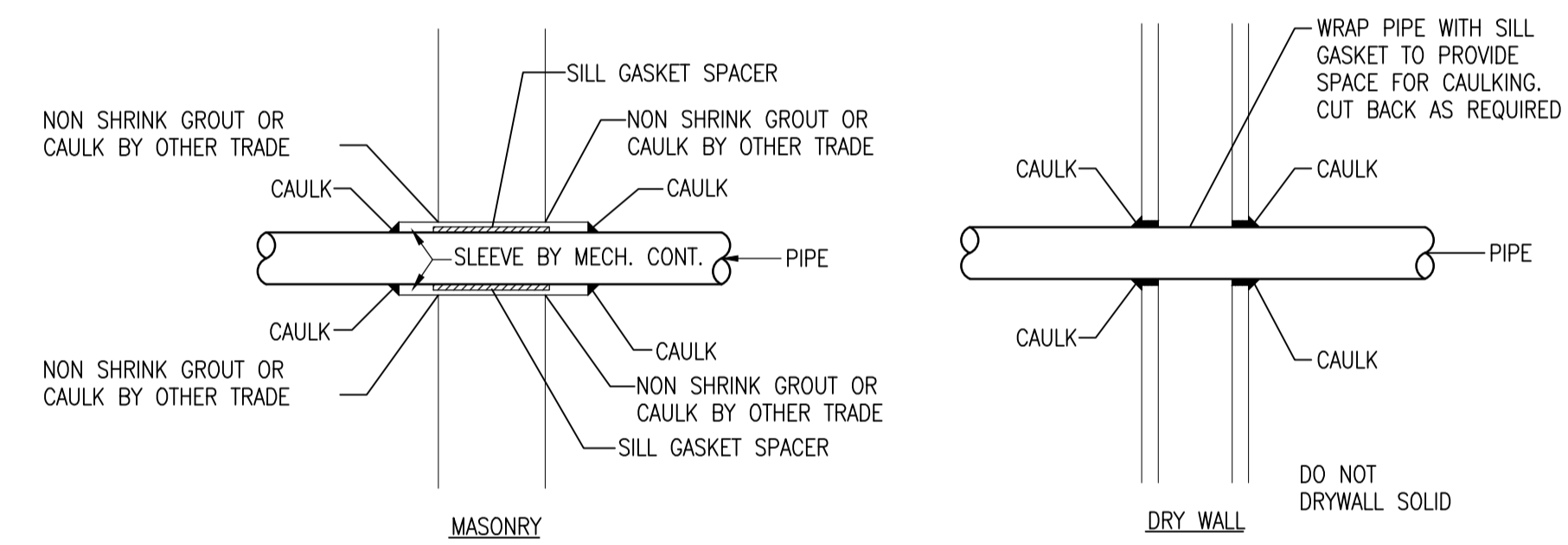
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5 TYPICAL PIPE IDENTIFICATION
M103 NTS

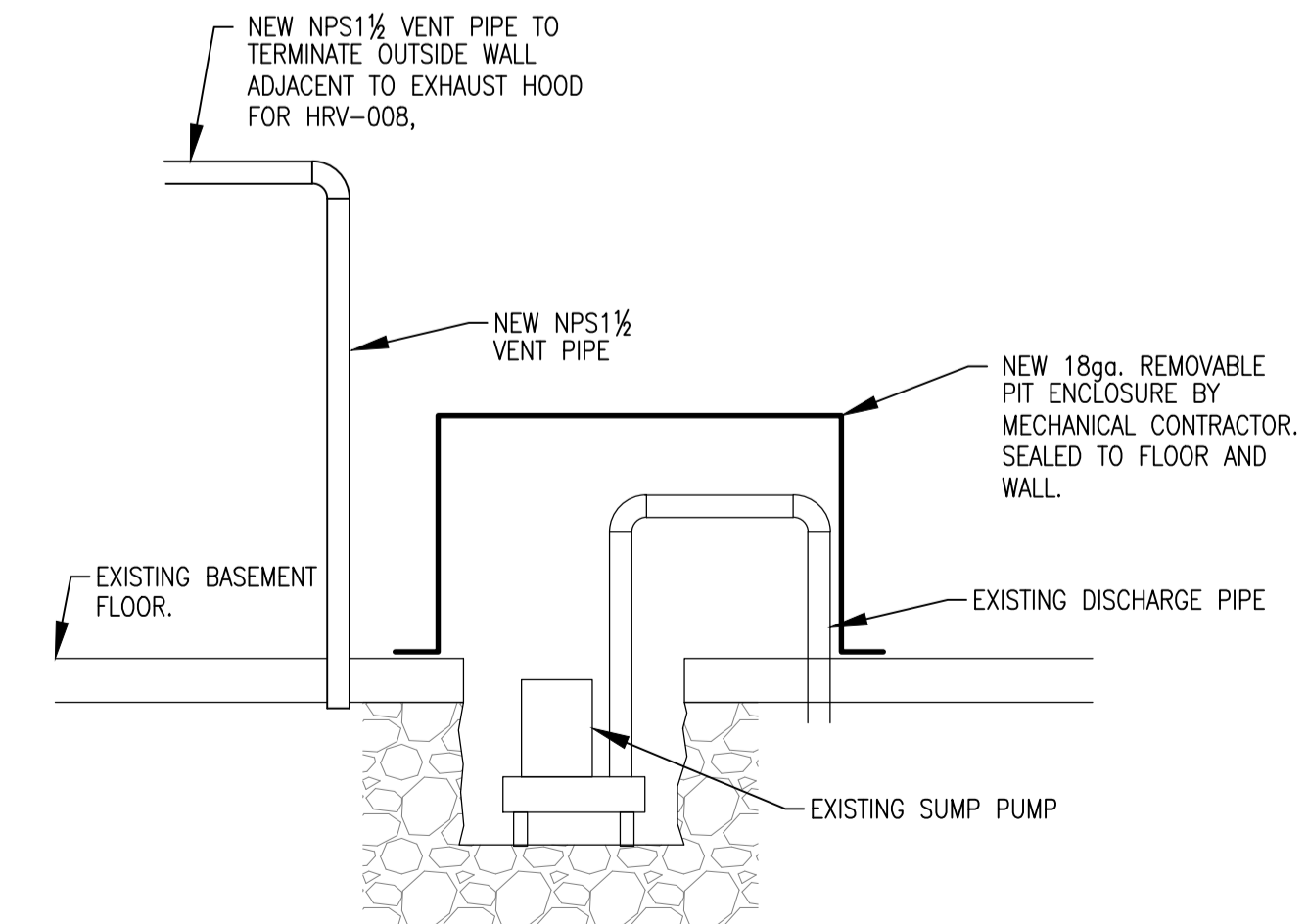


6 INSULATED PIPE THRU UNRATED PARTITION
M103 NTS

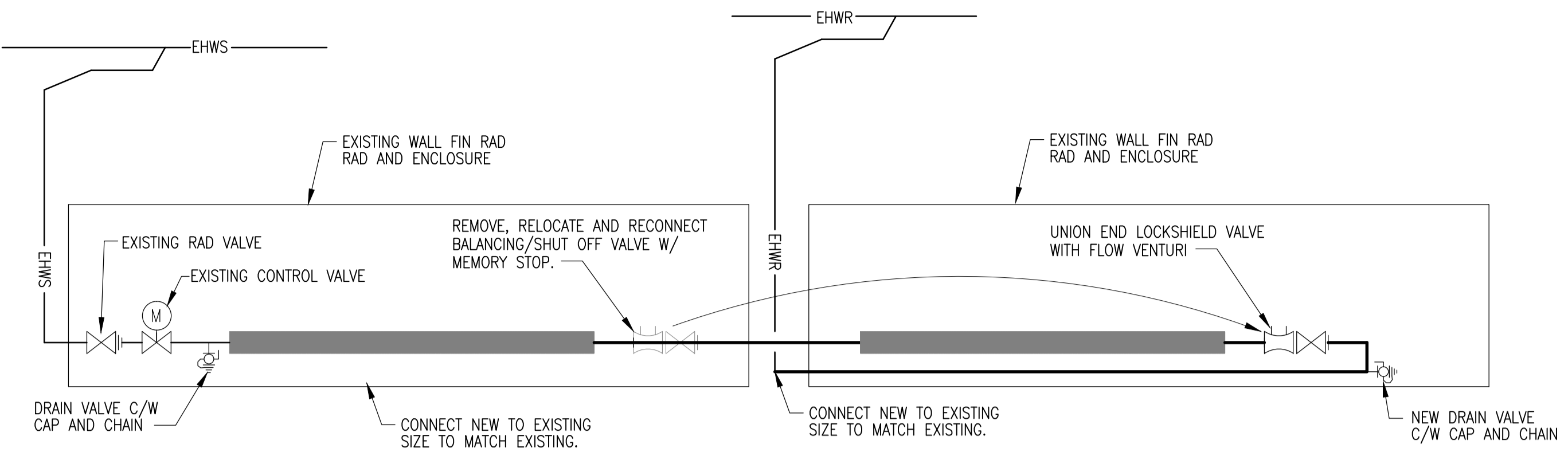


7 UNINSULATED PIPE THRU UNRATED PARTITION
M103 NTS

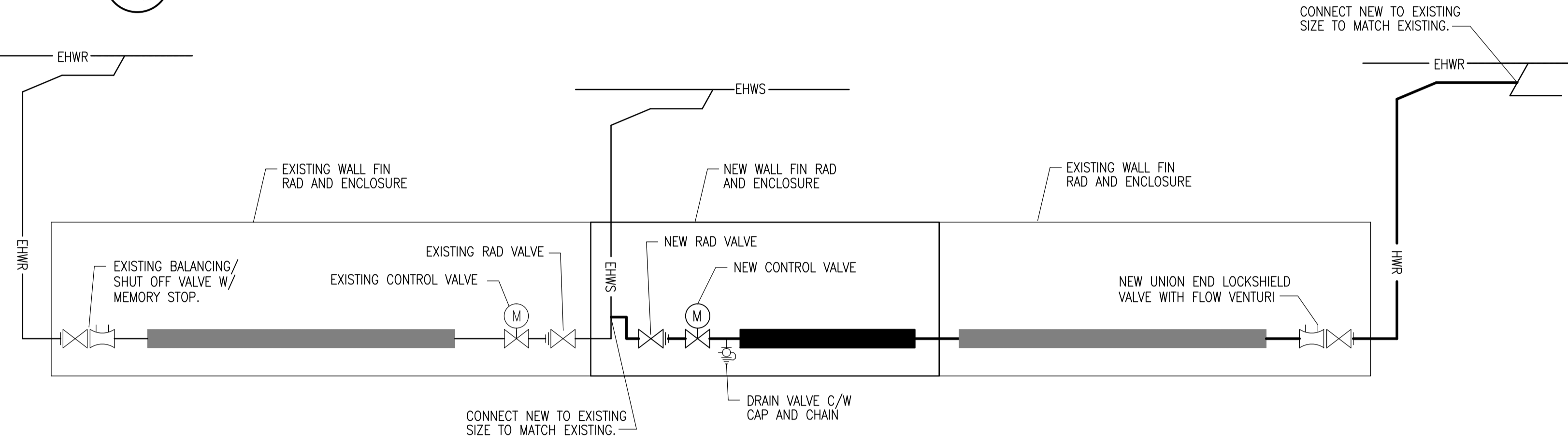
HEATING SCHEDULE							
SYMBOL	STANDARD OF ACCEPTANCE		ELEMENT	CAPACITY kW	EAT °C	AWT °C	ACCESSORIES &/OR REMARKS
	MANUFACTURER	MODEL					
WFA	ENG A	WF-1A-457	1Ø32x102X102	1.44/m	18	82	



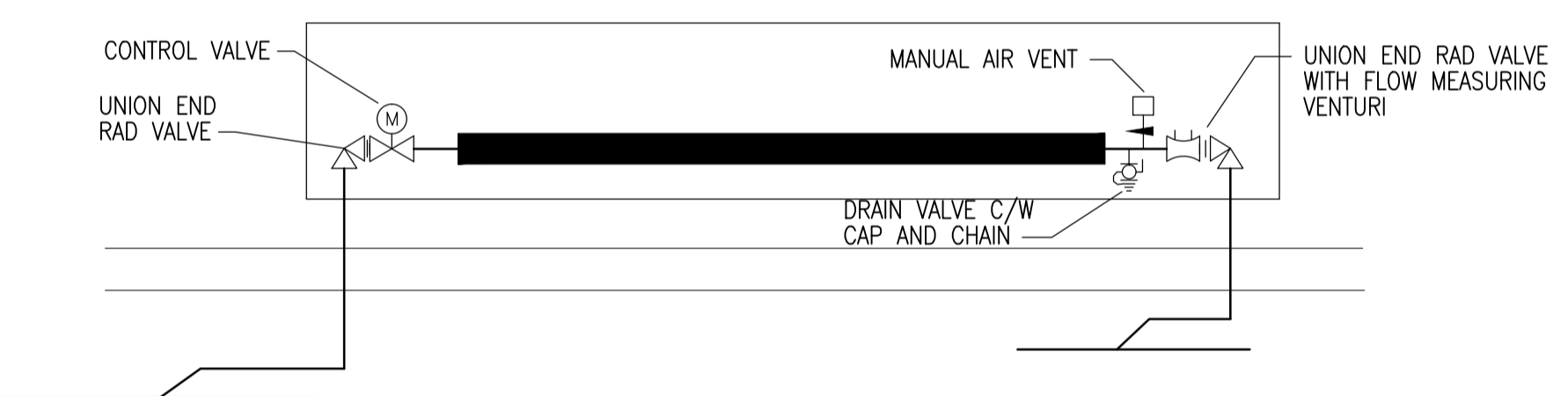
8 SUMP PIT ENCLOSURE DETAIL
M103 NTS



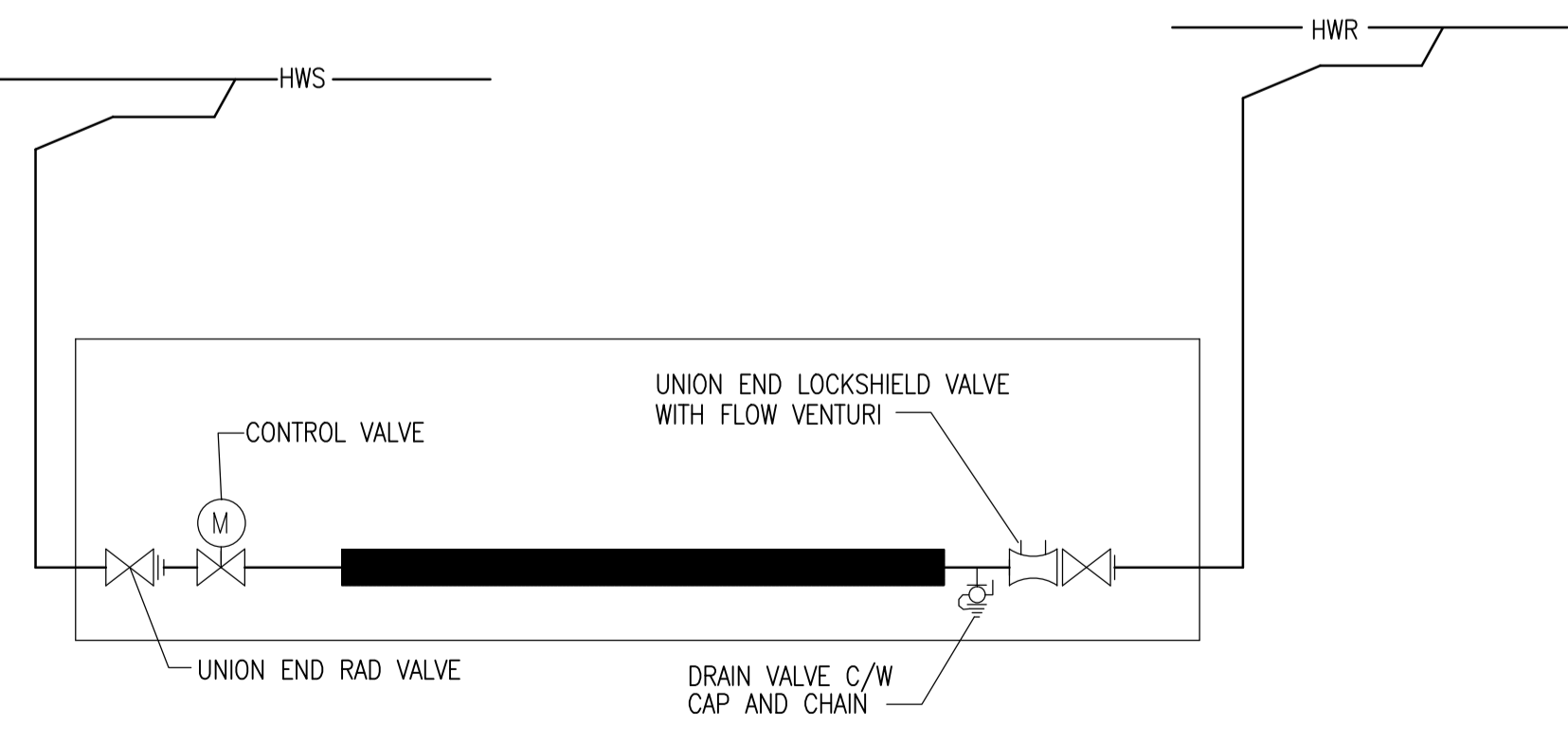
1 RADIATION SCHEMATIC - SINGLE ROW DOWN FEED
M103 NTS



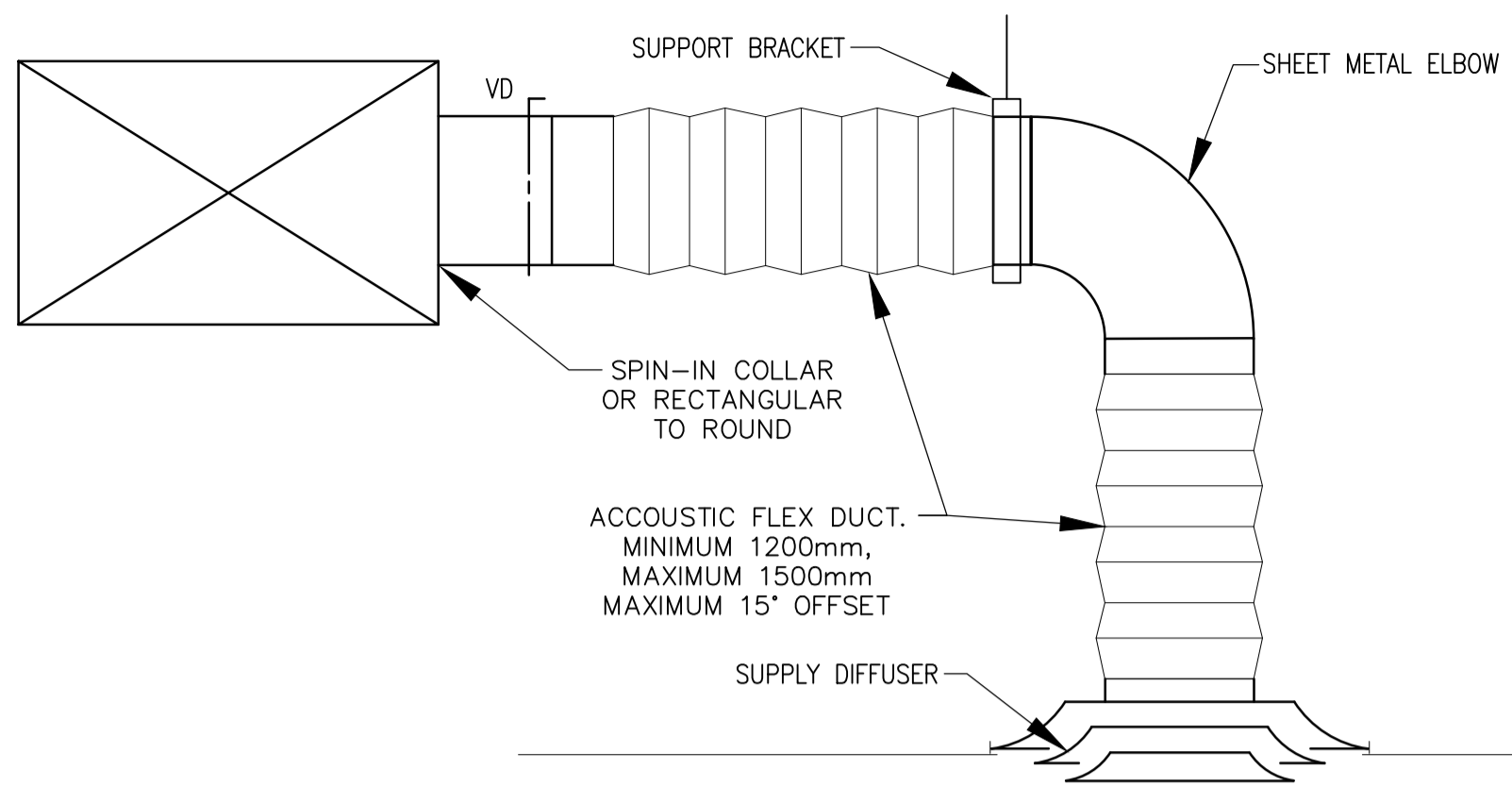
2 RADIATION SCHEMATIC - SINGLE ROW DOWN FEED
M103 NTS



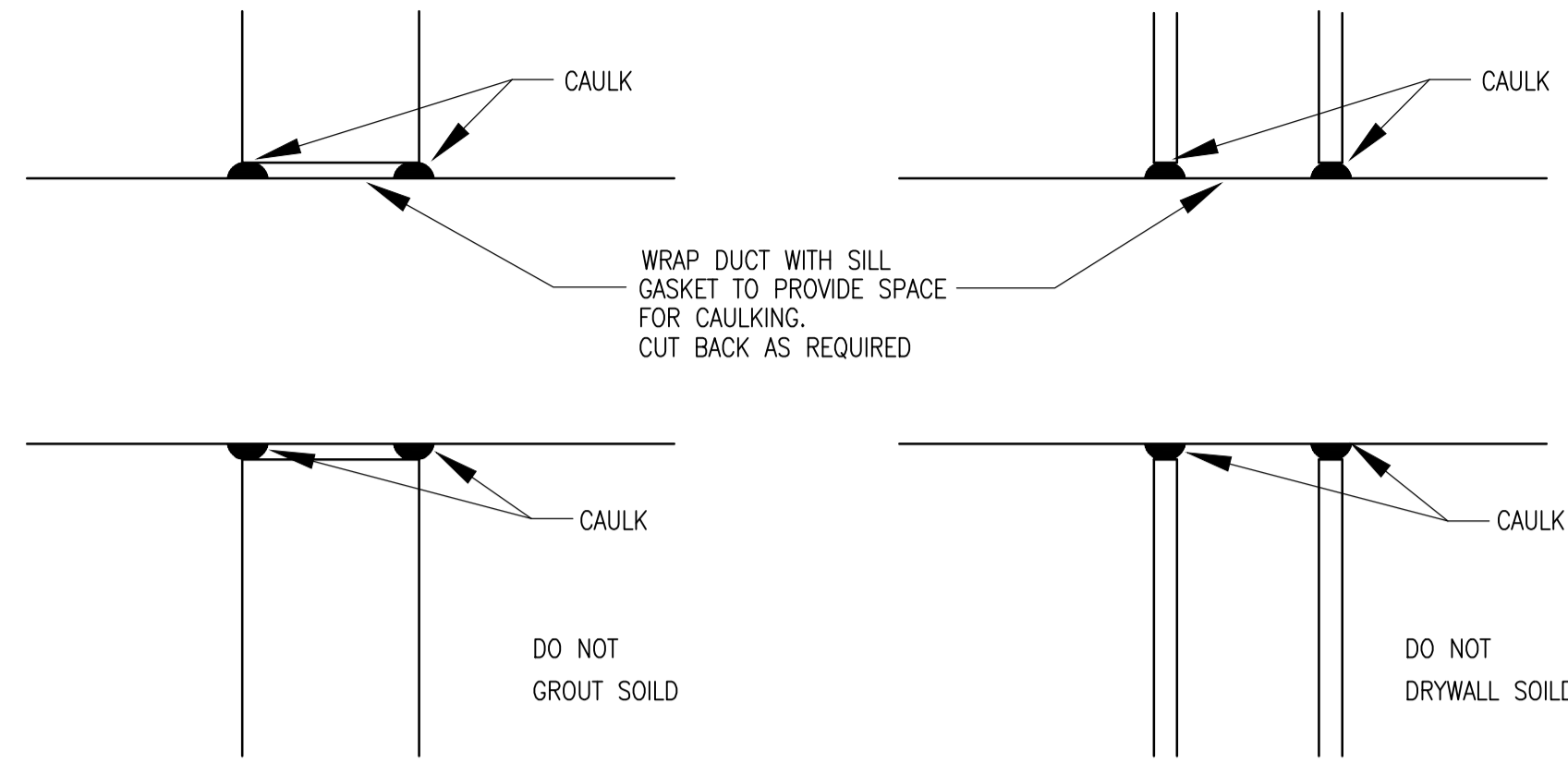
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M103 NTS



