SPECIFICATIONS

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1. Definitions

1. The following Section of this Specification are of the abbreviated type and include incomplete sentences. Definite and indefinite articles have often been omitted and sentences are written in the form of direct instructions to the Contractor without using the phrase `the Contractor shall.' Standard specifications and other quality references inserted govern materials and workmanship without using phrases `conform with,' `conformity therewith,' etc. Omitted words and phrases to be supplied in the same manner as they are when a note appears on the Drawings.

2. The Specifications are separated into Sections for reference convenience only. Such separation must in no instance make Owner or his Consultants arbiter to establish subcontract limits between Contractor and Subcontractor.

3. Provide all items, articles, materials, operations or methods listed, mentioned or scheduled on Drawings and/or in Specifications, including all labour, materials, equipment, tools, services, and incidentals necessary and required to complete the work. Responsibility for breakdown into and extension of subcontracts, including co-ordination of same, rests entirely with the Contractor.

4. Standard Specifications referred to are editions in force at Tender Closing Date.

2. Terminology

1. Consultants are the team of Architects, Engineers and other experts commissioned by the Owner, directly or indirectly, to execute design, contract documents and supervision for the project, including any of their agents or employees.

2. Prime Consultant is the Architect.

3. Contractor is the Firm or Corporation who, having signed the Agreement, has the sole legal responsibility to carry out the work shown or described in the Contract Documents for the Owner, whether contractually assigned to a Subcontractor or supplier, or not.

3. Minimum Standards

1. Unless otherwise specified, work and material to conform or exceed the minimum standards set out in the editions of the Canadian Government Specification Board, Canadian Standards Associations, the Ontario Building Code, Underwriters' Laboratories of Canada, the Canadian Electrical Code, the Local Building Code in force, whichever is applicable.

2. Copies of Standard Specifications referred to in this Specification to be kept on the site.

3. The use of the name (or its abbreviation) of any of the following bodies, accompanied by the reference number of a specification of that body to mean that the entire specification of the body to apply as noted:

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

4. Cooperation

1. Each trade to co-operate with the trades of adjacent or affected work. Supply in good time requirements affecting adjacent and underlying work in writing and items to be set or built in. Similarly, heed requirements and build-in items provided by other trades.

2. Take necessary precautions to protect work of other trades from contamination, marring or other damage due to application or installation processes, methods and activities.

3. General Contractor and each trade to co-operate with Contractors which may be assigned or selected by the Owner to perform work under Cash Allowances. Owner reserves the right to assign non-unionized labour to perform work under Cash Allowances, at Owners discretion.

5. Coordination

1. Co-ordinate the work of all trades in such a manner that each trade co-operates with the trade of adjacent work.

2. Organize weekly job site meetings and send out notices stating time and place to Consultants, subcontractors, Suppliers and all others whose presence is required at the meetings.

3. Take note of all persons attending these meetings and submit to Consultants and Owner, Minutes of these Meetings showing any major decisions made and instructions or information required.

4. Co-ordinate the Work in this Contract with the work of others awarded work under Cash Allowances.

6. Building Dimensions and Co-ordination

1. Ensure that all necessary job dimensions are taken and all trades are coordinated for the proper execution of the work. Assume complete responsibility for the accuracy and completeness of such dimensions, and for co-ordination.

2. Verify that all work, as it proceeds, is executed in accordance with dimensions and positions indicated which maintain levels and clearances to adjacent work, as set out by requirements of the drawings, and ensure that work installed in error is rectified before construction resumes.

3. Check and verify all dimensions referring to the work and the interfacing of all services. Verify all dimensions with the trade concerned when pertaining to the work of other trades. Be responsible to see that Subcontractors for various trades co-operate for the proper performance of the Work.

4. Avoid scaling directly from the drawings. If there is ambiguity or lack of information, immediately inform the Consultant. Be responsible for any change through the disregarding of this clause.

5. All details and measurements of any work which is to fit or to conform with work installed shall be taken at the building.

6. Advise Consultant of discrepancies and if there are omissions on drawings, particularly reflected ceiling plans and jointing patterns for paving, ceramic tile, or carpet tile layouts, which affect aesthetics, or which interfere with services, equipment or surfaces. DO NOT PROCEED without direction from the Consultant.

7. Ensure that each Subcontractor communicates requirements for site conditions and surfaces necessary for the execution of the Subcontractor's work, and that he provides setting drawings, templates and all other information necessary for the location and installation of material, holes, sleeves, insets, anchors, accessories, fastenings, connections and access panels. Inform other Subcontractors whose work is affected by these requirements and preparatory work.

8. Prepare interference drawings to properly co-ordinate the work where necessitated. Refer to Section 01340.

7. Use of Premises Before Substantial Performance

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

8. Layout of Work

1. Layout work with respect to the work of all trades. Arrange mechanical and electrical work such as piping, ducts, conduits, panels, equipment and the like to suit the architectural and structural details.

2. Alterations necessary due to conflict and interference between trades, to be executed at no cost to the Owner unless notification is given in writing before Tender Closing Date.

9. By-Laws and Regulations

1. Nothing contained in the Drawings and Specifications are to be so construed as to be knowingly in conflict with any law, by-law or regulation of municipal, provincial or other authorities having jurisdiction.

2. Perform work in conformity with such laws, by-laws and regulations and make any necessary changes or deviations from the Drawings and Specifications subsequently required as directed and at no cost to the Owner unless notification is given in writing before Tender Closing Date.

3. Furnish inspection certificates and/or permits as may be applicable as evidence, that installed work conforms with laws, by-laws, and regulations of authorities having jurisdiction.

10. Protection

1. Take necessary precautions and provide and install required coverings to protect material, work and finishes from contamination, damage, the elements, water and frost.

2. Make good any damage or replace damaged materials, as directed. Repairs to be made by the trade having originally installed or fabricated the damaged material, finish or item. Protect electrical equipment from water and the elements.

3. Protect adjacent private and public property from damage and contamination.

4. Protect curbs and sidewalks from damage from trucking by means of boards and the like. Repair, or pay or repair of damage to existing roads and sidewalks.

5. Mark glass after glazing in an acceptable manner and leave in place until final clean-up.

6. Protect floor finishes from construction traffic and transport of construction materials and equipment by means of 6 mm plywood panels.

11. Delivery, Handling and Storage of Materials

1. Schedule material delivery so as to keep storage at site to the absolute minimum, but without causing delays due to late delivery.

2. Store materials which will be damaged by weather in suitable dry accommodation. Provide heat, as required, to maintain temperatures recommended by material manufacturer.

3. Store highly combustible or volatile materials separately from other materials, and under no circumstances, within the building. Protect against open flame and other fire hazards. Limit volume of supply on the site to minimum required for one day's operations.

4. Handle and store material so as to prevent damage to material, structure and finishes. Avoid undue loading stresses in materials or overloading of floors.

5. Do not store material and equipment detrimental to finished surfaces within areas of the building where finishing has commenced or has been completed. No storage will be available within the school. Contractor to make necessary arrangements exterior to the school in storage containers as needed. Coordinate locations with school prior to placement and protect all existing surfaces.

6. Deliver package material in original, and Storage of unopened and undamaged containers with manufacturer's labels and seals intact.

12. Debris

1. Assign clean-up duties to a crew with own Foremen which will be of sufficient size to prevent accumulation of debris and dirt in any part of the structure or on the site.

2. Remove construction debris on a daily basis and legally dispose of same.

3. Under no circumstances should debris, rubbish or trash be burned or buried on the site.

13. Cutting, Fitting and Patching

1. Required cutting to be done by General Contractor. Patching and painting of work to be executed by the General Contractor.

2. All sub-trades are to notify the General Contractors bidding as to the extent of the cutting, patching, and painting of their respective trades.

3. Drilling, cutting, fitting and patching necessary due to failure to deliver items to be built-in time, or installation in wrong location to be executed, as directed, at no cost to the Owner.

4. Give written notification prior to commencement of drilling and cutting of load bearing structural members and finished surfaces.

5. Cut holes with smooth, true, clean edges, after they are approved by applicable trade. Size holes and openings for hot water and steam pipes, so as to allow for expansion and contraction of such pipes.

14. Fastenings

1. Supply all fastenings, anchors and accessories required for fabrication and erection or work.

2. Metal fastenings to be of the same material as the metal component they are anchoring, or of a metal which will not set up an electrolysis action which would cause damage to the fastening or metal component under moist conditions.

3. Exposed metal fastenings and accessories to be of the same texture, color, and finish as base metal on which they occur. Keep to a minimum; evenly space and lay out.

4. Fastenings to be permanent, of such a type and size and installed in such a manner to provide positive anchorage of the unit to be secured. Wood plugs are not acceptable. Install anchors at required spacing to provide required load bearing or shear capacity.

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

15. Surplus Materials

1. Surplus materials specifically so specified, to remain property of the Owner and be neatly stockpiled or stored, as directed.

2. All other surplus materials to become property of the Contractor; to be removed from the site and legally disposed of.

16. Documents Required and General Duties

1. **At Commencement of Contract**
   - .1 The Owner has paid for the cost of the Building Permit. Mechanical Subcontractor will pay the cost of other Fees related to the Work Specified under Mechanical Scope. Electrical Subcontractor will pay the cost of all permits and fees related to the Work specified under Electrical Scope.
   - .2 The General Contractor is to pay all other fees and refundable deposits if applicable.

2. **During Construction**
   - .1 Adjust Allowances, as required.
   - .2 Organize Job Meetings in accordance with Section 01200.
   - .3 Supply Monthly Progress Reports and Construction Schedule in accordance with Section 01200.
   - .4 Confirm that payments are being made to subcontractors and suppliers by submission of receipts with the second and subsequent Progress Payment Application. No payment will be made for unincorporated material on the site, unless Bill of Sale in proper format is provided.

3. **Upon Completion**

1. Upon completion of work before the Final Certificate of Payment is issued, the following to be observed, executed and submitted:
   - .1 All deficiencies to have been completed in a satisfactory manner.
   - .2 All final clean-up to have been executed, as specified in Section 01710.
   - .3 Finishing Hardware, Inspection and Verification.
   - .4 Organize a Final Inspection tour at which to be present:
     - the Owner's authorized representative;
     - the Architectural, Structural, Mechanical and Electrical Consultants, and their supervisory personnel, if any;
     - the Contractor and his superintendent.

.5 Where the above procedure is impossible or where any deficiencies remain outstanding, the Owner's representative and the Consultant concerned, to inspect and accept the affected work and/or material upon notification by the Contractor, that all deficiencies involving this Consultant have been made good.
.6 A complete release of all liens arising out of this Contract, other than his own. If a subcontractor or supplier refuses to furnish a release of such a lien, furnish a bond satisfactory to the Owner to indemnify him against any claim under such a lien.
.7 Certificates of good standing from the Workers' Compensation board, for the General Contractor and all Subcontractors.
.8 All reference records, as specified, under Section 01720.
.9 Certificate of Inspection from Mechanical and Electrical Engineers.
.10 Copies of all Lists of Deficiencies with each Deficiency verified when complete by only this project's job Superintendent. The Final List of Deficiencies to be signed, completed by all concerned, if accepted.
.11 Statement of Completion from General Contractor.
.12 Final adjustment of all Allowances.
.13 H.E.P.C. Inspection Certificate and all other Inspection Certificates required by Provincial, Municipal and other authorities having jurisdiction.
.14 Balancing Reports.
.15 As-Built Drawings. – Hardcopy mark ups and digital pdf files and AutoCAD v2018 or higher.
.16 One hard copy of Operation and Maintenance Manuals. A digital copy (pdf file) of all closeout documents to be provided on USB memory stick format.

17. Progress Reports

1. Submit to the Architect, Monthly Progress Reports consisting of a concise narrative and a marked-up summary schedule showing physical percentage complete by item and in total. These progress calculations must agree with the Progress Payment Claims.

2. Keep permanent written daily records on the site on the progress of work. Record to be open to inspection at reasonable times and copies to be furnished upon request. Records to show notes of commencement and completion of different trades and parts of work; daily high and low temperatures and other weather particulars; number of men engaged on the site (including sub-trades) broken down in groups for each type of construction work, and particulars about excavation and shoring; erection and removal of form work; pouring and curing of concrete; floor finishing; placing and compaction of backfill, masonry work; roofing.

3. Daily progress to give particulars on commencement and completion of each trade or part of work; form work erections and removal; concrete pouring and curing; floor finishing; masonry work; roofing; waterproofing; finishing trades, tests and inspection and the like.

18. Inspection and Testing

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

End of Section

1. Selection of Products

1. If requested by the Consultant, provide the following services and/or information:

   .1 Assist the Consultant in determining qualified suppliers.
   .2 Obtain proposals from suppliers.
   .3 Make appropriate recommendations for consideration of Consultant.
   .4 Notify Consultant of any effect anticipated by selection of product or supplier under consideration, on construction schedule and contract sum.

2. On notification of selection, enter into purchase agreement with designated supplier.

2. Cash Allowance

1. Expend cash allowance **only** as authorized by the Owner though the Consultant's written instructions.

2. Include in Contract price the Contractor's charges for handling at site, including uncrating and storage, protection from elements and damage, labour, installation and finishing, testing, adjusting and balancing, and other expenses including overhead and profit on account of Cash Allowance in accordance with Article GC4.1 of the General Conditions of the Contract as amended.

3. Credit the Owner with any unused portion of Cash Allowances in the statement for final payment.

4. If a test made under payment by a specific allowance proves that the material or system is not in accordance with the Documents, then the subsequent testing including Owner's testing of replacement materials or systems shall be Contractor's expense and not taken from Cash Allowance.

5. Add or deduct any variation in cost from the Cash Allowance. No adjustment will be made to Contractor's expense.

6. The amount of each allowance includes the net cost of the product or service, delivery and unloading at the site.

7. All refunds, trade and/or quantity discounts which the Contractor may receive in the purchase of goods under allowances, to be extended to the Owner.

8. Receipted invoices covering all disbursements made by the Contractor under Allowances, to be submitted to the Consultant for audit.

9. Where the Cash Allowance stipulates "Supply Only," the Contract Price and not the Cash Allowances include the installation and hook-up costs. The installation and hook-up of some equipment and materials are specified under other Sections of the Specifications. The General Contract includes the installation and hook-up not specified elsewhere.

10. Contractor's profit and overhead on all Cash Allowances to be carried in his lump sum amount, not in the Cash Allowances.

11. All Cash Allowances will be dealt with in accordance with Article GC4.1 of the General Conditions.

12. All expenditures under Cash Allowances must be approved by the Owner.

13. Include in the Stipulated Price quoted, a Cash Allowance in the amount of **Six Thousand Dollars ($6,000).**

    To be allocated as follows:
    1. Door Hardware, supply only.

14. H.S.T. Goods and Services tax is not included in Cash Allowance amount and is to be carried in the General Contractor's Stipulated Sum Amount.

15. Refer to Section 01005 for co-operation with others assigned to this Section.

3. Contingency Allowance

1. Include in the Stipulated Price quoted, a Contingency Allowance in the amount of **Twenty Five Thousand Dollars**, **$25,000.00**

2. Costs of Change Orders taken from Contingency Allowance will be issued in accordance to Section 00820 Supplementary Conditions (CCDC2).

3. Credit the Owner with any unused portion of the Contingency Allowance in the statement for final payment.

End of Section

1. Project Meetings for Coordination

1. In consultation with the Consultant during the second week of construction, arrange for site meetings weekly or every 2 weeks as appropriate to the stage of construction, for project coordination. Such meetings shall fall at the same time each week the meeting is scheduled.

2. Responsible representatives of the Contractor's and Subcontractor's office and field forces and suppliers shall be obliged to attend.

3. Inform the Owner, Consultant, and those others whose attendance is obligatory, of the date of each meeting, in sufficient time to ensure their attendance.

4. Provide physical space for meetings, prepare an agenda, chair and record the minutes of each meeting. Relevant information must be made available to all concerned, in order that problems to be discussed may be expeditiously resolved. Identify "action by: _____".

5. Within three days after each meeting, distribute two copies of the minutes to each invited person.

2. Pre-construction Meeting

1. Within 5 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.

2. Include in the agenda the following:

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

3. Project Meetings for Progress of Work

1. Conduct progress meetings in accordance with the schedule and/or decisions made at Pre-construction meeting.

2. Inform the Owner, Consultant, project consultants, Subcontractors and suppliers and those whose attendance is obligatory, of the date of the meeting, in sufficient time to ensure their attendance.

3. Include in the agenda the following:

   .1 Review, approval of minutes of previous meeting.
   .2 Review of Work progress since previous meeting.
   .3 Field observations, problems, conflicts.
   .4 Problems which impede construction schedule.
   .5 Review of off-site fabrication delivery schedules.
   .6 Corrective measures and procedures to regain projected schedule.
   .7 Revisions to construction schedule.
   .8 Progress during succeeding work period.
   .9 Review submittal schedules: expedite as required.
   .10 Maintenance of quality standards.
   .11 Pending changes and substitutions.
   .12 Review proposed changes for effect on construction schedule and on completion date.
   .13 Other business.

4. Progress Records

1. Maintain a permanent written record on the site of the progress of the work using standard OGCA form. This record shall be available to the Consultant at the site, and a copy shall be furnished to same on request. The record shall contain:

   .1 Daily weather conditions, including maximum and minimum temperatures.
   .2 Dates of the commencement and completion of stage or portion of the work of each trade in each area of the project.
   .3 Conditions encountered during excavation.
   .4 Dates of erection and removal of formwork, in each area of the project.
   .5 Dates of pouring the concrete in each area of the project, with quantity and particulars of the concrete.
   .6 Work force on project daily per trade.
   .7 Visits to site by personnel of Consultant, Jurisdictional Authorities and testing companies.

End of Section

1. General

1. Submit to Architect, for review, shop drawings, product data and samples specified.

2. Until submission is reviewed, work involving relevant product must not proceed.

2. Shop Drawings

1. Drawings to be originals prepared by Contractor, Subcontractor, Supplier or Distributor, which illustrate appropriate portion of work; showing fabrication, layout, setting or erection details as specified in appropriate Sections.

2. Identify details by reference to sheet and detail numbers shown on Contract Drawings.

3. Maximum sheet size 24” x 36” as a PDF.

3. Project Data

1. Certain specification Sections specify that manufacturer's standard schematic drawings, catalogue sheets, diagrams schedules, performance charts, illustrations and other standard descriptive data will be accepted in lieu of shop drawings.

2. Above will only be accepted if they conform to following:
   .1 Delete information which is not applicable to project.
   .2 Supplement standard information to provide additional information applicable to project.
   .3 Show dimensions and clearances required.
   .4 Show performance characteristics and capacities.
   .5 Show wiring diagrams (when requested) and controls.

4. Coordination of Submissions

1. Review shop drawings, product data and samples prior to submission.

2. Verify:
   .1 Field measurements.
   .2 Field construction criteria.
   .3 Catalogue numbers and similar data.

3. Coordinate each submission with requirement of work and Contract documents. Individual shop drawings will not be reviewed until all related drawings are available.

4. Contractor's responsibility for errors and omissions in submission is not relieved by Architect's review of submittals.

5. Contractor's responsibility for deviations in submission from requirements of Contract documents is not relieved by Architect's review of submission, unless Architect gives written acceptance of specified deviations.

6. Notify Architect, in writing at time of submission, of deviations from requirements of Contract documents.

7. After Architect's review, distribute copies.

5. Submission Requirements

1. Schedule submissions at least fourteen (14) days before dates that reviewed submissions will be required to be returned.

2. Submit a digital copy (PDF) of shop drawings, product data to Architect for review.

3. Accompany submissions with transmittal letter, in duplicate, containing:
   .1 Date.
   .2 Project title and number.
   .3 Contractor's name and address.
   .4 Number of each shop drawing, product data and sample submitted.
   .5 Other pertinent data.

4. Submissions must include:
   .1 Date and revision dates.
   .2 Project title and number.
   .3 Name of:
      .1 Contractor.
      .2 Subcontractor.
      .3 Supplier.
      .4 Manufacturer.
      .5 Separate detailer when pertinent.

5. Identification of product or material.
   .1 Relation to adjacent structure or materials.
   .2 Field dimensions, clearly identified as such.
   .3 Specification Section number.
   .4 Applicable standards, such as CSA or CGSB numbers.
   .5 Contractor's stamp, initialled or signed, certifying review of submission, verification of field measurements and compliance with Contract documents.

6. Interference Drawings
   .1 Prepare interference drawings for all work in confined space ie: ceiling space.

End of Section

1. Access

1. Provide and maintain adequate service roads to project site to provide safe and convenient access for deliveries.

2. Contractor's Site Office

1. Contractor's trailer will be used as site office during construction and to accommodate site meetings. It shall be furnished with drawing layout table, telephone, and facsimile machine for the duration of the project. Facsimile is to be installed on dedicated line and not connected to telephone line. Coordinate location with Owner and obtain approval. Pay telephone not acceptable.

2. Maintain in clean condition.

3. Provide and maintain in clean condition: two separate plans layout tables, minimum 48" x 72" each. One table shall be used by the General Contractor, and Subcontractors, at their discretion. The second shall be provided for use by subcontractors and by the consultant or Inspection and Testing Companies during site visits or project meetings.

3. Storage Sheds

1. Provide adequate weathertight sheds with raised floors, for storage of materials, tools and equipment which are subject to damage by weather.

4. Sanitary Facilities

1. Existing sanitary facilities cannot be used during construction. Contractor to provide their own portable toilets and coordinate location with school. Keep area and premises in sanitary condition.

5. Parking

1. Existing on-site parking can be used for construction during the months of July and August. Spaces will be designated by the owner. There is no-onsite parking during the school year September to June. The general contractor is responsible for coordinating parking with the local municipality.

6. Site Enclosures

1. Erect temporary site enclosures, hoarding, using prefabricated lock fence system.

2. Size and location of enclosure to suit area of construction.

7. Enclosure of Structure

1. Provide temporary weathertight enclosures protection for exterior openings until permanently enclosed.

2. Erect enclosures to allow access for installation of materials and working inside enclosure.

3. Design enclosures to withstand wind pressure.

4. Erect dust barriers to prevent dust migration to non-renovated areas.

8. Power supply

1. Electrical power is available in existing building and will be provided at no charge for construction purpose.

9. Water Supply

1. Water is available in existing building and will be provided at no charge for construction purposes.

10. Scaffolding

1. Construct and maintain scaffolding in rigid, secure and safe manner.

2. Erect scaffolding independent of walls. Remove promptly when no longer required.

3. Scaffolding to be designed by a professional Engineer when required under the Occupational Health and Safety act.

11. Heat and Ventilating

1. Not applicable.

End of Section

1. Construction Safety Measures

1. Observe and enforce construction safety measures required by the National Building Code; the O.B.C.; The Provincial Government; Workers' Compensation Board; and, Municipal authorities.

2. In particular, the Occupational Health and Safety Act (Ont. Re. 213/91), the Occupational Health and Safety Act, the regulations of the Ontario Ministry of Labour and Ontario Hydro Safety requirements shall be strictly enforced.

3. Contractor shall ensure that copies of all applicable construction safety regulations, codes and standards are available on the jobsite throughout the period of construction. All workers are to be informed that these documents are available for reference at any time.

4. The Contractor shall ensure that all supervisory personnel on the jobsite are fully aware of the contents of the Occupational Health and safety Act (Ontario Regulation 213/91 - Construction Projects) the Workers' Compensation Act" and, Bill 208 (Chapter 7, Standards of Ontario) “An Act to Amend the Occupational Health & Safety Act and the Workers’ Compensation Act”, and, that they comply with all requirements and procedures prescribed therein. These documents include, but are not limited to, the following construction safety requirements:

    .1 Contractor to register with the Director of the Occupational Health and Safety Division before or within 30 days of the commencement of the project, (O.Reg. 213/91, sec 5).
    .2 File a notice of project with a Director before beginning work on the project, (O.Reg 313/91, sec 6).
    .3 Notification prior to trenching deeper than 1.2m, (O.Reg. 213/91, sec 7).
    .4 Accident Notices and Reports, (O.Reg. 213/91, sec 8 through sec 12).
    .5 General Safety Requirements, (O.Reg. 213/91, sec 13 through sec 19).
    .6 General Construction Requirements, e.g. protective clothing, hygiene practices, housekeeping, temporary heat, fire safety, access to the jobsite, machine and equipment guarding and coverings, scaffolds and platforms, electrical hazards, roofing, et al, (O.Reg. 213/91, sec 20 through sec 221).
    .7 Establish a Joint Health and Safety Committee where more than 19 workers are employed for more than 3 months, (Bill 208, S.8(2) to S.8(14).
    .8 Establish a Worker Trades Committee for all projects employing more than 49 workers for more than 3 months, (Bill 208, S-8a(1) to S.8b(4).
    .9 Ensure that all activities arising out of (.07) and (.08) above are recorded and that minutes are available to an inspector of the Ontario Ministry of Labour.

5. The Contractor shall be considered as the "Constructor" in consideration of the rights and responsibilities for all construction safety requirements, procedures, facilities and inspection of all work performed by the Contractor, Subcontractors/Sub-trades and other Contractors engaged on this project.

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

2. Material Safety Data Sheet

1. Material safety Data Sheets (MSDS) must be available at the jobsite for any product listed on the Hazardous Ingredients List prior to being used, installed or applied inside of the building.

2. A Material Safety Data Sheet is to be submitted to the Architect for any product which is known to create, or suspected of creating, a health hazard or discomfort during construction or upon commissioning of the project including, but not limited to, the following:
   .1 adhesives
   .2 solvents
   .3 sealants, (caulking, vapour seals, etc.)
   .4 sprayed-on fireproofing
   .5 resilient flooring
   .6 carpet, paint, varnish or other coatings
   .7 exposed membrane waterproofing
   .8 special coatings, (terrazo sealants, chafing coatings, etc.)
   .9 solder, brazing and welding and other filler metal
   .10 other products whose particles or vapours may become air borne after installation.
   .11 any other product as directed by the Consultant.