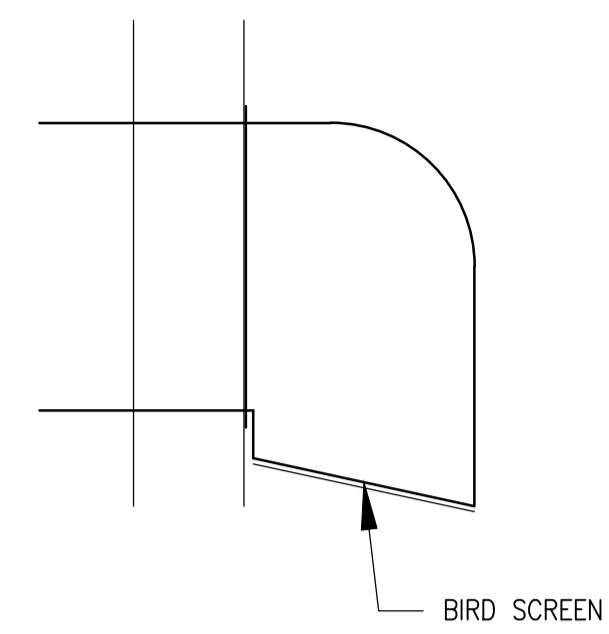
4 RADIATION SCHEMATIC - SINGLE ROW DOWN FEED
M103 NTS



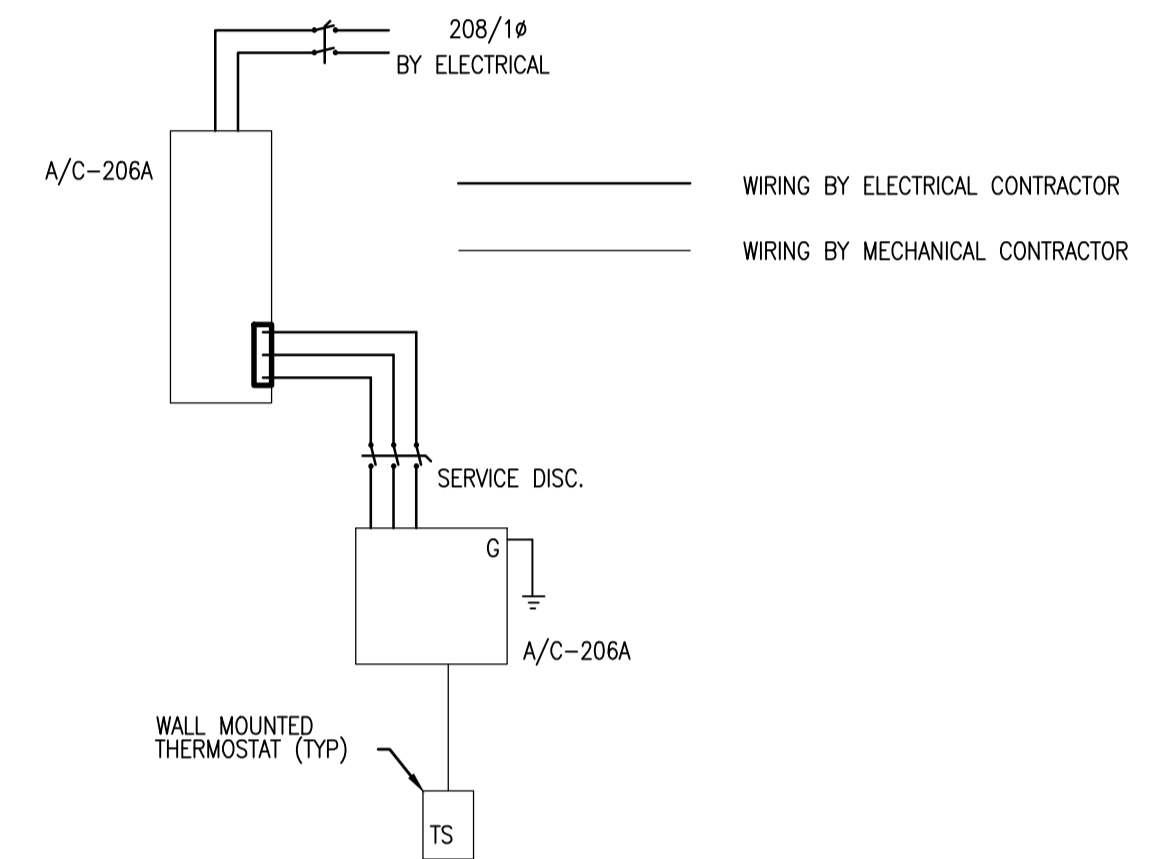
1 TYPICAL SUPPLY DIFFUSER CONNECTIONS
M104 NTS



2 DUCT IN UNRATED WALL
M104 NTS



3 INTAKE AND EXHAUST HOOD
M104 NTS



4 DUCTLESS SPLIT WIRING SCHEMATIC
M104 NTS

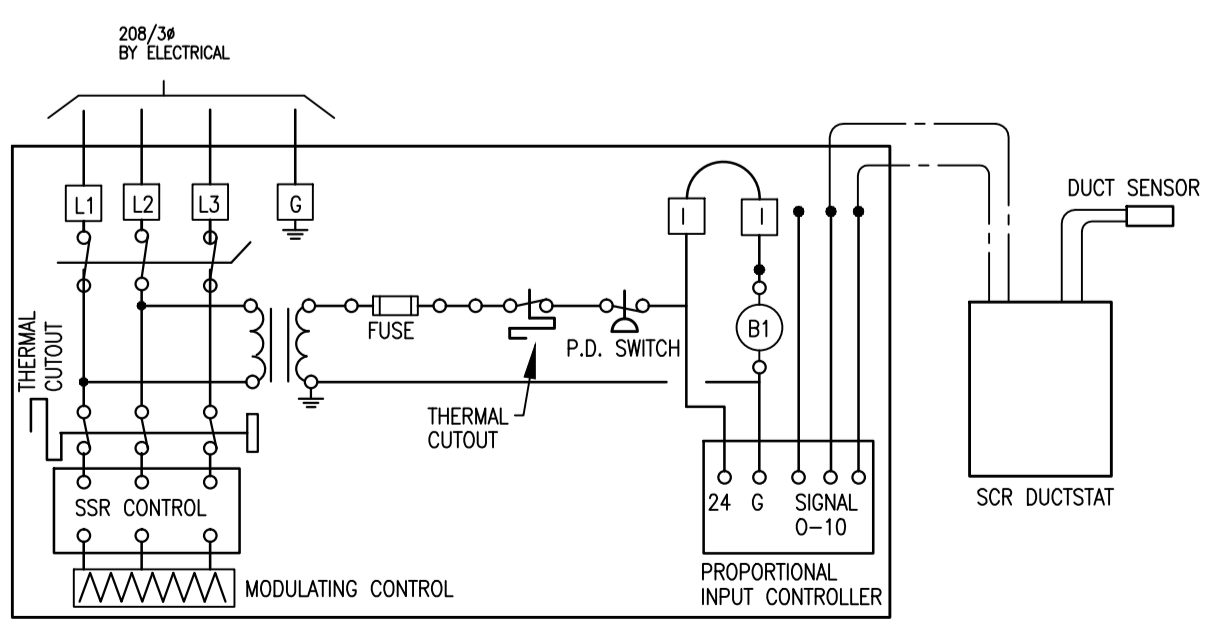
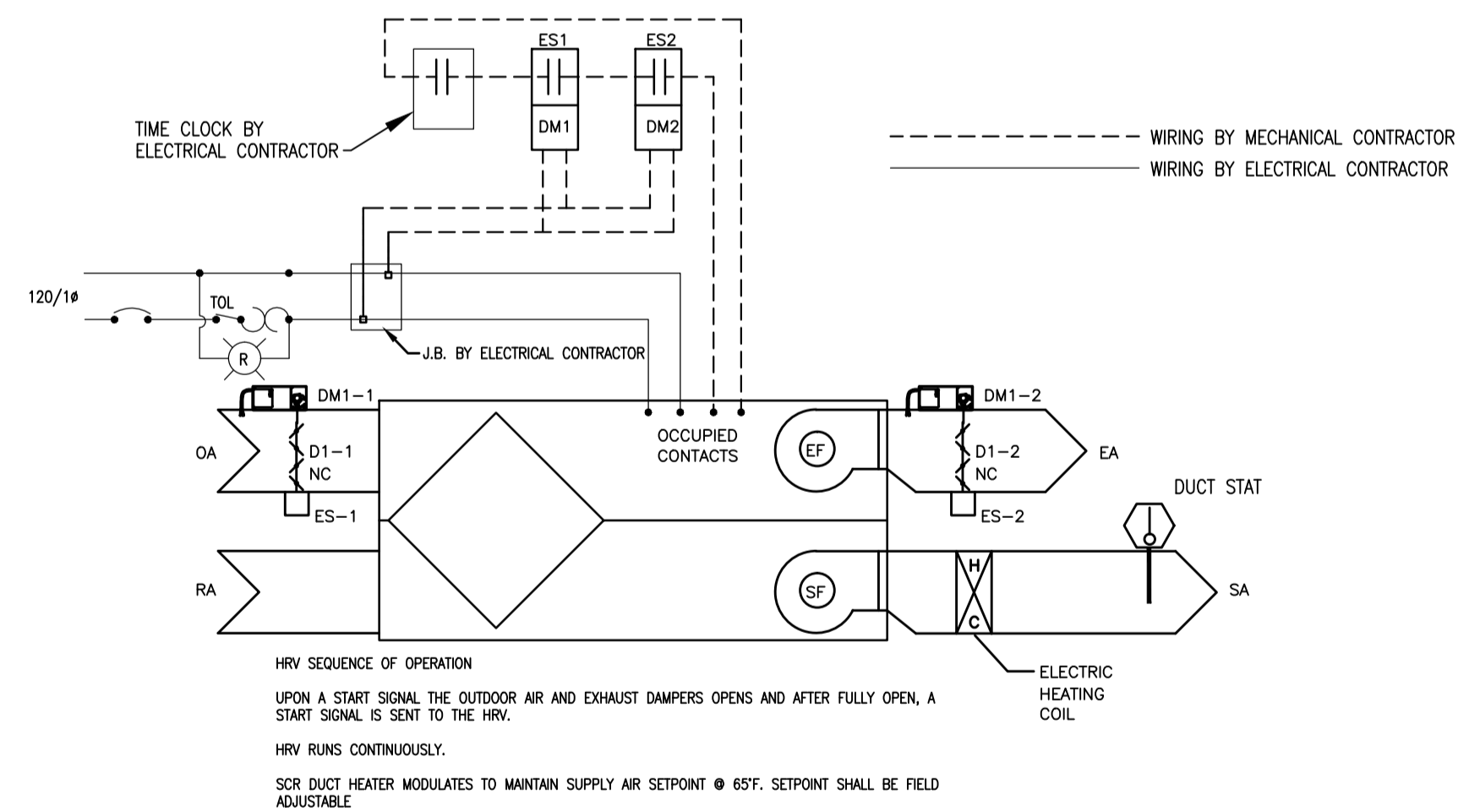
FAN AND DAMPER SCHEDULE																	
SYMBOL	SERVES	LOCATION	STANDARD OF ACCEPTANCE		AIRFLOW		DRIVE	RPM	BHP WATTS	MOTOR		CONTROL DAMPER	DAMPER MOTOR	DISC	SONES	ACCESSORIES	SYMBOL
			MANUFACTURER	MODEL#	L/s	SP(Pa)				WATTS	VOLTAGE						
SF-211	CLASSROOM 211	STORAGE 232	LOREN COOK	SQIB-180	750	120	BELT	747	322	1/3	120/1/60	N	N	Y	5.8	VIBRATION ISOLATOR SPEED CONTROLLER	SF-211
SF-232	STOR./COMM. RM. 232	STORAGE 232	LOREN COOK	GN-522	100	75	DIRECT	1400	-	76	120/1/60	N	N	Y	2.0	VIBRATION ISOLATOR FAN TO RUN CONTINUOUSLY	SF-232

GRILLES AND DIFFUSERS SCHEDULE						
SYMBOL	STANDARD OF ACCEPTANCE		AIRFLOW L/s	NECK SIZE	MODULE SIZE	ACCESSORIES AND / OR REMARKS
	MANUFACTURER	MODEL				
A	PRICE	SCDA	0-45	150	610 x 610	BALANCING DAMPER IN BRANCH DUCT SET FOR VERTICAL AIR FLOW
B	PRICE	SCDA	46-95	200	610 x 610	BALANCING DAMPER IN BRANCH DUCT SET FOR VERTICAL AIR FLOW
C	PRICE	SCDA	96-175	250	610 x 610	BALANCING DAMPER IN BRANCH DUCT SET FOR VERTICAL AIR FLOW
D	PRICE	SCDA	176-280	300	610 x 610	BALANCING DAMPER IN BRANCH DUCT SET FOR VERTICAL AIR FLOW
E	PRICE	SCDA	281-585	380	610 x 610	BALANCING DAMPER IN BRANCH DUCT SET FOR VERTICAL AIR FLOW
F	PRICE	PDDR	0-235	550 x 250	610 x 305	BALANCING DAMPER IN BRANCH DUCT
G	PRICE	PDDR	236-550	550 x 550	610 x 610	BALANCING DAMPER IN BRANCH DUCT

A/C SPLIT SYSTEM SCHEDULE						
SYMBOL	SERVES	STANDARD OF ACCEPTANCE		COOLING CAPACITY BTU/H @ ARI	VOLTAGE	ACCESSORIES AND/OR REMARKS
		MANUFACTURER	MODEL			
A/C-206A	COMM. ROOM 206A	DAIKIN	PKA-A12HA4 (INDOOR) PKA-A12NH44 (OUTDOOR)	12,000	208/1	EVAPORATOR UNIT, WALL MOUNTED, -17°C AMBIENT R410A REFRIGERANT, WALL MOUNTED CONTROLLER.

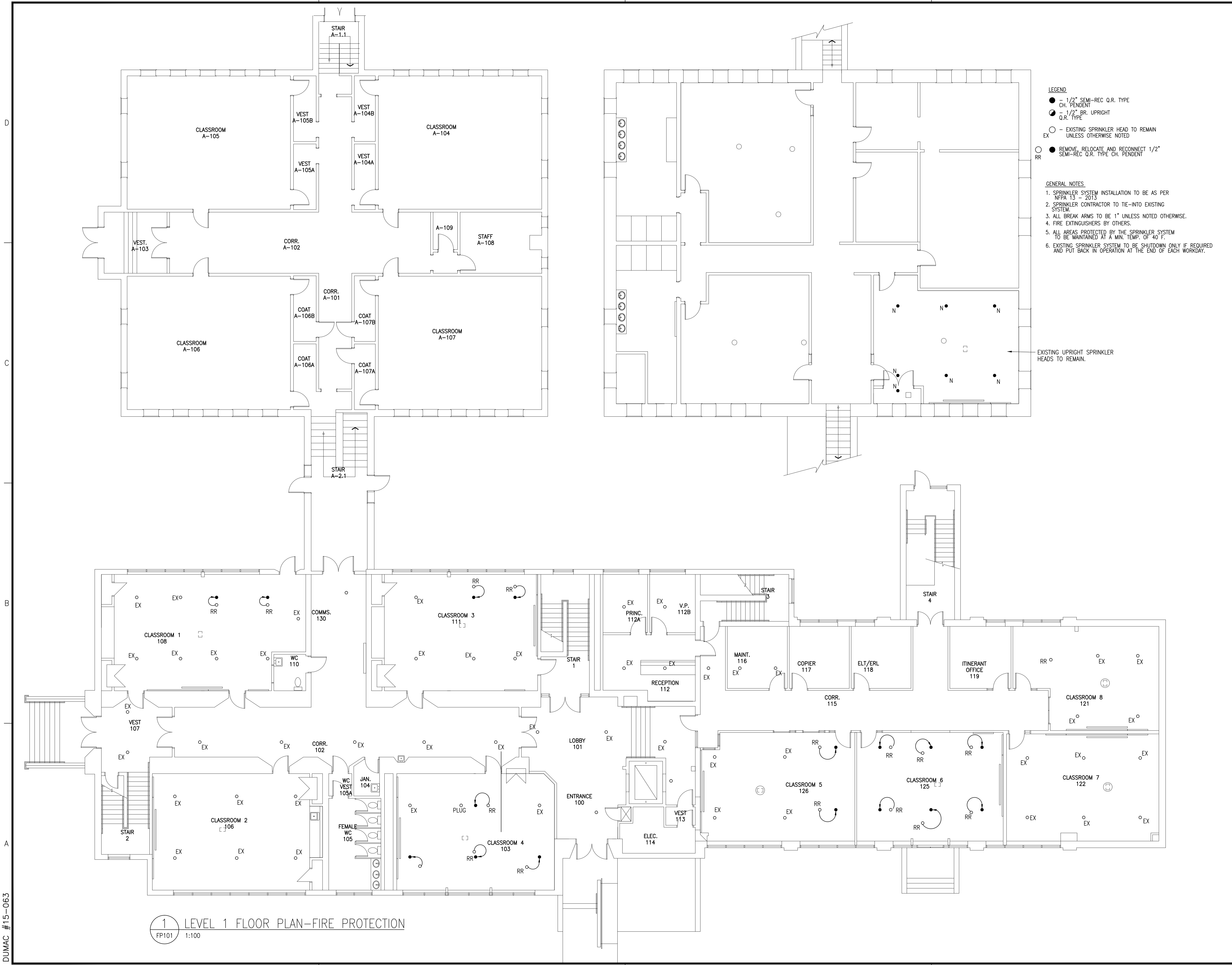
HEAT RECOVERY UNIT SCHEDULE								
SYMBOL	LOCATION	STANDARD OF ACCEPTANCE		AIRFLOW L/s @ WG	RPM	MOTOR watts	DISC. VOLTS	ACCESSORIES AND/OR REMARKS
		MANUFACTURER	MODEL					
HRV-1	CLASSROOM A-008	NU-AIR	NU500	200 @ .4"	1275	20500	120/1	SINGLE POINT POWER CONNECTION, TWO SPEED MOTORS. MOTORIZED SUPPLY AND EXHAUST DAMPERS. INTAKE AND EXHAUST HOODS.

ELECTRIC DUCT HEATER SCHEDULE								
SYMBOL	STANDARD OF ACCEPTANCE		AIRFLOW L/s	SIZE	DUCT HEATER	DISCONNECT SWITCH	VOLTS	REMARKS
	MANUFACTURER	MODEL						
RH-008	CHROMALOX		200	350x200	5.0KW	Y	208/3	SCR CONTROL AND DUCT SENSOR



5 HRV CONTROL WIRING SCHEMATIC
M104 NTS





- LEGEND**
- - 1/2" SEMI-REC Q.R. TYPE CH. PENDENT
 - - 1/2" BR. UPRIGHT Q.R. TYPE
 - - EXISTING SPRINKLER HEAD TO REMAIN UNLESS OTHERWISE NOTED
 - RR - REMOVE, RELOCATE AND RECONNECT 1/2" SEMI-REC Q.R. TYPE CH. PENDENT

- GENERAL NOTES**
1. SPRINKLER SYSTEM INSTALLATION TO BE AS PER NFPA 13 - 2013
 2. SPRINKLER CONTRACTOR TO TIE-INTO EXISTING SYSTEM
 3. ALL BREAK ARMS TO BE 1" UNLESS NOTED OTHERWISE.
 4. FIRE EXTINGUISHERS BY OTHERS.
 5. ALL AREAS PROTECTED BY THE SPRINKLER SYSTEM TO BE MAINTAINED AT A MIN. TEMP. OF 40 F.
 6. EXISTING SPRINKLER SYSTEM TO BE SHUTDOWN ONLY IF REQUIRED AND PUT BACK IN OPERATION AT THE END OF EACH WORKDAY.

EXISTING UPRIGHT SPRINKLER HEADS TO REMAIN.

1 LEVEL 1 FLOOR PLAN-FIRE PROTECTION
FP101 1:100



KEY PLAN

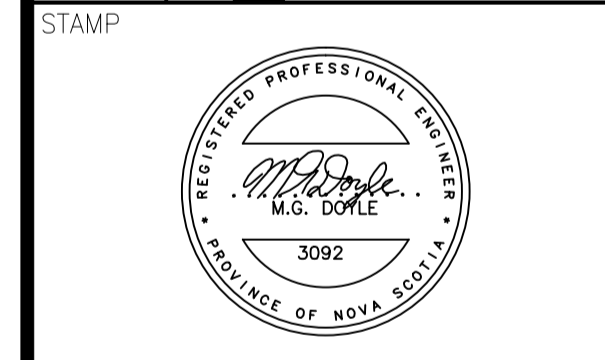
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PROJECT
BEAUFORT SCHOOL RENOVATION

HALIFAX, NOVA SCOTIA
PROJECT NO.: HRSB #3820

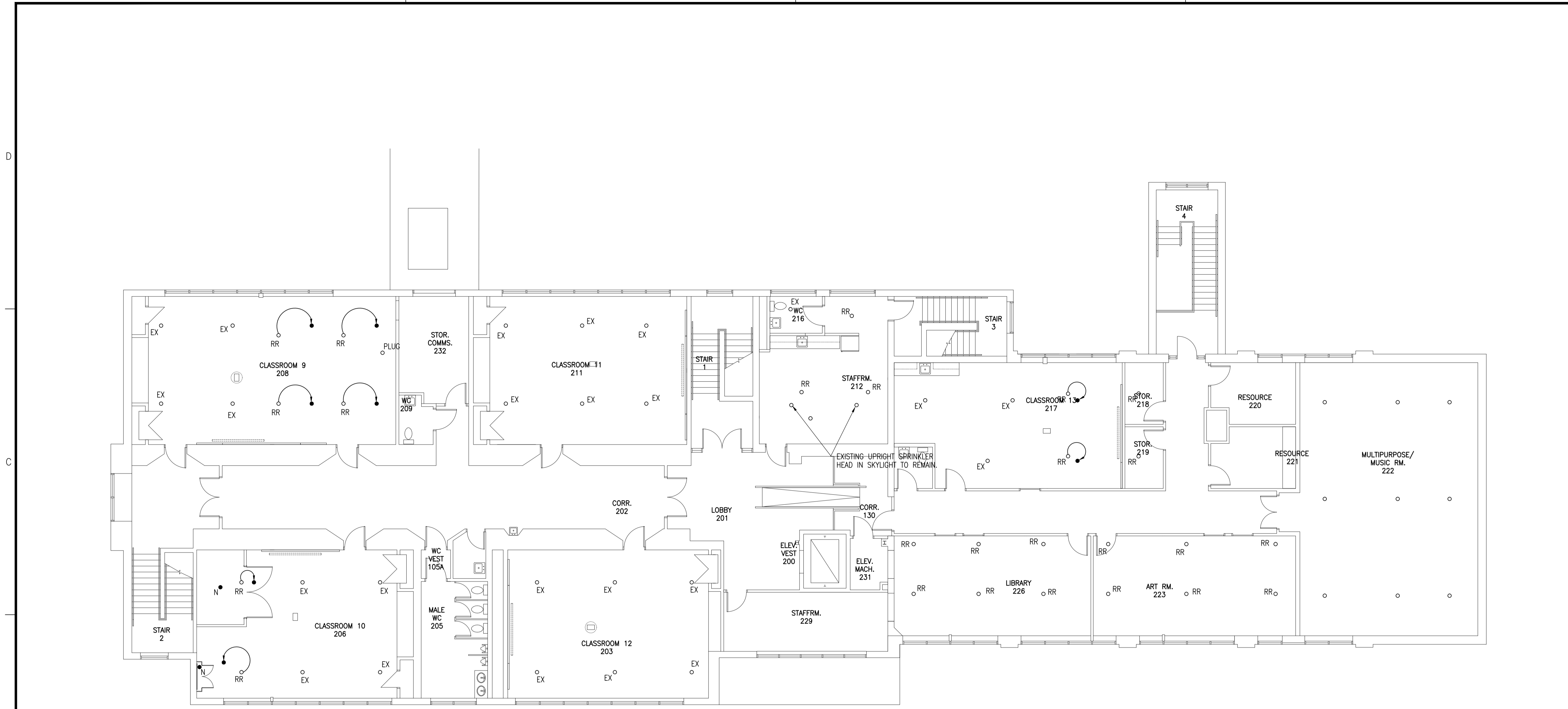
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INTERNAL NO.:

FP-101

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DUMAC #15-063

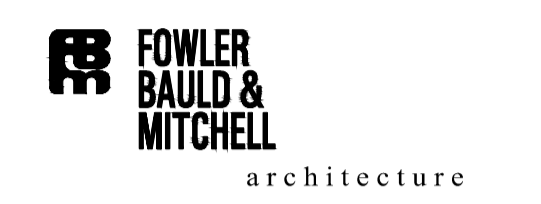


1 LEVEL 2 FLOOR PLAN-FIRE PROTECTION
 FP102 1:100

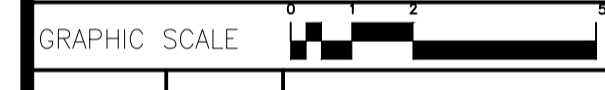


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HALIFAX, NOVA SCOTIA	
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SHEET TITLE	LEVEL 2 - FIRE PROTECTION
INTERNAL NO.:	

FP-102

SHEET - OF

DUMAC #15-063

LIGHTING LEGEND

- ER^aER EXISTING DUAL SWITCHING TO BE DISCONNECTED, RELOCATED AND RECONNECTED. EXTEND EXISTING CIRCUITRY AS REQUIRED.
- E^aER EXISTING DUAL SWITCHING TO REMAIN
- \$ 125V, 20A SINGLE POLE TOGGLE SWITCH TO MATCH EXISTING
- \$3 125V, 20A THREE-WAY TOGGLE SWITCH TO MATCH EXISTING
- E a/b EXISTING 3 LAMP RECESSED DEEP CELL PARABOLIC C/W TWO BALLASTS FOR SPLIT SWITCHING TO REMAIN
- E EXISTING LIGHTING TO REMAIN TO REMAIN
- ER EXISTING LIGHTING FIXTURE TO BE DISCONNECTED, RELOCATED AND RECONNECTED. EXTEND EXISTING CIRCUITRY AS REQUIRED.
- ER a/b EXISTING 3 LAMP RECESSED DEEP CELL PARABOLIC C/W TWO BALLASTS FOR SPLIT SWITCHING TO BE DISCONNECTED, RELOCATED AND RECONNECTED. EXTEND EXISTING CIRCUITRY AS REQUIRED.
- NL ERW EXISTING LIGHTING FIXTURE TO BE WIRED TO UNSWITCHED NIGHT LIGHTING CIRCUIT
- 1' NL LIGHTING FIXTURE WIRED TO UNSWITCHED NIGHT LIGHTING CIRCUIT
- 1' NEW 2'x4', 2 LAMP RECESSED LENSED TROFFER TO MATCH EXISTING
- 2' a/b NEW 2'x4', 3 LAMP RECESSED DEEP CELL PARABOLIC C/W TWO BALLASTS FOR SPLIT SWITCHING TO MATCH EXISTING
- 3' NEW 4', 2 LAMP FLUORESENT STRIP FIXTURE C/W WIREGUARD AND 2x 32W-T8 LAMPS. CHAIN HANG. MANUFACTURER: PHILIPS #SB248-120S0-WG OR EQUAL
- 4' NEW 2'x2' RECESSED FLUORESCENT LENSED TROFFER C/W 3x 17W-T8 LAMPS. MANUFACTURER: PHILIPS #

POWER LEGEND

NOTE: PROVIDE LAMICOID IDENTIFICATION PLATES FOR ALL EXISTING AND NEW DEVICES

- E EXISTING RECEPTACLE TO REMAIN
- 125V, 5-15R DUPLEX RECEPTACLE MOUNTED 18" AFF (450mm)
- 125V, 5-15R DUPLEX RECEPTACLE MOUNTED IN ACCESSIBLE CEILING SPACE FOR OWNER SUPPLIED LCD PROJECTOR
- EXISTING ABOVE CEILING RECEPTACLE FOR OWNER SUPPLIED LCD PROJECTOR TO REMAIN
- 125V, 5-20R DUPLEX RECEPTACLE MOUNTED 18" AFF (450mm)
- 125V, 5-20R DUPLEX SURGE SUPPRESSION RECEPTACLE MOUNTED ADJACENT EQUIPMENT RACK. COORDINATE EXACT LOCATION ON SITE PRIOR TO ROUGH-IN
- 125V, 5-15R DUPLEX RECEPTACLE MOUNTED IN MILLWORK FOR DISHWASHER. COORDINATE EXACT MOUNTING LOCATION WITH ARCHITECTURAL AND MILLWORK INSTALLER
- 125V, 5-15R DUPLEX RECEPTACLE MOUNTED IN MILLWORK COORDINATE EXACT MOUNTING LOCATION WITH ARCHITECTURAL AND MILLWORK INSTALLER
- 125V, 5-15R DUPLEX FRIDGE RECEPTACLE. COORDINATE EXACT MOUNTING LOCATION WITH ARCHITECTURAL AND MILLWORK INSTALLER.
- EXISTING RECEPTACLE TO BE DISCONNECTED, RELOCATED AND RECONNECTED. EXTEND EXISTING CIRCUITRY AS REQUIRED.
- 125V, 5-20R GFCI DUPLEX RECEPTACLE MOUNTED ABOVE COUNTER COORDINATE EXACT MOUNTING LOCATION WITH ARCHITECTURAL AND MILLWORK INSTALLER
- 125V, 5-20R MICROWAVE RECEPTACLE MOUNTED IN MILLWORK. COORDINATE EXACT MOUNTING LOCATION WITH ARCHITECTURAL AND MILLWORK INSTALLER
- BRANCH CIRCUIT WIRING PANEL BOARD
- INDICATES MECHANICAL EQUIPMENT NUMBER. REFER TO MOTOR STARTER AND CONTROL LIST, DRAWING EP702.
- NF NON-FUSED DISCONNECT SWITCH
- NF WP WEATHERPROOF, NON-FUSED DISCONNECT SWITCH
- T MECHANICAL CONTROLLER OR THERMOSTAT. ELECTRICAL CONTRACTOR TO SUPPLY AND INSTALL EMPTY 4" OUTLET BOX C/W TILE RING AND 3/4" C TO ACCESSIBLE CEILING SPACE. INSTALL PULL CORD. COORDINATE EXACT LOCATION ON SITE WITH MECHANICAL CONTRACTOR.
- \$TOL MANUAL MOTOR STARTER C/W RED ON PILOT LIGHT
- TX CONTROLS TRANSFORMER SUPPLIED AND INSTALLED BY MECHANICAL CONTRACTOR. 120VAC WIRING BY ELECTRICAL CONTRACTOR
- T/C TIME CLOCK. SEE DETAIL 2/EP601.

EMERGENCY AND EXIT LIGHTING LEGEND

- 72W 36W WALL MOUNTED EMERGENCY BATTERY UNIT C/W 2x 4W LED HEADS WATTAGE CAPACITY AS NOTED. WIRE AND CONNECT TO UNSWITCHED PORTION OF ASSOCIATED ROOM LIGHTING CIRCUIT.
- 2x12Vx4W LED REMOTE EMERGENCY LIGHTING HEADS - WALL MOUNTED
- 2x12Vx4W LED REMOTE EMERGENCY LIGHTING HEADS - CEILING MOUNTED
- DC EMERGENCY LIGHTING D.C. WIRING. RUN 2#12 RW90+#12B-1/2"C
- Single Faced, Self Powered Pictogram Style Exit Fixture - Wall Mounted
- Single Faced, Self Powered Pictogram Style Exit Fixture - Ceiling Mounted
- Double Faced, Self Powered Pictogram Style Exit Fixture - Ceiling Mounted

FIRE ALARM SYSTEM LEGEND

(REFER TO DETAIL, DRAWING ESS04)
NOTE: PROVIDE LAMICOID IDENTIFICATION PLATES FOR ALL EXISTING AND NEW DEVICES

- E EXISTING FIRE ALARM PULL STATION TO REMAIN. PROVIDE POLYCARBONATE SHIELD WITH WARNING SIGN
- F FIRE ALARM PULL STATION TO MATCH EXISTING TYPE. MOUNT AT 1220mm AFF.
- E F FIRE ALARM HORN/STROBE TO REMAIN
- F FIRE ALARM HORN/STROBE TO MATCH EXISTING TYPE.
- F LOW AUDIO FIRE ALARM HORN/STROBE
- WP F EXTERIOR WEATHERPROOF FIRE ALARM HORN/STROBE C/W GUARD
- RP F EXISTING FIRE ALARM BELL TO BE REPLACED WITH HORN/STROBE TO MATCH EXISTING.
- D E FIRE ALARM SYSTEM DOOR HOLD OPEN DEVICE TO REMAIN
- D FIRE ALARM SYSTEM DOOR HOLD OPEN DEVICE BY DIV. 08, WIRED BY ELECTRICAL CONTRACTOR
- S E EXISTING FIRE ALARM SYSTEM SMOKE DETECTOR TO REMAIN
- S FIRE ALARM SYSTEM SMOKE DETECTOR TO MATCH EXISTING TYPE.
- IM FIRE ALARM ISOLATION MODULE
- PS BOOSTER POWER SUPPLY
- R ADDRESSIBLE RELAY
- ANN FIRE ALARM REMOTE ANNUNCIATOR

INTRUSION ALARM SYSTEM LEGEND

(REFER TO DETAIL, DRAWING ESS02)

- M INTRUSION ALARM SYSTEM MOTION DETECTOR-WALL MOUNTED
- M INTRUSION ALARM SYSTEM MOTION DETECTOR-CEILING MOUNTED
- DC INTRUSION ALARM SYSTEM DOOR CONTACT
- S INTRUSION ALARM SYSTEM SIREN-WALL MOUNTED
- SEC E EXISTING SECURITY INTRUSION SYSTEM ALARM PANEL
- Z-EXP ZONE EXPANSION MODULE
- PS POWER SUPPLY

ACCESS CONTROL SYSTEM LEGEND

- CR E EXISTING ACCESS CONTROL CARD READER TO REMAIN
- CR ER EXISTING ACCESS CONTROL CARD READER TO BE DISCONNECTED, RELOCATED AND RECONNECTED. EXTEND CIRCUITRY AS REQUIRED. COORDINATE WITH DOOR HARDWARE CONTRACTOR.
- CR ACCESS CONTROL CARD READER SUPPLIED, INSTALLED AND WIRED BY ELECTRICAL CONTRACTOR. REFER TO DETAIL 3/ESS02.
- KT400 ER EXISTING DOOR CONTROLLER TO BE RELOCATED AND RECONNECTED
- PSB POWER SUPPLY SUPPLIED BY DIV. 08, INSTALLED AND WIRED BY ELECTRICAL CONTRACTOR.
- REX REX MOTION DETECTOR SUPPLIED AND INSTALLED BY DIV. 08 WIRED BU ELECTRICAL CONTRACTOR. REFER TO DETAIL 3/ESS02.

COMMUNICATIONS LEGEND

(REFER TO DETAIL, DRAWING ESS01)
NOTE: PROVIDE LAMICOID IDENTIFICATION PLATES FOR ALL EXISTING AND NEW OUTLETS

- WN DATA OUTLET MOUNTED IN ACCESSIBLE CEILING SPACE FOR FUTURE WIFI CONNECTION RUN 1x CAT6 FT6 RATED CABLE BACK TO COMM ROOM AND TERMINATE. PROVIDE ALL NECESSARY TERMINATION HARDWARE, PATCH PANELS, ETC AS REQUIRED.
- DATA OUTLET MOUNTED 18" AFF(450mm). RUN 2x CAT6 FT6 RATED CABLES BACK TO COMM ROOM AND TERMINATE. PROVIDE ALL NECESSARY TERMINATION HARDWARE, PATCH PANELS, ETC AS REQUIRED.
- VOIP/DATA OUTLET MOUNTED 18" AFF(450mm). RUN 2x CAT6 FT6 RATED CABLES BACK TO COMM ROOM AND TERMINATE. PROVIDE ALL NECESSARY TERMINATION HARDWARE, PATCH PANELS, ETC AS REQUIRED.
- VOIP/DATA OUTLET MOUNTED IN MILLWORK. COORDINATE MOUNTING LOCATION WITH ARCHITECTURAL AND MILLWORK INSTALLER. RUN 2x CAT6 FT6 RATED CABLES BACK TO COMM ROOM AND TERMINATE. PROVIDE ALL NECESSARY TERMINATION HARDWARE, PATCH PANELS, ETC AS REQUIRED.
- DATA OUTLET MOUNTED IN ACCESSIBLE CEILING SPACE FOR OWNERS LCD PROJECTOR. RUN 1x CAT6 FT6 RATED CABLE BACK TO COMM ROOM AND TERMINATE. PROVIDE ALL NECESSARY TERMINATION HARDWARE, PATCH PANELS, ETC AS REQUIRED.
- MULTI-MEDIA OUTLET MOUNTED 18" AFF(450mm) REFER TO DETAIL 1/ES505.
- MULTI-MEDIA OUTLET MOUNTED IN ACCESSIBLE CEILING SPACE REFER TO DETAIL 1/ES505.
- EXISTING VOICE/DATA OUTLET TO REMAIN
- EXISTING VOICE OUTLET TO REMAIN
- DATA OUTLET MOUNTED 18" AFF(450mm). RUN 1x CAT6 FT6 RATED CABLE BACK TO COMM ROOM AND TERMINATE. PROVIDE ALL NECESSARY TERMINATION HARDWARE, PATCH PANELS, ETC AS REQUIRED.

PUBLIC ADDRESS SYSTEM LEGEND

(REFER TO DETAIL, DRAWING ESS03)

- S PUBLIC ADDRESS SYSTEM SPEAKER WIRED TO GENERAL PUBLIC AREA ZONE.
- S PUBLIC ADDRESS SYSTEM SPEAKER WIRED TO INDIVIDUAL ROOM ZONE
- ACC ADMINISTRATIVE MASTER CONSOLE MOUNTED ON DESK COORDINATE EXACT LOCATION ON SITE WITH HRSB REPRESENTATIVE
- EMERGENCY INTERCOM STATION IN TWO GANG BOX @ 900mm A.F.F.
- PB INTERCOM SYSTEM WEATHERPROOF DOOR BELL PUSHBUTTON MOUNTED @ 1200mm A.F.F.
- P INTERIOR WALL MOUNTED PUBLIC ADDRESS HORN
- G V H PUBLIC ADDRESS SYSTEM EXTERIOR HORN C/W WIREGUARD MOUNTED 8000mm A.F.F. C/W GUARD, UNLESS OTHERWISE INDICATED
- S ERW EXISTING PUBLIC ADDRESS SYSTEM SPEAKER TO BE REWIRED TO PUBLIC ADDRESS PANEL. CONNECT TO GENERAL PA ZONE.
- S ERW EXISTING PUBLIC ADDRESS SYSTEM SPEAKER TO BE REWIRED TO PUBLIC ADDRESS PANEL. CONNECT TO INDIVIDUAL ROOM ZONE.
- \$K1 DOORBELL ACTIVATE/DE-ACTIVATE SWITCH
- AS AUDIO SOURCE RACK

INTERCOM SYSTEM LEGEND

(REFER TO DETAIL, DRAWING ESS05)

- INT M MASTER AUDIO/VIDEO INTERCOM STATION
- INT S SUB-MASTER AUDIO/VIDEO INTERCOM STATION
- INT EXTERIOR AUDIO/VIDEO INTERCOM DOOR STATION
- DR INTERCOM SYSTEM DOOR RELEASE ADAPTER



KEY PLAN

LOGO

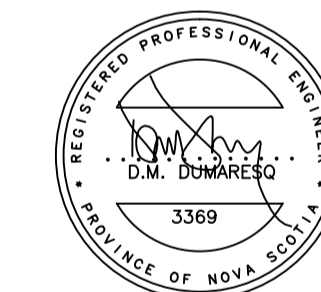


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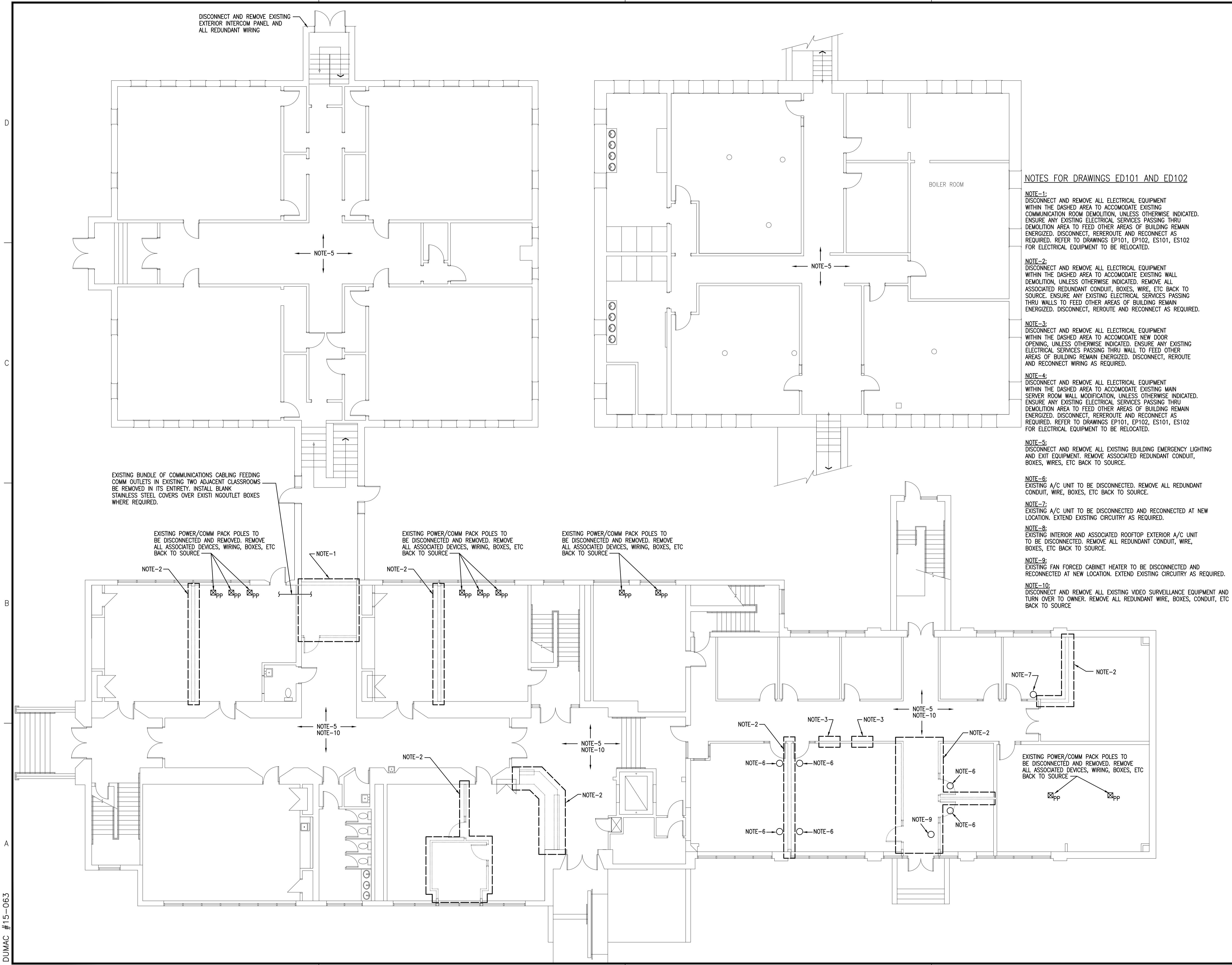


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PROJECT
BEAUFORT SCHOOL RENOVATION
HALIFAX, NOVA SCOTIA
PROJECT NO.: HRSB #3820
SHEET TITLE
ELECTRICAL LEGEND
INTERNAL NO.:

E-001

SHEET - OF -

DUMAC #15-063



DUMAC #15-063

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NOTES FOR DRAWINGS ED101 AND ED102

NOTE-1:
 DISCONNECT AND REMOVE ALL ELECTRICAL EQUIPMENT WITHIN THE DASHED AREA TO ACCOMMODATE EXISTING COMMUNICATION ROOM DEMOLITION, UNLESS OTHERWISE INDICATED. ENSURE ANY EXISTING ELECTRICAL SERVICES PASSING THRU DEMOLITION AREA TO FEED OTHER AREAS OF BUILDING REMAIN ENERGIZED. DISCONNECT, REROUTE AND RECONNECT AS REQUIRED. REFER TO DRAWINGS EP101, EP102, ES101, ES102 FOR ELECTRICAL EQUIPMENT TO BE RELOCATED.

NOTE-2:
 DISCONNECT AND REMOVE ALL ELECTRICAL EQUIPMENT WITHIN THE DASHED AREA TO ACCOMMODATE EXISTING WALL DEMOLITION, UNLESS OTHERWISE INDICATED. REMOVE ALL ASSOCIATED REDUNDANT CONDUIT, BOXES, WIRE, ETC BACK TO SOURCE. ENSURE ANY EXISTING ELECTRICAL SERVICES PASSING THRU WALLS TO FEED OTHER AREAS OF BUILDING REMAIN ENERGIZED. DISCONNECT, REROUTE AND RECONNECT AS REQUIRED.

NOTE-3:
 DISCONNECT AND REMOVE ALL ELECTRICAL EQUIPMENT WITHIN THE DASHED AREA TO ACCOMMODATE NEW DOOR OPENING, UNLESS OTHERWISE INDICATED. ENSURE ANY EXISTING ELECTRICAL SERVICES PASSING THRU WALL TO FEED OTHER AREAS OF BUILDING REMAIN ENERGIZED. DISCONNECT, REROUTE AND RECONNECT WIRING AS REQUIRED.

NOTE-4:
 DISCONNECT AND REMOVE ALL ELECTRICAL EQUIPMENT WITHIN THE DASHED AREA TO ACCOMMODATE EXISTING MAIN SERVER ROOM WALL MODIFICATION, UNLESS OTHERWISE INDICATED. ENSURE ANY EXISTING ELECTRICAL SERVICES PASSING THRU DEMOLITION AREA TO FEED OTHER AREAS OF BUILDING REMAIN ENERGIZED. DISCONNECT, REROUTE AND RECONNECT AS REQUIRED. REFER TO DRAWINGS EP101, EP102, ES101, ES102 FOR ELECTRICAL EQUIPMENT TO BE RELOCATED.

NOTE-5:
 DISCONNECT AND REMOVE ALL EXISTING BUILDING EMERGENCY LIGHTING AND EXIT EQUIPMENT. REMOVE ASSOCIATED REDUNDANT CONDUIT, BOXES, WIRES, ETC BACK TO SOURCE.

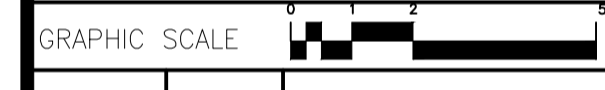
NOTE-6:
 EXISTING A/C UNIT TO BE DISCONNECTED. REMOVE ALL REDUNDANT CONDUIT, WIRE, BOXES, ETC BACK TO SOURCE.

NOTE-7:
 EXISTING A/C UNIT TO BE DISCONNECTED AND RECONNECTED AT NEW LOCATION. EXTEND EXISTING CIRCUITRY AS REQUIRED.

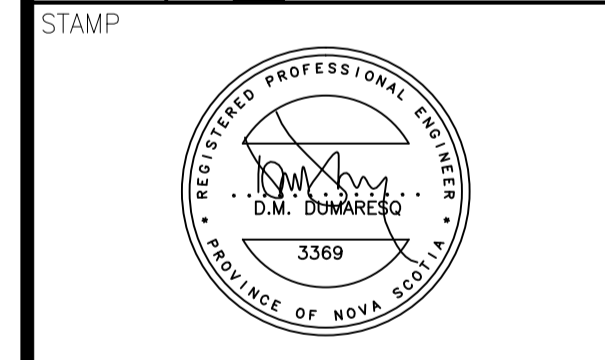
NOTE-8:
 EXISTING INTERIOR AND ASSOCIATED ROOFTOP EXTERIOR A/C UNIT TO BE DISCONNECTED. REMOVE ALL REDUNDANT CONDUIT, WIRE, BOXES, ETC BACK TO SOURCE.

NOTE-9:
 EXISTING FAN FORCED CABINET HEATER TO BE DISCONNECTED AND RECONNECTED AT NEW LOCATION. EXTEND EXISTING CIRCUITRY AS REQUIRED.

NOTE-10:
 DISCONNECT AND REMOVE ALL EXISTING VIDEO SURVEILLANCE EQUIPMENT AND TURN OVER TO OWNER. REMOVE ALL REDUNDANT WIRE, BOXES, CONDUIT, ETC BACK TO SOURCE.