3. Comply with WHMIS regulation, Workplace Hazardous Material Information System.

3. Fire Safety Requirements

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

4. Overloading

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

5. Falsework

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

6. Scaffolding

1. Design and construct scaffolding in accordance with CSA S269.2-M1980.

2. Scaffolding to be designed by a Professional Engineer when required under the Occupational Health and Safety Act.

7. Materials Specifically Excluded

1. Asbestos and/or asbestos-containing products are not permitted. Submit Material Safety Data Sheets for any product suspected of containing asbestos if so requested by Consultant. Examples of some materials requiring close scrutiny and/or confirmation include:
   .1 Transite drainage pipe - whether buried or above grade - not permitted.
   .2 Composite floor tile containing asbestos - not permitted.
   .3 Lay-in ceiling tiles containing asbestos - not permitted.
   .4 Insulation and/or jacketing for pies, ducts, motors, pumps, etc. - not permitted if any asbestos is present.

2. Solder for all piping is to be lead-free.
   .1 "Lead Free" shall mean solder which contains less than 0.030% of lead when dissolved in fluoroboric and nitric acids and tested by inductively coupled argon plasma atomic emission spectroscopy. "Steelbond 281" and "Silverbrite" are acceptable solder products.
   .2 The mechanical contractor shall provide an affidavit signed by the Principal of the company, on company letterhead, that all of the solder used on the project was either one of the two acceptable products or that the solder used (identified by brand name) meets or exceeds the testing criteria.
   .3 The Owner shall undertake random testing of the soldered joints. Should testing prove that the solder used was not as specified, the Owner shall take action against the contractor to the full extent of the law.

3. All paint and finish coatings are to be lead and mercury-free. Submit Material Safety Data Sheets confirming that these products are free of all lead and/or mercury compounds.

End of Section

PART 1 - GENERAL

1.1 Related Work

1. These specifications apply to all 16 divisions of the project specification. It is the responsibility of the contractor to apply these provisions wherever practical within specification limits to all products and services used on this project.

2. It is recognized that currently specified materials and methods may conflict with the basic intention of this section. Where reasonable alternate materials and methods exist that are not specified here, and that do not compromise quality or create additional cost for the owner, notify the Architect of such alternate materials or methods. Do not proceed to use alternate materials or methods to those specified without the express approval of the Architect.

3. Elsewhere, apply the provisions of this section to all work. Exceptions can only be made when signed off by the Architect. Suitability of all products used is the responsibility of the contractor.

1.2 Compliance Specifications

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

1.3 Beyond Compliance Specifications

1. These specifications apply in addition to all applicable health, safety and environmental compliance regulations. They are incorporated here to reflect the Owner’s intention to develop a specification which maximizes environmentally “friendly” materials and methods wherever possible within current technical and budget limitations.

2. Beyond compliance specifications recognize that performance well beyond the minimum regulatory standard is often desirable, possible and affordable, often with no cost or low cost options. It also recognizes that application methods or protocols may be as important as the material specified. Therefore, these specifications cover both material and methods.

3. The primary goal of beyond compliance specification is to reduce the use of products or methods which have negative health and environmental impacts both during and after construction. These considerations may include full life cycle impacts, associated with raw materials, manufacturing, transport, deconstruction and their eventual fate.

4. These specifications will specifically address primary categories of readily identifiable products, ingredients and methods.

5. These provisions apply to both indoor and outdoor applications equally.

1.4 Exceptions

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

PART 2 - MATERIALS

2.1 Products or Substances to be Avoided or Limited in Use

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

2.2 Volatile Organic Compounds

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

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

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

2.3 Chlorinated Substances

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

2.4 Plasticizers

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

2.5 Man Made Mineral Fibres

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

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

2.6 Radiation

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

2.7 Biocides

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

2.8 Heavy Metals

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

2.9 Aluminum

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

2.10 Ozone Depleting Substances

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

2.11 Greenhouse Gasses

1. Products which contain, use or generate Greenhouse gasses such as CO2 should be avoided if suitable substitutes are available.

2.12 Bituminous (tar) Products

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

2.13 Chemical Compounds

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

2.14 Adhesives

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

2.15 Composite Products

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

2.16 Cleaners and Solvents

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

End of Section

1. Fires

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

2. Disposal of Wastes

1. Do not bury rubbish and waste materials on site.

2. Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.

3. Asbestos and Hazardous Substances

1. General Contractor is to inform Architect in the event of encountering material suspected of containing asbestos or hazardous substances.

2. Architect will notify owner of such findings and owner to engage directly a certified Asbestos Abatement Contractor.

End of Section

1. General

1. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.

2. Store volatile waste in covered metal containers and remove from premises daily.

3. Prevent accumulation of waste which create hazardous conditions.

4. Provide adequate ventilation during use of volatile or noxious substances.

2. Materials

1. Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

2. Provide on-site dump containers for collection of waste materials and rubbish.

3. Cleaning During Construction

1. Maintain project grounds, and public properties free from accumulations of waste materials and rubbish.

2. Remove waste materials, and rubbish from site.

3. Vacuum clean interior building areas when ready to receive finish painting and continue vacuum cleaning on an as-needed basis until building is ready for substantial completion or occupancy.

4. Schedule cleaning operations so that resulting dust and other contaminants will not fall on wet, newly painted surfaces.

4. Final Cleaning

1. At completion of Work, remove waste materials, rubbish, tools, equipment, machinery, and surplus materials, and clean all surfaces exposed to view; leave project clean and ready for occupancy.

2. Employ experienced workers, or professional cleaners, for final cleaning.

3. In preparation for Substantial Performance or Fitness for Occupancy status, whichever occurs first, conduct final inspection of interior and exterior surfaces exposed to view, and of concealed spaces.

4. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials from all sight-exposed interior and exterior finished surfaces; polish resilient and ceramic surfaces so designated to shine finish. Vacuum carpet.

5. Clean and polish glass and mirrors.

6. Repair, patch and touch-up marred surfaces to specified finish, to match adjacent surfaces.

7. Broom-clean paved surfaces; rake clean other surfaces of grounds.

8. Clean exposed ductwork and structure.

9. Replace filters.

10. Clean bulbs and lamps and replace those burned out.

11. Clean diffusers and grilles.

12. Clean sinks, faucets, and water closets and controls.

13. Maintain cleaning until project, or portion thereof, is occupied by Owner.

End of Section

1. Requirements Included

1. Record documents, samples, and specifications.
2. Equipment and systems.
3. Product data, materials and finishes, and related information.

2. Quality Assurance

1. Prepare instructions and data by personnel experienced in maintenance and operation of described products.

3. Format

1. Organize data in the form of an instructional manual.
2. Binders: commercial quality, 8½" x 11" maximum 2½" ring size.
3. When multiple binders are used, correlate data into related consistent groupings.
4. Cover: Identify each binder with type or printed title "Project Record Documents", list title of Project, identify subject matter of contents.
5. Arrange content under Section numbers and sequence of Table of Contents.
6. Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
7. Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

4. Contents, Each Volume

1. Table of Contents: Provide title of project; names, addresses, and telephone numbers of Consultant and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.
2. For each Product or System: list names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
3. Product Data: mark sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.
4. Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
5. Typed Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

5. Submission

1. Submit for review a digital pdf file of completed closeout documents in final form 15 days prior to substantial performance. For equipment put into use with Owner's permission during construction, submit Operating and Maintenance Manuals within 10 days after start-up. For items of Work delayed materially beyond date of Substantial Performance, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

2. Consultant comments will be returned and the contractor is to revise content of documents as required prior to final submittal.

3. Submit one (1) hard copy of revised volumes of data in final form within ten days after final inspection.

4. For contract drawings (architectural, landscaping, structural, mechanical, electrical), transfer neatly as-built notations onto second set and submit both sets.

5. Prepare digital pdf file for submission on USB of completed closeout documents.

6. Record Documents and Samples

1. In addition to requirements in General Conditions, maintain at the site for Owner one record copy of:
   .1 Contract Drawings.
   .2 Specifications.
   .3 Addenda
   .4 Change Orders and other modifications to the Contract.
   .5 Reviewed shop drawings, product data and samples.
   .6 Field test records.
   .7 Inspection certificates.
   .8 Manufacturer's certificates.

2. Store Record Documents and Samples in Field Office apart from documents used for construction. Provide files, racks, and secure storage.

3. Label and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "Project Record" in neat, large, printed letters.

4. Maintain Record Documents in a clean, dry, and legible condition. Do not use Record Documents for construction purposes.

5. Keep Record Documents and samples available for inspection by Consultant.

7. Recording As-Built Conditions

1. Consultant will provide electronic copies of project drawings in PDF format. Make one (1) hardcopy of the project drawings for the purpose of recording as-built conditions. Mark and record changes on an on-going basis as construction proceeds. **Near the end of the construction period transfer all marks to the supplied electronic documents and submit for consultant review as project record as-built documents**. As an alternative, scan the record set in PDF format and submit for consultant review.

2. Refer to drawings/specifications for additional mechanical and electrical requirements.

3. Record information concurrently with construction progress. Do not conceal work until required information is recorded.

4. Contract Drawings and shop drawings: legibly mark each item to record actual construction, including:
   .1 Measure depths of elements of foundation in relation to finish first floor datum.
   .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
   .4 Field changes of dimension and detail.
   .5 Changes made by change orders.
   .6 Details not on original Contract Drawings.
   .7 References to related shop drawings and modifications.

5. Specifications: legibly mark each item to record actual construction, including:
   .1 Manufacturer, trade name, and catalog number of each project actually installed, particularly optional items and substitute items.
   .2 Changes made by Addenda and Change Orders.

6. Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.

8. Digital As-Built Drawings

1. Retain the services of a CAD drafting company acceptable to the consultant to prepare digital CAD As-Built documents for all Architectural and Engineering drawings.

2. After the consultant has found the Redlined As-Built drawings to be acceptable, transfer to digital file all information recorded on As-Built drawings. Layering of information as per consultant's instructions.

9. Equipment and Systems

1. Each Item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

2. Panelboard Circuit Directories: provide electrical service characteristics, controls, and communications.

3. Include installed colour coded wiring diagrams.

4. Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shutdown, and emergency instruction. Include summer, winter, and any special operating instructions.

5. Maintain Requirements: include routine procedures and guide for troubleshooting; disassembly, repair and reassemble instructions; and alignment, adjusting, balancing, and checking instructions.

6. Provide servicing and lubrication schedule, and list of lubricants required.

7. Include manufacturer's printed operation and maintenance instructions.

8. Include sequence of operation by controls manufacturer.

9. Provide original manufacturer's parts lists, illustrations, assembly drawings, and diagrams required for maintenance.

10. Provide installed control diagrams by controls manufacturer.

11. Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.

12. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

13. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

14. Include test balancing reports as specified in mechanical specifications.

15. Additional Requirements: As specified in individual specification sections.

10. Materials and Finishes

1. Building Products, Applied Materials, and Finishes: include product data, with catalog number, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured products.

2. Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

3. Moisture-protection and Weather-exposed Products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommend schedule for cleaning and maintenance.

4. Additional Requirements: as specified in individual specifications sections.

11. Guarantees, Warranties and Bonds

1. Separate each warranty or bond with index tab sheets keyed to the List of Contents listing.

2. List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal. Use Guarantee/Warranty Form as provided in Section 01721 whenever standard preprinted trade or manufacturer's Guarantee/Warranty forms are not available.

3. Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work.

4. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial Performance is determined.

5. Verify that documents are in proper form, contain full information, and are notarized.

6. Co-execute submittals when required.

7. Retain warranties and bonds until time specified for submittal.

End of Section

1. Maintenance Manual

1. On completion of project, submit to Owner one (1) copy of Operations Data and Maintenance Manual in English, made up as follows:

    .1 Bind data in vinyl hard covered, 3 ring loose leaf binder for 8½" x 11" size paper.
    .2 Enclose title sheet, labeled "Operation Data and Maintenance Manual", project name, date and list of contents.
    .3 Organize contents into applicable sections of work to parallel project specification break-down. Mark each section by labeled tabs protected with celluloid covers fastened to hard paper dividing sheets.
    .4 A digital copy of all documents in the operations and manuals must be provided on a USB, format to be PDF.

2. Include following information, plus data specified.

    .1 Maintenance instructions for finished surface and materials.
    .2 Copy of hardware and paint schedules.
    .3 Description, operation and maintenance instructions for equipment and systems, including complete list of equipment and parts list. Indicate nameplate information such as make, size, capacity, serial number.
    .4 Names, addresses and phone numbers of sub-contractors and suppliers.
    .5 Guarantees, Warranties and bonds showing:
        .1 Name and address of project.
        .2 Guarantee commencement date (date of Final Certificate of Completion).
        .3 Duration of guarantee.
        .4 Clear indication of what is being guaranteed and what remedial action will be taken under guarantee.
        .5 Signature and seal of Contractor.
        .6 Additional material used in project listed under various Sections showing name of manufacturer and source of supply.

3. Neatly type lists and notes. Use clear drawings, diagrams or manufacturers' literature.

4. Include a complete set of final shop drawings indicating corrections and changes made during fabrication and installation.

End of Section

1. Standard Warranty

1. Refer to HDSB Supplementary Conditions and to Standard Contract Document CCDC for warranty requirements and conditions for the standard warranty which is required for the work of this contract.

2. Extended Warranties

1. Refer to individual specifications sections for requirements of extended warranties required for particular sections or items of work.

2. Extended warranties are required to be issued by manufacturers, fabricators, suppliers and/or installers, sometimes jointly, due to their unique position in the construction process and their ability to guarantee a particular section of work. Refer to individual requirements of extended warranties requested.

3. Unless specifically noted otherwise, all extended warranties shall commence on the date of Substantial Performance of the Work as certified by the Consultant.

4. Listed below is a summary of extended warranties required for individual Sections. This list, if inconsistent with the specified requirements of individual extended warranties, shall be deemed correct with respect to length of extended warranties. Extended warranties required shall include, but not be limited to, the following:

   Extended warranties (total warranty period listed, including entire building warranty)

Architectural Woodwork (06400)	2 years
Caulking (Section 07900)	5 years
Painting (Section 09900)	2 years

End of Section

PART 1 - GENERAL

1.1 Related Work Specified Elsewhere

1. Not applicable.

1.2 Existing Conditions

1. Take over structures to be demolished based on their conditions (on date that tender is accepted).

1.3 Demolition Drawings

1. Where required by authorities having jurisdiction, submit for approval drawings, diagrams or details clearly showing sequence of disassembly work or supporting structures.

1.4 Protection

1. Prevent movement, settlement or damage of adjacent grades. Provide bracing, shoring as required.

2. Prevent debris from blocking surface drainage inlets which must remain in operation.

3. Protect existing items designated to remain and materials designated for salvage. In the event of damage to such items, immediately replace or make repairs to approval of Owner and at not cost to Owner.

PART 2 - PRODUCTS

1. Not applicable.

PART 3 - EXECUTION

3.1 Work

1. Dispose of demolished materials except where noted otherwise.

3.2 Safety Code

1. Unless otherwise specified, carry out demolition work in accordance with Canadian Construction Safety Code 2010.

2. Should material resembling spray or trowel-applied asbestos be encountered, notify Architect. Any asbestos encountered will be removed by the Owner's Contractor.

3.3 Preparation

1. Disconnect electrical and telephone service lines entering areas to be demolished as per rules and regulations of authorities having jurisdiction. Post warning signs on electrical lines and equipment which must remain energized to serve other areas during period of demolition.
2. Inspect site and rectify with Architect items designated for removal and items to remain.
3. Disconnect and cap mechanical services in accordance with requirements of local authority having jurisdiction.
4. Natural gas supply lines to be removed by gas company or by qualified tradesman in accordance with gas company instructions.

3.4 Demolition & Field Work

1. Demolish areas as indicated on the drawings.
2. Remove existing equipment, services and obstacles, where required, for refinishing or making good of existing surfaces, and replace same as work progresses.
3. At end of each day's work, leave work in safe condition so that no part is in danger of toppling or falling. Protect interiors of parts not to be demolished from exterior elements at all times).
4. Demolish in a manner to minimize dusting. Keep dusty materials wetted.
5. Demolish masonry and concrete walls in small sections. Carefully remove and lower structural framing and other heavy or large objects.
6. Burning materials on site is not permitted.
7. Remove contaminated or dangerous materials from site and dispose of in safe manner.
8. Employ rodent and vermin exterminators to comply with health regulations.

3.5 Salvage

1. Carefully dismantle items containing materials for salvage and stockpile salvaged materials at locations as directed by Architect.

3.6 Restoration

1. Upon completion of work, remove debris, trim services and leave work site clean.
2. Reinstall areas and existing works outside areas of demolition to match condition of adjacent, undisturbed areas.

End of Section

PART 1 - GENERAL

1.1 Related Work

1. Structural Steel Framing — refer to Structural Drawings
2. Miscellaneous Metal Fabrication: — Section 05500

1.2 Reference Standards

1.	CSA-S304.1-04	Design of Masonry Structures
2.	CSA- A370-04 (R2009)	Connectors to Masonry.
3.	CAN/CSA-A371-04 (R2009)	Masonry Construction for Buildings.
4.	CSA A179-04 (R2009)	Mortar and Grout for Unit Masonry
5.	CSA-A82-06	Fired Masonry Brick From Clay or Shale
6.	CSA A165 Series-04	CSA Standards for Concrete Masonry Units.
7.	CSA G30.18-09	Carbon Steel Bars for Concrete Reinforcement
8.	CAN/CSA-A3000-08	Cementitious Materials Compendium
9.	ASTM A951/A951M-06	Standard Specification for Steel Wire for Masonry Joint Reinforcement
10.	ASTM C216-07a	Standard Specification for Facing Brick (Solid Masonry Units Made from Clay of Shale)
11.	ASTM C568-08a	Standard Specification for Limestone Dimension Stone
12.	ASTM A1064/A1064	Standard Specification for Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
13.	ASTM C331-05	Standard Specification for Lightweight Aggregates for Concrete Masonry Units
14.	ASTM A153/A153M-09	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

1.3 Source Quality Control

1. Submit laboratory test reports certifying compliance of masonry units (and mortar ingredients) with specification requirements.

2. For clay units, in addition to requirements set out in referenced CSA and ASTM Standards include data indicating initial rate of absorption for units proposed for use.
3. All masonry: mortar and grout is to be tested in accordance with CSA-S304.

1.4 Product Delivery, Storage and Handling

1. Ensure that materials are delivered to job site in dry condition.

2. Store under waterproof cover on pallets or plank platforms held off ground by means of plank or timber skids.

3. Store cement under cover. Keep dry and unfrozen.

4. Pile sand on platforms. Exclude foreign matter.

5. Materials stacked on floors of building shall not exceed structural design loads.

1.5 Cold Weather Requirements

1. Comply with Clause 6.7.2 of CSA-A371.

1.6 Hot Weather Requirements

1. Protect freshly laid masonry from drying too rapidly, by means of waterproof, non-staining coverings.

1.7 Protection

1. Until completed and protected by flashings or other permanent construction, keep masonry dry using waterproof, non-staining coverings that extend over walls and down sides sufficient to protect walls from wind driven rain.

2. Protect masonry and other work from marking and other damage. Protect completed work from mortar droppings. Use non-staining coverings.

3. Provide temporary bracing of masonry work during and after erection until permanent lateral support is in place.

4. When air temperature has dropped below 0 degrees C (eg. Overnight), ensure that materials are above freezing and free from ice when installed.

5. Prevent work from freezing for at least 48 hours by enclosure, artificial heat, or other acceptable method.

6. Provide adequate bracing to walls during erection to prevent damage due to winds or other lateral loads.

7. Make good any damage to masonry work until completion of the work.

8. Build masonry in enclosures heated by approved smokeless means, when temperature remains below 0 degrees C. All materials shall be above 4 degrees when installed.

9. Demolish and replace masonry work damaged by freezing.

10. Supplement CSA-A371 as follows:

    .1 Maintain temperature of mortar between 5° C and 50° C until used.

PART 2 - PRODUCTS

2.1 Materials

1. **Concrete Masonry Units:**

   Must be "Bubble Cure" or autoclave process, modular metric size conforming to CSA Standard A165 series.
   Normal Weight - H/20/A/M, S/20/A/M.
   Lightweight - H/20/C/M, S/20/C/M.
   Use normal weight in below ground floor elevation. Use light weight for all above grade walls. All exposed corners to have bullnose units. All block to be uniform in color, shade and texture. Special shapes as required.

2. **Portland Cement:**

   .1 Type 10, in accordance with CSA A3001.

3. **Masonry Cement:**

   .1 Type “S” and shall comply with CSA A3002.

4. **Hydrated Lime**:

   .1 Type “S”, in accordance with CSA A179.

5. **Aggregate:**

   .1 Fine grain aggregate, grading in accordance with CSA A179. When 6mm joints are specified, grain shall pass through a 1.18 mm sieve.

6. **Water:**

   .1 Ensure that water contains no salts which may cause efflorescence.

7. **Horizontal Masonry Reinforcing:**

   Welded truss type or ladder type, as specified from wire to ASTM A951, hot dipped galvanized after fabrication to ASTM A153-05, Class B2, minimum coating 457 G/m2, wire size 4.76 mm diameter. Reinforcing as per the following:
   - Single wythe walls Dur-O-Wal DW 100;
   - Double wythe walls (up to 390 in width) Dur-O-Wal DW 120;
   - Double wythe walls (greater than 390) Dur-O-Wal DW 220;
   - Cavity Walls Blok-Lok- Blok truss II - BL37 to accommodate 95 mm cavity with 64 mm thick insulation. Use Blok-truss BL 30- or DW 100 if using Ferro slotted block ties.

   Similar reinforcing by Dur-O-Wal, Blok-Lok, and Hohmann & Barnard Inc. is acceptable.

8**. Reinforcing Bars:** billet steel to grade 400, deformed bars to CSA-G30.18.

9. **Bolts and Anchors:** To CSA-A370.

10. **Natural Mortar:**

    .1 **Generally:** Use materials only as specified in CSA A179. Ensure that weather and aggregate used in mortar, other than in walls buried in earth, will not cause efflorescence.
    .2 **Mixes:** Mix mortars as specified in CSA A179 using the Proportion Specification.
    .3 **Mortar Types:**
        .1 For masonry walls in contact with earth and bedding forbearing plates and lintels: Mortar Type "S".
        .2 For load-bearing walls: Mortar Type "S".
        .3 For all other masonry walls, use regular Type "N" mortar.
    .4 **Grout:** To CSA A179 Table 5.

11. **Mortar Dropping Control Device**: "Mor-Control" manufactured by Dur-O-Wal or Mortar-Net.

PART 3 - EXECUTION

3.1 Workmanship

1. Build masonry plumb, level, and true to line, with joints in proper alignment.

2. Layout coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.

3. Set out and build masonry work to the respective dimensions called for on the drawings. Build and lay the block true to line, and level, align vertical joints. Keep angles, reveals, etc. square and plumb.

4. Assume complete responsibility for dimensions of this work.

5. Construct masonry fire rated assemblies in accordance with tested design specifications.

6. Make all joints uniform, in line, square and plumb, with mortar compressed to form joints as specified.

7. Course units to bring wall to required elevations using even, uniform, horizontal and vertical joints of maximum 10mm thickness.

8. Check and co-ordinate location of all anchors, connections and built-in items.

9. Bond units at intersection of walls by horizontal prefabricated "tee" or corner reinforcing units.

10. Lay each solid unit in full bed or mortar. Fill vertical joints. Slushing of joints not permitted.

11. Base course to be solid concrete masonry units laid in full mortar bed.

12. Lay each hollow unit in full bed or mortar for face shells. Butter vertical joints full. When laying closure units, butter vertical units already in place instead of units being placed.

13. Lay exposed masonry units using blocks having square, unbroken edges and corners.

14. Tolerances:

    .1 Variation from mean plane: 6 mm when measured with 3000 mm straight edge.
    .2 Variation from plumb: 6 mm on any vertical line up to 6000 mm high.
    .3 Variation in wall opening sizes: 6 mm maximum.
    .4 Variation of building lines from plan: in any bay or 6000 mm maximum – 12 mm or in 1200 mm or more, 20 mm.

15. Lay out masonry units carefully so as to run as often as possible in full and half unit dimensions. All exposed ends shall match the finish of the faces.

16. All units cut around pipes, ducts, openings, etc. shall be accurately and neatly cut with a power carborundum wheel, and remaining voids shall be slushed full with mortar.

17. Make joints flush and smooth on both sides excepts where they are to be exposed to view. When exposed to view, tool the joints concave, unless otherwise noted.

18. Lay and set up all units carefully so that both faces of the walls are true and even. Do not use chipped or cracked units where exposed to view, even where the defect would not impair strength or durability.

19. Take particular care to keep cavities, weep holes, vents and exposed faces of all units free of mortar.

3.2 Tolerances

1. Clause 6.2 of CAN3-A371 applies except as follows: Walls to receive thinset ceramic tile: plumb within 1:600.

3.3 Exposed Masonry

1. Remove chipped, cracked, and otherwise damaged units in exposed masonry and replace with undamaged units.

3.4 Jointing

1. Concave joints, allow joints to set just enough to remove excess water, then tool with round jointer to provide smooth, compressed, uniformly concave joints.

2. Raked joints, where split rib blocks are used, allow joints to set just enough to remove excess water, then rake joints uniformly to depth of rib and compress with square tool to provide smooth, compressed, raked joints of uniform depth.

3. Where joints are concealed in walls and where walls are to receive plaster, tile insulation, or other applied material, except paint or similar thin finish coating, strike flush.

3.5 Joining of Work

1. Where necessary to temporarily stop horizontal runs of masonry, and in building corner, Step-back masonry diagonally to lowest course previously laid. Do not "tooth" new masonry. Fill in adjacent course before heights of stepped masonry reach 1200 mm.

3.6 Cutting

1. Cut out neatly for electrical switches, outlet boxes, and other recessed or built-in objects.

2. Make cuts straight, clean, and free from uneven edges. Use masonry saw where necessary.

3.7 Building-In

1. Build in items required to be built into masonry by other trades.

2. Prevent displacement of built-in items during construction. Check for plumbness, alignment, and correctness of position, as work progresses.

3. Brace door jambs to maintain plumbness. Fill door frame with concrete.

3.8 Support of Loads

1. Where concrete fill is used in lieu of solid units, use 20 MPa concrete to Section 03300.

2. Install building paper below voids to be filled with concrete; keep paper 25 mm back from faces of units.

3.9 Provision for Movement

1. Leave 5 mm space below shelf angles.

2. Leave 6 mm space and do not use wedges between tops of non-load bearing walls and partitions and structural elements.

3.10 Loose Steel Lintels

1. Install loose steel lintels. Centre over opening width.

3.11 Horizontal Reinforcing

1. Horizontal reinforcing at 400 mm o.c. (every 2nd course), except solid walls greater than, or equal to 340 mm in width. At 340 mm, or greater, horizontal reinforcing at 200 mm o.c. (every course). Use prefabricated corners and tees at all intersecting load bearing walls.

3.12 Vertical Reinforcing

1. Install vertical reinforcing to size and spacing as shown on Drawings. Fill voids with 20MPa concrete.

3.13 Bonding

1. Walls of two or more widths: bond using metal ties in accordance with subsection 9.4 of CSA-A371.

2. Procedure approval by Architect.

3.14 Testing

1. Masonry units to be tested in accordance with S304.1, Clause 15.1, for engineered masonry design, and in conformance with clause 15.1.2.

2. Mortar testing to be in accordance with S304.1, clause 15.2.

3. Grout testing to be in accordance with S304.1, clause 15.3.

3.15 Blockwork - General

1. Do not wet concrete block before laying.

2. Lay block with thicker end of face shell upward.

3. Lay interior block in running board, concave tooled joints.
4. Use solid block or hollow block filled with concrete for top 2 courses under point bearing loads extending minimum 200 mm each side of bearing and where indicated.

5. Install special shaped units where indicated.

6. In block walls install continuous trussed wire reinforcement, as noted.

7. Where resilient base is indicated, tool the joints to within 100 mm of the floor. Cut joints flush behind the base.

8. Extend all walls/partitions to underside of steel/concrete deck unless shown otherwise on drawings and as required. Co-ordinate wall locations with structure above and prior to commencing work, advise Consultant of interference.

9. When masonry walls are not built at once, the ends of the walls are to be raked back at an angle, or terminated at a control joint. Toothing will not be permitted.

3.16 Mortar

1. Measure loose damp ingredients accurately by volume. Place water in mixer, add half volume of sand, add cement, add remainder of sand, add water for plasticity. Mix for at least four minutes. Keep mixer clean.

2. Incorporate colour into mixes in accordance with manufacturer's instructions.

3. Use clean mixer for coloured mortar.

4. Prehydrate pointing mortar by mixing ingredients dry, then mix again adding just enough water to produce damp unworkable mix that will retain its form when pressed into a ball. Allow to stand for not less than 1 hour nor more than 2 hours then remix with sufficient to produce mortar of proper consistency for pointing.

3.17 Concrete Core Fill

1. All concrete block walls shall have vertical grout core fill each side of openings and where shown and as detailed on the drawings.

2. Core fill in walls shall extend from bottom bearing surface to underside of bond beams or structure.

3. Grout core fill shall be placed with a trunk or chute in maximum lifts 2000 mm. Compaction shall be by interior mechanical vibrator. All fill shall be placed in accordance with CSA A23.1.

4. Fill minimum ½ block core each side of frame from foundation to underside of lintels of all door openings over 1 metre wide.

5. Provide inspection openings in base of walls to be grouted. Make good to match adjacent block work after inspection and approval by Engineer.

3.18 Reinforced Block Lintels

1. Install reinforced concrete block lintels at all openings where steel lintels are not indicated in accordance with structural details.

2. Install shoring and bracing as required to openings prior to placing lintel units and concrete fill.

End of Section

PART 1 - GENERAL

1.1 Related Work

1. Finish painting: Section 09900

1.2 Scope

1. Provide all miscellaneous metal items except those listed above Under Article 1.1.

1.3 Reference Standards

1. ASTM A167-87	Specification for Stainless and Heat-Resisting Chromium - Nickel Steel Plate, Sheet and Strip.
2. ASTM A325-90	Specification for High Strength Bolts for Structural Steel Joints.
3. ASTM A143-74(1989)	Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
4. ASTM A307-90	Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
5. ASTM A563M-90	Specification for carbon and Alloy Steel Nuts.
6. ASTM A780-90	Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized coatings.
7. CAN/CSA-S16.1-M89	Limit States Design of Steel Structures.
8. CSA W59-M1989	Welded Steel Construction (Metal Arc Welding)
9. CAN/CSA-G40.20-M92	General Requirements for Rolled or Welded Structural Quality Steel.
10. CAN/CSA-G40.21-M92	Structural Quality Steels.
11. CAN/CSA-G164-M92	Hot-Dip Galvanizing of Irregularly Shaped Articles
12. CISC/CPMA 2-75	Canadian Institute of Steel Construction/Canadian Paint Manufacturers Association-A Quick Drying Primer for Use on Structural Steel.
13. CAN/CGSB-1.40-M89	Primer, Structural Steel, Oil Alkyd Type.
14. CAN/CGSB-1.108-M89	Bituminous Solvent Type Paint.

1.4 Shop Drawings

1. Submit shop drawings in accordance with Section 01340 prepared and stamped by a Professional Engineer licensed to design structures in the Province of Ontario.

2. Clearly indicate materials, core thickness, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details and accessories.

PART 2 - PRODUCTS

2.1 Materials

1. Metals

    .1 **Steel sections and plates:** to CAN3 G40.21-M81, Grade 50W for tubes and Grade 44W for plates and flat shapes.
    .2 **Welding Materials:** to CSA W59-M1989.
    .3 **Bolts and anchor bolts:** to ASTM A307, A325, and A563 as applicable.
    .4 **Stainless Steel:** Type 302 or 304 alloy conforming to ASTM A167, No. 4 finish.

2. Primers, Coatings and Shop Painting

    .1 **Interior Steel in Dry Areas:** Quick drying oil alkyd conforming to CISC/CPMA 2.75.
    .2 **Exterior Steel, Interior Steel in Unheated Areas, Steel Embedded in Concrete:** Hot dip galvanized conforming to CSA G164, minimum Z275 coating.
    .3 **Galvanizing** of structural steel components and loose lintels: refer to Section 5120.
    .4 **Galvanized Coating Touch-Up:** W.R. Meadows “Galvafroid” or Kerry Industries “Z.R.C.” zinc rich coating or similar manufacturer containing minimum 90% zinc by weight.
    .5 Apply one shop coat(s) of primer or coating as indicated above and according to manufacturer’s recommendations. Do not prime aluminum, stainless steel or those components to be galvanized or encased in concrete.
    .6 Use primer unadulterated, as provided by manufacturer. Paint on dry surfaces free from rust scale and grease. Do not paint when temperature is lower than 10 deg. Celsius and rising.
    .7 Clean surfaces to be field welded; do not paint.

3. Fastenings

    .1 Use nuts and bolts conforming to ASTM A307, A325, and A563 as applicable.

        .1 For interior work, use cadmium-plated fastenings where other protection is not specified.
        .2 For exterior work, use Type 300 or 400 stainless steel.

4. Anchors and Shims

    .1 For exposed anchorage of aluminum, if applicable, use stainless steel and otherwise to match metal anchored. For non-exposed work, anchors and shims may be galvanized steel.

5. Pipe

    .1 To ASTM A53, extra strong steel pipe for bollards.

6. Bituminous Paint

    .1 Alkali-resisting to meet specified requirements of CAN/CGSB-1.108, Type 2. Use to insulate contact between dissimilar metals.

2.2 Fabrication

1. Build work square, true, straight and accurate to required size, with joints closely fitted and properly secured.

2. Weld all connections where possible, and bolt where not possible unless indicated otherwise on drawings.

3. Use self-tapping shake-proof countersunk flat headed screws on items required to be assembled by screws or as indicated.

4. Where possible, work to be fitted and shop assembled, ready for erection.

5. Exposed welds to be continuous for length of each joint. File or grind exposed welds smooth and flush.

6. Weld all stainless steel by the Argon Arc Process. Grind smooth and polish joints, crence-free, and flush without seams.

2.3 List of Miscellaneous Metal Fabrications

1. This Section includes but is not limited to the following list. Note: **Galvanize all exterior items** and other items noted. Prime paint all interior items.

    .1 Anchors, Bolts, Inserts, Sleeves for work in this Section.
    .2 Hangers and Supports (for work in this Section).
    .3 Lintels.
    .4 Steel Brackets for millwork.

PART 3 - EXECUTION

3.1 General

1. Supply and install all miscellaneous metal work indicated on the Drawings and not indicated in work of other Sections in addition to items listed below.

3.2 Fabrication & Erection

1. Erect metal work square, plumb, straight, and true, accurately fitted, with tight joints and intersections.

2. Insulate metals, where necessary, to prevent corrosion due to contact between dissimilar metals and between metals and masonry or plaster. Use bituminous paint, butyl tape, building paper or other approved means.

3. Provide suitable and acceptable means of anchorage, such as dowels, anchor clips, bar anchors, expansion bolts and shields, toggles.

4. Make field connections with items specified in Articles 2.1.4 and 2.1.5 and 2.1.8 or weld to CSA S16-1969 and CSA S16S1-1975.

5. Hand items to be cast into concrete or built into masonry over to appropriate trades together with setting templates.

6. Touch-up rivets, field welds, bolts and burnt or scratched surfaces after completion of erection.

7. Touch-up galvanized surfaces with zinc primer where burned by field welding. Spray or brush apply a minimum of three (3) coats of zinc-rich paint to achieve a dry film thickness of 8 mils. Apply a finish coat of aluminum paint to provide a colour blend with the surround galvanizing.

3.5 Vanity Brackets

1. Angle steel frame, as shown on drawings - shop prime painted.

3.6 Wall Brackets and Hooks

1. As shown on Drawings - prime paint.

End of Section

PART 1 - GENERAL

1.1 Related Work

1. Not applicable.

1.2 Source Quality Control

1. Identify lumber by grade stamp of an agency certified by Canadian Lumber Standards Administration Board.

PART 2 - PRODUCTS

2.1 Materials

1. **Wood Materials:** Material, straight, sawn square, true, dressed four (4) sides properly sized, shaped to correct dimensions from nominal sizes indicated or specified.

2. **Lumber: Use only grade marked lumber. Where left exposed, use best brand of lumber available.** lumber and moisture content to conform to official grading rules of NLGA, for particular lumber and grade, and structurally conform to latest requirements of Ontario Building Code. Conform to Grading Standards, CSA Standard Softwood Lumber 2005. Moist content is not greater than 19% at time of installation.

3. **Blocking, Cants, Bucks, Grounds and Nailing Strips:** Douglas fir Graded 122-C, construction or No. 2 Pine, pressure treated in accordance with CSA 080 Series 08.

4. **Plywood:** Douglas fir plywood to CSA 0121-08, good one side with waterproof adhesive.

5. **Rough Hardware:** Nails, screws, bolts, lag screws, anchors, special fastening devices and supports required for erection of all carpentry components. Use galvanized components where exposed to exterior atmosphere.

PART 3 - EXECUTION

3.1 General

1. Do all wood framing in accordance with the Ontario Building Code, Engineering Design in Wood and CSA 086 - 01.

2. Machine dressed work shall be slow fed using sharp cutters and finished members shall be free from drag, feathers, slivers or roughness of any kind.

3. Frame materials with tight joints rigidly held in place.

4. Design construction methods for expansion and contraction of the materials.

5. Erect work plumb, level, square and to required lines.

6. Be responsible for methods of construction for ensuring that materials are rigidly and securely attached and will not be loosened by the work of other trades.

3.2 Furring and Blocking

1. Supply and install furring and blocking, required.

2. Align and plumb faces of furring and blocking to tolerance of 1:600.

3.3 Rough Bucks, Nailers

1. Install wood bucks and nailers, as indicated, including wood bucks and linings around frames for doors and windows.

2. Except where indicated, otherwise, use material at least 38 mm thick secured with 9 mm bolts located within 300 mm from ends of members and uniformly spaced at 1200 mm between.

3. Countersink bolts where necessary to provide clearance for other work.

3.4 Roof Fascias, Cants, Nailers, Curbs

1. Install wood cants, fascia backing, nailers, curbs and other wood supports for roofing, sheet metal fork, roof mounted equipment.
   Refer to Section 07550 Modified Bituminous Roofing.

2. In reference to section 07550 Modified Bituminous Roofing, subsection 3.4 Carpentry and Section 07610 Sheet Metal Roofing: all wood blocking work related to roofing including but not limited to parapets, walls and curbs is by Section 06100 Rough Carpentry. The general contractor is responsible to turn over this work in a dry condition to roofing contractor for making watertight as part of roofing work. After acceptance, the roofing contractor is responsible to maintain water tightness.

3.5 Supports for Mechanical Units

1. Install wood blocking for prefabricated curbs for mechanical units to allow for a level installation on sloping roof.

3.6 Pressure Treated Wood

1. Use wood pressure treated in accordance with CSA 080 for all wood members in contact with exterior walls and roofs.

2. Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation.

3. Fasten each slat to steel frames with 2 screws at top, bottom and at diagonal bracing.

3.7 Installation of Hollow Metal Frames

1. Set frames plumb and square in their exact location and at correct elevation. Firmly block and brace to prevent shifting. Shim up where required to ensure proper alignment dimensions from finished floor to head of frame. Install temporary wood spreaders at mid-height.

2. Where pressed steel frames are installed in concrete walls, secure frames to concrete using lead expansion shields and anchor bolts through pipe sleeves. Perform drilling of concrete as required. Fill recessed bolt heads flush to frame face with approved metal filler and sand smooth.

3. Install fire rated door frames in accordance with requirements of National Fire Code Volume 4, produced by The National Fire Protection Association (NFPA 80).

3.8 General

1. Supply and install all other carpentry shown on drawings or as required for completion of work. Cooperate with other trades in installing items supplied by other sections, cut openings in woodwork when so required and make good disturbed surfaces.

End of Section

PART 1 - GENERAL

1.1 Related Work

1. Rough carpentry: Section 06100
2. Painting: Section 09900

1.2 Reference Standards

1. Do millwork to Millwork Standards of the Architectural Woodwork Manufacturers' Association of Canada (AWMAC) Premium Grade.

1.3 Samples

1. Submit duplicate 300 x 300 mm samples of each type of paneling laminate, melamine and each type of solid wood or plywood to receive stain or natural finish.
2. Submit sample of each type of hardware specified in accordance with Section 01340.
3. Submit a typical prototype unit representative of the work of this section.

1.4 Shop Drawings

1. Submit Shop Drawings in accordance with Section 01340.
2. Clearly indicate details of construction, profiles, jointing, fastening and other related details.

1.5 Qualification

1. Millwork manufacturer to be certified for commercial projects.

1.6 Warranty

1. Submit a two (2) year warranty for the work of this section against defects in material and workmanship.

PART 2 - PRODUCTS

2.1 Materials

1. Softwood lumber: to CSA 0121-M1978 and National Lumber Grades Authority (NLGA) requirements, with maximum moisture content of 10% for interior work. Yard lumber select for natural finish of species, indicated to AWMAC premium grade.
2. Hardwood lumber: to National Hardwood Lumber Association (NHLA) requirements, moisture content of maximum 10% for interior work, of species indicated to AWMAC premium grade. Species: Maple, unless otherwise noted.

3. Hardwood plywood: to CSA 0115-1967 of thickness indicated, rotary cut face veneer, birch plywood, veneer core. Select veneers to provide book match veneer strips to be 240 mm wide minimum. Grade: Select White.

4. Nails and staples: to CSA B111-1974 galvanized for exterior work, interior high-humidity areas and for treated lumber; plain finish elsewhere. Use spiral thread nails except where specified elsewhere.

5. Particle Board core: to CAN3-0188.1-M, Grade R, 720 kg/m3 density in thicknesses indicated.

2.2 Plastic Laminate Clad Cabinetwork

1. All cabinet frames whether for base, wall or tall floor standing cases, shall be fabricated so each is a self-contained module.

2. Gables and panels shall be fabricated from 19 mm thick plastic laminate surfaced panels.

3. Bottoms shall be fabricated utilizing the same materials and edge finish as gables. Edges to be thoroughly sealed and moisture proofed prior to attachment to gables.

4. Toe kick rail shall have a 100 mm x 19 mm section, machined to receive four screw nails for attachment to bottom front edge of gables. Cabinet base shall be plywood attached to plastic laminate cabinet separately,

5. All shelves shall be adjustable at 13 mm increments and each will be supported by a shelf support resting in four pilaster strips attached to the gables.

6. Doors shall be fabricated from 19 mm thick melamine surfaced panels. All four edges shall be P.V.C. edging.

7. Drawer fronts shall be fabricated utilizing the same material and edge finish as doors. All four edges shall P.V.C. edging. Fronts will be secured to drawer bodies with five screw nails through the front of the drawer body into the core of the drawer front.

8. Drawer bodies shall consist of box construction fabricated from 13 mm birch plywood with solid birch edge, front, sides and back with a 6 mm hardboard bottom dadoed and glued into box members. Joint front, sides and back with carefully fitted glued and tenoned joints. Alternately, Blum Metabox drawer body and side can be used.

9. **Finish:**

   .1 Plastic laminate exterior and interior surfaced panels shall be finished both sides in the same colours. Final selections to be confirmed by architect. Basis of design:
   Room 120: typical finish is Wilsonart Norwegian Ash 8241, and countertops are Wilsonart Lakeshore 5046.
   Room 207: typical finish is Wilsonart Anderson Cherry 8266, and countertops are Wilsonart Striation Planked Y0417.

2.3 Plastic Laminated Tops

1. Unless noted otherwise, 19 mm thick particle board core with post forming grade plastic laminate finish bonded with resorcinal formaldehyde resin glue to a particleboard core. All countertop front face to return vertically 35 mm ±. All front and backsplash edges to be rounded.

2. Underside to receive a backing sheet, sanded one side and bonded same as surfacing material.

3. Exposed edges to be finished with same material as used for the top.

2.4 Edge Banding

1. Solid polyvinyl chloride (PVC), 3 mm thickness x full width of panel edge, colour/pattern to match finished face of laminate panel or as selected by Consultant. All exposed edges of banding to be radiused to 2 mm radius after installation on panels. Submit sample of edge-banded panel with radiused edges to Consultant for approval prior to fabrication of architectural woodwork.

2.5 Cabinet Hardware

1. Furnish and install all hardware to custom casework as follows:

.1 **Cupboard Doors - 19 mm thick:**

Hinges	200 Series 110° Salice
Roller Catches	807N 2G (SgDr) Onward
Elbow Catches	T03222 C15 (DhDr)
Door Pulls	CBH235-3 1/2” C32D

.2 **Drawers - 19 mm thick.:**

Drawer Slides	KV1300X length to suit
Drawer Pulls	CBH235-3 1/2” C32D
Drawer Locks	8703 - 14a National

.3 **Shelving:**

Plaster strips	KV255 Zinc Knape & Vogt
Shelf Clips	KV256 Zinc Knape & Vogt

.4 **Table Legs:**

MS Manicure Station (1) Richelieu 624705174 round table leg, matte chrome fin.

2.6 Shop Fabrication

1. Shop install cabinet hardware.

2. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes and other fixtures.

3. Shop assemble work for delivery to site in size easily handled and to insure passage through building openings.

PART 3 - EXECUTION

3.1 Installation

1. Set and secure all material and components in place, rigid, plumb and square.

2. Provide heavy duty fixture attachments for wall mounted cabinets.

3. Use draw bolts in countertop joints.

4. At junction of plastic laminate counter back splash and adjacent wall finish, apply small bead of sealant.

5. Apply water resistant building paper over wood framing members in contract with masonry or cementitious construction.

6. After installation, fit and adjust operating hardware for wood and laminated plastic cabinet doors, drawers and shelves.

End of Section

PART 1 - GENERAL

1.1 Related Work

1. Rough Carpentry (Architectural) Plywood: Section 06100
2. Firestopping and Smoke Seals for Mechanical Work: Division 15
3. Firestopping and Smoke Seals for Electrical Work: Division 16
4. Sound Seal at Gypsum Board Partition Section 09250

Note: Firestopping and Smoke Seals within mechanical and electrical assemblies are specified in Divisions 15 and 16. All other firestopping and smoke seals are the responsibility of this Section.

1.2 Reference

1. ASTM E814 - Test Method of fire tests of through-penetration firestops, Factory Mutual.
2. CAN4-S101M - Standard Methods of Fire Endurance Tests of Building Construction and Materials.
3. CAN4-S115M - Standard Method of Fire Tests of Firestop Systems.
4. ULC - List of Equipment and Materials.

1.3 System Description

1. Firestopping Materials: CAN4-S115M ASTM E814 to achieve a fire protection rating as noted on Drawings.
2. It is the intent of this Section that in conjunction with Divisions 15 and 16 a competent, single source be responsible for the firestopping and smoke seals of the entire project.

1.4 Submittals

1. Submit product data to requirements of Section 01340.
2. Submit manufacturer's product data for materials and prefabricated devices, providing descriptions are sufficient for identification at job site. Include manufacturer's printed instructions for installation, ULC design references.
3. Submit proposed type of fireproofing system for each location for approval by Architect. Fireproofing System must be appropriate to achieve expected appearance and finish.

1.5 Quality Assurance

1. Manufacturer: Company specializing in manufacturing products of this Section with minimum five years documented experience.

2. Applicator: Approved, licensed and supervised by the manufacturer of firestopping materials. Company with minimum five years documented experience.

3. Product: Manufactured under ULC Follow-up Program. Each container or package shall bear ULC label.

1.6 Regulatory Requirements

1. Conform to applicable code for fire protection ratings.

2. Provide certificate of compliance for authority having jurisdiction indicating approval.

1.7 Delivery, Storage & Handling

1. Deliver and store materials in a dry, protected area, off ground in original, undamaged, sealed containers with manufacturer's labels and seas intact.

1.8 Project & Site Conditions

1. Application temperature and ventilation as per Manufacturer's instructions.

1.9 Sequencing & Scheduling

1. Sequence work to permit installation of firestopping and smoke seal materials to be installed after adjacent work is complete and before closure of spaces.

PART 2 - PRODUCTS

2.1 Materials

1. A/D Firebarrier Firestop Systems, by A/D Fire Protection Systems Inc., capable of maintaining an effective barrier against flame, smoke and gases in compliance with requirements of CAN4-S115 and not to exceed opening sizes for which they are intended.

2. Mineral Wood Backing Insulation: ULC labelled, preformed non-combustible material (A/D Firebarrier Mineral Wool) by A/D Fire Protection Systems Inc.

3. Retainers: Clips to support mineral wool.

4. Firestopping Sealant: ULC labelled, single component silicone bases, A/D Silicone Firebarrier Sealant by A/D Fire Protection Systems Inc.

5. Firestopping Seal: ULC labelled, single component water-base seal, A/D Firebarrier Seal by A/D Fire Protection Systems Inc.

6. Firestopping Foam: ULC labelled, two components silicone foam, A/D Firebarrier RTV Foam by A/D Fire Protection Systems Inc.

7. Firestopping Mortar: ULC labelled, non-combustible fibre reinforced, foamed cement mortar, A/D Firebarrier Mortar by A/D Fire Protection Systems Inc.

8. Damming Material: In accordance with tested assembly being installed as applicable and as acceptable to authorities having jurisdiction.

PART 3 - EXECUTION

3.1 Examination

1. Examine surfaces to receive work of this Section and report any defects which may affect the Work of this Section.

2. Verify that openings are ready to receive the Work of this Section.

3. Confirm compatibility of surfaces to receive firestopping and smoke seal materials.

4. Beginning of installation means acceptance of existing surfaces and substrate.

3.2 Preparation

1. Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials. Ensure that substrates and surfaces are clean, dry and frost free.

2. Prepare surfaces in contact with firestopping materials and smoke seals to manufacturer's instruction.

3.3 Application

1. Install firestopping and smoke seal material and components in accordance with ULC listing and manufacturer's instructions.

2. Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.

3. Apply in sufficient thickness to achieve rating to uniform density and texture.

4. Provide temporary forming if required.

5. Tool or trowel exposed surfaces to a neat finish where required.

6. Remove excess material promptly as work progresses and upon completion.

7. Protect installed material until cured or set.

3.4 Cleaning

1. Clean adjacent surfaces of firestopping and smoke seal materials.

3.5 Field Quality Control

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

3.6 Scheduling

1. Firestop and smoke seal at:

    .1 Penetrations through fire separations (rated and non-rated); masonry, concrete, and gypsum board partitions and walls.
    .2 Top of fire separations (rated and non-rated); masonry and gypsum board partitions.
    .3 Intersection of fire separation masonry and gypsum board partitions.
    .4 Control and sway joints in fire separation masonry and gypsum board partitions and walls.
    .5 Penetrations through fire separation floor slabs, ceilings and roofs, if applicable.
    .6 Openings and sleeves installed for future use through fire separations.
    .7 Refer to AD drawings for locations of fire separations.
    .8 Refer to AD725 for detail of top of wall fire separation assembly.

3.7 Sound Seal

1. At top of all non fire separations masonry partitions compress mineral wool and fill space between masonry and structure. Apply sealant on at least one side of the sound separation.

End of Section

PART 1 - GENERAL

1.1 Related Work Specified Elsewhere

1. Not applicable.

1.2 Environmental Conditions

1. Sealant and substrata materials to be minimum 5 deg. C.

2. Should it become necessary to apply sealants below 5 deg. C, consult sealant manufacturer and follow their recommendations.