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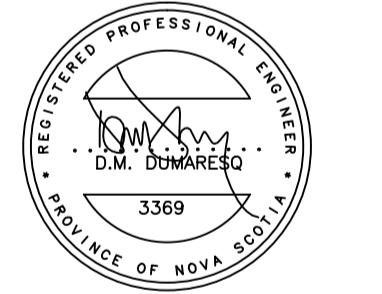
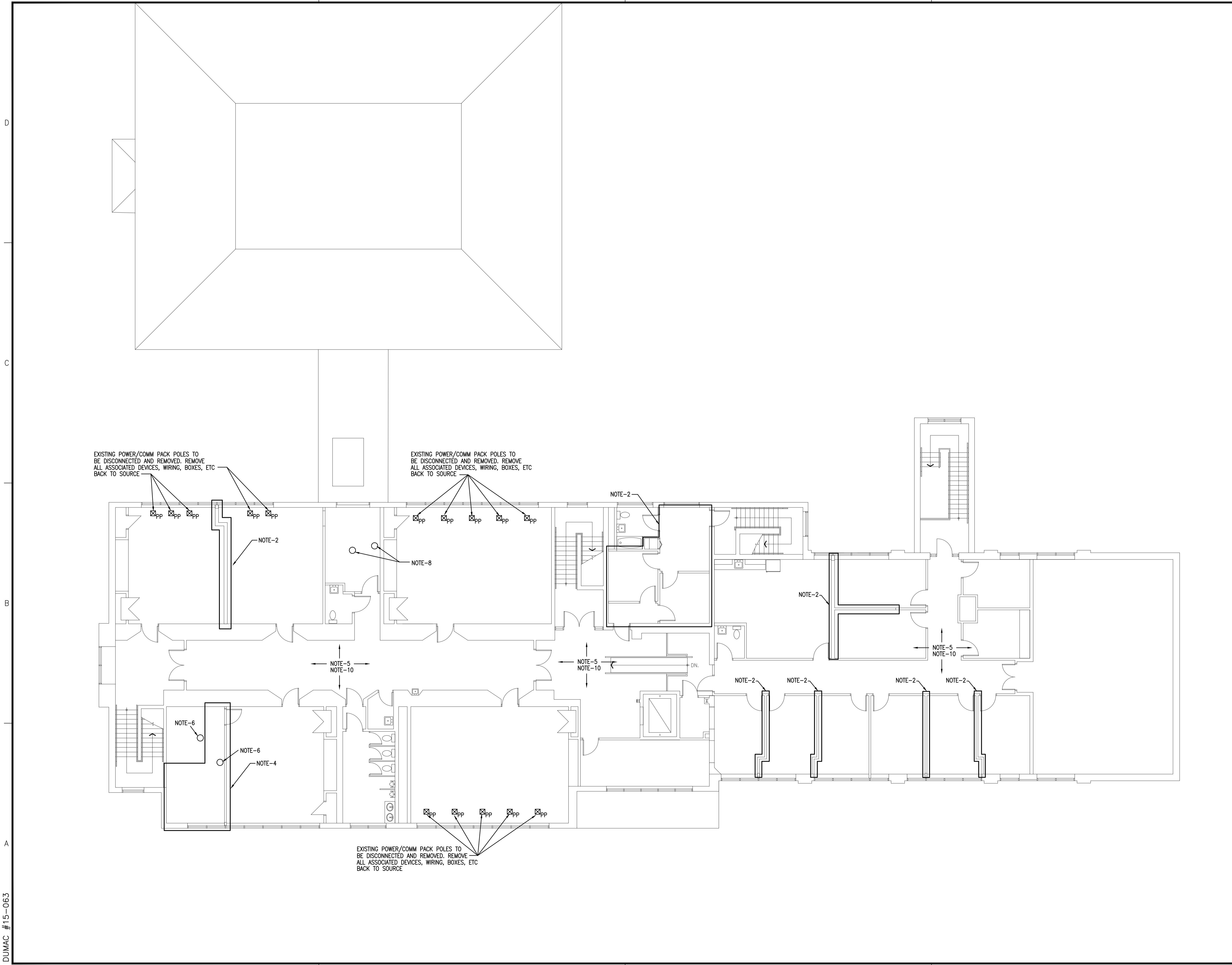
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BEAUFORT SCHOOL RENOVATION

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SHEET TITLE
LEVEL 1 - ELECTRICAL DEMOLITION

INTERNAL NO.:

ED101



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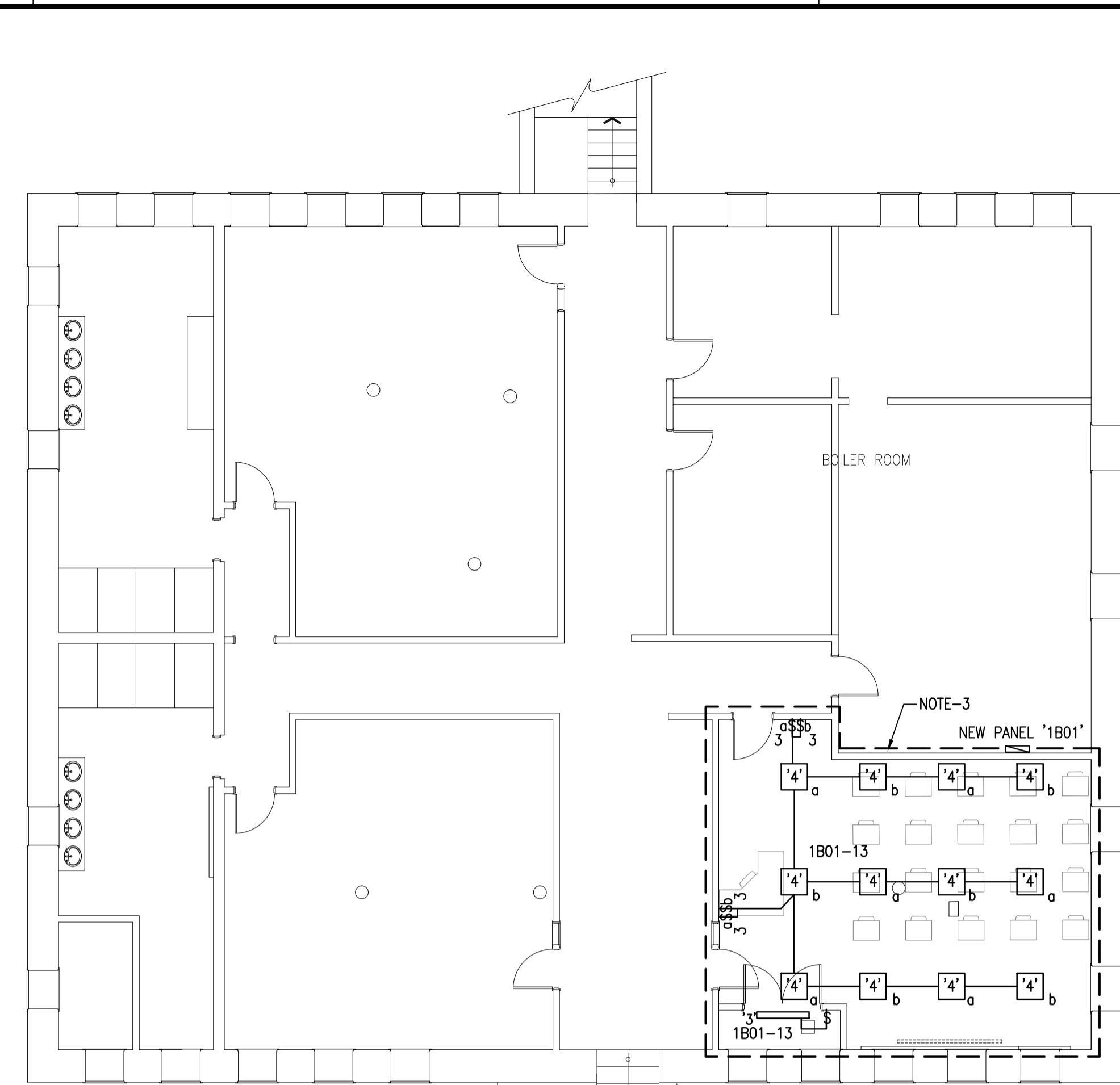
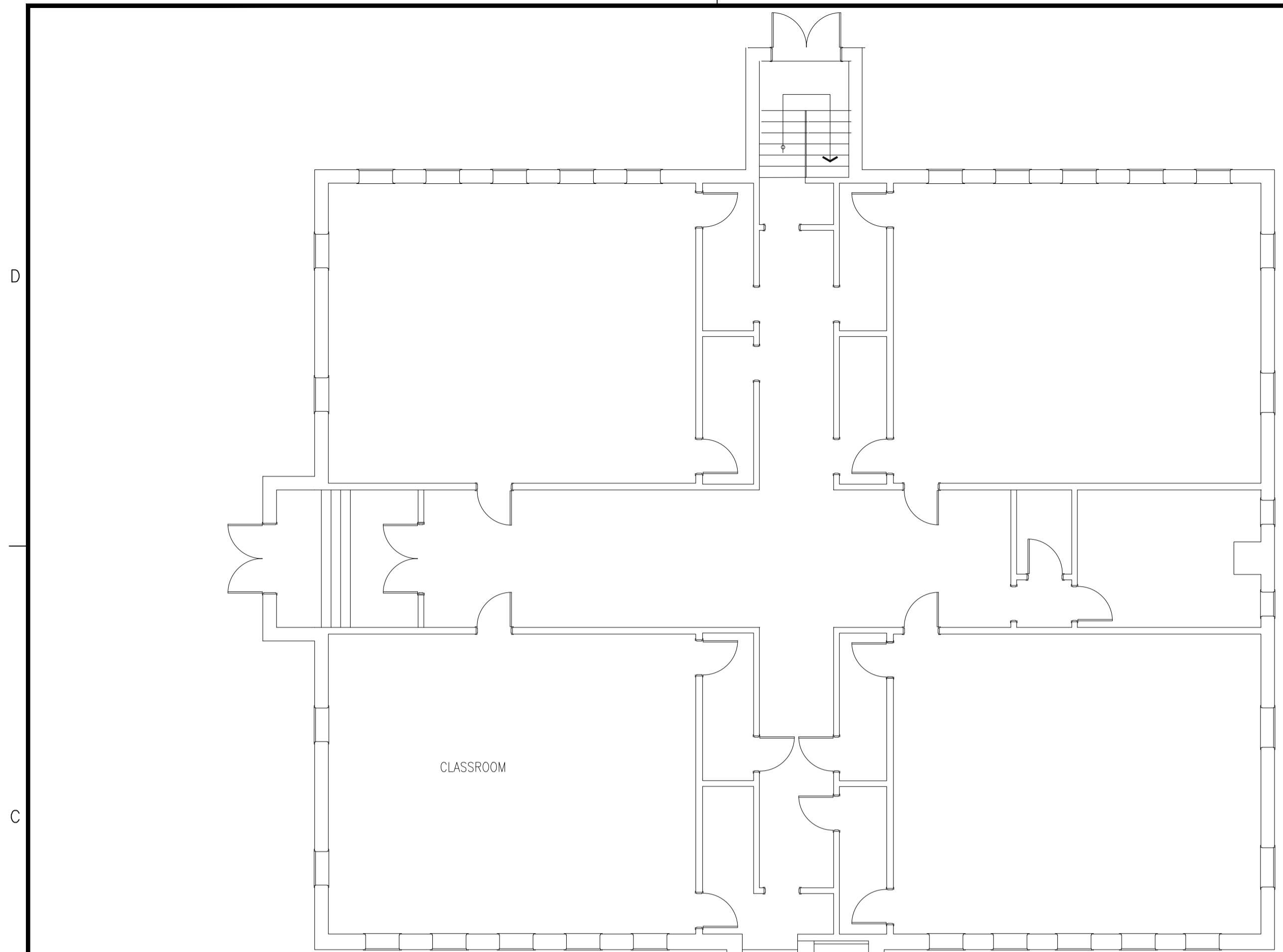
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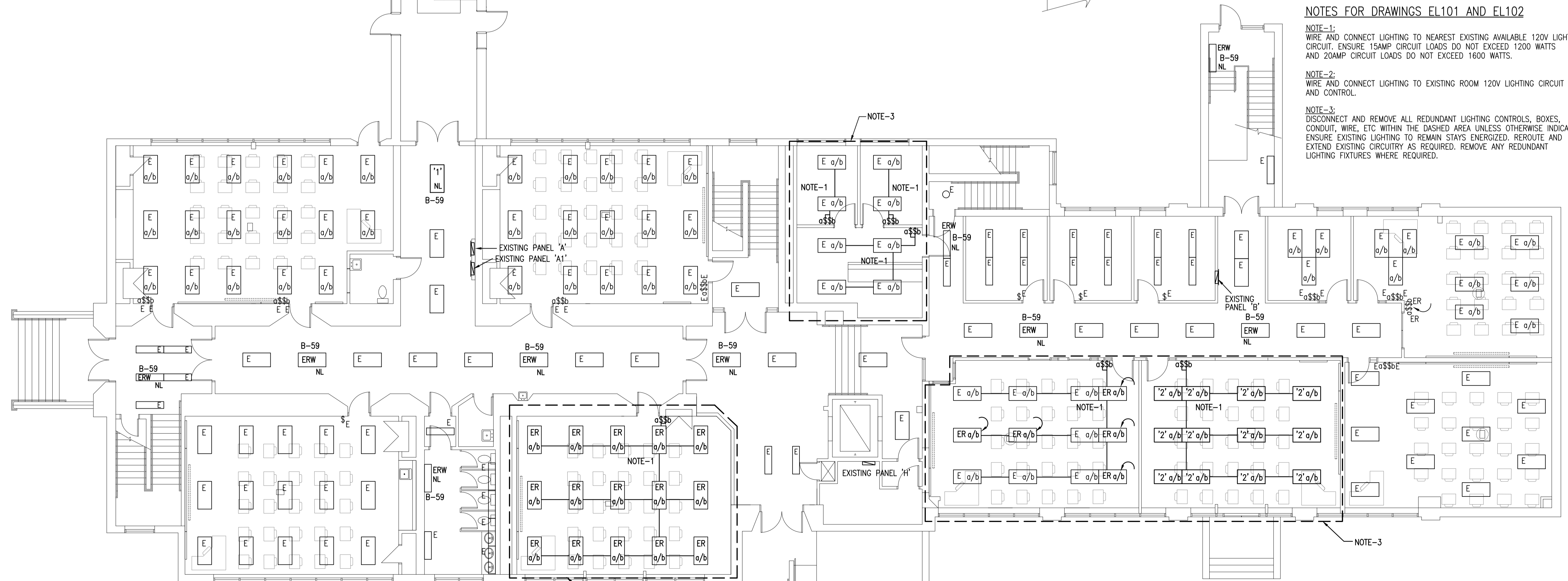
SHEET TITLE
LEVEL 2 -
ELECTRICAL
DEMOLITION

INTERNAL NO.:

ED102



2 BASEMENT BUNGALOW PLAN - LIGHTING
EL101 SCALE = 1:100



1 LEVEL 1 FLOOR PLAN - LIGHTING
EL101 SCALE = 1:100

NOTES FOR DRAWINGS EL101 AND EL102

NOTE-1:
WIRE AND CONNECT LIGHTING TO NEAREST EXISTING AVAILABLE 120V LIGHTING CIRCUIT. ENSURE 15AMP CIRCUIT LOADS DO NOT EXCEED 1200 WATTS AND 20AMP CIRCUIT LOADS DO NOT EXCEED 1600 WATTS.

NOTE-2:
WIRE AND CONNECT LIGHTING TO EXISTING ROOM 120V LIGHTING CIRCUIT AND CONTROL.

NOTE-3:
DISCONNECT AND REMOVE ALL REDUNDANT LIGHTING CONTROLS, BOXES, CONDUIT, WIRE, ETC WITHIN THE DASHED AREA UNLESS OTHERWISE INDICATED. ENSURE EXISTING LIGHTING TO REMAIN STAYS ENERGIZED. REROUTE AND EXTEND EXISTING CIRCUITRY AS REQUIRED. REMOVE ANY REDUNDANT LIGHTING FIXTURES WHERE REQUIRED.



KEY PLAN

LOGO



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PROJECT

BEAUFORT SCHOOL

RENOVATION

HALIFAX, NOVA SCOTIA

PROJECT NO.: HRSB #3820

SHEET TITLE

LEVEL 1 -

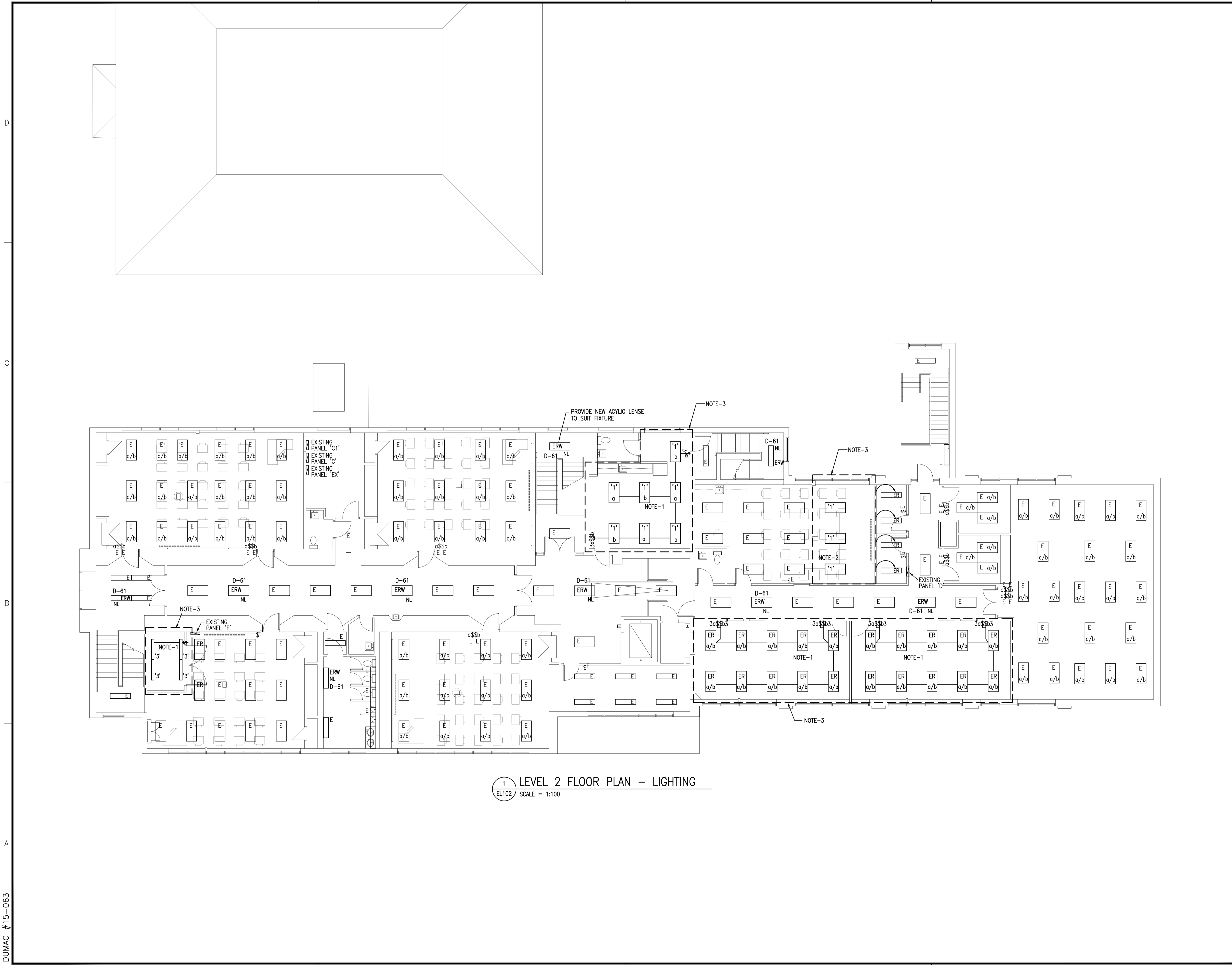
LIGHTING

INTERNAL NO.:

EL101

SHEET - OF -

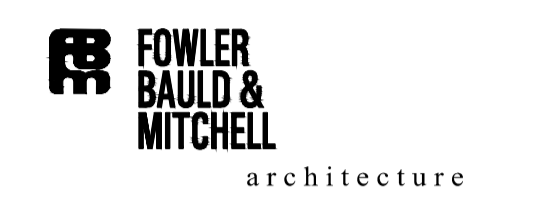
DUMAC #15-063



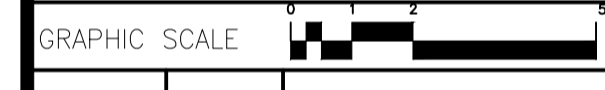
1 LEVEL 2 FLOOR PLAN - LIGHTING
 EL102 SCALE = 1:100

KEY PLAN

LOGO



Fowler Bauld & Mitchell Ltd.
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SCALE	1:100
DRAWN BY:	STAFF
CHECKED BY:	STAFF
REVIEWED BY:	STAFF
APPROVED BY:	STAFF
AS-BUILT CHECK	
DATE:	08 APR 2016

PROJECT
 BEAUFORT SCHOOL
 RENOVATION

HALIFAX, NOVA SCOTIA
 PROJECT NO.: HRSB #3820

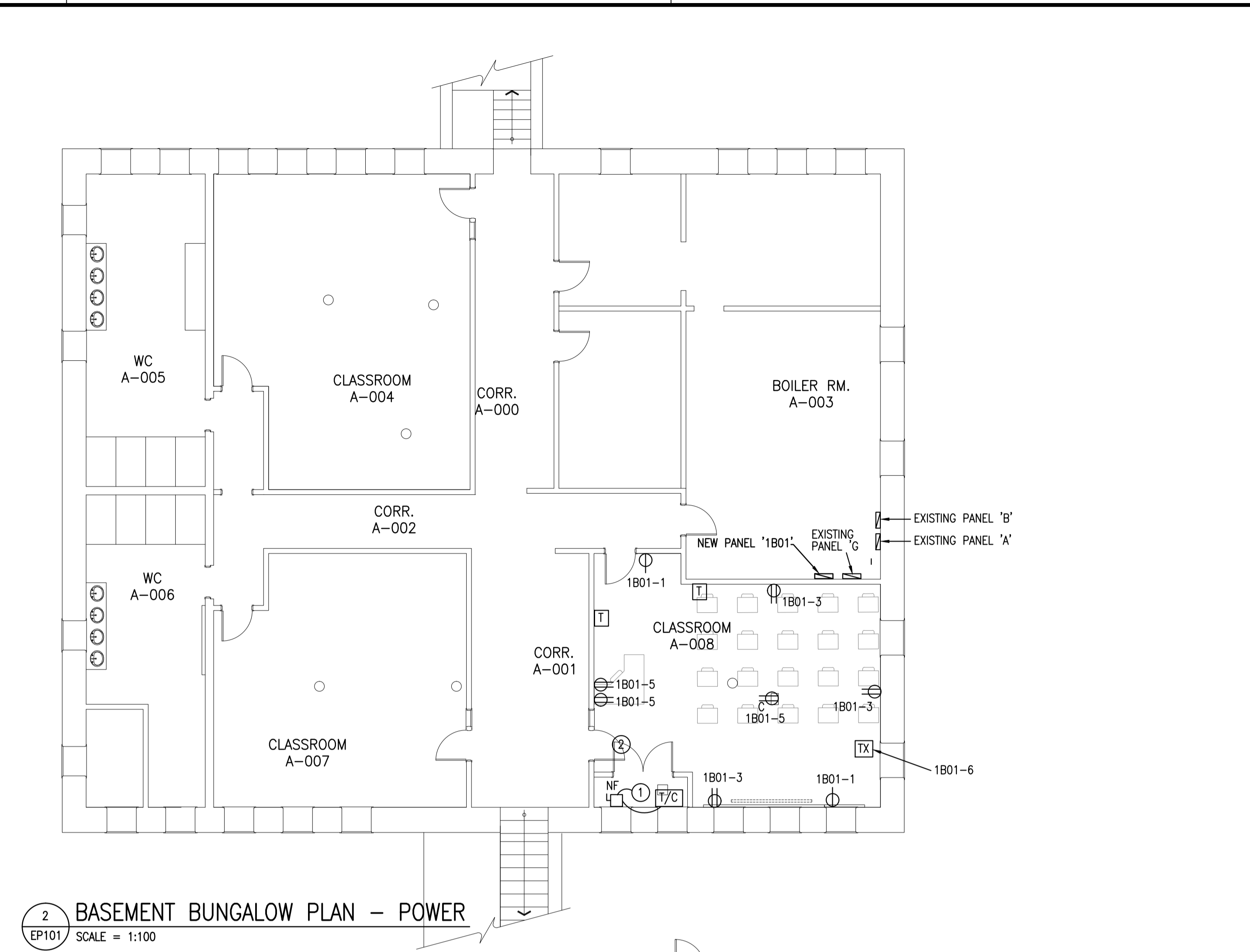
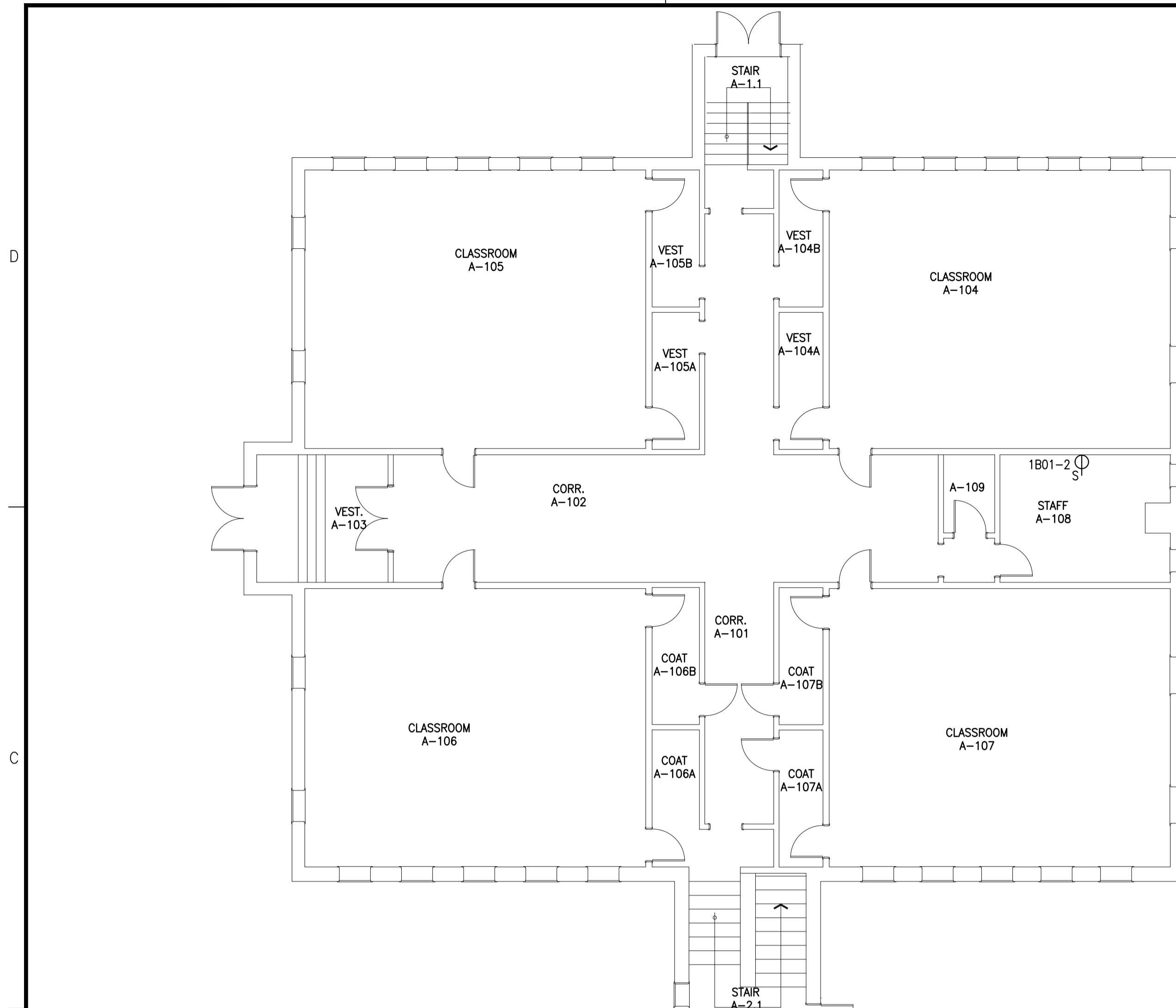
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 LIGHTING