1.3 Warranty

1. Contractor hereby warrants that caulking work will not leak, crack, crumble, melt, shrink, run lose adhesion or stain adjacent surfaces in accordance with General Conditions, but for five (5) years total.

PART 2 - PRODUCTS

2.1 Materials

1. Primers: type recommended by sealant manufacturer.

2. Joint Fillers:

    .1 General: compatible with primers and sealants, outsized 30 to 50%.
    .2 Polyethylene, urethane, neoprene or vinyl: extruded closed cell foam, Shore A hardness 20, tensile strength 140 to 200 kPa.
    .3 Neoprene or butyl rubber: round solid rod, Shore A hardness 70.
    .4 Polyvinyl chloride or neoprene: extruded tubing with 6 mm minimum thick walls.
    .5 Bond breaker: pressure sensitive plastic tape which will not bond to sealants.
    .6 Sealant Type A: One component, chemical curing, conforming to CAN2-19.13-M82, Class C-2-25-B-N; multi-component, chemical curing, conforming to CAN2-19.24-M80, Type 2, Class B.
    .7 Sealant Type B: Multi-component, chemical curing mildew resistant conforming to CGSB 19-GP-22M.
    .8 Sealant type C: Multi-component, acrylic emulsion base, conforming to CGSB 19-GP-17M.
    .9 Sealant type D: One component, polyurethane base, chemical curing, conforming to CAN2-19.13-M82, Class C-1-25-B-N; or multi-component, chemical curing, conforming to CAN2-19.24-M80, type 1.

3. Color of Sealants: to be selected by Consultant. Allow for a total of three (3) colours for Type A, two colours for Type B, two colours for Type C and one colour for Type D. Locations as directed on site by Consultant.

4. Joint cleaner: xylol, methylethyl-ketone or non-corrosive type recommended by sealant manufacturer and compatible with joint forming materials.

5. Vent tubing: 6 mm inside diameter extruded polyvinyl chloride tubing.

PART 3 - EXECUTION

3.1 New Work

1. Caulk where specified in 3.4 and everywhere required.

2. Remove dust, paint, loose mortar and other foreign matter. Dry joint surfaces.

3. Remove rust, mill scale and coatings from ferrous metals by wire brush, grinding or sandblasting.

4. Remove oil, grease and other coatings from non-ferrous metals with joint cleaner.

5. Prepare concrete, masonry, glazed and vitreous surfaces to sealant manufacturer's instructions.

6. Examine joint sizes and correct to achieve depth ratio 1/2 of joint width with minimum width and depth of 6 mm, maximum width 25 mm.

7. Install joint filler to achieve correct joint depth.

8. Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.

9. Apply bond breaker tape where required to manufacturer's instructions.

10. Prime sides of joints to sealant manufacturer's instructions immediately prior to caulking.

3.2 Application

1. Apply sealants, primers, joint fillers, bond breakers, to manufacturer's instructions. Apply sealant using gun with proper size nozzle. Use sufficient pressure to fill voids and joints solid. Superficial pointing with skin bead is not acceptable.

2. Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities. Neatly tool surface to a slight concave joint.

3. In masonry cavity construction, vent caulked joints from cavity to 3 mm beyond external face of wall by inserting vent tubing at bottom of each joint and maximum to 1500 mm o.c. vertically. Position tube to drain to exterior.

4. In precast concrete panel facing, vent space behind panels by inserting vent tubing at bottom of each vertical caulked joint and at every second intersection of horizontal and vertical joints. Position tube to drain to exterior.

5. Clean adjacent surfaces immediately and leave work neat and clean. Remove excess sealant and droppings using recommended cleaners as work progresses. Remove masking after tooling of joints.

6. Use sealants specified in the following locations:

   Type A: Joints between windows or door frames and adjacent building components; control and expansion joints and all other locations where sealing is required, except in locations designated for Type B, C and D. Ensure that sealant chosen (from the several specified under "MATERIALS") for each location is recommended by manufacturer for use on surfaces encountered.

   Type B: Joints between splash backs and walls.

   Type C: Joints between interior metal door frames and partitions.

   Type D: Joints in horizontal surfaces between concrete slabs, pavers and precast concrete panels.

End of Section

PART 1 - GENERAL

1.1 Work Included

1. A single manufacturer shall fabricate products included within the scope of this Section.

2. Manufacturer shall be a member in good standing of the Canadian Steel Door Manufacturers Association (CSDMA).

3. Supply only of steel frame products including frames, transom frames, sidelight and window assemblies with provision for glazed, paneled or louvered openings, fire labeled and non-labeled, as scheduled or detailed by the Architect.

4. Supply only of flush steel doors with provision for glazed, paneled or louvered openings, insulated and un-insulated, fire labeled, with or without temperature rise ratings and non-labeled, as scheduled or detailed by the Architect.

5. Supply only of steel panels, similar in construction to steel doors, with flush or abetted bottoms for steel frames, transom frames, sidelight and window assemblies, fire labeled and non-labeled, as scheduled or detailed by the Architect.

6. Doors and frames shall be prepared for, but not limited to, preparation for continuous hinges, heavy weight hinges, cylindrical locks, rim and concealed vertical rod/ mortise lock case exit devices, surface door closers and concealed overhead stops.

1.2 Related Work

1. Building-in of frame product into unit masonry, previously placed concrete, structural or steel or wood stud walls.

2. Supply and installation of wood, plastic or composite core doors.

3. Supply and installation of builders' hardware except as specified for acoustic assemblies.

4. Drilling and tapping for surface mounted or non-templated builders' hardware.

5. Caulking of joints between frame product and other building components.

6. Supply and installation of gaskets or weather-strip.

7. Supply and installation of louvers or vents.

8. Supply and installation of glazing materials.

9. Site touch-up and painting.

10. Wiring for electronic or electric hardware.

11. Field measurements.

12. Fasteners for frame product in previously placed concrete, masonry or structural steel.

13. Steel lintels, posts, columns or other load-bearing elements.

14. Field welding.

1.3 Requirements of regulatory agencies

1. Install fire labeled steel door and frame product in accordance with NFPA-80, current edition, unless specified otherwise.

1.4 References

1.	ANSI A115.IG-1994	Installation Guide for Doors and Hardware
2.	ANSI A250.4-1994	Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcings.
3.	ASTM A653-M97	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
4.	ASTM A924-M97	Standard Specification for General Requirements for Sheet, Metallic-Coated by the Hot-Dip Process.
5.	ASTM B117-95	Method of Salt Spray (Fog) Testing.
6.	ASTM C177-97	Test Method for Steady-State heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot -Plate Apparatus.
7.	ASTM C518-91	Test method for Steady State Heat Flux Measurements and Thermal Transmission properties by means of the heat Flow Meter Apparatus.
8.	ASTM C578-95	Specification for Rigid, Cellular polystyrene Thermal Insulation.
9.	ASTM C665-95	Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
10.	ASTM D1735-92	Practice for Testing Water Resistance of Coating Using Water Fog Apparatus.
11.	CAN4-S104-M80	Fire Tests of Door Assemblies.
12.	CAN4-S105-M85	Standard Specification for Fire Door Frames Meeting the performance required by CAN4-S104.
13.	CAN4-S106-M80	Standard Method for Fire Tests of Window and Glass Block Assemblies.

14. CGSB 41-Gp-19Ma Rigid Vinyl Extrusions for Windows and Doors
15. CGSB 82.5-M88 Insulated Steel Doors.
16. CSA A101-M83 Mineral Fiber Thermal insulation for Buildings.
17. CSA W59-M89 Welded Steel Construction (Metal Arc Welding)
18. ISO 9001:1994 Quality Systems – Model for Quality Assurance.
19. NFPA-80, 1999 Fire Doors and Windows
20. CSDMA Dimensional Standards for Commercial Steel Doors and Frames.
21. Manufacturers Standard and Galvanized Sheet Gauges
22. Fleming Fire Labeling Specifications
23. ULC List of Equipment and Materials, Volume 2

1.5 Testing and Performance

1. Door constructions covered by this specification shall be certified as meeting Level “A” (1,000,000 cycles) and Twist Test Acceptance Criteria (deflection not to exceed 6.4 mm /13.6kg force, total deflection at 136.1kg force not to exceed 63.5 mm and permanent deflection not to exceed 3.2 mm) when tested in strict conformance with ANSI-A250.4-1994. Test shall be conducted by an independent nationally recognized accredited laboratory.

2. Fire labeled product shall be provided for those openings requiring fire protection and temperature rise ratings, as determined and scheduled by the Architect. Doors, frames, transom frames and sidelight assemblies shall be tested in strict accordance with CAN4-S106. Product shall be listed by Underwriters Laboratories of Canada under an active Factory Inspection Program and shall be constructed as detailed in Follow-Up Service procedures issued to the manufacturer.

3. Should any door or frame specified by the Architect to be fire rated, not qualify for labeling due to design, hardware, glazing or any other reason, the Architect shall be so advised before manufacturing commences.

4. Core materials for exterior doors shall attain a thermal resistance rating of RSI 1.06 (R6.0) when tested in accordance with ASTM C177 or ASTM C518.

5. Product shall be manufactured by a firm experienced in the design and production of standard and custom commercial steel door and frame assemblies, the integration of builders’ or electronic hardware and glazing materials and their impact on the scope of work.

6. Manufacturer shall be assessed and registered as meeting the requirements of Quality Systems under ISO 9001.
7. Product quality shall meet standards set by the Canadian Steel Door Manufacturers Association.

1.6 Test Reports

1. All alternates to this specification shall be submitted to the Architect for acceptance ten (10) days prior to bid date, complete with test reports from independent, nationally recognized testing authorities, certifying that:

    .1 Steel door and frame assemblies furnished under this section meet the acceptance criteria of ANSI-A250.4-1994, Level “A”.
    .2 Insulated door cores furnished in exterior doors under this Section meet the specified thermal resistance rating.

2. All reports shall include name of testing authority, date of test, location of test facility, descriptions of test specimens, procedures used in testing and indicate compliance with acceptance criteria of the test.

1.7 Submittals

1. Submit shop drawings in accordance with the General Conditions of the Contract.

2. Indicate each type of door, frame, steel, core, material thickness, mortises, reinforcements, anchorages, locations of exposed fasteners, openings (glazed, paneled or louvered) and arrangement of standard builders’ hardware.

3. Include a schedule identifying each unit, with door marks or numbers referencing the numbering in Architect’s schedules or drawings.

4. Provide confirmation in writing that all aspects to reinforcing, construction, and gauge of metal are met as written in this section.

1.8 Warranty

1. All steel door and frame product shall be warranted from defects in workmanship for a period of one (1) year from date of shipment.

2. All steel door and frame product shall be warranted against rust perforation for a period of five (5) years when the installed and finish painted with a commercial quality paint to the manufacturers recommendations.

3. Finish paint adhesion on all door and frame product shall be warranted for a period of five (5) years when the product has been properly cleaned and finish painted with a commercial quality paint applied as recommended by the paint manufacturer. This warranty shall not exceed that provided by the paint manufacturer.

PART 2 - PRODUCTS

2.1 Doors

1. **Materials**

.1 Doors shall be fabricated from tension leveled steel to ASTM A924-M97, galvanized to ASTM A653-M97, Commercial Steel (CS), Type B, coating designation ZF75, known commercially as paintable Galvanneal.

.2 Door Cores:
Honeycomb:
Structural small cell (25.4 mm maximum) kraft paper "honeycomb". Weight: 36.3 kg per ream (minimum), density: 16.5 kg/m^3 (minimum), sanded to the required thickness.
.1 Polystyrene:
Rigid extruded, fire retardant, closed cell board, density 16kg/m^2, thermal values: RSI 1.06 minimum, conforming to ASTM C578.
.2 Temperature Rise Rated (TRR):
Solid slab core of non-combustible, inorganic composite to limit temperature rise on the "unexposed" side of door to 250°C at 30 or 60 minutes, as required by governing building code requirements and determined and scheduled by the Architect.

.3 Adhesives:
.1 Honeycomb Cores and Steel Components:
Heat resistant, spray grade, resin reinforced neoprene/rubber (polychloroprene) based, low viscosity, contact cement or ULC approved equivalent.
.2 Interlocking Edge Seams:
Resin reinforced polychloroprene (RRPC), fire resistant, high viscosity, sealant/adhesive or UL approved equivalent.
.3 Polystyrene Cores:
Heat resistant, epoxy based, low viscosity, contact cement.
4. Primer:
Rust inhibitive touch-up only.
5. Exterior Top Caps:
Rigid polyvinylchloride (PVC) extrusion.

2. **Construction**

.1 General:
.1 This section is based on doors and frames as manufactured by Fleming. Doors and frames by other manufacturers are acceptable subject to be similar to the one specified and meeting the terms of this section.
.2 Doors shall be swinging, 44.4 mm thick of the types and sizes indicated on the schedules or drawings.
.3 Exterior doors shall be lock seam, flush.
.4 Face sheets for exterior doors shall be fabricated from (16) gauge steel.

.5 Longitudinal edges of exterior doors shall be mechanically interlocked, fully welded, ground smooth with no visible seams. Do not fill seams.
.6 Face sheets of interior doors shall be fabricated from 18 gauge steel, except for heavy traffic doors (noted **HT** in Door Schedule) face sheet to be 16 gauge.
.7 Longitudinal edge of heavy traffic doors (noted **HT** in Door Schedule) shall be mechanically interlocked, fully welded, ground smooth with no visible seams. Do not fill seams.
.8 Interior doors shall be stiffened, insulated and sound deadened with honeycomb core laminated under pressure to each face sheet.
.9 Stiffened, insulated and sound deadened with core where Temperature Rise Rated (TRR) fire labeled doors are specified.
.10 Longitudinal edges of interior doors shall be mechanically interlocked, adhesive assisted with edge seams visible.
.11 Door faces of all steel doors shall be fabricated without visible seams, free of scale, pitting, coil brakes, buckles and waves.
.12 Formed edges shall be true and straight with a minimum radius for the thickness of steel used.
.13 Lock and hinge edges shall be beveled 3 mm in 50 mm unless builders' hardware or door swing dictates otherwise.
.14 Top and bottom of doors shall be provided with inverted, recessed, 16 gauge steel end channels, welded to each face sheet at 150 mm on center maximum.
.15 Exterior doors shall be provided with factory installed flush PVC top caps. Fire labeled exterior doors shall be provided with factory installed flush steel top caps.
.16 Unless ineligible due to design, size, hardware or glazing specified on the Architects' or hardware Suppliers' schedules or details, fire labeled doors shall be provided for those openings requiring fire protection ratings and temperature rise ratings, as determined and scheduled by the Architect.
.17 Exterior doors shall be internally reinforced with 20 gauge continuous; interlocking steel stiffeners at 150mm O.C. max, with voids between stiffeners filled and insulated with 24kg/m3 density loose batt type fiberglass material to suit fully welded design.

.2 **Hardware Preparations:**
.1 Doors shall be factory blanked, reinforced, drilled and tapped for fully templated mortised hardware only, in accordance with the final approved schedule and templates provided by the hardware supplier.
.2 Doors shall be factory blanked and reinforced only for mortised hardware that is not fully templated.
.3 Doors shall be factory reinforced only for surface mounted hardware.
.4 Templated holes 12.7mm diameter and larger shall be factory prepared, except mounting and through bolt holes, which shall be by the contractor responsible for installation on site, at the time of application. Templated holes less than 12.7mm diameter shall be factory prepared only when required for the function of the device (for knobs, levers, cylinders, thumb or turn pieces) or when these holes over-lap function holes.

.5 Drilling and tapping for surface mounted hardware or mortised hardware that is not fully templated shall be by the contractor responsible for installation on site, at the time of application.
.6 Hinge and pivot reinforcements shall be 10 gauge steel minimum high frequency type reinforcing.
.7 Hinge reinforcements for acoustic doors and doors in excess of 2450mm rabbet height shall be 10 gauge minimum with each cutout provided with 114.3mm heavy weight (4.6mm) high frequency type.
.8 Lock, strike and flush bolt reinforcements shall be 12 gauge steel minimum.
.9 Reinforcements for concealed closers and holders shall be 12 gauge steel minimum.
.10 For surface mounted hardware, reinforcements shall be 16 gauge steel minimum.
.11 All pairs of fire labeled doors shall be provided with 12 gauge steel surface mounted flat bar astragal, shipped loose for application on site, by the contractor responsible for installation.
.12 Pairs of doors up to 2450mm x 2450mm, to 1½ hour fire rating maximum shall be provided without astragals. Lock edge seam of such doors shall be tacked-welded and ground smooth. All other fire labeled pairs shall be provided with 12 gauge steel surface mounted flat bar astragal, shipped loose for application on site, by the contractor responsible for installation.
.13 Where electrically or electronically operated hardware is specified on the Architects' schedules or details of the final approved schedule and templates provided by the hardware supplier, hardware enclosures and/or junction boxes, where indicated on the templates, shall be provided and interconnected with CSA Approved 12.7mm diameter conduit and connectors.
.14 Prepare doors to receive security door contacts – refer to electrical drawings for locations. Door contacts to be installed at 100 mm from the latch side door edge.
.15 Doors and Frames shall be prepared for, but not limited to preparations for heavy weight oversized Butt Hinges, Continuous Hinges, Cylindrical Locksets, Concealed Vertical Rod and Mortise Lock Case Exit Devises, Surface Door Closer and concealed Overhead Stops.

.3. Glazing:
.1 Where 6mm thick glazing materials are specified on the Architects schedules or details, doors shall be provided with 20 gauge steel glazing trim and snap-in glazing stops.
.2 Where other that 6mm glazing is specified on the Architect's schedules or details, doors shall receive 20 gauge steel trim and screw fixed glazing stops. Screws shall be #6 x 32mm oval head scrulox (self-drilling) type at 300mm on center maximum.
.3 Glazing trim and stops shall be accurately fitted, butted at corners, with removable glazing stops located on the 'push' side of the door.

.4 Louver Preparations:
.1 Where specified on the Architect's schedules or details, non-labeled doors shall be prepared on accordance with the louver manufacturer's details.

.2 Where specified on the Architect's schedules or details, fire labeled doors shall be prepared for UL listed sight-proof fusible link louvers in accordance with the louver manufacturer's details.
.3 Louvers shall be supplied and installed by others.

.5 Finishing:
.1 Remove weld slag and splatter from exposed surfaces.
.2 All tool marks, abrasions and surface blemishes shall be filled and sanded to present smooth uniform surfaces.
.3 On exposed surfaces where zinc coating has been removed during fabrication, doors shall receive a factory applied touch-up primer.
.4 Primer shall be fully cured prior to shipment.

2.2 Panels

1. Panels shall be fabricated form the same materials, construction and finished in the same manner as doors as specified in Section 2.1.

2.3 Frame Product

1. **Materials**

.1 Steel:
Frame product shall be fabricated from tension leveled steel to ASTM A924-M97, galvanized to ASTM A653-M97, Commercial Steel (CS), Type B, coating designated ZF75, known commercially as paintable Galvanneal.

.2 Primer:
Rust inhibitive touch up only.

.3 Miscellaneous:
.1 Door Silencers:
GJ-64, Single Stud rubber/neoprene type
.2 Thermal Breaks:
Rigid polyvinylchloride (PVC) extrusion
.3 Fiberglass:
Loose batt type, density: 24kg/m^3 (minimum), conforming to ASTM C665

2. **Construction**

.1 General:
.1 All steel frame product shall be as manufactured by Fleming of the types, sizes and profiles indicated on the Architects' schedules or details.
.2 Exterior frames shall be thermally broken, Fleming *Therma-Frame* Series, fabricated from 16 gauge steel.
.3 Exterior frame product shall be supplied profile welded (PW)
.4 Interior and exterior sections of thermally broken frames shall be separated by a continuous PVC thermal break.
.1 Thermally broken sections shall not be assembled by means of screws, grommets or other fasteners and welds shall not cause

thermal transfers between interior and exterior surfaces of the frame sections.

.2 Closed sections (mullions and center rails) of thermally broken frames shall be factory insulated with 24kg/m^3 loose batt type fiberglass material.

.5 Insulation of open sections (jambs, heads and sills) on exterior frame product shall be provided and installed by the contractor responsible for installation.

.6 Interior frames shall be Fleming F-Series, fabricated from 16 gauge steel.

.7 Interior frame product shall be supplied profile welded (PW)

.8 Knocked-down and knocked-down drywall frames shall not be acceptable.

.9 Jambs, heads, mullions, sills and center rails shall be straight and uniform throughout their lengths.

.10 Frame product shall be square, free of defects, wraps or buckles.

.11 Corner joints shall be profile welded (PW) (continuously welded on the inside of the profiles' faces, rabbets, returns and soffit intersections with exposed faces filled and ground to a smooth, uniform, seamless surface)"

.12 Joints at mullions, transom bars, sills or center rails shall be coped accurately, butted and tightly fitted, with faces securely welded, matching corner joint faces.

.13 All steel mullions will be fabricated from the same materials as specified for the steel frames. Steel mullions will be fabricated as a fully assembled three piece unit consisting of a front, back and full height one piece attachment clip as per Fleming F Series. The attachment clip will completely fill the stop area of the mullion on both sides and span the void between each side forming a grid channel like structure. Mullions used as hinge mullions or strike mullions between doors will be filled with grout by the general contractor either prior to or following installation of the frame. The head of the frame shall have an opening sufficient for the grout to be poured in to the mullion.

.14 Mullions shall be fabricated with continuous 20 gauge galvanneal steel internal reinforcing clips.

.15 Frame product shall be fabricated with integral door stops having a minimum height of 16mm.

.16 Glazing stops shall be formed 20 gauge steel, 16mm height channel, accurately fitted, butted at corners and fastened to frame sections with #6 x 32mm oval head scrulox (self-drilling) type screws at 300mm on center maximum.

.17 Where required due to site access, as indicated on the Architects' schedules or details, when advised by the contractor responsible for co-ordination or installation, or when shipping limitations so dictate, frame product shall be fabricated in sections for splicing in the field.

.1 Field spliced jambs, heads and sills shall be provided with 16 gauge steel splice plates securely welded into one section, extending 100mm minimum each side of splice joint.

.2 Field splices at closed sections (mullions or center rails) shall be 16 gauge steel splice angles securely welded to the abutting member. Face of splice angle shall extend 100mm minimum into closed sections when assembled.

.3 Field splice joints shall be welded, filled and ground to present a smooth uniform surface by the contractor responsible for installation after assembly.

.18 Each door opening shall be provided with two (2) temporary steel jamb spreaders welded to the base of the jambs or mullions to maintain proper alignment during shipping and handling. Spreaders shall be removed by the contractor responsible for installation prior to anchoring of frame to floor.

.19 Each door opening shall be prepared for GJ-64 or equivalent, single stud door silencers, three (3) for single door openings, two (2) for double door openings. Silencers shall be shipped loose for installation by the contractor after finish painting.

.20 Unless ineligible due to design, size, hardware or glazing specified on the Architects' or Hardware Suppliers' schedules or details, fire labeled frame product shall be provided for those openings required fire protection ratings as determined and scheduled by the Architect.

.2 Hardware Preparations

.1 Frame product shall be blanked, reinforced, drilled and tapped for fully templated mortised hardware only, in accordance with the final approved schedule and templated provided by the hardware supplier.

.2 Frame product shall be factory blanked and reinforced only for mortised hardware that is not fully templated.

.3 Frame product shall be reinforced only for surface mounted hardware.

.4 Drilling and tapping for surface mounted hardware or mortised hardware that is not fully templated shall be by the contractor responsible for installation on site, at the time of application.

.5 Frames shall be prepared for 114.3mm standard weight hinges (minimum).

.6 Hinge and pivot reinforcements shall be 10 gauge steel minimum reinforcing, high frequency type shall be provided.

.7 Hinge reinforcements for acoustic frames and frames in excess of 2450mm rabbet height shall be 10 gauge minimum with each cutout provided with 114.3mm heavy weight (4.6mm) high frequency type.

.8 Strike reinforcements shall be 16 gauge steel minimum.

.9 Reinforcements for surface mounted hardware, concealed closers and holders and flush bolts shall be 12 gauge steel minimum.

.10 Mortised cutouts shall be protected with 22 gauge steel minimum guard boxes.

.11 Where electrically or electronically operated hardware is specified on the Architects schedules or details or the final approved schedule and templates provided by the hardware supplier, hardware enclosures and/or junction boxes, where indicated on templates, shall be provided and inter-connected with CSA Approved 12.7mm diameter conduit and connectors.

.12 Prepare frames to receive security door contacts – refer to electrical drawings for locations. Door contacts to be installed at 100 mm from the latch side door edge.

.3 Anchorage:

.1 Frame product shall be provided with anchorage appropriate to floor, wall and frame construction.

.2 Each wall anchor shall be located immediately above or below each hinge reinforcement on the hinge jamb and directly opposite on the strike jamb, except as indicated below.
.3 Frame product installed in unit masonry partitions shall be provided with 4.0mm diameter steel wire anchors, 18 gauge steel adjustable stirrup and strap or "T" type anchors as conditions dictate.
.4 Where frame product is installed prior to construction of the adjacent wall, each jamb shall be provided with 16 gauge steel floor anchors. Each anchor shall be provided with two (2) holes for mounting to the floor and shall be securely welded to the inside of the jamb.
.5 Floor anchors for thermally broken exterior frames shall be designed so as not to permit thermal transfers from exterior to interior surfaces of the frame sections.
.6 Frame product installed in drywall partitions shall be provided with 20 gauge steel snap-in or "Z" type stud type anchor.
.7 Jambs of frames in previously placed concrete, masonry or structural steel shall be punched and dimpled to accept machine bolt anchors, 6.4mm diameter, located not more than 150mm from the top and bottom of each jamb. Anchor preparations and guides shall also be located immediately above or below the intermediate hinge reinforcings and directly opposite on the strike jamb. Each preparation shall be provided with 16 gauge anchor bolt guides.
.8 Anchor bolts and expansion shell anchors for the above preparations shall be provided by the contractor responsible for installation.
.9 After sufficient tightening of the anchor bolts, the heads shall be welded do as to provide a non-removable application. Welded bolt head and dimple shall be filled and ground to present a smooth uniform surface by the contractor responsible for installation, prior to finish painting.
.10 Where indicated on the Architects' schedules or details, channel extensions shall be provided from the top of the frame assembly to the underside of the structure above. Extensions shall be fabricated from 12 gauge steel formed channel, mounting angles welded to inside of frame head and adjusting brackets. Formed channels, adjusting brackets and fasteners shall be shipped loose. Channels shall be mechanically connected to mounting angles and adjusting brackets with supplied fasteners, on site, by contractor responsible for installation.

.4 Finishing:
.1 Remove weld slag and spatter from exposed surfaces.
.2 All tool marks, abrasions and surface blemishes shall be filled and sanded to present smooth and uniform surfaces.
.3 On exposed surfaces where zinc has been removed during fabrication, frame product shall receive a factory applied touch-up primer.
.4 Primer shall be fully cured prior to shipment.

2.4 Sizes and Tolerances

1. All sizes and tolerances shall be in accordance with the Canadian Steel Door Manufacturers Association "Recommended Dimensional Standards for Commercial Steel Doors and Frames" as follows:

.1 Widths of door openings shall be measured from inside of frame jamb rabbet with a tolerance of +1.6mm, -0.8mm.
.2 Heights of door openings shall be measured from the finished floor (exclusive of floor coverings) to the head rabbet of the frame with a tolerance of ± 1.2mm.
.3 Unless builders' hardware dictates otherwise, doors shall be sized so as to fit the above openings and allow a 3mm clearance at jambs and head. A clearance of 19mm between the bottom of the door and the finished floor (exclusive of floor coverings) shall be provided. Tolerances on door sizes shall be ± 1.2mm.
.4 Manufacturing tolerances on formed frame profiles shall be ± 0.8mm for faces, door stop heights and jamb depths. Tolerances for throat openings and door rabbet shall be ± 1.6mm and ± 0.4mm respectively. Hardware cutout dimensions shall be as per template dimensions, +0.4mm, -0.

2.5 Hardware Locations

1. Hardware preparations in frame product shall be as noted below and locations on doors shall be adjusted for clearances specified in 2.4.

2. Top of upper hinge preparation for 114.3mm hinges shall be located 180mm down from head, transom mullion or panel as appropriate. The top of the bottom hinge preparation for 114.3mm hinges shall be located 310mm from finished floor as defined in 2.4.3. Intermediate hinge preparations shall be spaced equally between top and bottom cutouts. For dutch door frames, top and bottom hinge locations shall be as above, with the tops of intermediate hinges located at 930mm and 1403mm from finished floor.

3. Strike preparations for unit, integral, cylindrical and mortise locks and roller latches shall be centered 1033mm from finished floor. Strikes for deadlocks shall be centered at 1200mm from finished floor. Strikes for panic or fire exit hardware shall be located as per device manufacturer's templates.

4. Push and/or pulls on doors shall be centered 10701mm from finished floor.

5. Preparations not noted above shall be as per hardware manufacturer's templates.

6. Hardware preparation tolerances shall comply with the ANSI A115 series standards.

PART 3 - EXECUTION

3.1 Site and Protection of Materials

1. The contractor responsible for installation shall remove wraps or covers from door and frame product upon delivery at building site.

2. All materials shall be thoroughly inspected upon receipt and all discrepancies, deficiencies and/or damages shall be immediately reported in writing to the supplier. All damage shall be noted on the carriers' Bill of Landing.

3. Contractor responsible for installation shall ensure all materials are properly stored on planks or dunnage in a dry location. Product shall be stored in a vertical position, spaced with blocking to permit air circulation between them. Materials shall be covered to protect them from damage from any cause.

4. Contractor shall notify the supplier in writing of any errors or deficiencies in the product itself before initiating any corrective work.

3.2 Installation

1. Install doors and frames in accordance with the Door and Hardware Institute "Installation guide for doors and hardware".

2. Set frame product plumb, square, aligned, without twist at correct elevation.

3. Frame Product Installation Tolerances:

    .1 Plumbness tolerance, measured through a line from the intersecting corner of vertical members and the head to the floor, shall be $\pm$ 1.6mm.
    .2 Squareness tolerance, measured through a line 90^0 from one jamb at the upper corner of the product, to the opposite jamb, shall be $\pm$ 1.6mm.
    .3 Alignment tolerance, measured on jambs, through a horizontal line parallel to the plane of the wall, shall be $\pm$ 1.6mm.
    .4 Twist tolerance, measured at face corners of jambs, on parallel lines perpendicular to the plane of the wall, shall be $\pm$ 1.6mm.

4. Fire labeled product shall be installed in accordance with NFPA-80.

5. Secure anchorages and connections to adjacent construction.

6. Brace frame product rigidly in position while building-in. Remove temporary steel shipping jamb spreaders. Install wood spreaders at mid points of frame rabbet height and at floor level to maintain frame widths. Provide vertical support at center of head for openings exceeding 1250mm in width. Remove wood spreaders after product has been built-in.

7. Frame product in unit masonry shall be fully grouted in place.

8. Install doors maintaining clearances outlined in Section 2.4.

9. Install louvers and vents.

10. Adjust operable parts for correct clearances and function.

11. Steel surfaces shall be kept free of grout, tar or other bonding materials or sealers.

12. Any grout or other bonding material shall be cleaned from products immediately following installation.

13. Exposed field welds shall be finished to present a smooth uniform surface and shall be touched-up with a rust inhibitive primer.

14. Exposed surfaces that have been scratched or otherwise marred during shipment, installation or handling shall be touched-up with a rust inhibitive primer.

15. Finish paint in accordance with Section 09900.

16. Install glazing materials and door silencers.

End of Section

PART 1 - GENERAL

1.1 General Finish Notes

1. Colour and material references named will be based on one manufacturer, as carried by the Contractor or, in the case that no specific manufacturer is carried, based on the Consultant's choice.

2. Approved alternative manufacturers will be acceptable only as indicated in the specifications. However, approved alternate products submitted must match the products named in the Specification to the Consultant's selection. Alternate products other than those named in the specifications will not be allowed unless previously approved by the Consultant.

3. Consult Architect prior to painting any surface not included in the formulae as listed.

4. Final colour for exterior painted surfaces and prominent interior areas shall be approved on the job site by the Architect.

5. Paint samples: Contractor to submit paint samples for all areas required to "Match Adjacent Finish".

6. All similar paint formulations are to be identical when dry. Variations in tone, texture or sheen shall not be accepted.

7. Submit two 300 mm x 300 mm paint samples of each colour required for approval by the Architect.

8. Locations of accent paint called for in the Material and Colour Schedule, to be issued after Contract award, not specifically identified on the drawings are to verified on site with the Architect.

1.2 Interior Finish Notes:

1. All heating units, recessed convectors, grilles, pipes, access panels, hangers and miscellaneous exposed metal work (except stainless steel or anodized aluminum) to be painted to match the surfaces on which they occur unless noted otherwise on the colour schedule, prefinished in suitable colour or directed by the Architect. If prefinished equipment is damaged, it shall be re-painted. Painting to be by formulations specified in Section 09900.

2. Do not paint over nameplates, identification tags, etc.

3. Make good all existing surfaces and finishes that are damaged during construction.

End of Section

PART 1 - GENERAL

1.1 Related Work

1. Gypsum Board: Section 09250
2. Rough Carpentry Section 06100

1.2 Reference Standards

1. Do work to CSA A82.31-1977, except where specified otherwise.

PART 2 - PRODUCTS

2.1 Materials

1. Metal Studs: non-load bearing channel stud framing to ASTM C645-09a, roll formed from 0.59 mm thickness electro-galvanized steel sheet for screw attachment of gypsum lath and metal lath, and with service access holes.

2. Structural Metal Studs: CSA-S13-01 and hot-dipped galvanized to ASTM A525M-87, minimum 1.22 (18ga.) use thicker materials where required to suit structural requirements. Framing shall be designed by a licensed professional engineer registered in the province of Ontario. Follow fabrication standards ASTM C955.

3. Floor and ceiling tracks: to ASTM C645-09a in width to suit stud sizes, 30 mm legs for floor track, 50 mm for ceiling track.

4. Metal channel stiffener: 38 mm size, 2 mm thick cold rolled galvanized steel.

5. Furring channels (channels, hangers, tie wire, insert, anchor): CGSB 7.1-98-CAN/CGSB.

6. Touch-up Zinc Rich Paint: CAN/CGSB-1.181-92.

PART 3 - EXECUTION

3.1 Stud Partitions

1. Align partition tracks at floor and underside of structure above and secure at 24” o.c. maximum. All partitions to extend to underside of structure above.

2. Place studs vertically at 16” o.c. and not more than 2” from abutting walls and at each side of openings and corners. Position studs in tracks at floor and ceiling. Cross brace steel studs, as required, to provide rigid installation to manufacturer's instructions.

3. Erect metal studding to tolerance 1:1000.

4. Attach studs to bottom track using screws.

5. Coordinate simultaneous erection of studs with installation of service lines. When erecting studs, ensure web openings are aligned.

6. Install steel frames and anchor frames securely to studs using minimum of three (3) anchors per jamb for jambs up to 84” high and a minimum of four (4) anchors per jambs for jambs over 84” high.

7. Provide two (2) studs at each side of openings wider than stud centre specified.

8. Install, cut to length, piece of runner horizontally over door frames.

9. Provide 38 mm x 89 mm vertical and horizontal wood studs secured between metal studs for attachments of bathroom fixtures, accessories, cabinet work, and other fixtures, including grab bars, towel rails, attached to steel stud partitions.

10. Install steel stud or furring channel between studs for attaching electrical and other boxes.

11. Extend all partitions to underside of structure above for sound and fire separation.

12. Maintain clearance under beams and structural slabs to avoid transmission of structural loads to studs.

3.2 Ceiling Furring

1. Install runners level to tolerance of 1/8” over 11’-8”. Provide runners at interruptions of continuity and change in direction.

2. Frame with furring channels, perimeter of openings to accommodate access panels, light fixtures, diffusers, grilles, etc.

3. Furring for bulkheads within or at termination or ceilings.

4. Install furring channels at 16” o.c. maximum.

3.3 Wall Furring

1. Install steel furring, as indicated.

2. Frame opening and around built-in equipment on four (4) sides with channels.

3. Box-in beads, columns, pipes, and around exposed services.

3.4 Fire-rated Assemblies

1. Where required, install Metal Stud System and Furring in accordance with appropriate ULC Design and with supplement to the National Building Code of Canada 1985.

End of Section

PART 1 - GENERAL

1.1 Related Work

1. Metal Stud System — Section 09111
2. Painting — Section 09900
3. Access Doors: — refer to related mechanical and electrical

1.2 Reference Standards

1. Do work to CSA A82.31-1977, except where specified otherwise.

PART 2 - PRODUCTS

2.1 Gypsum Board

1. Plain: to CSA A82.27-M1977 standard, 5/8” thick or as indicated, tapered edges.
2. Plain: to CSA A82.27-M1977, Fire-rated Type X, 5/8” thick or as indicated, tapered edges.
3. Plain: to CSA A82.27-M1977, Washroom walls 5/8” dens-shield where CWT is being installed or as indicated, tapered edges.

2.2 Fastenings and Adhesives

1. Screws: to CSA A82.31-1977.
2. Adhesive: to CGSB 71 GP 25M.
3. Laminating Compound: to CSA A82.31-1077.
4. Concrete Anchors: Phillips Red Head TW-614 or equivalent. Do not use powder activated fasteners for ceiling support.
5. Tie Wire: #16 ga. galvanized soft annealed steel wire.

2.3 Accessories

1. Casing Beads and Corner Beads: 0.5 mm base thickness commercial sheet steel with G90 zinc finish to ASTM A 525-78 A.
2. Joint compound: to CSA A82.31-1977, asbestos-free.
3. Caulking: Acoustical sealant.

PART 3 - EXECUTION

3.1 Gypsum Board Application

1. Do not apply gypsum board until bucks, anchors, blocking, electrical and mechanical work are approved.

2. Apply single and double layers gypsum board to metal furring or framing, using screw fasteners and laminating adhesive. Maximum spacing of screw 12” oc.

3. Apply gypsum board to concrete block surfaces, where indicated, using laminating adhesive.

4. Apply type x gypsum board where indicated, in accordance with U.L.C. requirements and with supplement to the National Building Code of Canada to obtain the required fire protection, fire rating and fire separation.

3.2 Accessories

1. Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces, where practical. Make joints tight, accurately aligned and rigidly secure. Mitre and fit corners accurately, free from rough edges.

2. Install casing beads around perimeter of suspended ceilings.

3. Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated.

3.3 Access Doors

1. Install access doors to electrical and mechanical fixtures specified in respective Sections.

2. Rigidly secure frames to furring or framing systems.

3.4 Taping and Filling and Sound Seal

1. Seal with acoustical sealant at ceilings, floors, wall intersections and all penetrations such as electrical outlets.

2. Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.

3. Finish corner beads, control joints and trim as required with two (2) coats of joint compound and one (1) coat of taping compound, feathered out onto panel faces.

4. Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after painting is completed.

5. Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.

6. Completed installation to be smooth, level or plumb, free from waves and other defects and ready for painting.

End of Section

PART 1 - GENERAL

1.1 Reference Standards

1. Fabrication: to ASTM 365-78 and CAN/GSB-92.1-M77.

2. Installation: to ASTM C636-76, except where specified otherwise.

1.2 Design Criteria

1. Maximum deflection 1/360 of span to ASTM 365-78 deflection test.

1.3 Samples

1. Submit two each 12” x 12” samples of each individual tile and grid type in accordance with Section 01340.

1.4 Warranty

1. Submit an extended warranty covering materials and labour and the repair or replacement of defective work but for two (2) years total.

PART 2 - PRODUCTS

2.1 Materials

1. **Acoustic Panel Type (ACT-1)**
    1. **ACT-1**: 610 mm x 1220 mm x 25mm, fine fissured, square lay-in, #1729 by Armstrong. Suspension system: 15/16” Prelude XL, white, by Armstrong.
    2. Acceptable equal as manufactured by CGC.

2. **Exposed Tee Bar Grid Components:** Cold rolled steel, zinc coated, shop painted, satin sheen, white, interlocking, main and cross tee of double web with rectangular bulb, depth governed by span, 1” exposed face.

3. **Hangers:** 1/8” galvanized soft annealed steel wire. Maximum spacing 12.0 feet.

4. **Accessories:** splices, clips, retainers, etc., to complement suspension system components.

2.2 Installation

1. Co-ordinate suspension system with related components.

2. Install acoustic units parallel to building lines with edge unit not less than 50% or unit width.

3. Scribe acoustic units to fit adjacent work. Butt joints tight, terminate edges with moulding.

4. Support suspension system main runners at 48” oc maximum with hangers from structure. Assembly shall support super-imposed loads. Maximum permissible deflection, 1/360 of span.

5. Attach cross member to main runner to provide rigid assembly.
6. Install suspension assembly to manufacturer's written instructions.

7. Install flush edge moulding at junction of acoustic unit ceiling and other materials around entire length of joint. Secure to construction. Butt joints neatly, square and true in alignment.

8. Set acoustic units in place.

9. Set all ceiling levels by the use of transit or laser level.

10. Provide for Owner one (1) complete carton of each type of ceiling tile.

End of Section

PART 1 - GENERAL

1.1 Related Work

1. Cast-in-Place Concrete: concrete floors refer to Architectural Drawing

1.2 Maintenance Data

1. Provide data for maintenance of resilient flooring for incorporation into Maintenance Manual.

1.3 Environmental Requirements

1. Maintain minimum 20 deg. C air temperature at flooring installation area for three (3) days before, during and for seven (7) days after installation.

PART 2 - PRODUCTS

2.1 Materials

1. **Vinyl composition tile (VCT):** to ASTM F 1066-1995 a, Type A design, asbestos free, 3 mm thick, 300 mm x 300 mm size Excelon Series, Imperial Texture by Armstrong. Allow for total of four (4) colours from full line.
   Acceptable Alternate: Tarkett.

2. **Resilient rubber base (RB):** top set coved, 3 mm thick, rubber, 100 mm high minimum 1200 mm long, including premoulded end stops and external corners. Acceptable materials: non-shrink Rubber Wall Base with toe as manufactured by Johnsonite. Colours: Three (3) from full Johnsonite "Coloright" colour line. Use straight base at carpet flooring.

3. **Base Accessories:** Pre-moulded end stops and external corners, of same material, size, and colour as base.

4. **Transition Strips:** thermoset vulcanized rubber, smooth, purpose made to accommodate wheeled traffic and prevent tripping; tapered designs to suit nature of transition; colour as selected by Consultant.

5. **Primers and adhesives:** waterproof, recommended by flooring manufacturer for specific material on applicable substrate, above, at or below grade. Use Johnsonite 990 Solvent Free Environmentally Safe White Acrylic Cove Base Adhesive for rubber base.

PART 3 - EXECUTION

3.1 Inspection

1. Ensure concrete floors are dry, by using test methods recommended by tile manufacturer, and inspect for negative alkalinity, carbonization or dusting.

2. Commencement of work indicates acceptance of conditions by flooring installer.

3.2 Subfloor Treatment

1. Remove subfloor ridges and bumps. Fill low spots, cracks, joints, holes and other defects with subfloor filler.

2. Clean floor and apply filler; trowel and float to leave smooth, flat hard surface. Prohibit traffic until filler cured.

3. Ensure of smooth transition between any raised surfaces at door ways. Prepare subfloor with leveling compound to ensure smooth transition. Typical where VCT meets PT floors.

3.3 Tile

1. Apply adhesive uniformly using recommended notched trowel in accordance with Flooring Manufacturer's instructions. Do not spread more adhesive than can be covered by flooring before initial set takes place.

2. Lay flooring with joints parallel to building lines to produce symmetrical tile pattern. Border tiles - minimum half tile width or as indicated by drawings and Finish Schedule.

4. Cut tile and fit neatly around fixed or excessively heavy objects.

5. Install flooring in pan type floor access covers and all clean out covers, where applicable. Maintain floor pattern.

6. Terminate flooring at center line of door in openings where adjacent floor finish or color is dissimilar.

7. Install metal edge strips at unprotected or exposed edges where flooring terminates.

8. At doorways to incrapack units, extend tile and base fully into door opening to incrapak classroom.

3.4 Base Application

1. Set base in adhesive tightly against wall and floor surfaces. Use lengths as long as practicable and not less than minimum 500 mm long.

2. Install straight and level to variation of 1:1000.

3. Scribe and fit to door frames and other obstructions. Use premoulded end pieces at flush door frames.

4. Miter internal corners. Use premoulded corner pieces at all external corners and ensure full adhesion through to ends of corner pieces. See detail for termination at door frames.

5. Leave in the building one (1) complete carton of each of two (2) colours of floor tile and twelve (12) tiles of each of the remaining colours. Colours of extra tile to be specified by Architect.

3.5 Initial Maintenance after Installation

1. Broom sweep or vacuum thoroughly.

2. Do not wet mop, wash, scrub, or strip the floor. These procedures will be done by the Owner.

3.6 Protection of Work

1. Following broom sweeping, protect new floors with 0.15 mm thick Polyethylene cover and lay planking in all necessary traffic areas to minimize damage by other trades. Maintain until just before final inspection.

3.7 Preparation for Inspection

1. Only if so notified by Architect, and in the presence of the Owner, scrub the floor using a neutral detergent and a floor machine of 170-250 rpm capability equipped with a scrub brush or a scrubbing pad (3M blue or equal).

2. Lightly rinse and allow to dry. Note: Do not flood the floor with rinse water, scrubbing, or stripping solutions. Final re-washing, if required, and waxing will be done by owner.

End of Section

PART 1 - GENERAL

1.1 Related Work

1. Room Finish Schedule — refer to drawings

1.2 Reference Standard

1. CAN/CGSB-85.100-93: Painting.
2. Underwriters Laboratories of Canada: List of Equipment and Materials.
3. Ontario Painting Contractors' Association (OPCA) Architectural Specification Manual.

1.3 Product Data

1. Submit to Architect, for review, product data for all formulas, including manufacturer's trade names.
2. Paint Manufacturer will provide periodic reviews and reports to Architect regarding work in this Section and adherence to manufacturer's product specifications.

1.4 Qualifications

1. Manufacturer: use only paint manufacturers and products listed in the OPCA Architectural Painting Specification Manual – Paint Product Recommendation section.
2. Applicators: company specializing in the work of this Section, and with a minimum of ten years documented experience. Employ only qualified journeymen and apprentices having a provincial Tradesmen Qualification certificate of proficiency.

1.5 Environmental Requirements

1. Do not apply paint finish in areas where dust is being generated.
2. Conform to requirements of OPCA Manual.
3. Comply with the requirements of Section 01570 Health and Environmental Specifications.

1.6 Extent of painting

1. For new construction, for rooms shown in room finish schedule to have painted walls, paint all non prefinished surfaces unless indicated otherwise, and repaint prefinished surfaces where indicated.

1.7 Finishes and Colours

1. Allow for 10 colours total from all formulations for this project. Doors, door frames, walls and ceilings will have different colors. Colors may change from room to room.

1.8 Warranty

1. Provide a two (2) year warranty on completion stating that the work has been performed with respect to the standards and requirements incorporated in the OPCA specification manual latest edition.

PART 2 - PRODUCTS

2.1 Materials

1. Acceptable products: Per Chapter 5 OPCA Manual as listed.

2. Paint materials for each paint system to be products of a single manufacturer.

3. Use low-VOC and low-odour paints only.

PART 3 - EXECUTION

3.1 Preparation of Surfaces in new Construction

1. Prepare surfaces to receive paint per Chapter 3 OPCA Manual.

2. Prepare wood surfaces to CGSB 85-GP-1M.

   .1 Use CGSB 1-GP-126M vinyl sealers over knots resinous areas.
   .2 Apply wood paste filler to nail holes and cracks.
   .3 Tint filler to match stains for stained woodwork.

3. Touch up shop paint primer on steel with CGSB 1-GP-40M to CGSB 85-GP-14M.

4. Prepare galvanized steel and zinc coated surface to CGSB 85-GP-16.

5. Prepare wallboard surfaces to CGSB 85-GP-33M. Fill minor cracks with plaster patching compound.

3.2 Application

1. Sand and dust between each coat to remove defects visible from distance up to 1.5 m.

2. Finish closets and alcoves as specified for adjoining rooms.

3. Apply each coat at the proper consistency. Each coat of finish should be fully dry and hard before applying the next coat, unless the manufacturer’s instructions state otherwise.

3.3 Mechanical and Electrical Equipment

1. Paint exposed conduits, pipes, hangers and other mechanical and electrical equipment occurring in finished areas as well as inside cupboards and cabinet work. Colour and texture to match adjacent surfaces, except as noted otherwise. Coordinate with

mechanical trades applying banding and labeling after pipes have been painted. Do not paint white PVC covers on exposed mechanical water, drain and other lines

2. Paint gas piping standard yellow where visible on roof or in service spaces.

3. Paint surfaces inside of ductwork and elsewhere behind grilles where visible using primer and one coat of matte black paint.

4. Paint both sides and edges of plywood backboards for equipment before installation.

5. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.

3.4 Paint Systems

1. System references listed are based on Chapters 4A and 4B of OPCA Manual and are OPCA Premium Grade, unless noted otherwise.

3.5 Interior Finishes

1. Wood, where applicable: INT. 1-A, Alkyd Semi-Gloss Finish, Premium Grade.

2. Wood, where applicable, INT-1E, lacquer finish semi gloss.

3. Gypsum board - Ceilings and bulkheads - INT. 4-B, Latex Flat Finish, Premium Grade.

4. Gypsum board – partitions INT-4B latex semi-gloss, Premium Grade.

5. Gypsum board – partitions where noted GF in room finish schedule. INT 4A, alkyd gloss finish, Premium Grade.

6. Concrete Block: INT. 8-A, Latex Semi-Gloss Finish, Premium Grade.

7. Concrete Block – Where noted GF in room finish schedule: INT.8B, Alkyd Gloss finish, Premium grade.

8. Structural Steel and Miscellaneous Metal:

    .1 Primed: INT. 12-A, Alkyd Semi-Gloss Finish, Premium Grade, four coats.
    .2 Galvanized: INT. 13-A, Alkyd Semi-Gloss Finish, Premium Grade, four coats.

9. Galvanized metal: INT. 13-A, Alkyd Semi-Gloss Finish, Premium Grade, four coats.

10. Galvanized steel deck: INT 13E, Alkyd dry fall.

End of Section

PART 1 - GENERAL

1.1 Shop Drawings

1. Submit shop drawings in accordance with Section 01340.

PART 2 - PRODUCTS

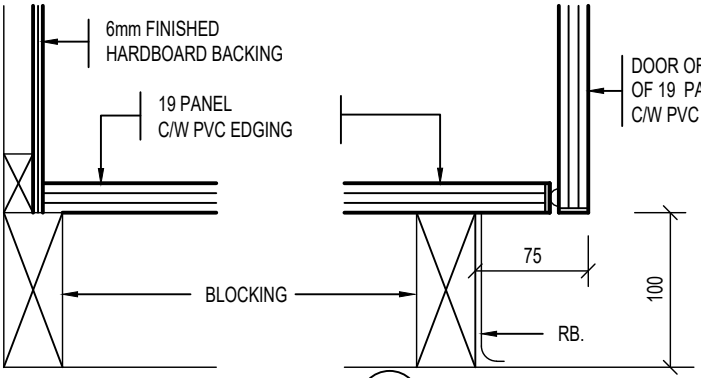
2.1 Fixtures

1. **Stainless Steel Tables** – custom fabricated heavy duty welded steel workbenches with fixed leg construction and stainless-steel top. Basis of design description:
    a. 4000lb weight capacity
    b. Stainless steel top: 1-1/2" thick 16 gauge Type 304 stainless steel on heavy duty base. Provide eased edge along front and rear edges and square edges along sides, polished corners and #4 brushed finish.
    c. Reinforce table top with perimeter steel framing and underbracing support.
    d. Use heavy gauge steel legs in post, channel or angle section, with pre-punched floor mounting pads. Anchor to floor.
    e. Provide single centered stiffener bar in lieu of bottom shelf.
    f. Powder coated finish.
    g. Overall height 34”.
    h. Provide the 4’ x 15’ tables each in two connected sections.
    i. Total Quantities: 2 @ 4’x15’ and 2 @ 2’x6’ as shown on the Technology Manufacturing Classroom 110A plan, drawing A1.00.