INTERNAL NO.:

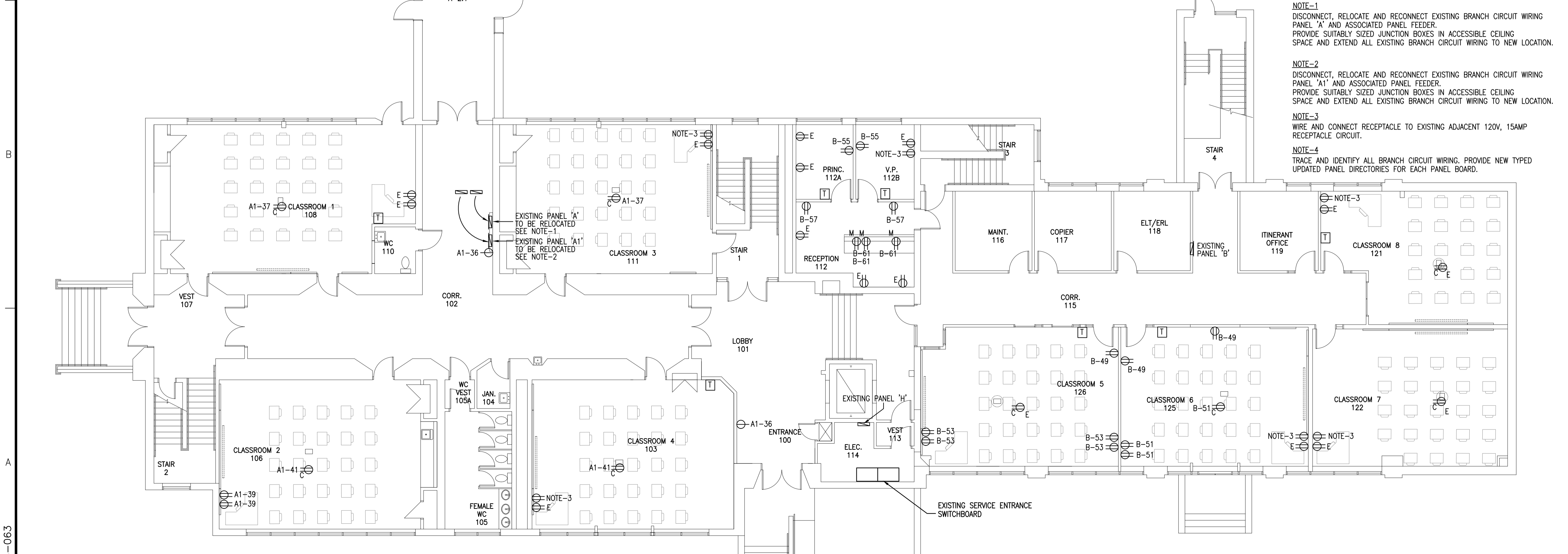
EL102

SHEET - OF -

DUMAC #15-063



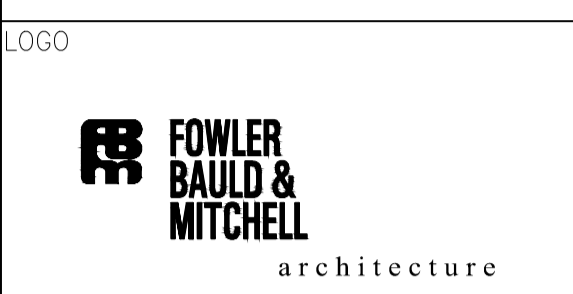
2 BASEMENT BUNGLOW PLAN - POWER
EP101 SCALE = 1:100



1 LEVEL 1 FLOOR PLAN-POWER
EP101 SCALE = 1:100

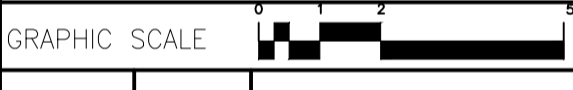


KEY PLAN



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- NOTE-1
DISCONNECT, RELOCATE AND RECONNECT EXISTING BRANCH CIRCUIT WIRING PANEL 'A' AND ASSOCIATED PANEL FEEDER. PROVIDE SUITABLY SIZED JUNCTION BOXES IN ACCESSIBLE CEILING SPACE AND EXTEND ALL EXISTING BRANCH CIRCUIT WIRING TO NEW LOCATION.
- NOTE-2
DISCONNECT, RELOCATE AND RECONNECT EXISTING BRANCH CIRCUIT WIRING PANEL 'A1' AND ASSOCIATED PANEL FEEDER. PROVIDE SUITABLY SIZED JUNCTION BOXES IN ACCESSIBLE CEILING SPACE AND EXTEND ALL EXISTING BRANCH CIRCUIT WIRING TO NEW LOCATION.
- NOTE-3
WIRE AND CONNECT RECEPTACLE TO EXISTING ADJACENT 120V, 15AMP RECEPTACLE CIRCUIT.
- NOTE-4
TRACE AND IDENTIFY ALL BRANCH CIRCUIT WIRING. PROVIDE NEW TYPED UPDATED PANEL DIRECTORIES FOR EACH PANEL BOARD.



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SCALE	1:100
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REVIEWED BY:	STAFF
APPROVED BY:	STAFF
AS-BUILT CHECK	
DATE:	08 APR 2016

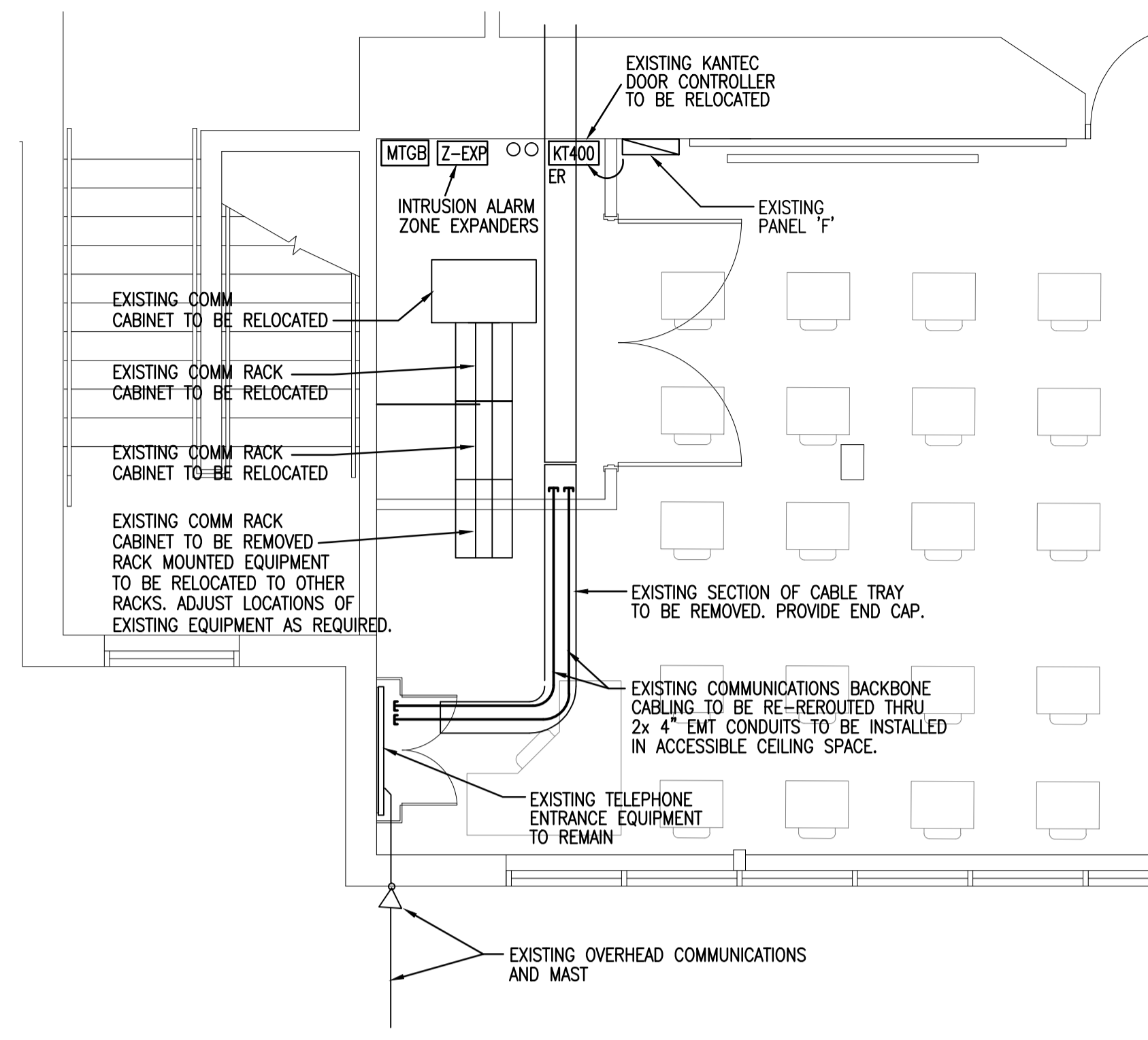
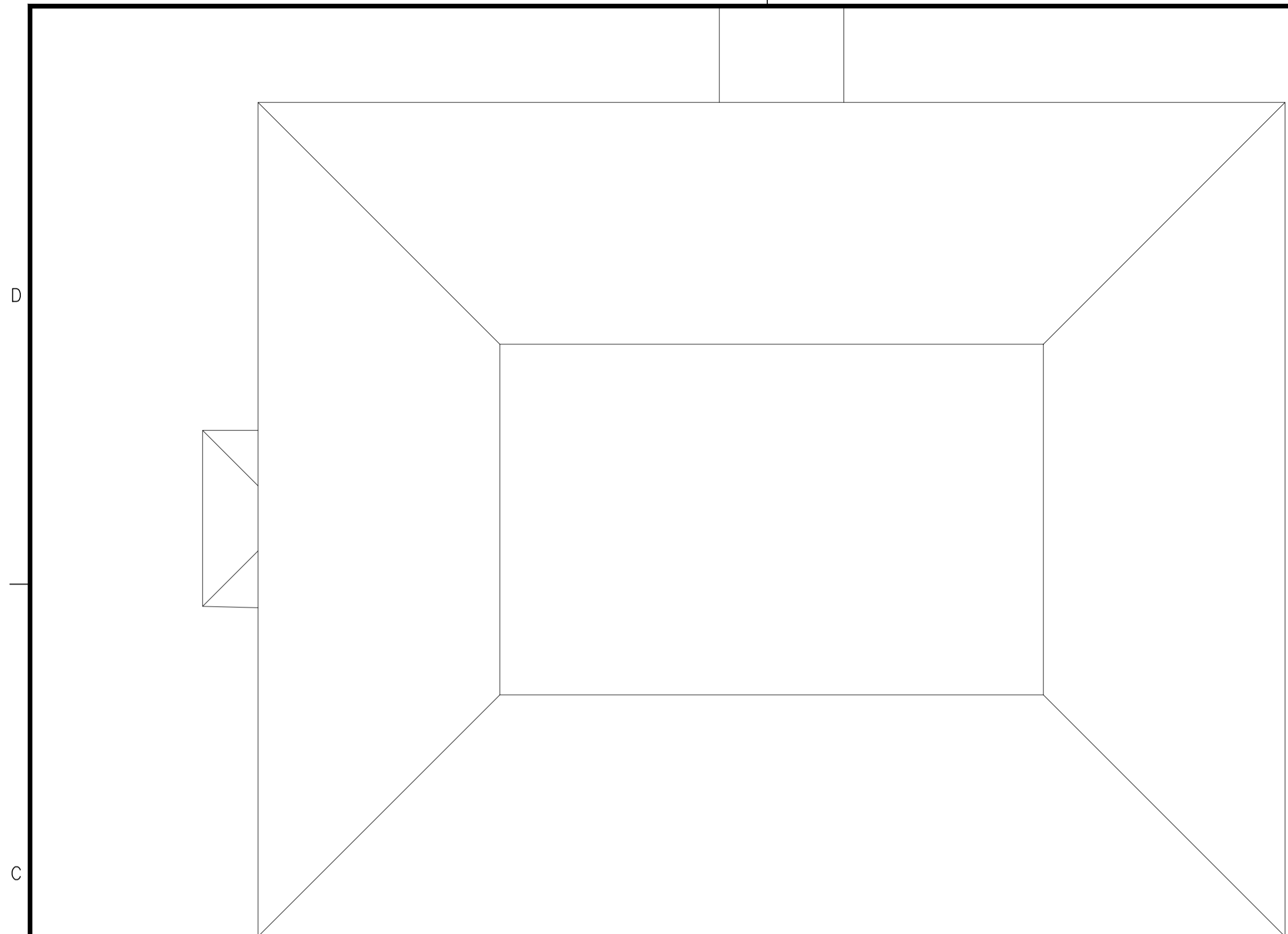
PROJECT
BEAUFORT SCHOOL
RENOVATION

HALIFAX, NOVA SCOTIA
PROJECT NO.: HRSB #3820

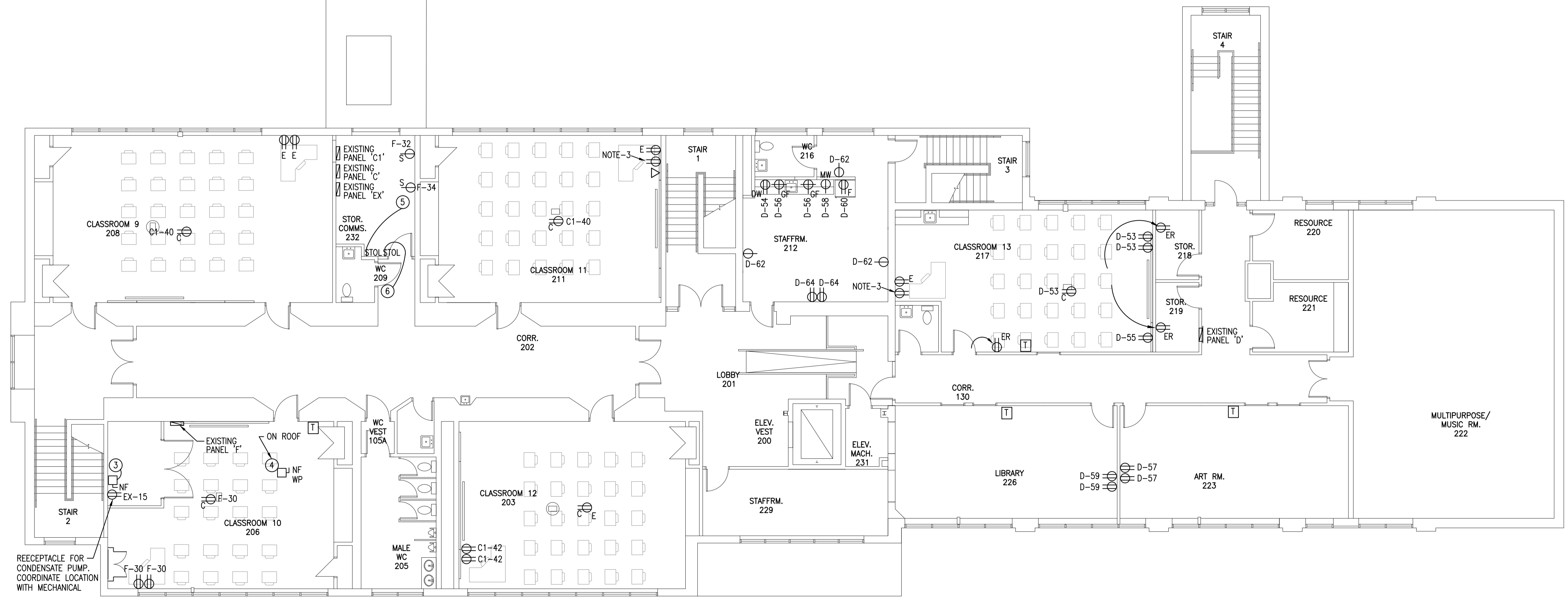
SHEET TITLE
LEVEL 1 -
POWER

INTERNAL NO.:

EP101



2 LEVEL 2 MAIN SERVER ROOM LAYOUT – POWER & SYSTEMS
 EP102 SCALE = 1:50



1 LEVEL 2 FLOOR PLAN – POWER
 EP102 SCALE = 1:100



KEY PLAN

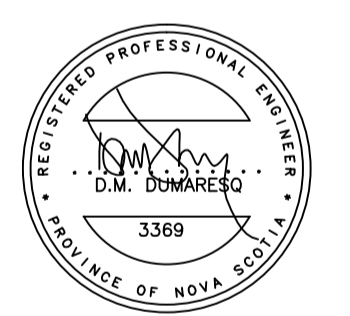
LOGO



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08 APR 2016 ISSUED FOR TENDER
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SCALE AS NOTED
 DRAWN BY: STAFF
 CHECKED BY: STAFF
 REVIEWED BY: STAFF
 APPROVED BY: STAFF
 AS-BUILT CHECK
 DATE: 08 APR 2016

PROJECT
 BEAUFORT SCHOOL
 RENOVATION

HALIFAX, NOVA SCOTIA
 PROJECT NO.: HRSB #3820

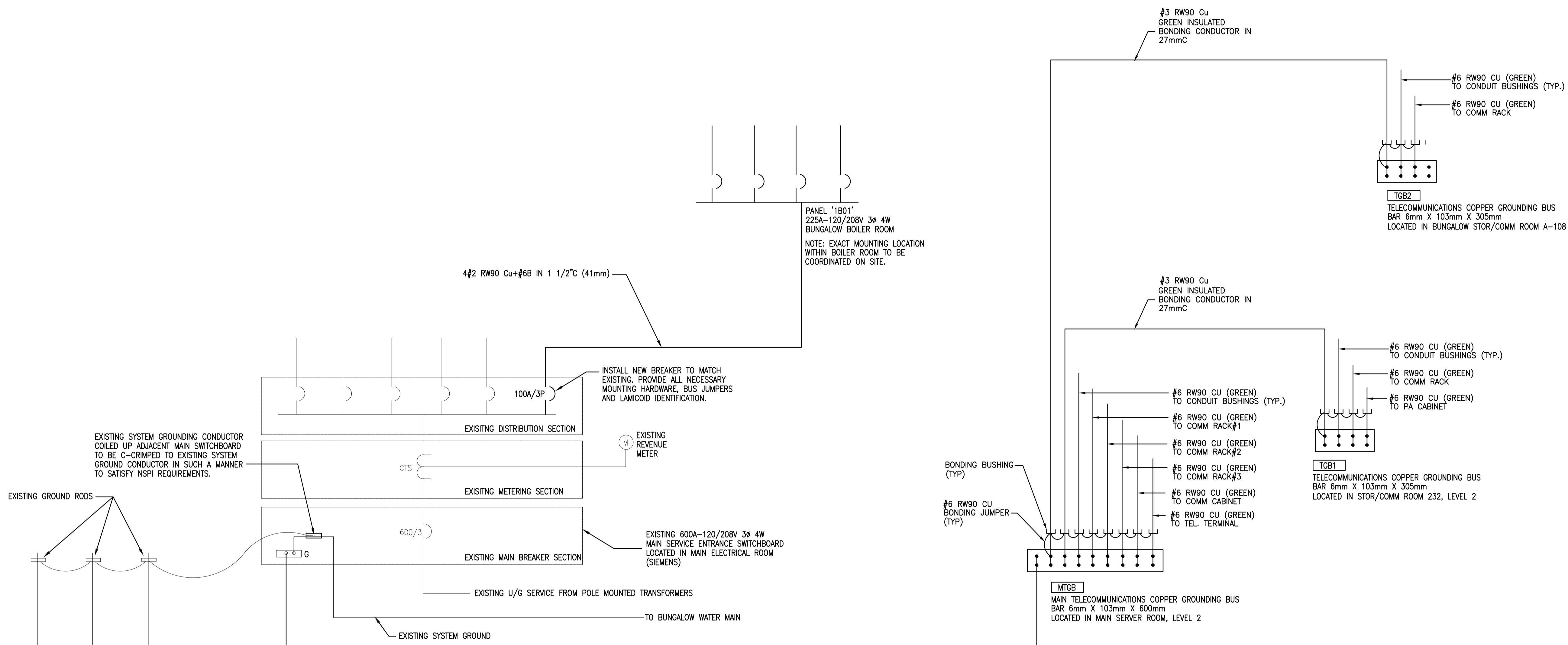
SHEET TITLE
 LEVEL 2 –
 POWER

INTERNAL NO.:

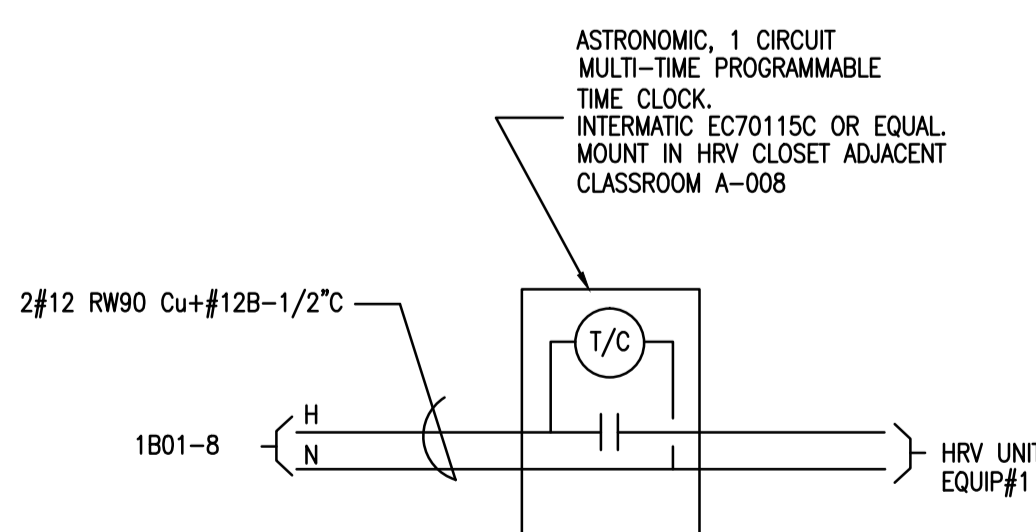
EP102

SHEET - OF -

DUMAC #15-063



1 PARTIAL POWER RISER DIAGRAM
EP601 N.T.S.

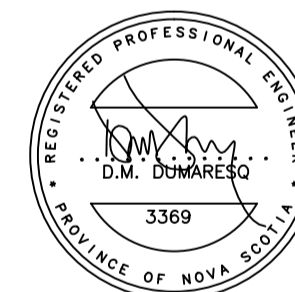


2 HRV UNIT TIME CLOCK WIRING DETAIL
EP601 N.T.S.

NOTES:

1. ALL BONDING CONNECTORS TO TGB BUSBAR REQUIRE TWO BOLT LONG BARREL COMPRESSION CONNECTORS.
2. MOUNT TGB BUSBAR ON INSULATED SUPPORTS.
3. IDENTIFY EACH BONDING CONDUCTOR WITH LAMICOID IDENTIFICATION PLATE AT BOTH ORIGINATING AND TERMINATION POINTS.
4. PROVIDE LAMACOID NAMEPLATE ON COMMUNICATIONS BONDING CONDUCTORS TO READ AS FOLLOWS:

IF THIS CONNECTOR OR CABLE IS LOOSE
OR MUST BE REMOVED, CONTACT THE
PRINCIPAL



NOTE: TRACE AND IDENTIFY ALL BRANCH CIRCUITS FED FROM THIS PANEL AT COMPLETION OF THIS PROJECT. PROVIDE TYPED UPDATED PANEL DIRECTORY. PROVIDE LAMICOID IDENTIFICATION PLATES FOR ALL RECEPTACLES.

EXISTING PANEL BOARD		VOLTS 120/208		PANEL LOCATION	EXISTING 'A'	TYPE	SIEMENS					
PHASE 3		WIRE 4		FED FROM	LEVEL 1 CORRIDOR	MAINS ENTER AT	250 AMPS MTG.					
DESIGNATION	WATTS			CIR. No.	BKR NO	A B C	BKR NO	CIR. No.	WATTS			DESIGNATION
	A	B	C						A	B	C	
EXISTING				1				2				EXISTING
				3				4				
				5				6				
				7				8				
				9				10				
				11				12				
				13				14				
				15				16				
				17				18				
				19				20				
				21				22				
				23				24				
				25				26				
				27				28				
				29				30				
				31				32				
				33				34				
				35				36				
				37				38				
				39				40				
				41				42				
ϕ 'A' TOTAL												
ϕ 'B' TOTAL												
ϕ 'C' TOTAL												
TOTAL LOAD												

NOTE: TRACE AND IDENTIFY ALL BRANCH CIRCUITS FED FROM THIS PANEL AT COMPLETION OF THIS PROJECT. PROVIDE TYPED UPDATED PANEL DIRECTORY. PROVIDE LAMICOID IDENTIFICATION PLATES FOR ALL RECEPTACLES.

EXISTING PANEL BOARD		VOLTS 120/208		PANEL LOCATION	EXISTING 'A1'	TYPE	SIEMENS					
PHASE 3		WIRE 4		FED FROM	LEVEL 1 CORRIDOR	MAINS ENTER AT	250 AMPS MTG.					
DESIGNATION	WATTS			CIR. No.	BKR NO	A B C	BKR NO	CIR. No.	WATTS			DESIGNATION
	A	B	C						A	B	C	
EXISTING				1				2				EXISTING
				3				4				
				5				6				
				7				8				
				9				10				
				11				12				
				13				14				
				15				16				
				17				18				
				19				20				
				21				22				
				23				24				
				25				26				
				27				28				
				29				30				
				31				32				
				33				34				
				35				36				
				37				38				
				39				40				
				41				42				
CEILING RECEPT-CLASS 111/108	500			15A				20A	500			RECEPT-LEVEL 1 CORRIDOR
RECEPT-CLASS 106				15A								
CEILING RECEPT-CLASS 103		500	500	15A								
ϕ 'A' TOTAL												
ϕ 'B' TOTAL												
ϕ 'C' TOTAL												
TOTAL LOAD												

NOTE: SUPPLY AND INSTALL BREAKERS AS INDICATED. BREAKER TYPE TO MATCH EXISTING. PROVIDE NEW UPDATED TYPED PANEL DIRECTORY.

NOTE: TRACE AND IDENTIFY ALL BRANCH CIRCUITS FED FROM THIS PANEL AT COMPLETION OF THIS PROJECT. PROVIDE TYPED UPDATED PANEL DIRECTORY. PROVIDE LAMICOID IDENTIFICATION PLATES FOR ALL RECEPTACLES.

EXISTING PANEL BOARD		VOLTS 120/208		PANEL LOCATION	EXISTING 'B'	TYPE	SIEMENS					
PHASE 3		WIRE 4		FED FROM	LEVEL 1 CORRIDOR	MAINS ENTER AT	225 AMPS MTG.					
DESIGNATION	WATTS			CIR. No.	BKR NO	A B C	BKR NO	CIR. No.	WATTS			DESIGNATION
	A	B	C						A	B	C	
EXISTING				1				2				EXISTING
				3				4				
				5				6				
				7				8				
				9				10				
				11				12				
				13				14				
				15				16				
				17				18				
				19				20				
				21				22				
				23				24				
				25				26				
				27				28				
				29				30				
				31				32				
				33				34				
				35				36				
				37				38				
				39				40				
				41				42				
				43				44				
				45				46				
				47				48				
				49				50				
				51				52				
				53				54				
				55				56				
				57				58				
				59				60				
				61				62				
				63				64				
				65				66				
RECEPT-CLASS 125	500			15A								
RECEPT-CLASS 125		500		15A								
RECEPT-CLASS 126			500	15A								
RECEPT-OFFICE 112A/112B	500			15A								
RECEPT-RECEPTION 112		500		15A								
NIGHT LIGHTS-LEVEL 1			800	20A								
RECEPT-RECEPTION 112				15A								
ϕ 'A' TOTAL												
ϕ 'B' TOTAL												
ϕ 'C' TOTAL												
TOTAL LOAD												

* BREAKER LOCK ON DEVICE
NOTE: SUPPLY AND INSTALL BREAKERS AS INDICATED. BREAKER TYPE TO MATCH EXISTING. PROVIDE NEW UPDATED TYPED PANEL DIRECTORY.

NOTE: TRACE AND IDENTIFY ALL BRANCH CIRCUITS FED FROM THIS PANEL AT COMPLETION OF THIS PROJECT. PROVIDE TYPED UPDATED PANEL DIRECTORY. PROVIDE LAMICOID IDENTIFICATION PLATES FOR ALL RECEPTACLES.

EXISTING PANEL BOARD		VOLTS 120/208		PANEL LOCATION	EXISTING 'C'	TYPE	SIEMENS					
PHASE 3		WIRE 4		FED FROM	LEVEL 2 STOR ROOM	MAINS ENTER AT	250 AMPS MTG.					
DESIGNATION	WATTS			CIR. No.	BKR NO	A B C	BKR NO	CIR. No.	WATTS			DESIGNATION
	A	B	C						A	B	C	
EXISTING				1				2				EXISTING
				3				4				
				5				6				
				7				8				
				9				10				
				11				12				
				13				14				
				15				16				
				17				18				
				19				20				
				21				22				
				23				24				
				25				26				
				27				28				
				29				30				
				31				32				
				33				34				
				35				36				
				37				38				
				39				40				
				41				42				
ϕ 'A' TOTAL												
ϕ 'B' TOTAL												
ϕ 'C' TOTAL												
TOTAL LOAD												

NOTE: SUPPLY AND INSTALL BREAKERS AS INDICATED. BREAKER TYPE TO MATCH EXISTING. PROVIDE NEW UPDATED TYPED PANEL DIRECTORY.

NOTE: TRACE AND IDENTIFY ALL BRANCH CIRCUITS FED FROM THIS PANEL AT COMPLETION OF THIS PROJECT. PROVIDE TYPED UPDATED PANEL DIRECTORY. PROVIDE LAMICOID IDENTIFICATION PLATES FOR ALL RECEPTACLES.

EXISTING PANEL BOARD		VOLTS 120/208		PANEL LOCATION	EXISTING 'C1'	TYPE	SIEMENS					
PHASE 3		WIRE 4		FED FROM	LEVEL 2 STOR ROOM	MAINS ENTER AT	250 AMPS MTG.					
DESIGNATION	WATTS			CIR. No.	BKR NO	A B C	BKR NO	CIR. No.	WATTS			DESIGNATION
	A	B	C						A	B	C	
EXISTING				1				2				EXISTING
				3				4				
				5				6				
				7				8				
				9				10				
				11				12				
				13				14				
				15				16				
				17				18				
				19				20				
				21				22				
				23				24				
				25				26				
				27				28				
				29				30				
				31				32				
				33				34				
				35				36				
				37				38				
				39				40				
				41				42				
ϕ 'A' TOTAL												
ϕ 'B' TOTAL												
ϕ 'C' TOTAL												
TOTAL LOAD												

NOTE: TRACE AND IDENTIFY ALL BRANCH CIRCUITS FED FROM THIS PANEL AT COMPLETION OF THIS PROJECT. PROVIDE TYPED UPDATED PANEL DIRECTORY. PROVIDE LAMICOID IDENTIFICATION PLATES FOR ALL RECEPTACLES.

EXISTING PANEL BOARD		VOLTS 120/208		PANEL LOCATION	EXISTING 'D'	TYPE	SIEMENS	
PHASE 3		WIRE 4		FED FROM	LEVEL 2 CORRIDOR	MAINS ENTER AT	250 AMPS MTG.	
DESIGNATION	WATTS							

EXISTING PANEL BOARD

NOTE: TRACE AND IDENTIFY ALL BRANCH CIRCUITS FED FROM THIS PANEL AT COMPLETION OF THIS PROJECT. PROVIDE TYPED UPDATED PANEL DIRECTORY. PROVIDE LAMICOID IDENTIFICATION PLATES FOR ALL RECEPTACLES.

VOLTS	120/208	PANEL	EXISTING 'EX'	TYPE	SIEMENS
PHASE	3	LOCATION	LEVEL 2 STOR ROOM	MAINS	ENTER AT
WIRE	4	FED FROM		AMPS	MTG.

DESIGNATION	WATTS			CIR. No.	BKR NO	A	B	C	BKR NO	CIR. No.	WATTS			DESIGNATION
	A	B	C								A	B	C	
EXISTING				1						2			EXISTING	
				3						4				
				5						6				
EQ#5 SF-211	330			7	20A					8				
EQ#6 SF-232		200		9	15A					10				
EQ#4 AC-206			1400	11	2P					12				
				13	15A					14				
RECEPT-CONDENSATE PUMP		200		15	15A					16				
				17						17				

NOTE: SUPPLY AND INSTALL BREAKERS AS INDICATED. BREAKER TYPE TO MATCH EXISTING. PROVIDE NEW UPDATED TYPED PANEL DIRECTORY.

TOTAL LOAD _____ KW _____ AMP

EXISTING PANEL BOARD

NOTE: TRACE AND IDENTIFY ALL BRANCH CIRCUITS FED FROM THIS PANEL AT COMPLETION OF THIS PROJECT. PROVIDE TYPED UPDATED PANEL DIRECTORY. PROVIDE LAMICOID IDENTIFICATION PLATES FOR ALL RECEPTACLES.

VOLTS	120/208	PANEL	EXISTING 'H'	TYPE	SIEMENS
PHASE	3	LOCATION	MAIN ELECT ROOM	MAINS	250
WIRE	4	FED FROM		ENTER AT	AMPS
				MTG.	

DESIGNATION	WATTS			CIR. No.	BKR NO	A	B	C	BKR NO	CIR. No.	WATTS			DESIGNATION
	A	B	C								A	B	C	
EXISTING				1						2			EXISTING	
				3						4				
				5						6				
				7						8				
				9						10				
				11						12				
				13						14				
				15						16				
				17						17				
				19						20				
				21						22				
				23						24				
				25						26				
				27						28				
				29						30				
				31						32				
				33						34				
				35						36				
				37						38				
				39						40				
				41						42				

NOTE: SUPPLY AND INSTALL BREAKERS AS INDICATED. BREAKER TYPE TO MATCH EXISTING. PROVIDE NEW UPDATED TYPED PANEL DIRECTORY.

TOTAL LOAD _____ KW _____ AMP

EXISTING PANEL BOARD

NOTE: TRACE AND IDENTIFY ALL BRANCH CIRCUITS FED FROM THIS PANEL AT COMPLETION OF THIS PROJECT. PROVIDE TYPED UPDATED PANEL DIRECTORY. PROVIDE LAMICOID IDENTIFICATION PLATES FOR ALL RECEPTACLES.

VOLTS	120/208	PANEL	EXISTING 'F'	TYPE	SIEMENS
PHASE	3	LOCATION	MAIN SERVER ROOM	MAINS	250
WIRE	4	FED FROM		ENTER AT	AMPS
				MTG.	

DESIGNATION	WATTS			CIR. No.	BKR NO	A	B	C	BKR NO	CIR. No.	WATTS			DESIGNATION
	A	B	C								A	B	C	
EXISTING				1						2			EXISTING	
				3						4				
				5						6				
				7						8				
				9						10				
				11						12				
				13						14				
				15						15				
				17						18				
				19						20				
				21						22				
				23						24				
				25						26				
				27						28				
				29						30				
				31						31				
				33						32				
				35						33				
				37						34				
				39						35				
				41						36				
										40				
										42				

NOTE: SUPPLY AND INSTALL BREAKERS AS INDICATED. BREAKER TYPE TO MATCH EXISTING. PROVIDE NEW UPDATED TYPED PANEL DIRECTORY.

TOTAL LOAD _____ KW _____ AMP

NEW PANEL BOARD

NOTE: TRACE AND IDENTIFY ALL BRANCH CIRCUITS FED FROM THIS PANEL AT COMPLETION OF THIS PROJECT. PROVIDE TYPED UPDATED PANEL DIRECTORY. PROVIDE LAMICOID IDENTIFICATION PLATES FOR ALL RECEPTACLES.

VOLTS	120/208	PANEL	EXISTING '1B01'	TYPE	SIEMENS
PHASE	3	LOCATION	BOILER ROOM	MAINS	225
WIRE	4	FED FROM	MAIN SWITCHBOARD	ENTER AT	AMPS
				MTG.	

DESIGNATION	WATTS			CIR. No.	BKR NO	A	B	C	BKR NO	CIR. No.	WATTS			DESIGNATION
	A	B	C								A	B	C	
RECEPT-MUSIC RM	500			1	20A				20A	2	500			RECEPT-COMM RACK ROOM A108
RECEPT-MUSIC RM		500		3	15A				15A	4		100		EXIT LIGHTS
RECEPT-MUSIC RM			500	5	15A				15A	6			100	CONTROL TRANSFORMERS
EQ#2 DUCT HEATER	1666			7	3P				20A	8	1000			EQ#1 HRV UNIT
		1666		9	20				15A	10		100		DOOR HARDWARE POWER SUPPLY
LIGHTING-MUSIC RM			1666	11	A				15A	12				
				13	20A					14				
				15						16				
				17						18				
				19						20				
				21						22				
				23						24				
				25						26				
				27						28				
				29						30				
				31						32				
				33						34				
SPARE				35	15A					35				SPARE
SPARE				37	15A					36				SPARE
SPARE				39	15A					37				SPARE
SPARE				41	15A					38				SPARE
										40				SPARE
										42				SPARE

NOTE: SUPPLY AND INSTALL BREAKERS AS INDICATED. BREAKER TYPE TO MATCH EXISTING. PROVIDE NEW UPDATED TYPED PANEL DIRECTORY.

TOTAL LOAD 9.298 KW 25.8 AMP

NOTE: EACH LIGHTING CIRCUIT TO HAVE SEPARATE NEUTRAL

EXISTING PANEL BOARD

NOTE: TRACE AND IDENTIFY ALL BRANCH CIRCUITS FED FROM THIS PANEL AT COMPLETION OF THIS PROJECT. PROVIDE TYPED UPDATED PANEL DIRECTORY. PROVIDE LAMICOID IDENTIFICATION PLATES FOR ALL RECEPTACLES.

VOLTS	120/208	PANEL	EXISTING 'G'	TYPE	SIEMENS
PHASE	3	LOCATION	BUNGALOW BOILER ROOM	MAINS	ENTER AT
WIRE	4	FED FROM		AMPS	MTG.

DESIGNATION	WATTS			CIR. No.	BKR NO	A	B	C	BKR NO	CIR. No.	WATTS			DESIGNATION
	A	B	C								A	B	C	
EXISTING				1						2			EXISTING	
				3						4				
				5						6				
				7						8				
				9						10				
				11						12				
				13						14				
				15						15				
				17						16				

NOTE: SUPPLY AND INSTALL BREAKERS AS INDICATED. BREAKER TYPE TO MATCH EXISTING. PROVIDE NEW UPDATED TYPED PANEL DIRECTORY.

TOTAL LOAD _____ KW _____ AMP



KEY PLAN

LOGO



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SCALE: N.T.S.
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 CHECKED BY: STAFF
 REVIEWED BY: STAFF
 APPROVED BY: STAFF
 AS-BUILT CHECK
 DATE: 08 APR 2016

PROJECT: BEAUFORT SCHOOL RENOVATION

HALIFAX, NOVA SCOTIA
 PROJECT NO.: HRSB #3820

SHEET TITLE: PANEL SCHEDULES, MOTOR STARTER AND CONTROL LIST

INTERNAL NO.: EP702

SHEET OF

MOTOR STARTER AND CONTROL LIST																			
EQUIPMENT NO.	LOCATION	EQUIPMENT	EQUIPMENT RATING		VOLTAGE	PHASE	PANEL & CIRCUIT NO.	STARTER			LOCATE AT MOTOR			REMOTE CONTROL			FEEDER DETAILS	EQUIPMENT NO.	
			KW	HP				MANUAL	IN COVER	MAGNETIC	IN COVER	LEGEND	LEGEND	LEGEND	LEGEND	LEGEND			LEGEND
1	MUSIC ROOM A-008	HRV-008	M	M	E		1B01-8											2#12+12B-16mmC	1
2	MUSIC ROOM A-008	DUCT HEATER	M	M	E		1B01-7,9,11											3#12+12B-21mmC	2
3	SERVER ROOM 206A	AC-206A (INDOOR)	M	M	E		FED FROM AC-206											4#12+12B-21mmC	3
4	ROOF	AC-206 (OUTDOOR)	M	M	E		EX-11,13											2#12+12B-16mmC	4
5	STOR/COMM ROOM 232	SF-211	M	M	E		EX-7	X	X	X								2#12+12B-16mmC	5
6	CORRIDOR 202	SF-232	M	M	E		EX-9	X	X	X								2#12+12B-16mmC	6
7																			7
8																			8
9																			9
10																			10
11																			11
12																			12

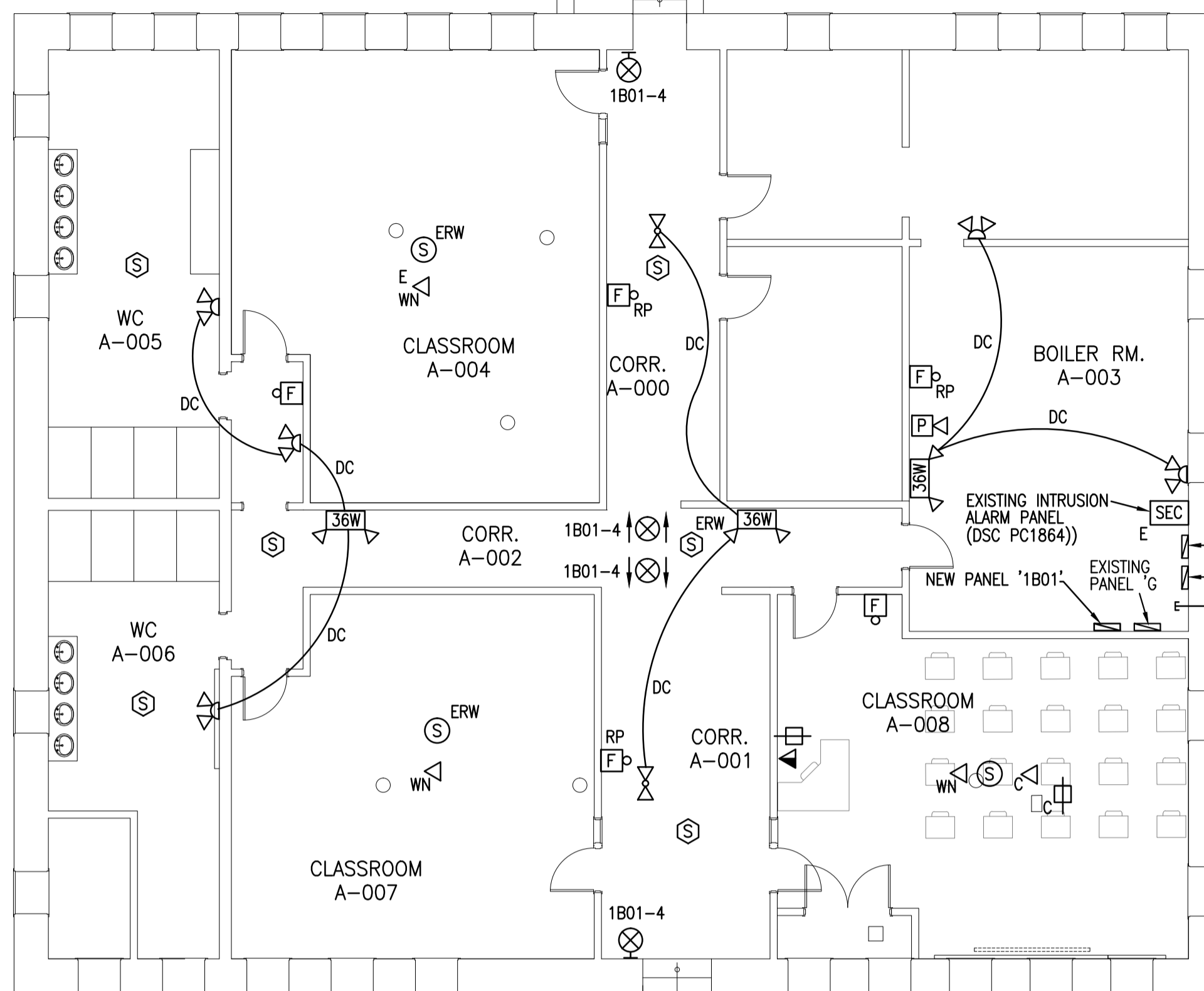
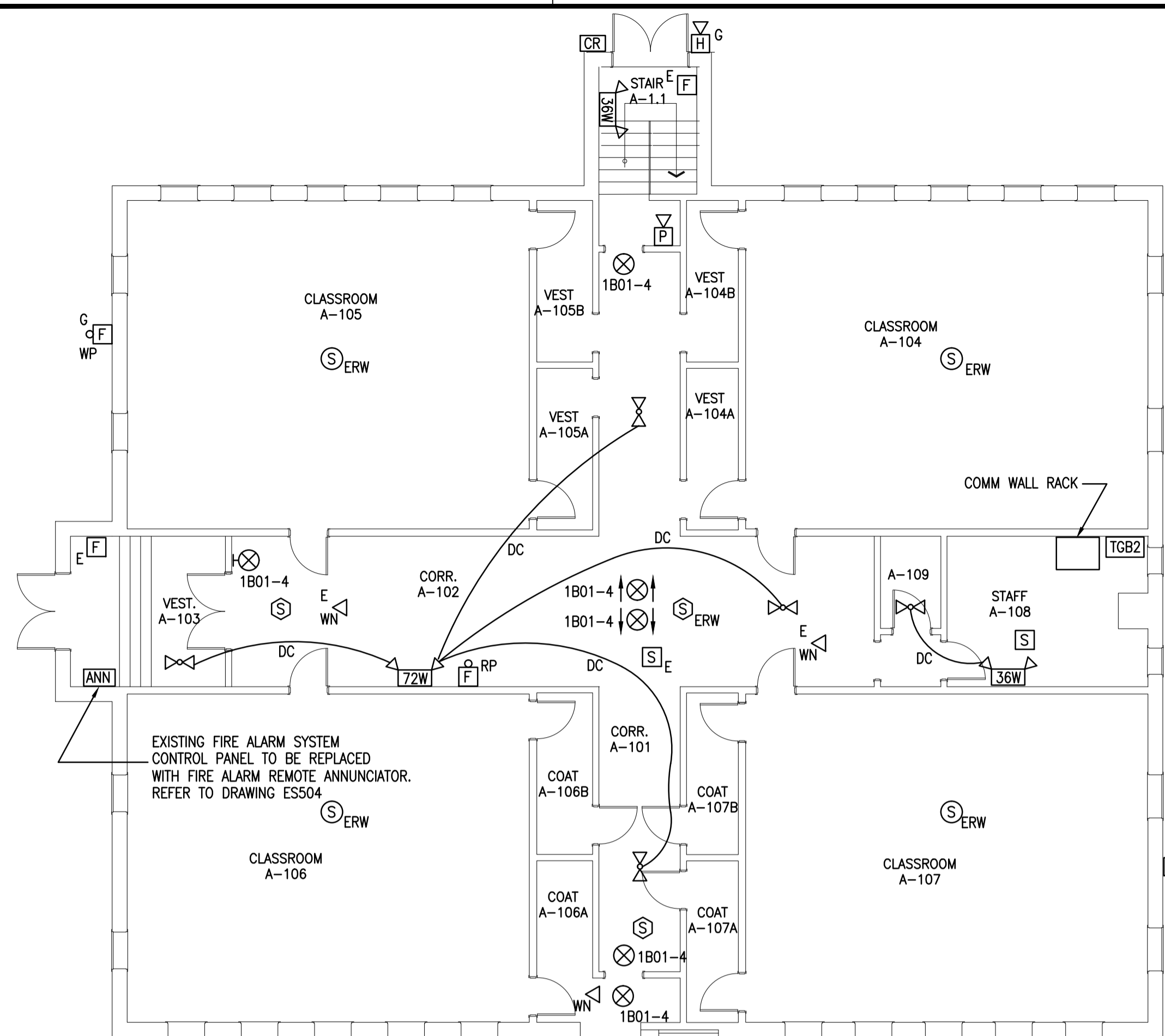
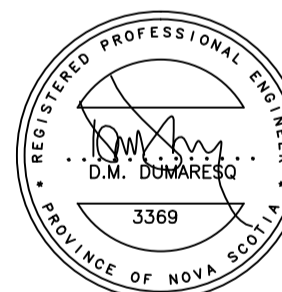
DUMAC #15-063