2. **Mirrors**: **(M1)** wall mounted 6 mm glass mirror, frameless, polished edge. Sizes, Room 120: 600x900, Room 207: 750X1000. Refer to plans for quantities.

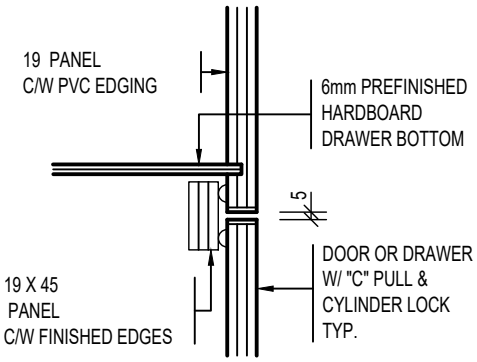
3. **Security Mirrors**: **(CM1)** 20”X30” glass indoor convex safety mirror for low clearances, rounded rectangular shape, on swivel mounted , vinyl frame.

End of Section

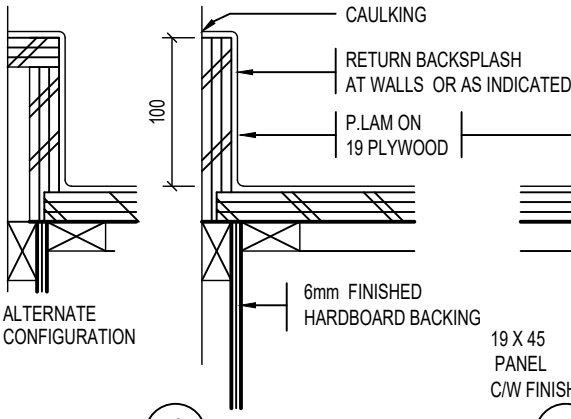


1 COUNTER AT WALL

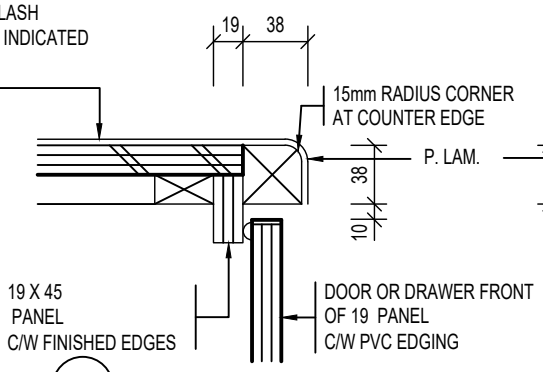
2 BASE



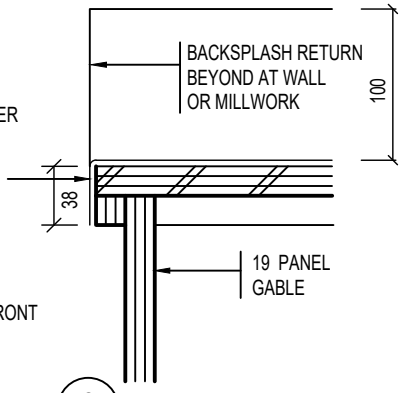
3 DRAWER FACE



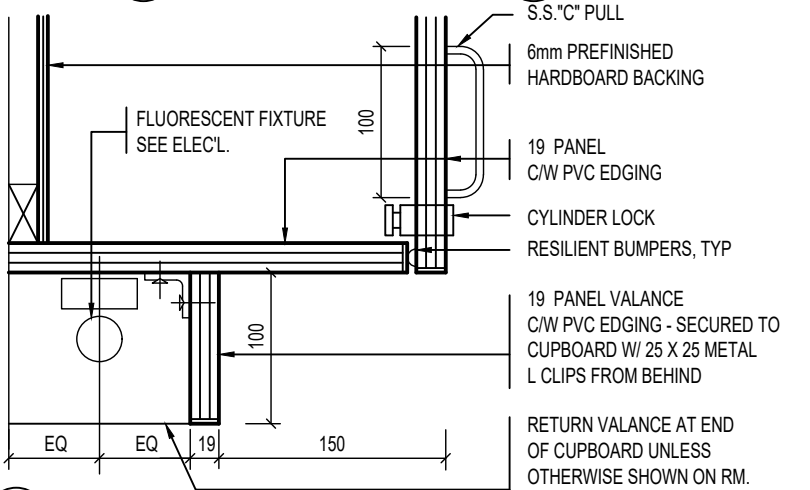
4 BACKSPLASH



5 COUNTER EDGE



6 END OF COUNTER



7 UPPER CUPBOARD

(VALANCE WHERE SHOWN ON ELEVATIONS)

TYPICAL NOTES:

1) MILLWORK IS 19mm CONSTRUCTION UNLESS OTHERWISE NOTED. REFER TO SPECIFICATIONS FOR MATERIAL TYPES & FINISHES
2) MILLWORK FILLER PANEL (FP) TO BE PROVIDED ON ALL EXPOSED FACES (TOP, BOTTOM, AND VERTICAL FACES) WHERE SHOWN
3) REFER TO MILLWORK SPECIFICATIONS

ABREVATIONS:

CLR	CLEAR
C/W	COMPLETE WITH
DIA	DIAMETER
ELEV	ELEVATION
EQ	EQUAL
EQ(x)	EQUAL
FFE	FINISHED FLOOR ELEVATION
FP	FILLER PANEL
MIN	MINIMUM
MAX	MAXIMUM
MTP	METAL TOILET PARTITION
N.I.C.	NOT IN CONTRACT
O/C	ON CENTER
O.C.	ON CENTER
P.LAM	PLASTIC LAMINATE
RB	RUBBER BASE
RM	ROOM
S.S.	STAINLESS STEEL
TYP	TYPICAL
W/	WITH

BISHOP TONNOS CSS CLASSROOM RENOVATIONS
100 Panabaker Dr, Ancaster, ON L9G 5E3

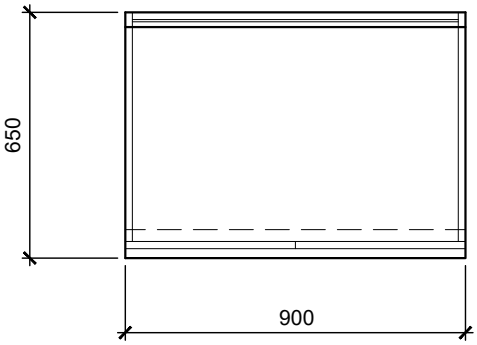
MILLWORK TYPICAL DETAILS

TYPICAL NOTE: MILLWORK IS 19mm CONSTRUCTION UNLESS OTHERWISE NOTED. REFER TO SPECIFICATIONS FOR MATERIAL TYPES & FINISHES

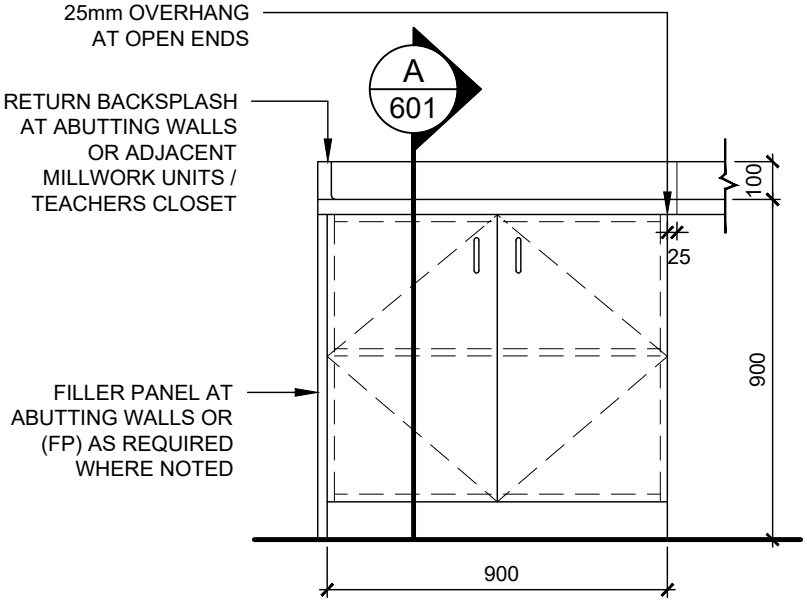
PROJ:	2024-25
SCALE:	AS NOTED
DRAWN:	AH
DATE:	FEB 2025

GRGURIC ARCHITECTS INCORPORATED
Web: www.2gai.com

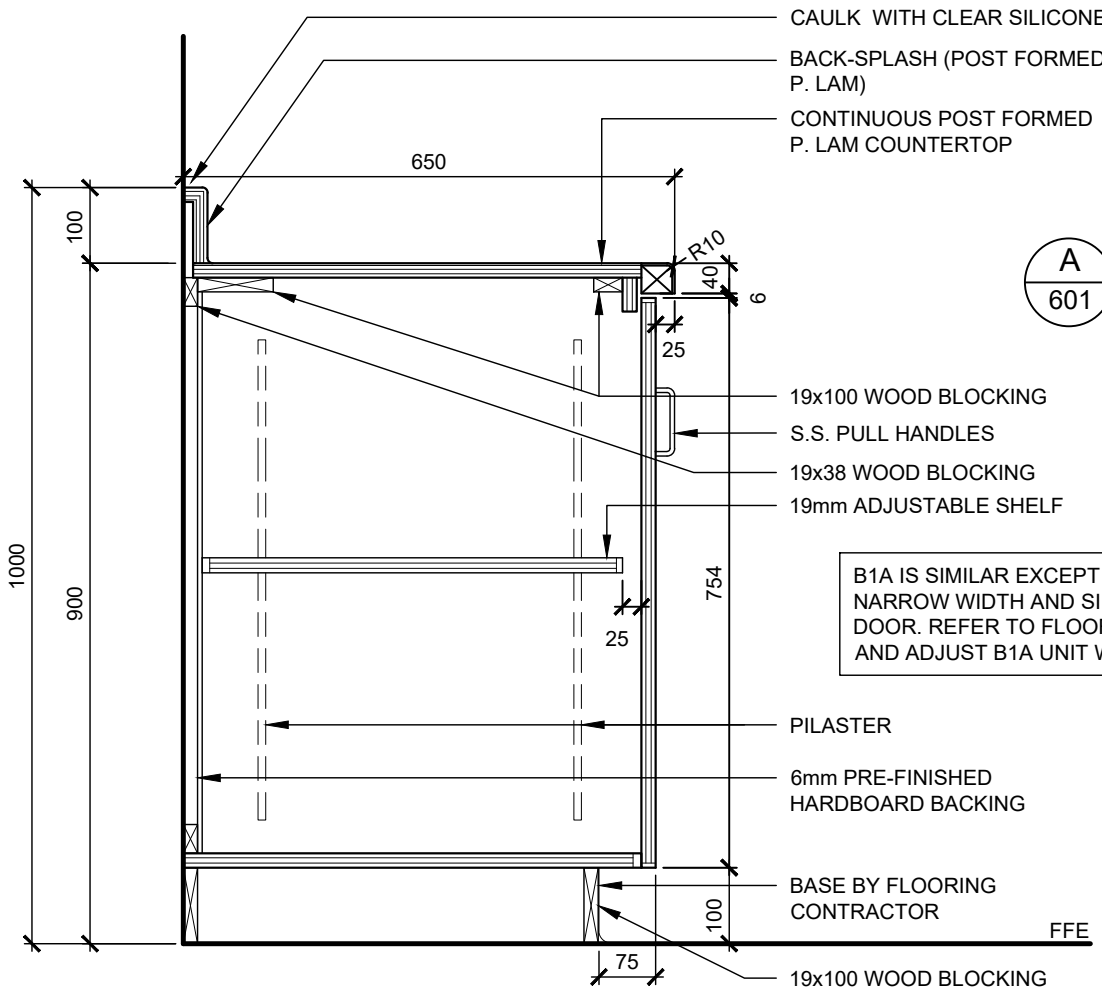
AD 600



PLAN VIEW
SCALE 1:20



ELEVATION
SCALE 1:20



A
601
SECTION
SCALE 1:10

B1A IS SIMILAR EXCEPT FOR
NARROW WIDTH AND SINGLE
DOOR. REFER TO FLOOR PLAN FOR OVERALL LINE-UP WIDTH
AND ADJUST B1A UNIT WIDTH TO SUIT

BISHOP TONNOS CSS CLASSROOM RENOVATIONS
100 Panabaker Dr, Ancaster, ON L9G 5E3

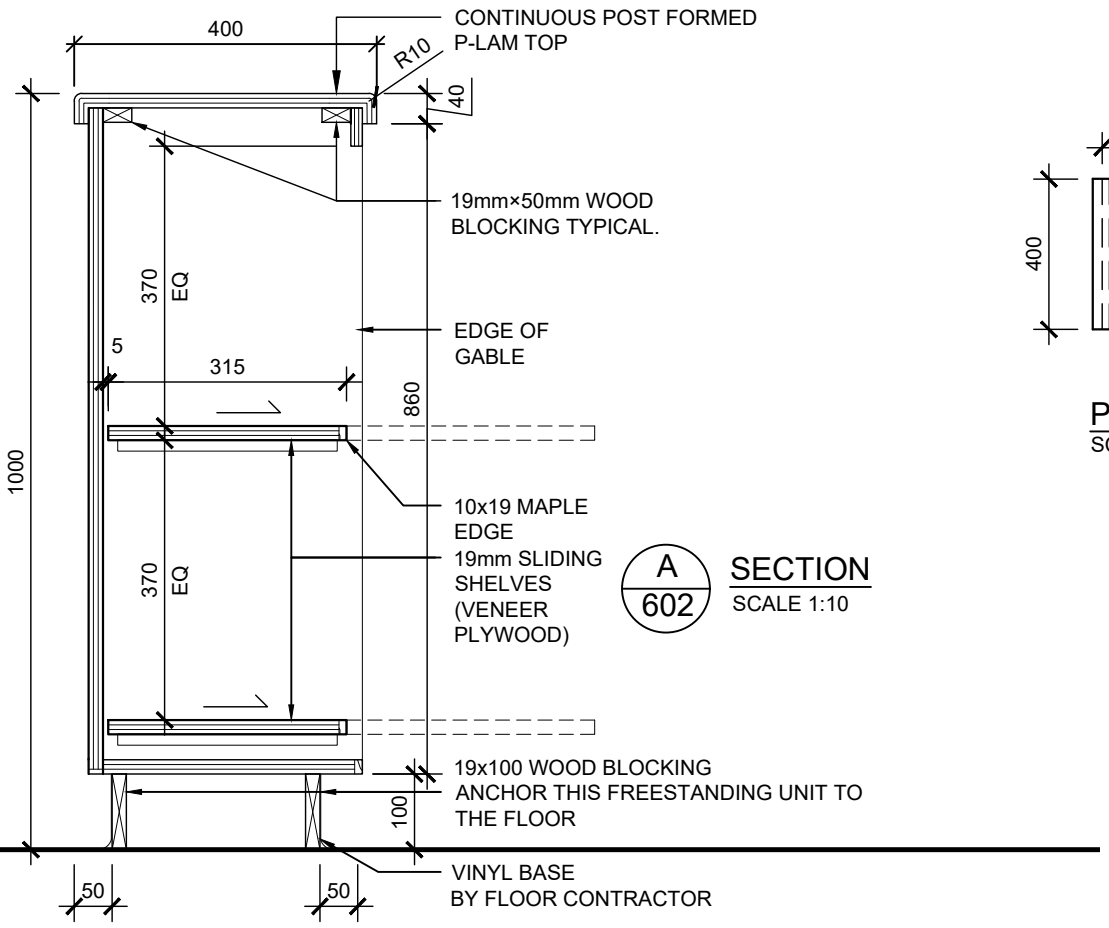
MILLWORK TYPE B1 & B1A

TYPICAL NOTE: MILLWORK IS 19mm CONSTRUCTION UNLESS OTHERWISE NOTED.
REFER TO SPECIFICATIONS FOR MATERIAL TYPES & FINISHES

PROJ:	2024-25
SCALE:	AS NOTED
DRAWN:	AH
DATE:	FEB 2025

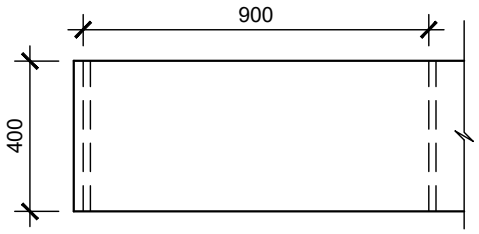
GRGURIC ARCHITECTS INCORPORATED
Web: www.2gai.com

AD 601

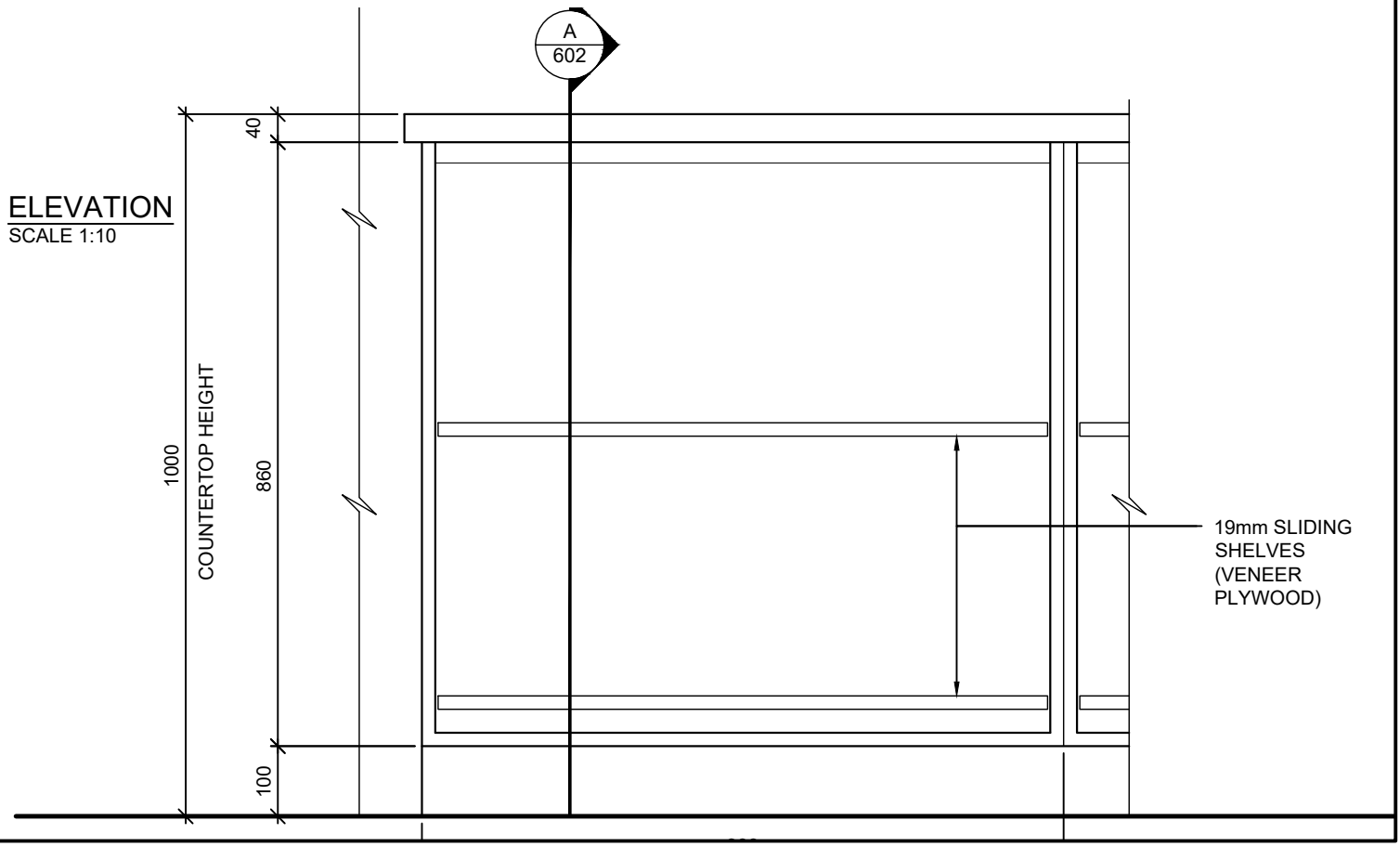


A
602

SECTION
SCALE 1:10



PLAN VIEW
SCALE 1:20



ELEVATION
SCALE 1:10

BISHOP TONNOS CSS CLASSROOM RENOVATIONS
100 Panabaker Dr, Ancaster, ON L9G 5E3

MILLWORK TYPE B2

TYPICAL NOTE: MILLWORK IS 19mm CONSTRUCTION UNLESS OTHERWISE NOTED. REFER TO SPECIFICATIONS FOR MATERIAL TYPES & FINISHES

PROJ:	2024-25
SCALE:	AS NOTED
DRAWN:	AH
DATE:	FEB 2025

GRGURIC ARCHITECTS INCORPORATED
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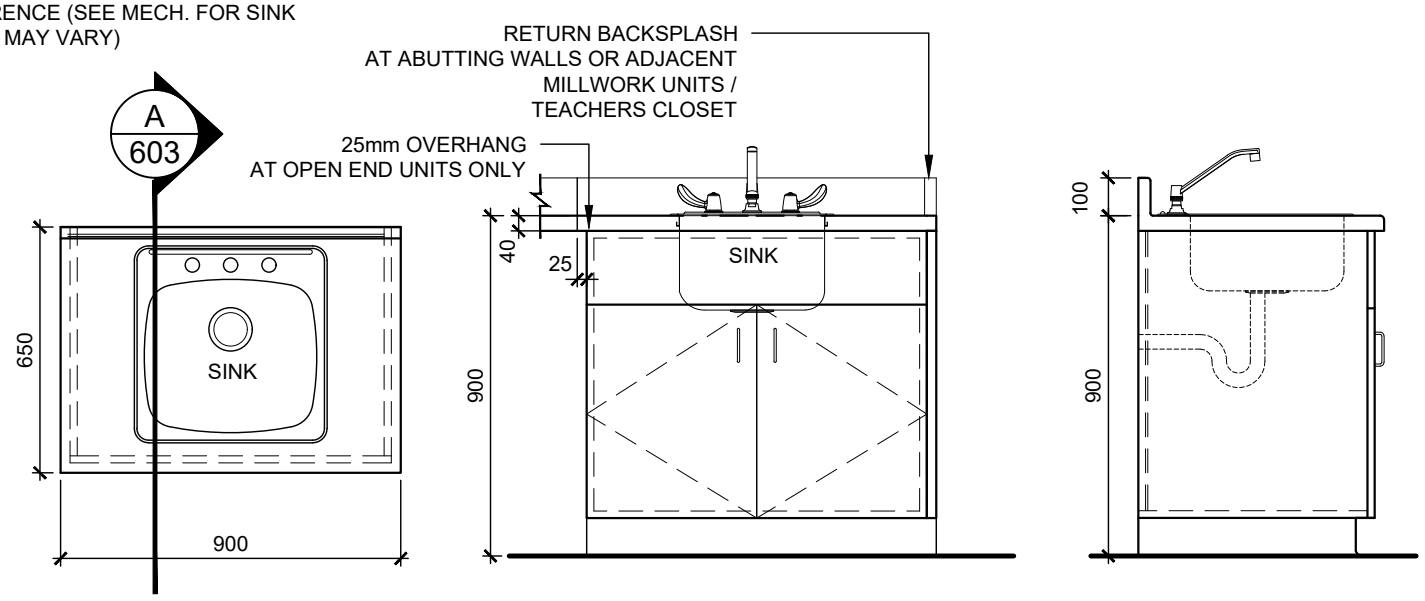
AD 602

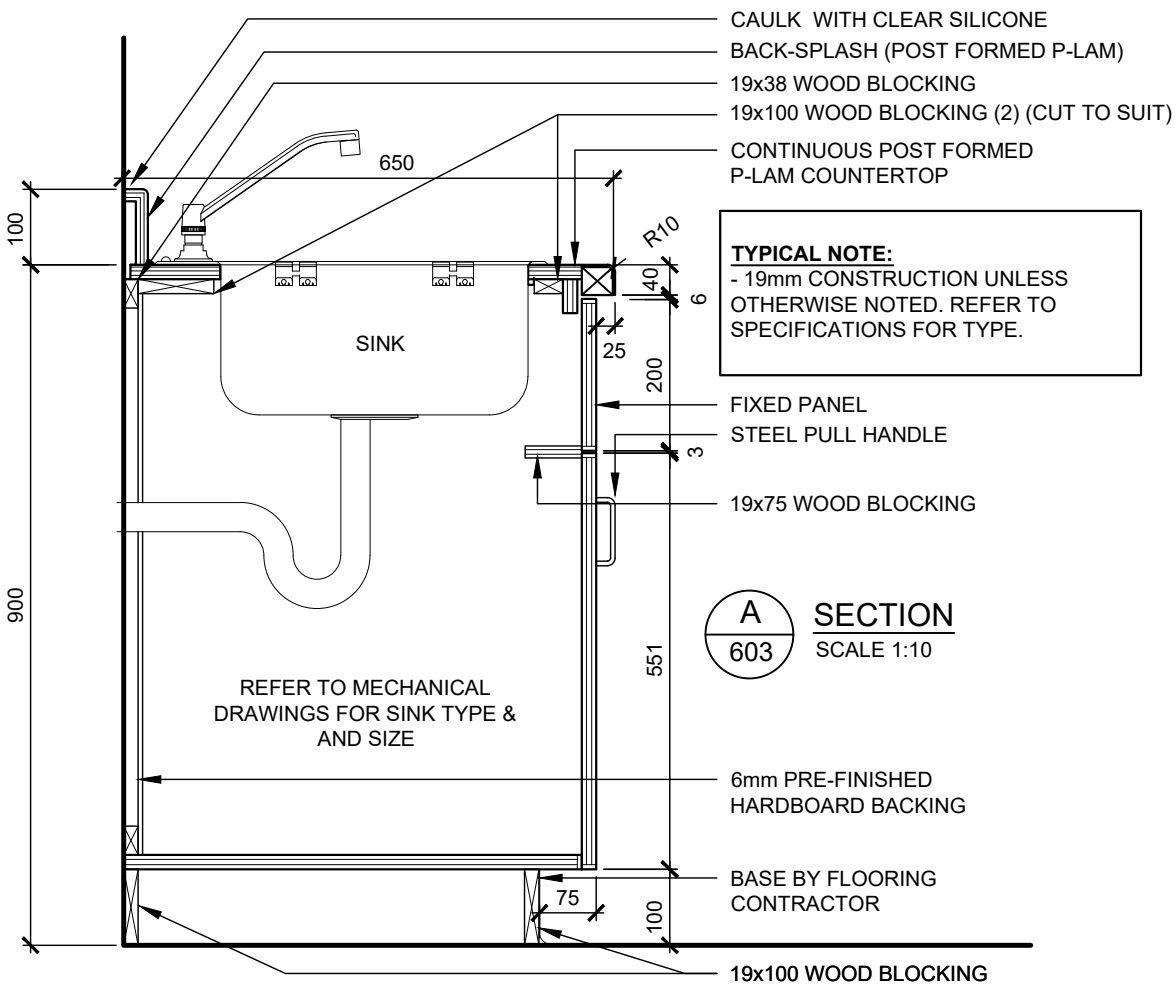
NOTE: SINK IS SHOWN FOR REFERENCE (SEE MECH. FOR SINK SIZES, MAY VARY)



PLAN
SCALE 1:20

ELEVATION
SCALE 1:20

SIDE ELEVATION
SCALE 1:20



TYPICAL NOTE:
- 19mm CONSTRUCTION UNLESS OTHERWISE NOTED. REFER TO SPECIFICATIONS FOR TYPE.