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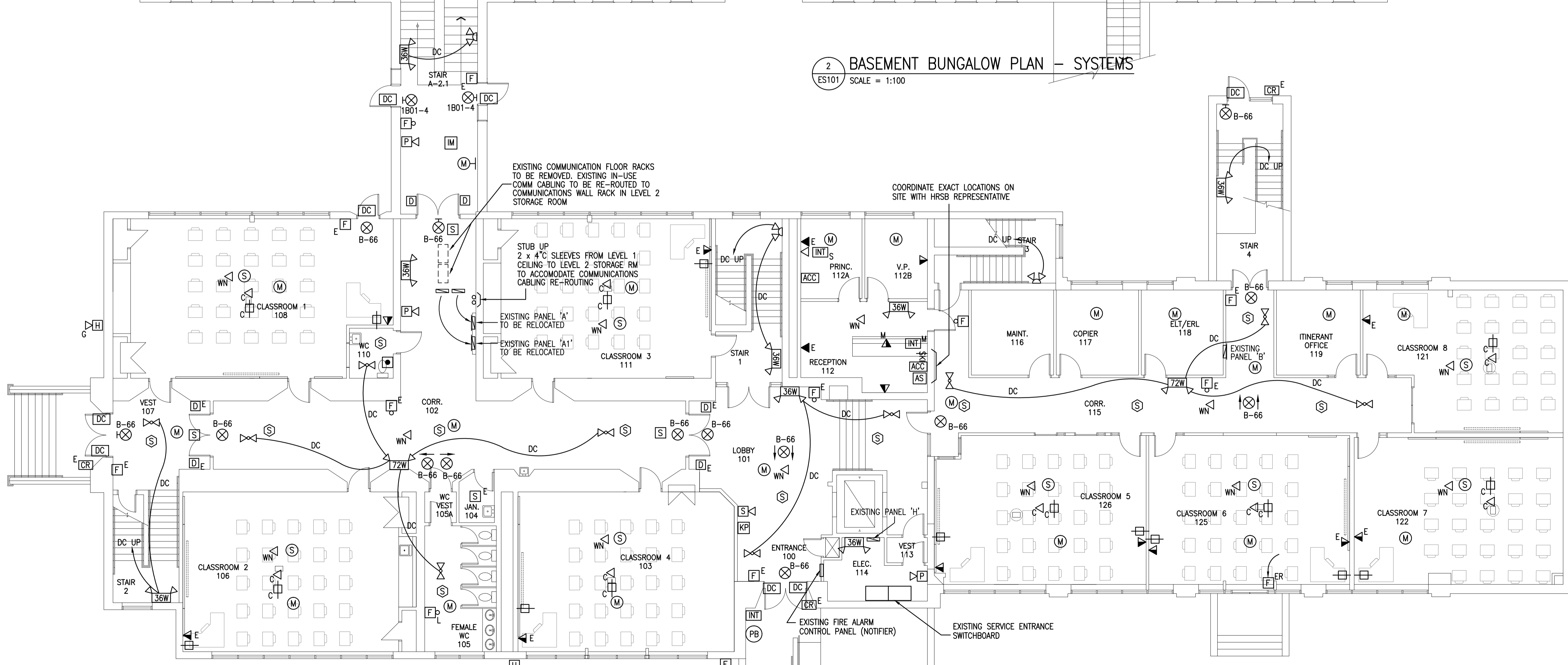
C

B

A

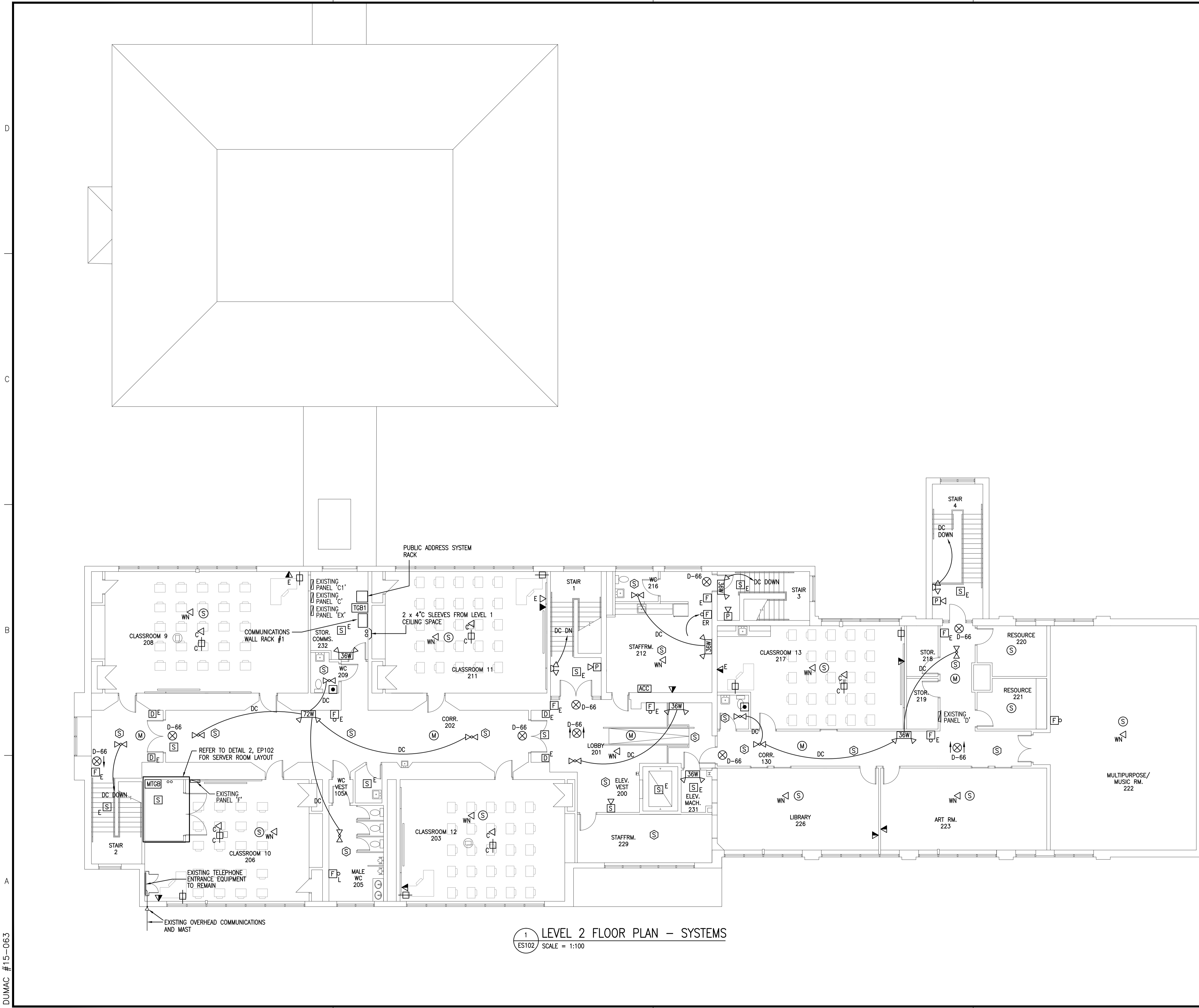


2 BASEMENT BUNGALOW PLAN - SYSTEMS
ES101 SCALE = 1:100



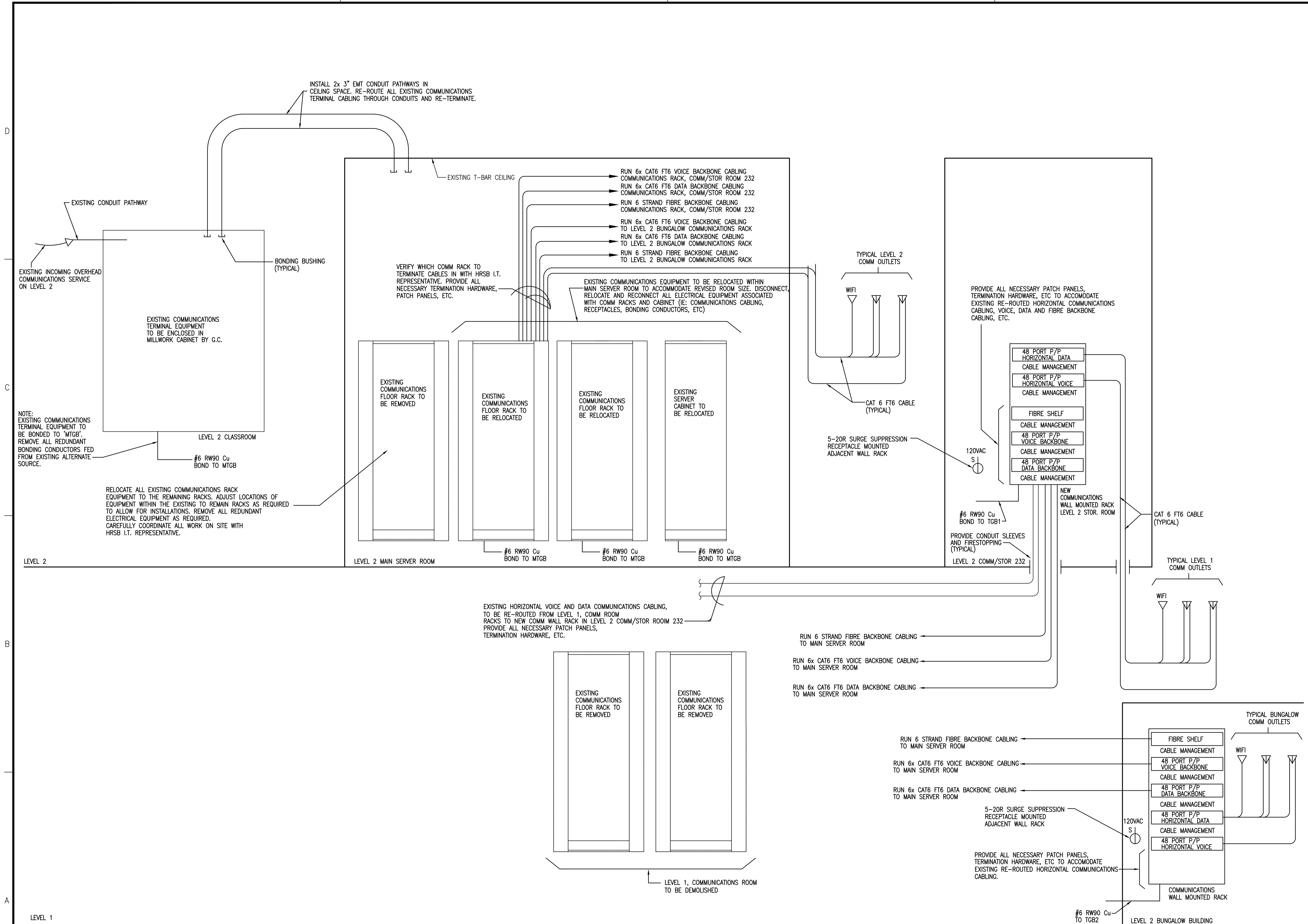
1 LEVEL 1 FLOOR PLAN - SYSTEMS
ES101 SCALE = 1:100

DUMAC #15-063

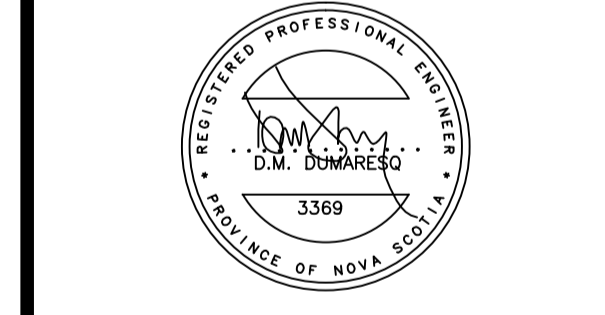


1 LEVEL 2 FLOOR PLAN - SYSTEMS
SCALE = 1:100

DUMAC #15-063



08 APR 2016	ISSUED FOR TENDER
DATE	MARK
	ISSUE

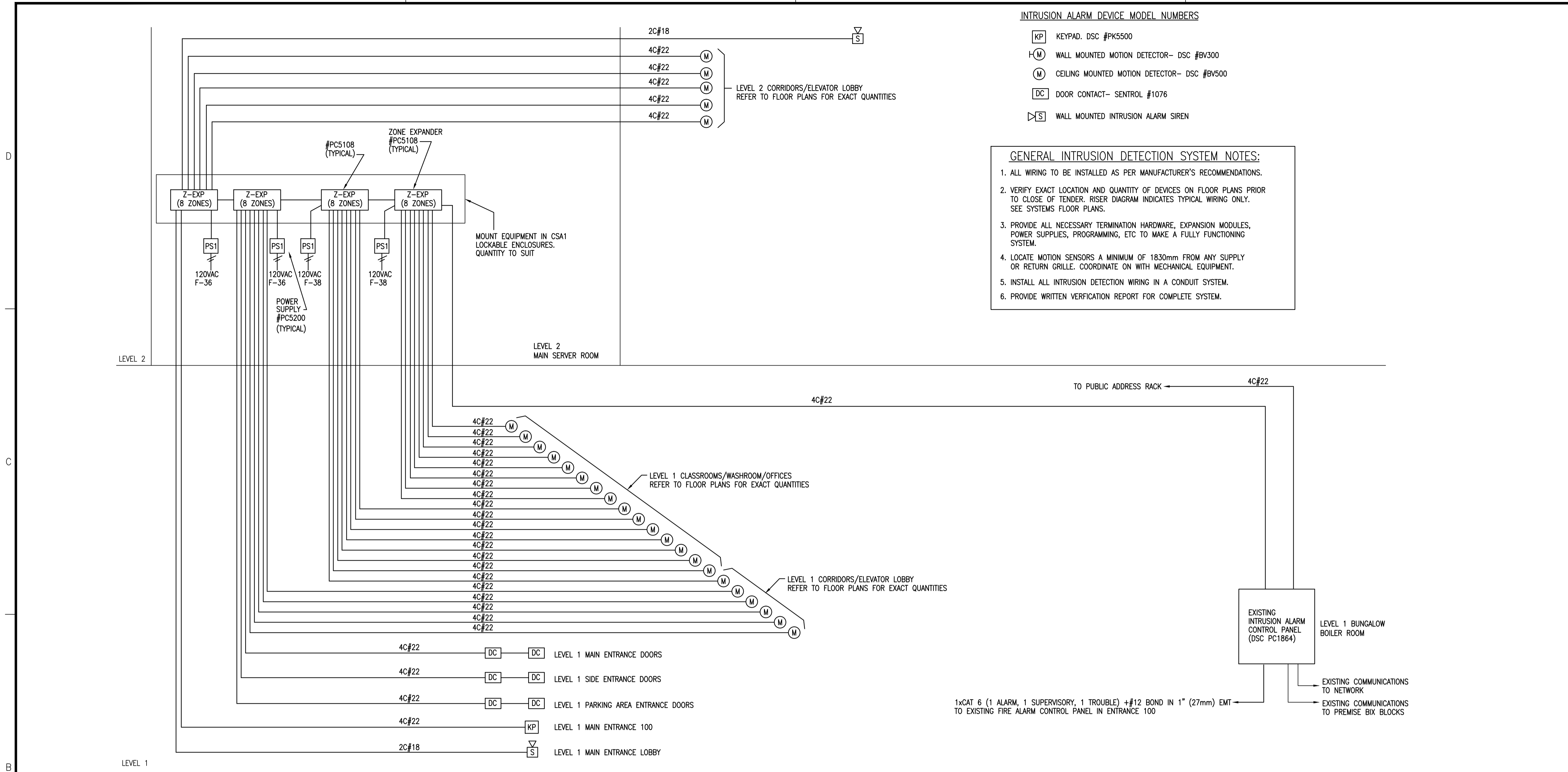


SCALE	N.T.S.
DRAWN BY:	STAFF
CHECKED BY:	STAFF
REVIEWED BY:	STAFF
APPROVED BY:	STAFF
AS-BUILT CHECK	
DATE:	08 APR 2016
PROJECT	BEAUFORT SCHOOL RENOVATION
HALIFAX, NOVA SCOTIA	
PROJECT NO.:	HRSB #3820
SHEET TITLE	STRUCTURED WIRING RISER DIAGRAM

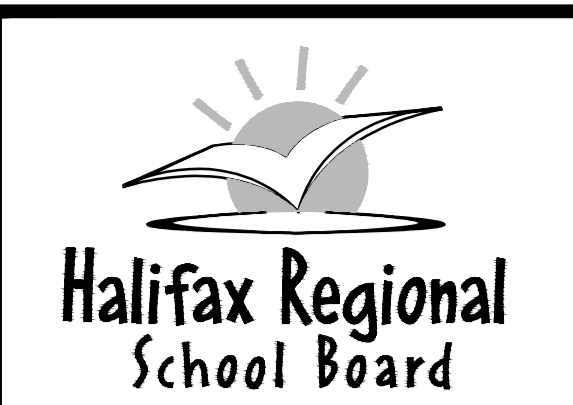
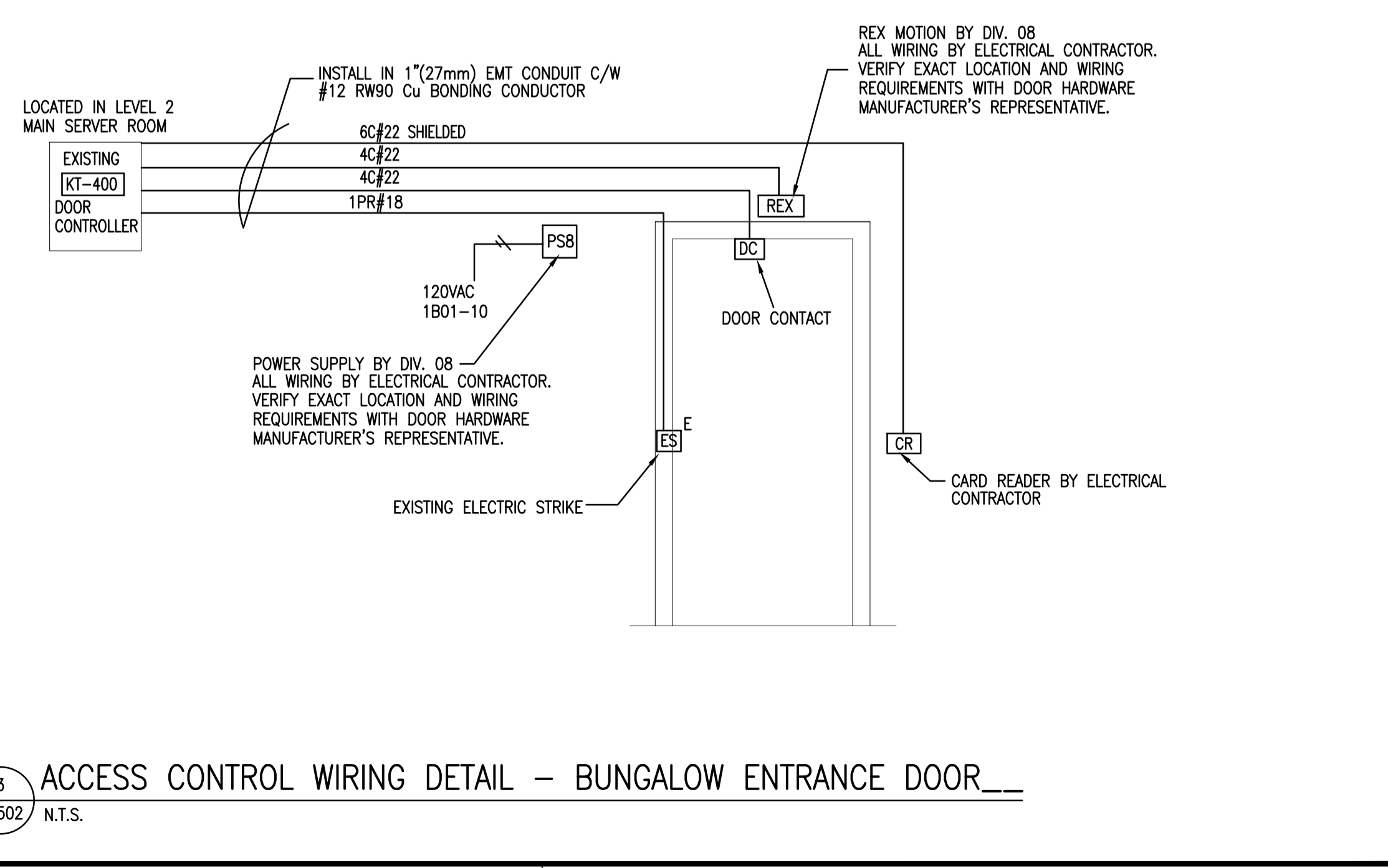
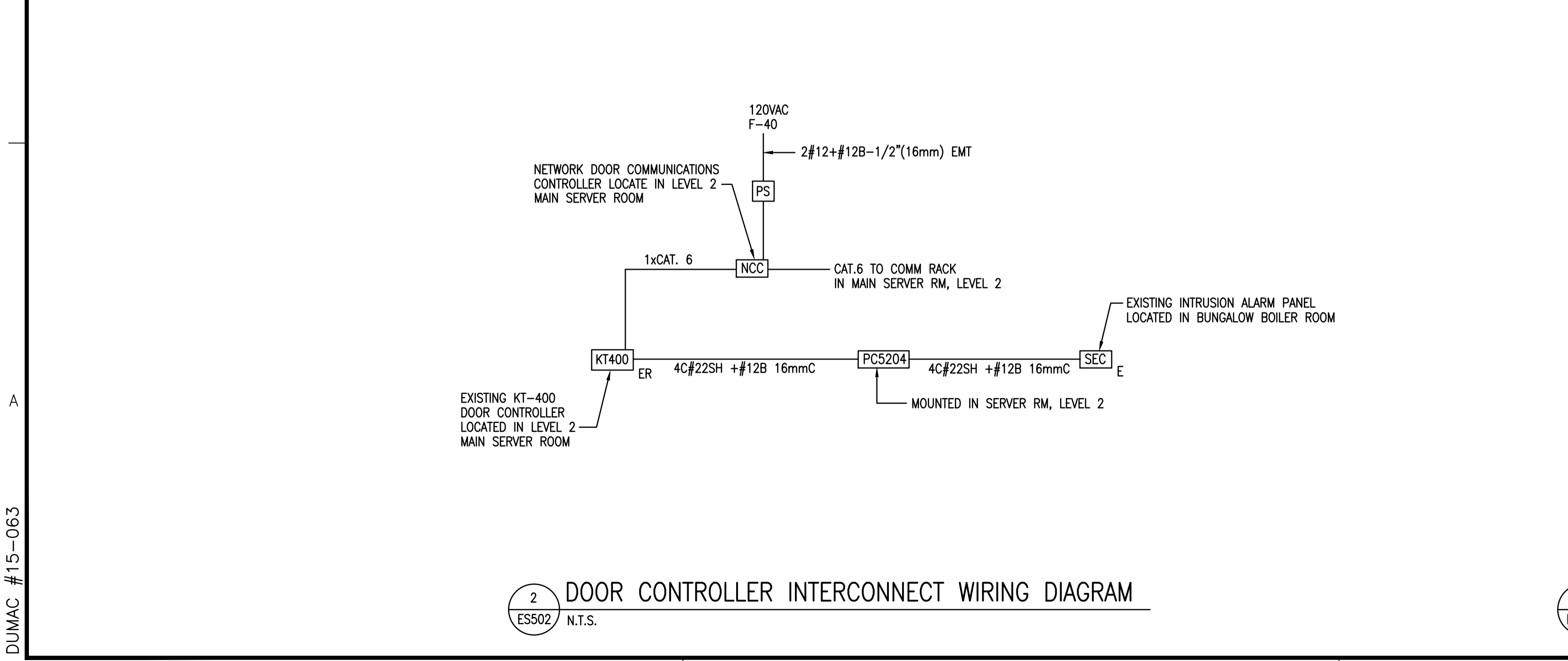
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SHEET	OF