A
603
SECTION
SCALE 1:10

BISHOP TONNOS CSS CLASSROOM RENOVATIONS
100 Panabaker Dr, Ancaster, ON L9G 5E3

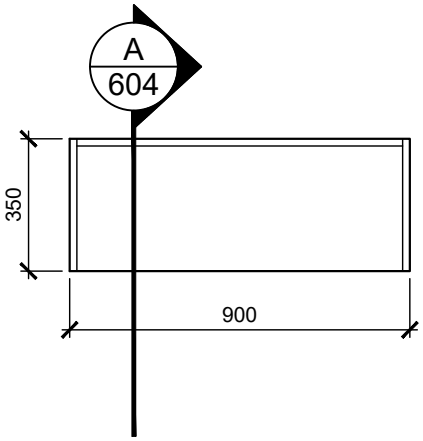
MILLWORK TYPE S1

TYPICAL NOTE: MILLWORK IS 19mm CONSTRUCTION UNLESS OTHERWISE NOTED. REFER TO SPECIFICATIONS FOR MATERIAL TYPES & FINISHES

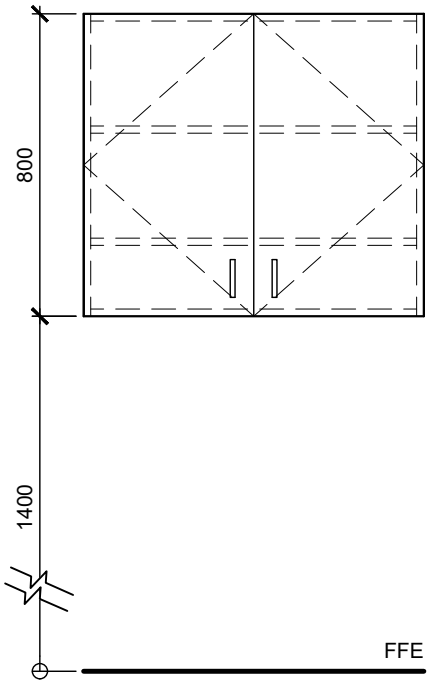
PROJ:	2024-25
SCALE:	AS NOTED
DRAWN:	AH
DATE:	FEB 2025

GRGURIC ARCHITECTS INCORPORATED
Web: www.2gai.com

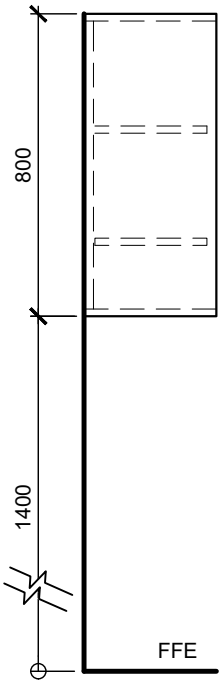
AD 603



PLAN
SCALE 1:20

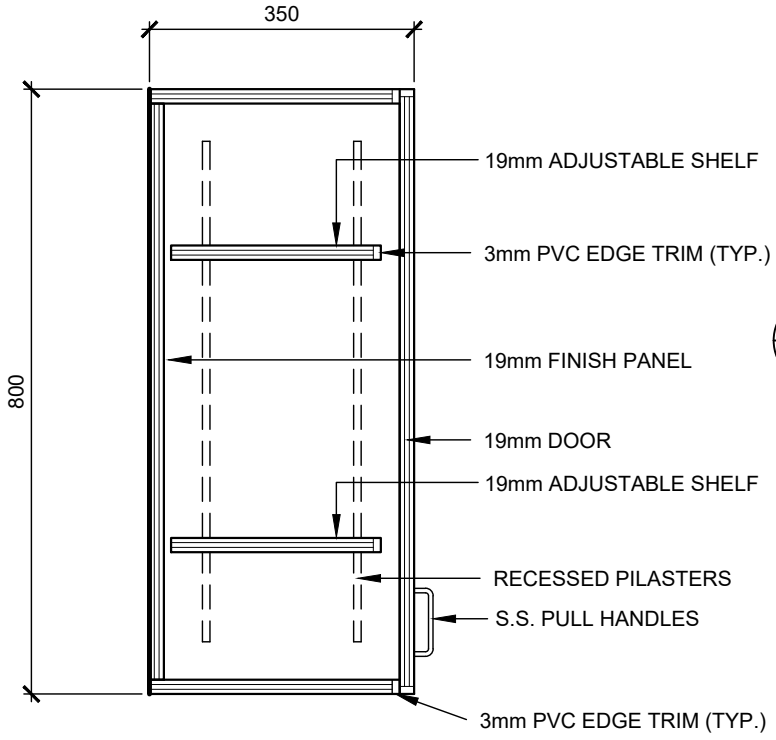


ELEVATION
SCALE 1:20



SIDE ELEVATION
SCALE 1:20

U1A IS SIMILAR EXCEPT FOR NARROW WIDTH AND SINGLE DOOR. REFER TO FLOOR PLAN FOR OVERALL LINE-UP WIDTH AND ADJUST B1A UNIT WIDTH TO SUIT



A
604
SECTION
SCALE 1:10

BISHOP TONNOS CSS CLASSROOM RENOVATIONS
100 Panabaker Dr, Ancaster, ON L9G 5E3

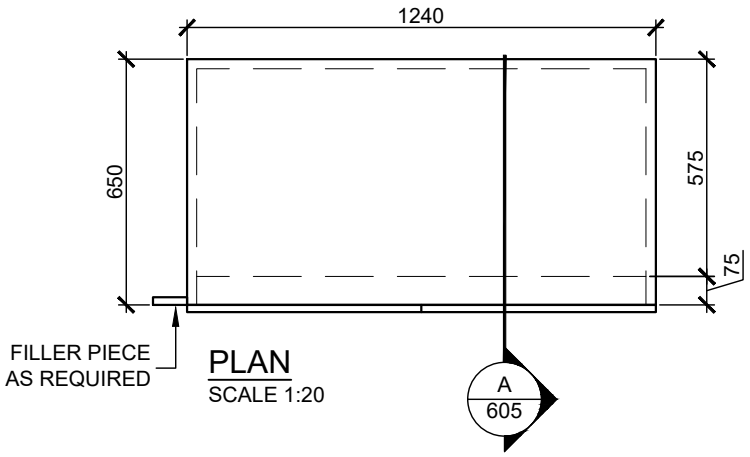
MILLWORK TYPE U1 & U1A

TYPICAL NOTE: MILLWORK IS 19mm CONSTRUCTION UNLESS OTHERWISE NOTED. REFER TO SPECIFICATIONS FOR MATERIAL TYPES & FINISHES

PROJ:	2024-25
SCALE:	AS NOTED
DRAWN:	AH
DATE:	FEB 2025

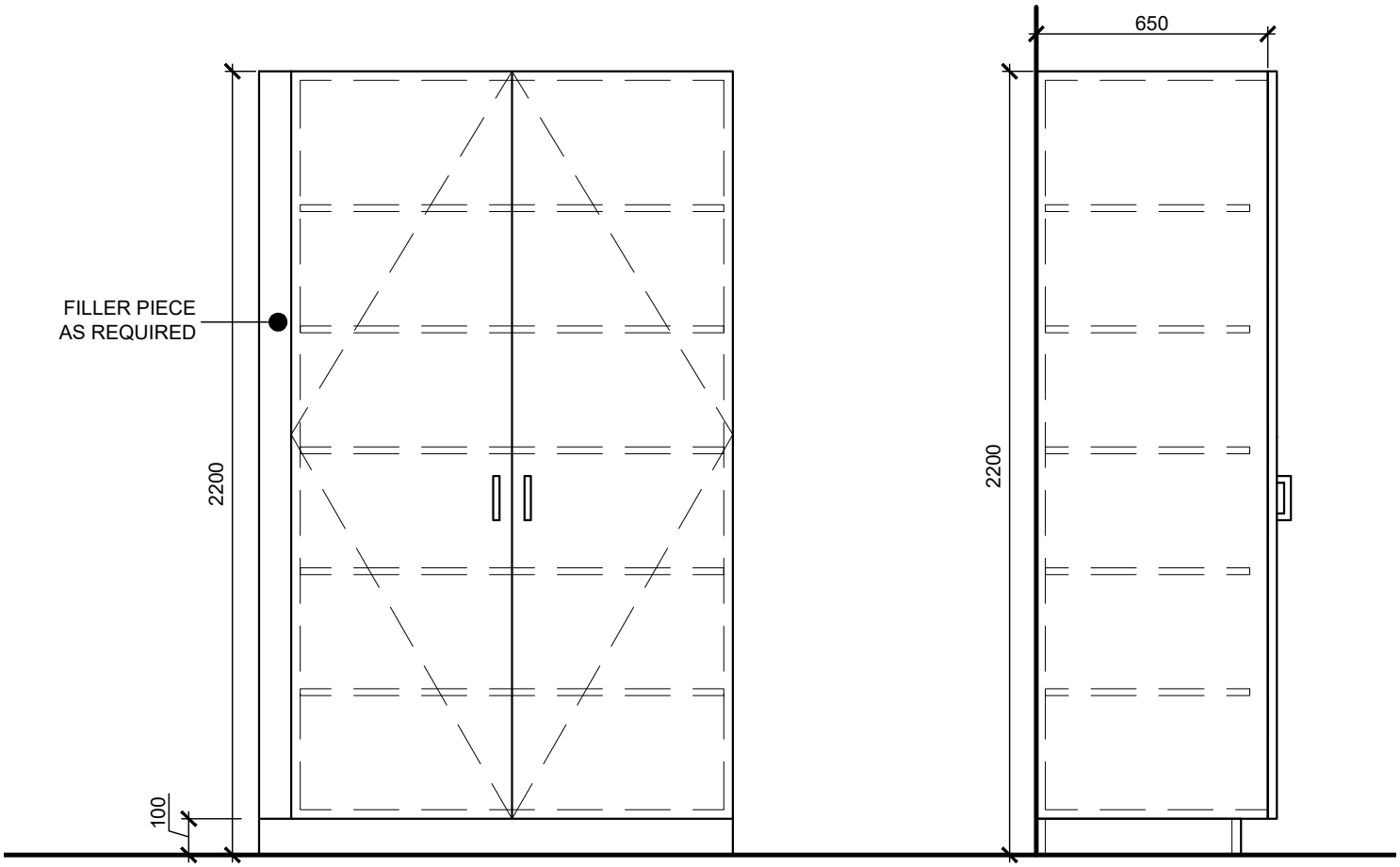
GRGURIC ARCHITECTS INCORPORATED
Web: www.2gai.com

AD 604



PLAN
SCALE 1:20

TYPICAL NOTE:
- 19mm CONSTRUCTION UNLESS OTHERWISE NOTED. REFER TO SPECIFICATIONS FOR TYPE.



FRONT ELEVATION
SCALE 1:20

SIDE ELEVATION
SCALE 1:20

BISHOP TONNOS CSS CLASSROOM RENOVATIONS
100 Panabaker Dr, Ancaster, ON L9G 5E3

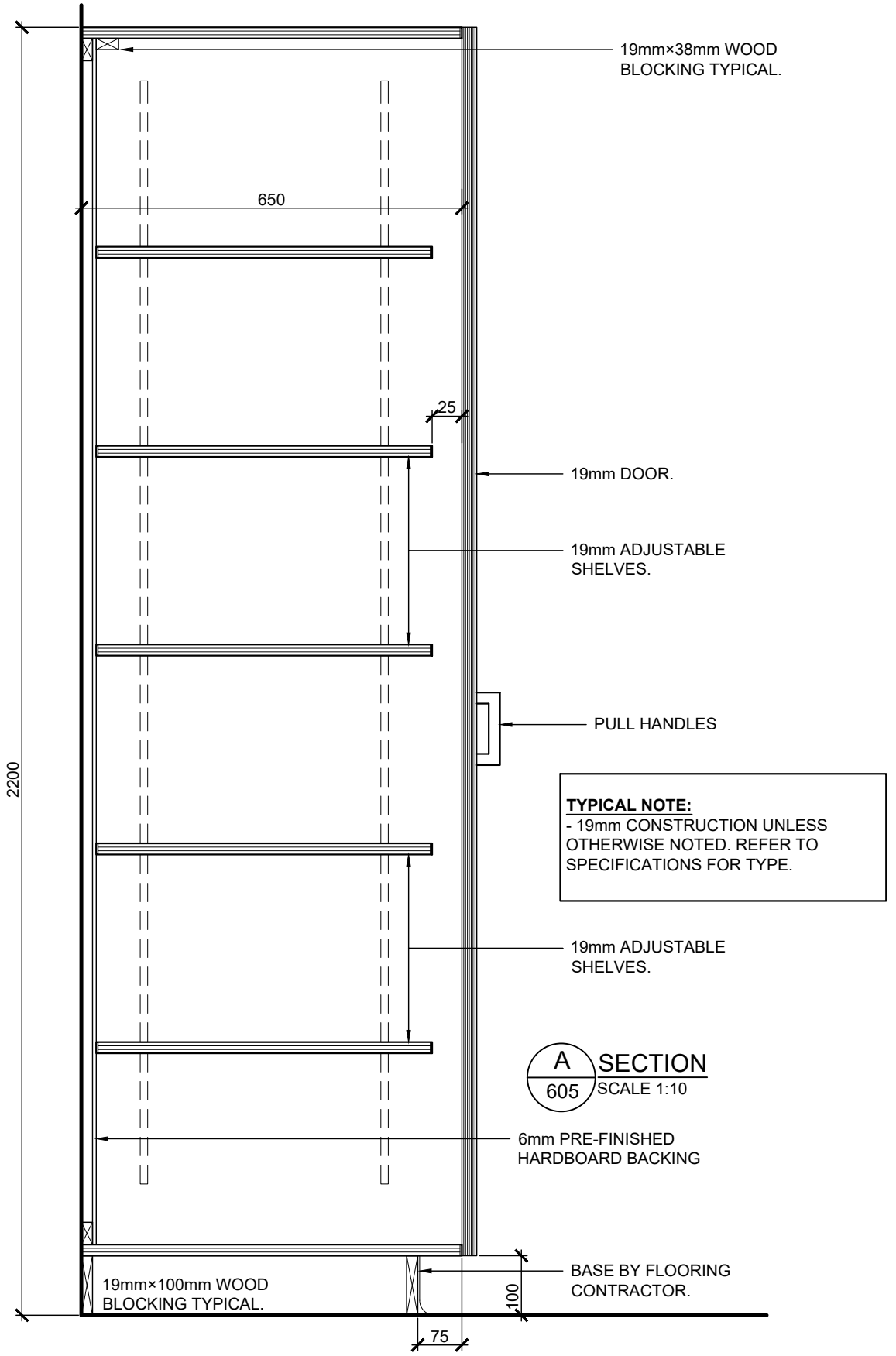
MILLWORK TYPE C1

TYPICAL NOTE: MILLWORK IS 19mm CONSTRUCTION UNLESS OTHERWISE NOTED. REFER TO SPECIFICATIONS FOR MATERIAL TYPES & FINISHES

PROJ:	2024-25
SCALE:	AS NOTED
DRAWN:	AH
DATE:	FEB 2025

GRGURIC ARCHITECTS INCORPORATED
Web: www.2gai.com

AD 605



BISHOP TONNOS CSS CLASSROOM RENOVATIONS
100 Panabaker Dr, Ancaster, ON L9G 5E3

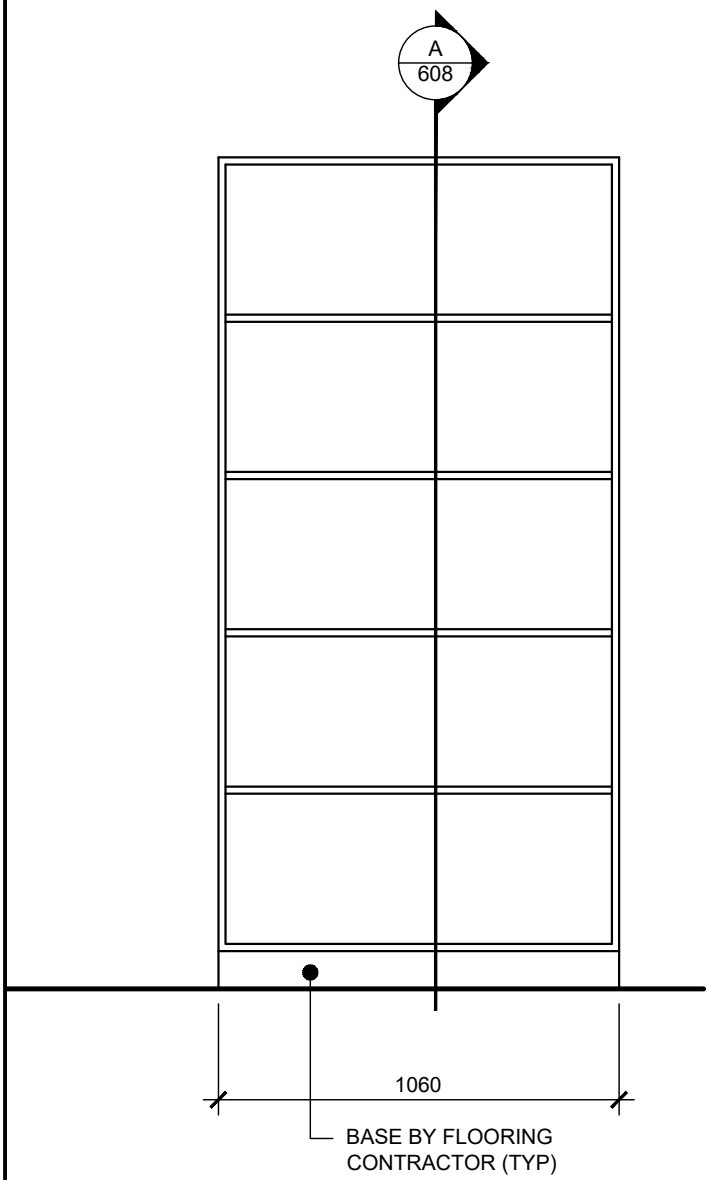
MILLWORK TYPE C1

TYPICAL NOTE: MILLWORK IS 19mm CONSTRUCTION UNLESS OTHERWISE NOTED. REFER TO SPECIFICATIONS FOR MATERIAL TYPES & FINISHES

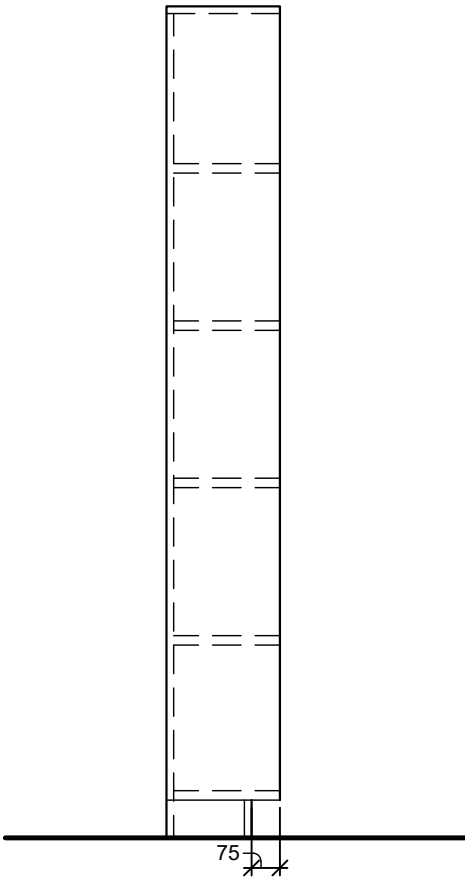
PROJ:	2024-25
SCALE:	AS NOTED
DRAWN:	AH
DATE:	FEB 2025

GRGURIC ARCHITECTS INCORPORATED
Web: www.2gai.com

AD 606



FRONT ELEVATION
SCALE 1:20



SIDE ELEVATION
SCALE 1:20

BISHOP TONNOS CSS CLASSROOM RENOVATIONS
100 Panabaker Dr, Ancaster, ON L9G 5E3

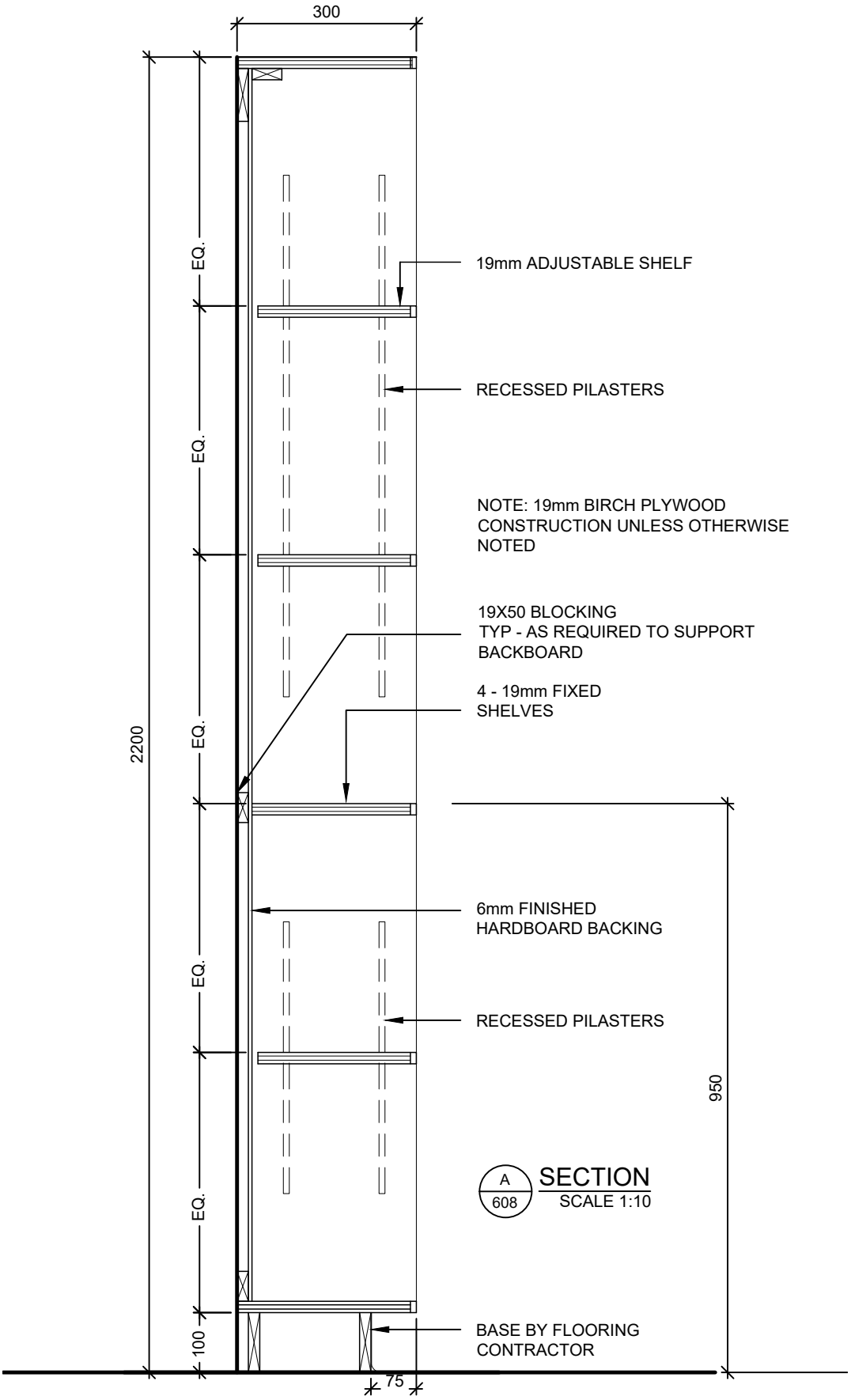
MILLWORK TYPE SH1
MANNEQUIN STORAGE

TYPICAL NOTE: MILLWORK IS 19mm CONSTRUCTION UNLESS OTHERWISE NOTED. REFER TO SPECIFICATIONS FOR MATERIAL TYPES & FINISHES