1 ES501 STRUCTURED WIRING RISER DIAGRAM N.T.S.

DUMAC #15-063

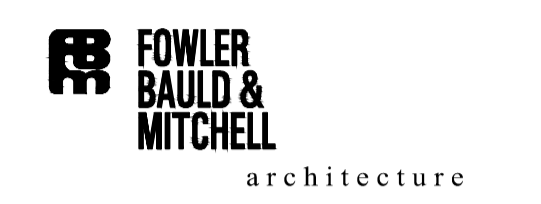


1 INTRUSION ALARM SYSTEM RISER DIAGRAM
ES502 N.T.S.



KEY PLAN

LOGO



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GRAPHIC SCALE

08 APR 2016 ISSUED FOR TENDER
DATE MARK ISSUE



SCALE N.T.S.
DRAWN BY: STAFF
CHECKED BY: STAFF
REVIEWED BY: STAFF
APPROVED BY: STAFF
AS-BUILT CHECK
DATE: 08 APR 2016

PROJECT
BEAUFORT SCHOOL
RENOVATION

HALIFAX, NOVA SCOTIA
PROJECT NO.: HRSB #3820

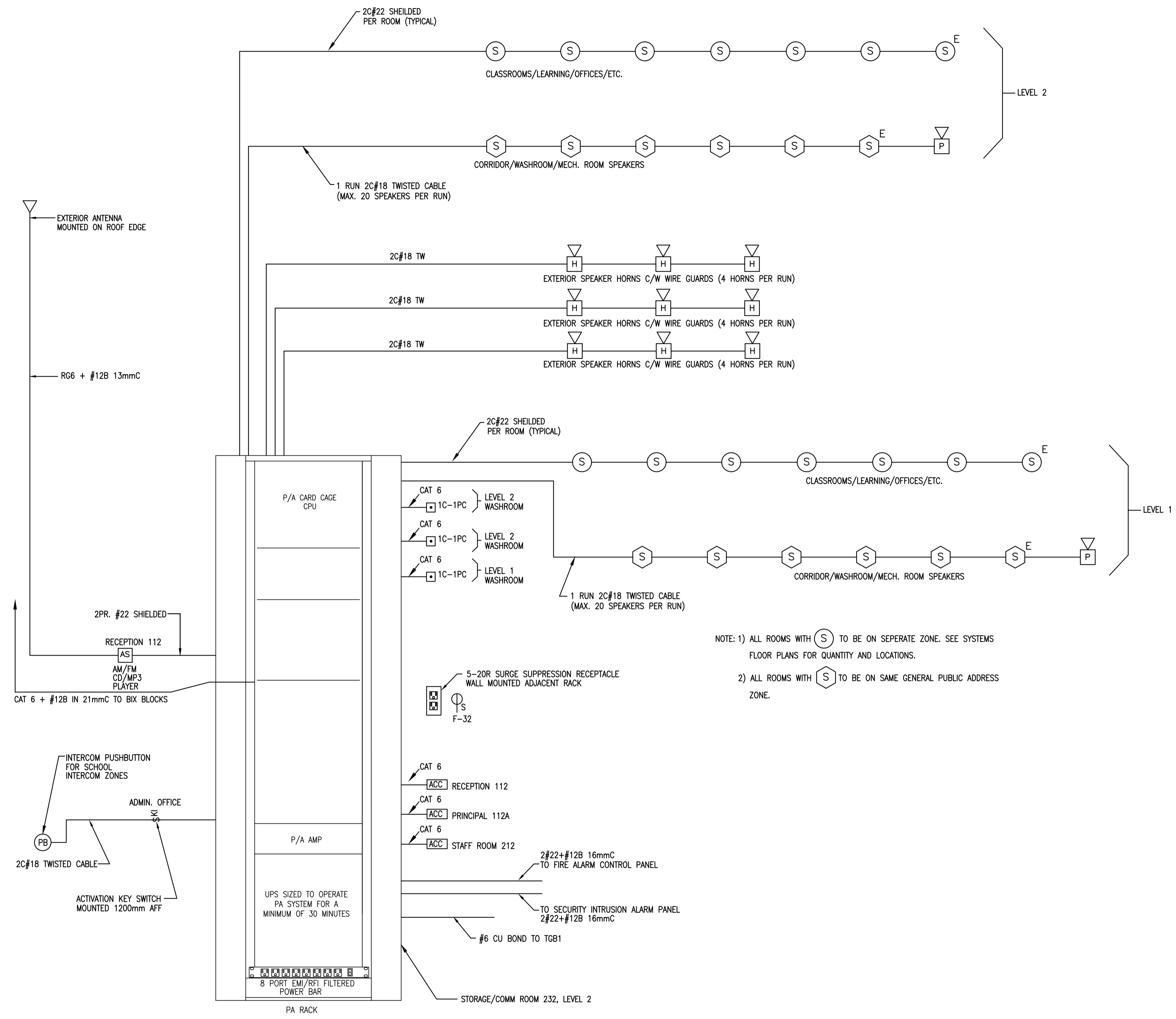
SHEET TITLE
INTRUSION ALARM AND
ACCESS CONTROL
DETAILS

INTERNAL NO.:

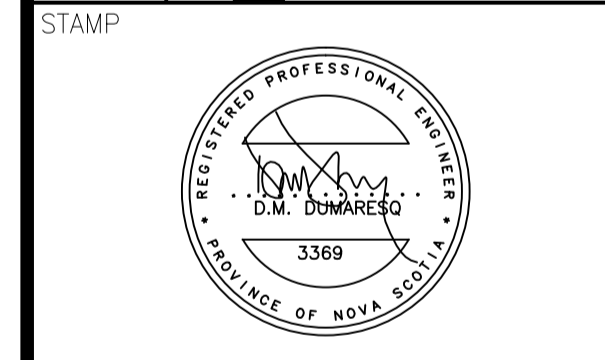
ES502

SHEET - OF -

DUMAC #15-063



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AS-BUILT CHECK	
DATE:	08 APR 2016

PROJECT
BEAUFORT SCHOOL RENOVATION

HALIFAX, NOVA SCOTIA
PROJECT NO.: HRSB #3820

SHEET TITLE
PUBLIC ADDRESS RISER DIAGRAM

INTERNAL NO.:

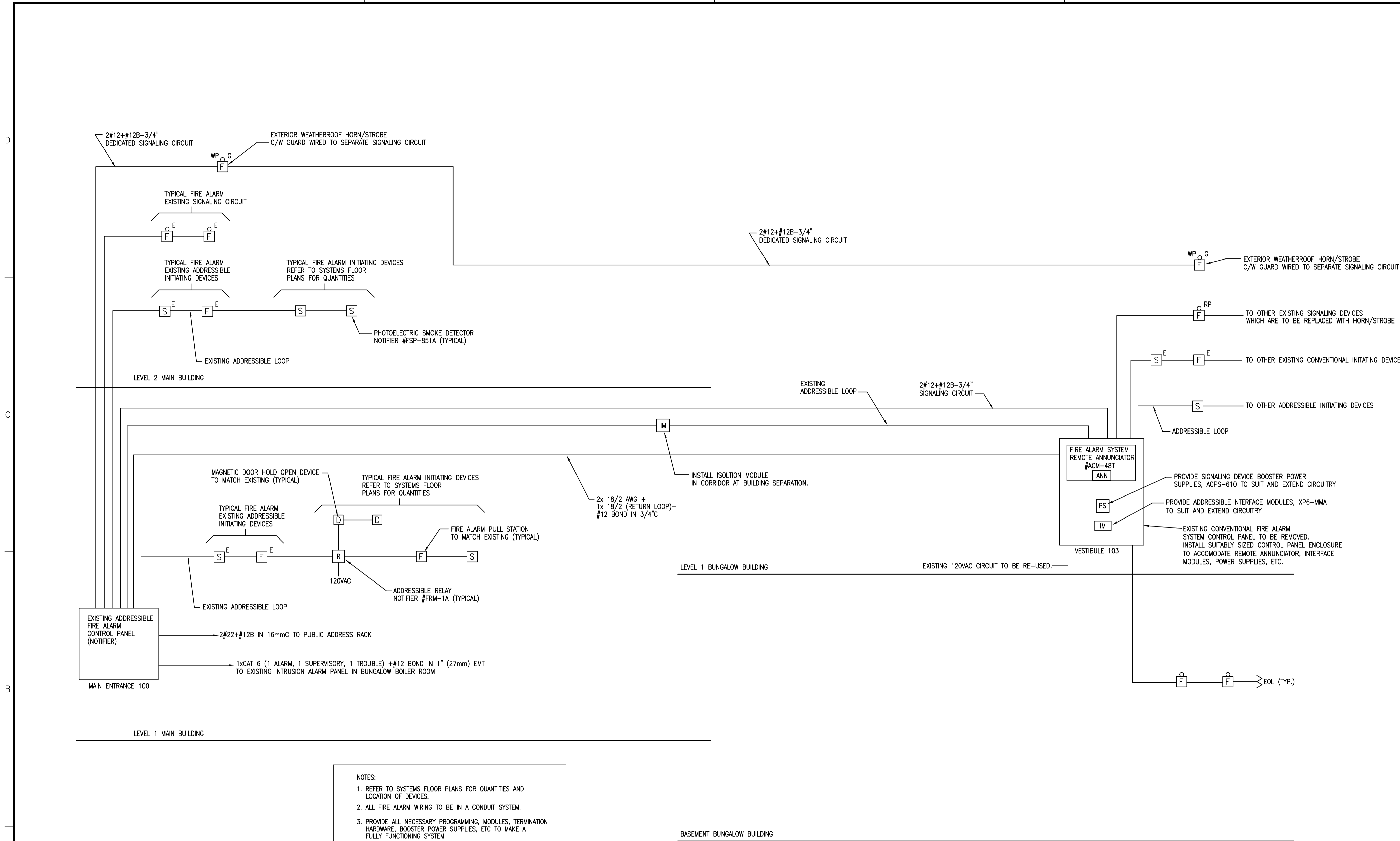
ES503

SHEET - OF -

1 PUBLIC ADDRESS RISER DIAGRAM
ES503 N.T.S.

- NOTES:
- 1.) WIRING TO BE INSTALLED TO SUIT MANUFACTURER. REFER TO SECTION 27 05 28 FOR WIRING METHODS.
 - 2.) FOR EXACT QUANTITY AND LOCATION OF DEVICES REFER TO SYSTEMS FLOOR PLANS ES101 AND ES102
 - 3.) INSTALL ALL P/A SYSTEM WIRING IN A "HOME RUN" CONFIGURATION.
 - 4.) ALL WIRING TO HAVE FT-6 JACKET
 - 5.) UPS SUPPLIED AND INSTALLED BY PA SYSTEM SUPPLIER

DUMAC #15-063



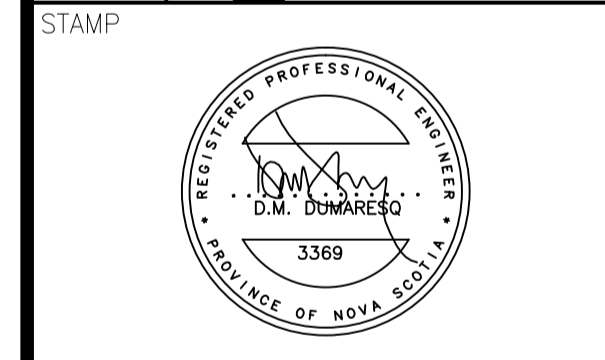
EXISTING ADDRESSABLE FIRE ALARM CONTROL PANEL (NOTIFIER)
 2#22+12B IN 16mmC TO PUBLIC ADDRESS RACK
 1xCAT 6 (1 ALARM, 1 SUPERVISORY, 1 TROUBLE) + #12 BOND IN 1" (27mm) EMT TO EXISTING INTRUSION ALARM PANEL IN BUNGALOW BOILER ROOM

- NOTES:
1. REFER TO SYSTEMS FLOOR PLANS FOR QUANTITIES AND LOCATION OF DEVICES.
 2. ALL FIRE ALARM WIRING TO BE IN A CONDUIT SYSTEM.
 3. PROVIDE ALL NECESSARY PROGRAMMING, MODULES, TERMINATION HARDWARE, BOOSTER POWER SUPPLIES, ETC TO MAKE A FULLY FUNCTIONING SYSTEM
 4. ALL WIRING TO BE INSTALLED AS PER MANUFACTURER'S RECOMMENDATIONS.
 5. ALL FIRE ALARM BELLS TO BE REPLACED WITH HORN/STROBES TO MATCH EXISTING.
 6. REPLACE EXISTING END OF LINE RESISTORS WHERE REQUIRED.
 7. PROVIDE REMOTE MONITORING CERTIFICATE.
 8. PROVIDE POLYCARBONATE GUARDS ON EACH AND EVERY PULL STATION (NEW AND EXISTING)
 9. PROVIDE WRITTEN FIRE ALARM VERIFICATION REPORT.

1 FIRE ALARM RISER DIAGRAM
 ES504 N.T.S.

GRAPHIC SCALE

08 APR 2016
 DATE MARK ISSUE



SCALE N.T.S.
 DRAWN BY: STAFF
 CHECKED BY: STAFF
 REVIEWED BY: STAFF
 APPROVED BY: STAFF
 AS-BUILT CHECK
 DATE: 08 APR 2016

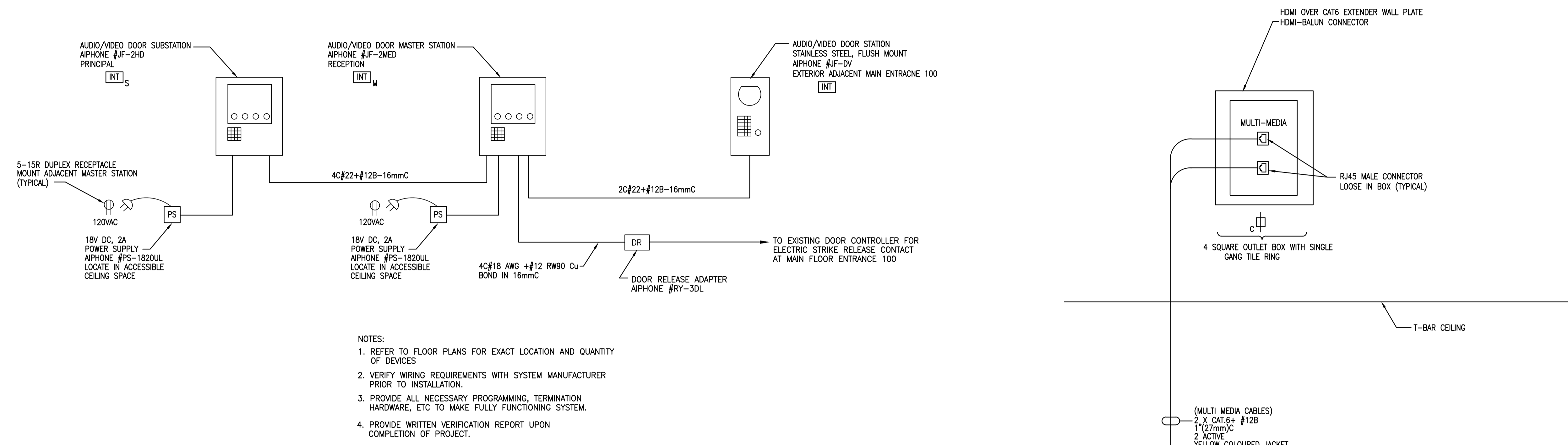
PROJECT
 BEAUFORT SCHOOL RENOVATION

HALIFAX, NOVA SCOTIA
 PROJECT NO.: HRSB #3820

SHEET TITLE
 FIRE ALARM SYSTEM RISER DIAGRAM

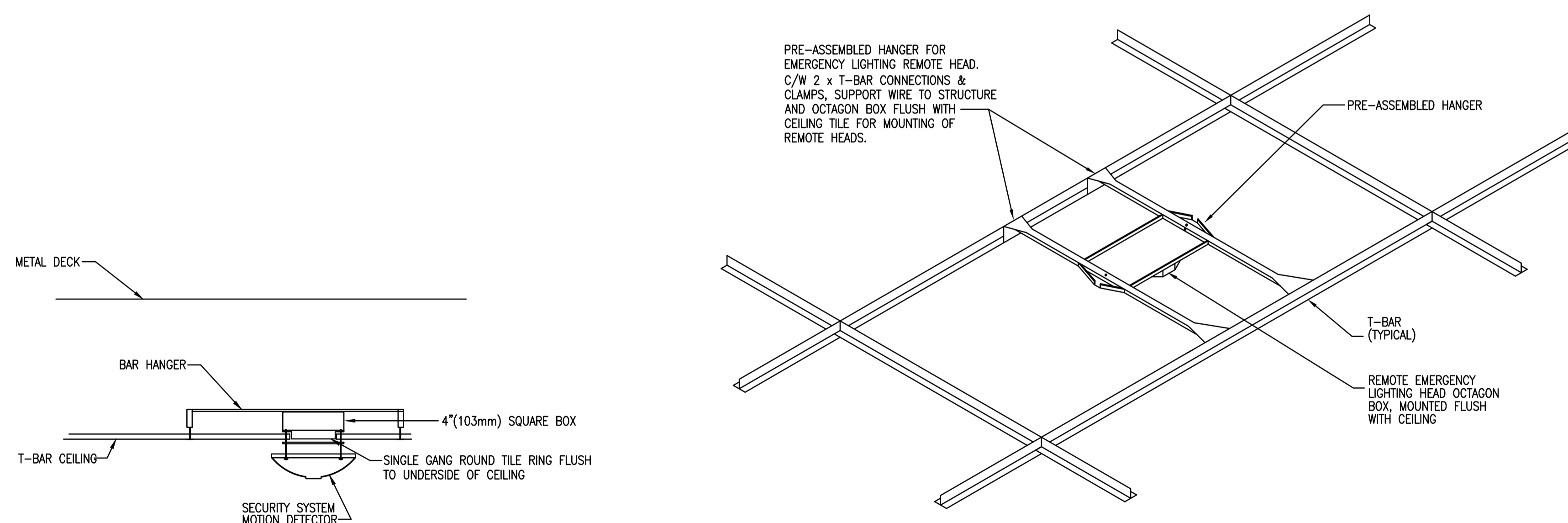
INTERNAL NO.:

ES504



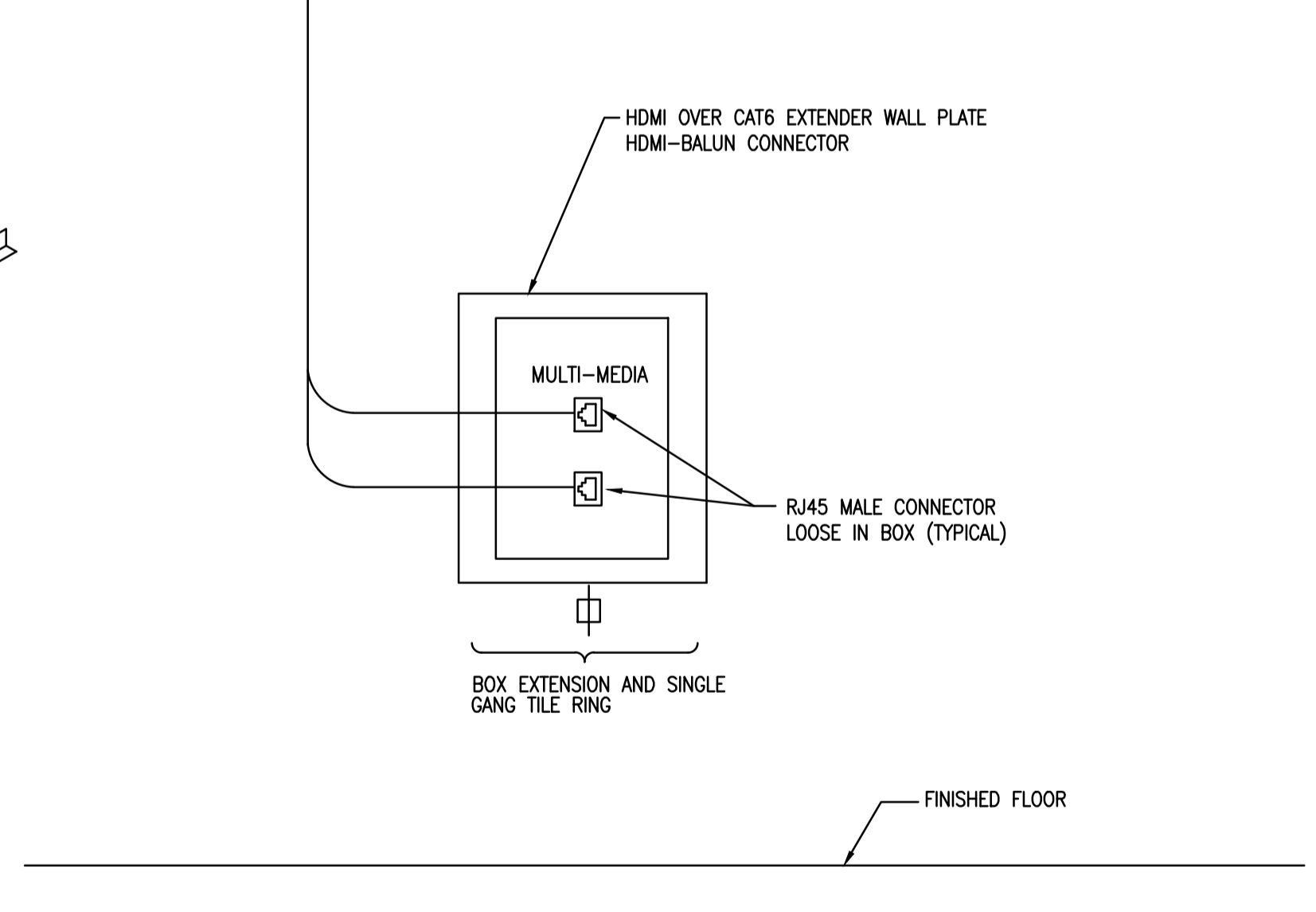
- NOTES:
1. REFER TO FLOOR PLANS FOR EXACT LOCATION AND QUANTITY OF DEVICES
 2. VERIFY WIRING REQUIREMENTS WITH SYSTEM MANUFACTURER PRIOR TO INSTALLATION.
 3. PROVIDE ALL NECESSARY PROGRAMMING, TERMINATION HARDWARE, ETC TO MAKE FULLY FUNCTIONING SYSTEM.
 4. PROVIDE WRITTEN VERIFICATION REPORT UPON COMPLETION OF PROJECT.

4 DOOR INTERCOM SYSTEM WIRING DETAIL
 ESS05 N.T.S.



2 TYPICAL EMERGENCY LIGHTING
 REMOTE HEAD CEILING MOUNTING DETAIL
 ESS05 N.T.S.

3 CEILING MOUNTED SECURITY SYSTEM MOTION DETECTOR DETAIL
 ESS05 N.T.S.



1 TYPICAL MULTI-MEDIA OUTLET INSTALLATION DETAIL
 ESS05 N.T.S.