PROJ:	2024-25
SCALE:	AS NOTED
DRAWN:	AH
DATE:	FEB 2025

GRGURIC ARCHITECTS INCORPORATED
Web: www.2gai.com

AD 607



BISHOP TONNOS CSS CLASSROOM RENOVATIONS

100 Panabaker Dr, Ancaster, ON L9G 5E3

MILLWORK TYPE SH1 SECTION MANNEQUIN STORAGE

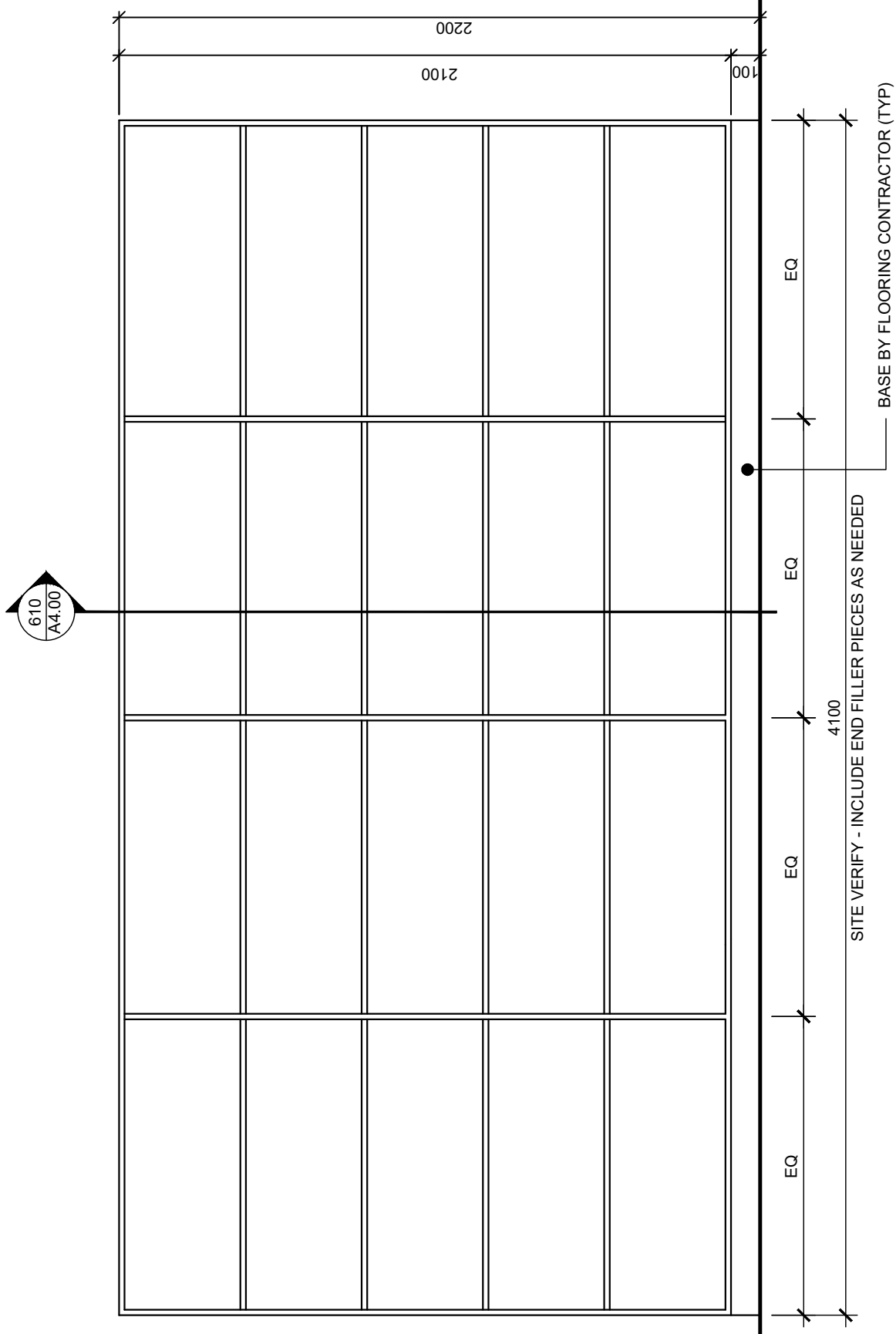
TYPICAL NOTE: MILLWORK IS 19mm CONSTRUCTION UNLESS OTHERWISE NOTED. REFER TO SPECIFICATIONS FOR MATERIAL TYPES & FINISHES

PROJ:	2024-25
SCALE:	AS NOTED
DRAWN:	AH
DATE:	FEB 2025

GRGURIC ARCHITECTS INCORPORATED

Web: www.2gai.com

AD 608



ELEVATION
SCALE 1:20

BISHOP TONNOS CSS CLASSROOM RENOVATIONS
100 Panabaker Dr, Ancaster, ON L9G 5E3

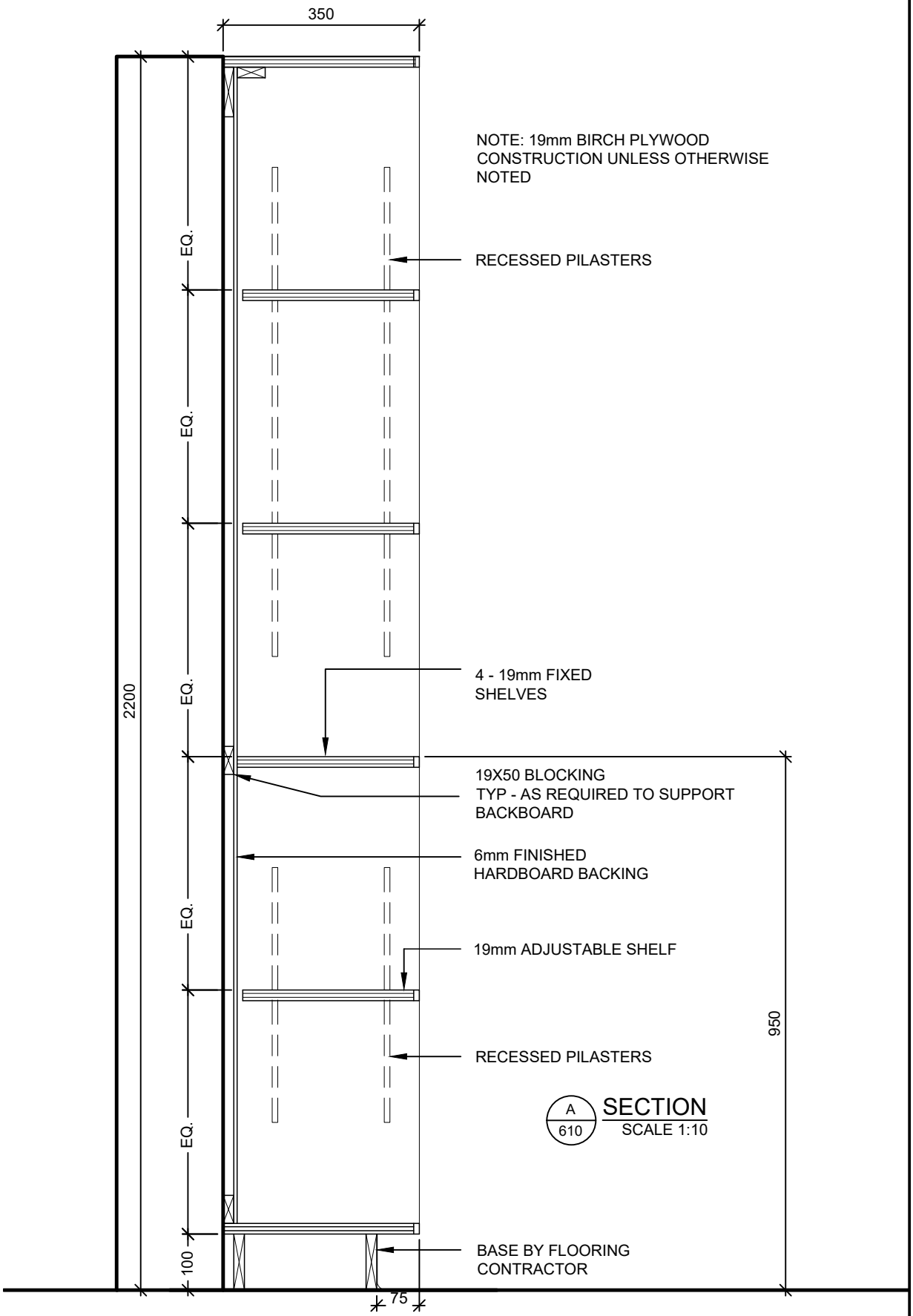
MILLWORK TYPE SH2
MANNEQUIN STORAGE

TYPICAL NOTE: MILLWORK IS 19mm CONSTRUCTION UNLESS OTHERWISE NOTED. REFER TO SPECIFICATIONS FOR MATERIAL TYPES & FINISHES

PROJ:	2024-25
SCALE:	AS NOTED
DRAWN:	AH
DATE:	FEB 2025

GRGURIC ARCHITECTS INCORPORATED
Web: www.2gai.com

AD 609



BISHOP TONNOS CSS CLASSROOM RENOVATIONS

100 Panabaker Dr, Ancaster, ON L9G 5E3

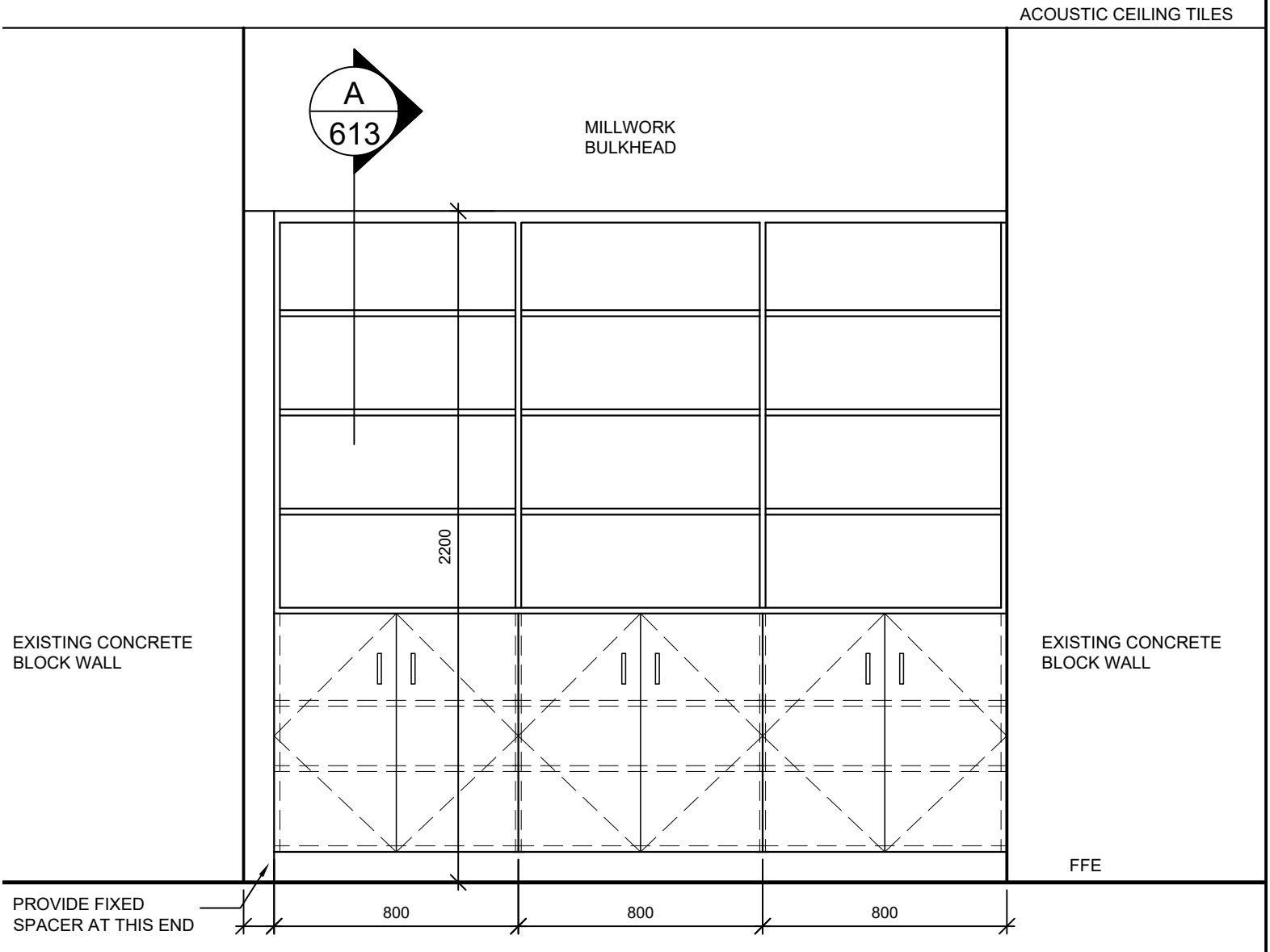
MILLWORK TYPE SH2 SECTION MANNEQUIN STORAGE

TYPICAL NOTE: MILLWORK IS 19mm CONSTRUCTION UNLESS OTHERWISE NOTED. REFER TO SPECIFICATIONS FOR MATERIAL TYPES & FINISHES

PROJ:	2024-25
SCALE:	AS NOTED
DRAWN:	AH
DATE:	FEB 2025

GRGURIC ARCHITECTS INCORPORATED
Web: www.2gai.com

AD 610



ELEVATION
SCALE 1:20

BISHOP TONNOS CSS CLASSROOM RENOVATIONS
100 Panabaker Dr, Ancaster, ON L9G 5E3

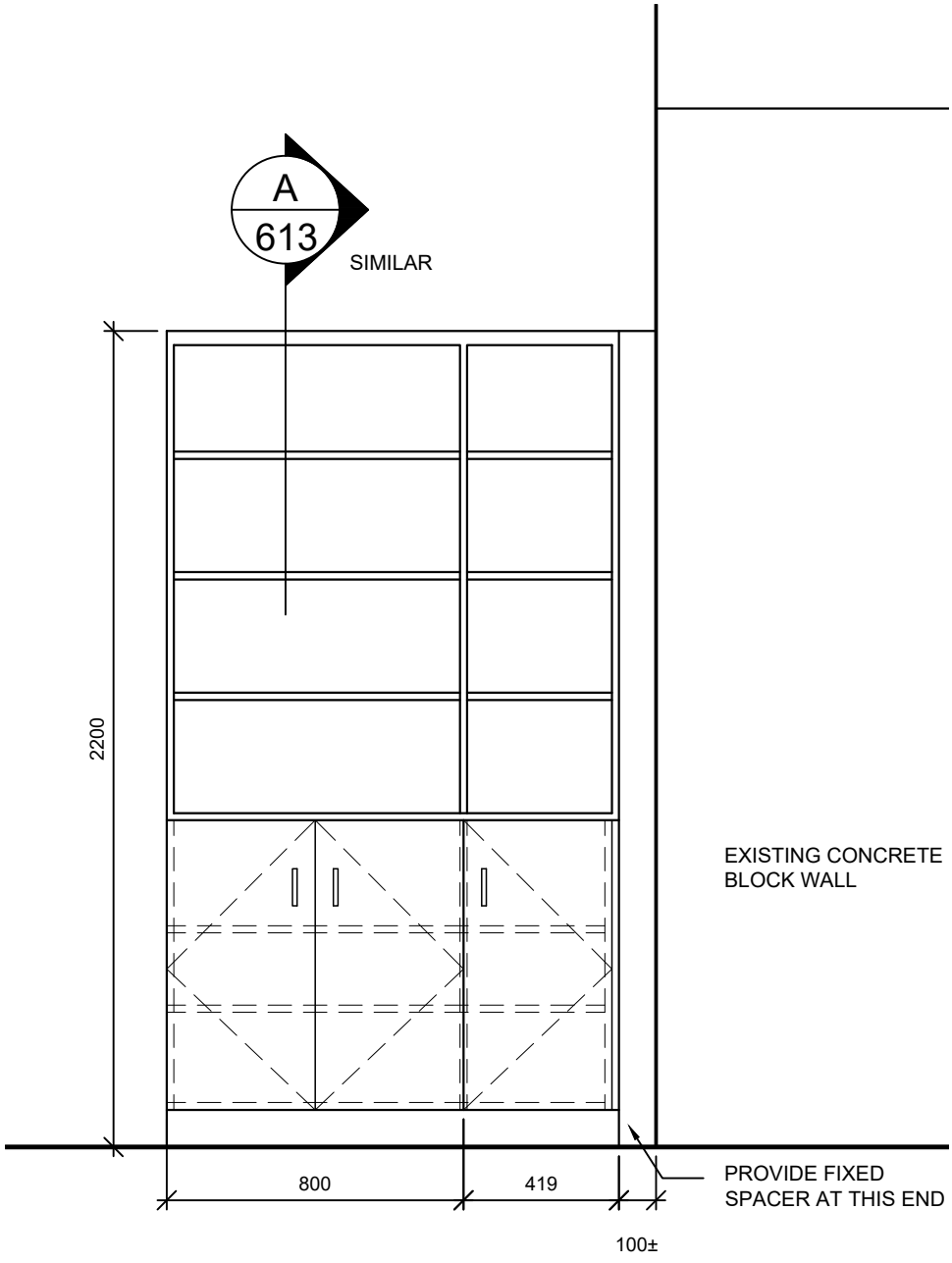
MILLWORK TYPE SH3
DISPLAY CASE

TYPICAL NOTE: MILLWORK IS 19mm CONSTRUCTION UNLESS OTHERWISE NOTED. REFER TO SPECIFICATIONS FOR MATERIAL TYPES & FINISHES

PROJ:	2024-25
SCALE:	AS NOTED
DRAWN:	AH
DATE:	FEB 2025

GRGURIC ARCHITECTS INCORPORATED
Web: www.2gai.com

AD 611



ELEVATION
SCALE 1:20

BISHOP TONNOS CSS CLASSROOM RENOVATIONS
100 Panabaker Dr, Ancaster, ON L9G 5E3

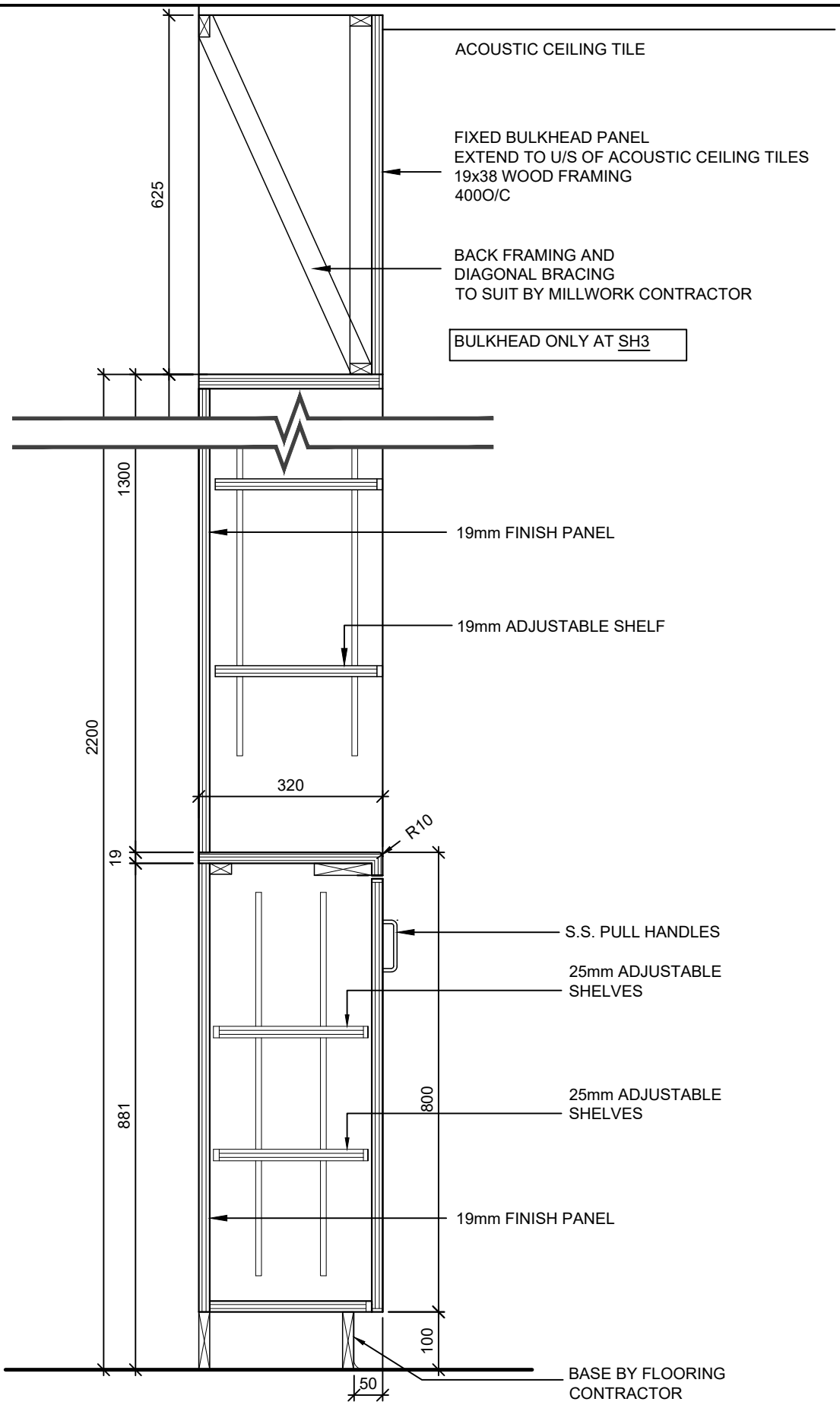
MILLWORK TYPE SH4
DISPLAY CASE

TYPICAL NOTE: MILLWORK IS 19mm CONSTRUCTION UNLESS OTHERWISE NOTED.
REFER TO SPECIFICATIONS FOR MATERIAL TYPES & FINISHES

PROJ:	2024-25
SCALE:	AS NOTED
DRAWN:	AH
DATE:	FEB 2025

GRGURIC
ARCHITECTS
INCORPORATED
Web: www.2gai.com

AD
612



A
613
SECTION
SCALE 1:10

BISHOP TONNOS CSS CLASSROOM RENOVATIONS
100 Panabaker Dr, Ancaster, ON L9G 5E3

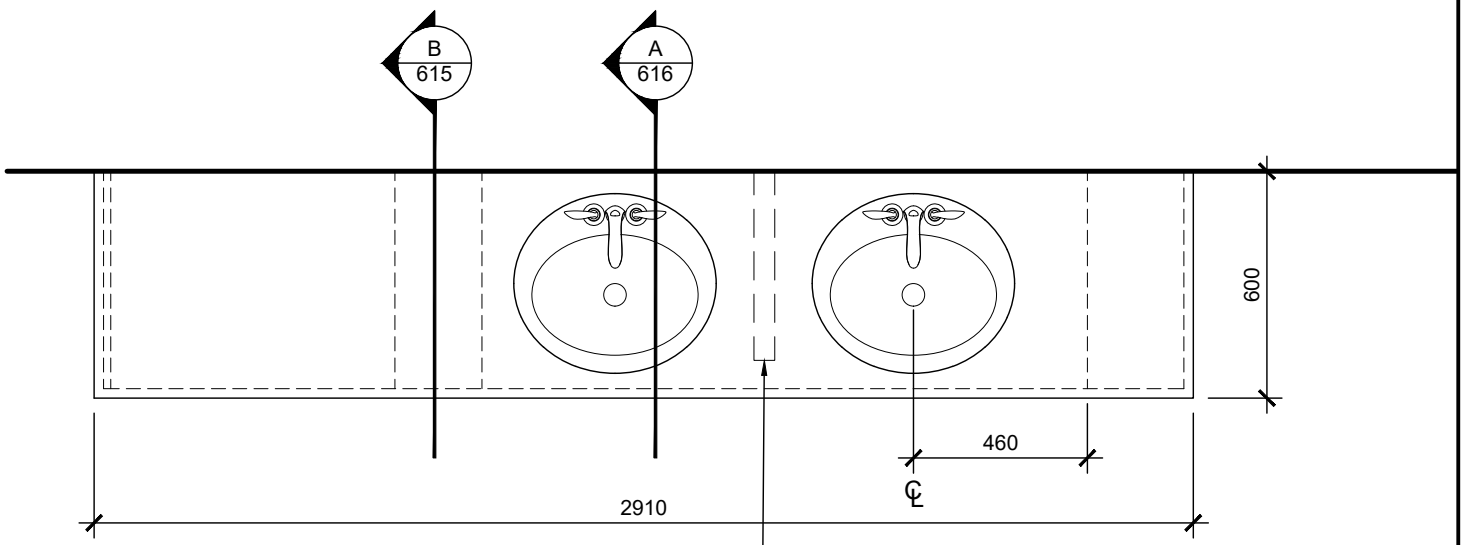
MILLWORK TYPE SH3 & SH4 SECTION
DISPLAY CASE

TYPICAL NOTE: MILLWORK IS 19mm CONSTRUCTION UNLESS OTHERWISE NOTED.
REFER TO SPECIFICATIONS FOR MATERIAL TYPES & FINISHES

PROJ:	2024-25
SCALE:	AS NOTED
DRAWN:	AH
DATE:	FEB 2025

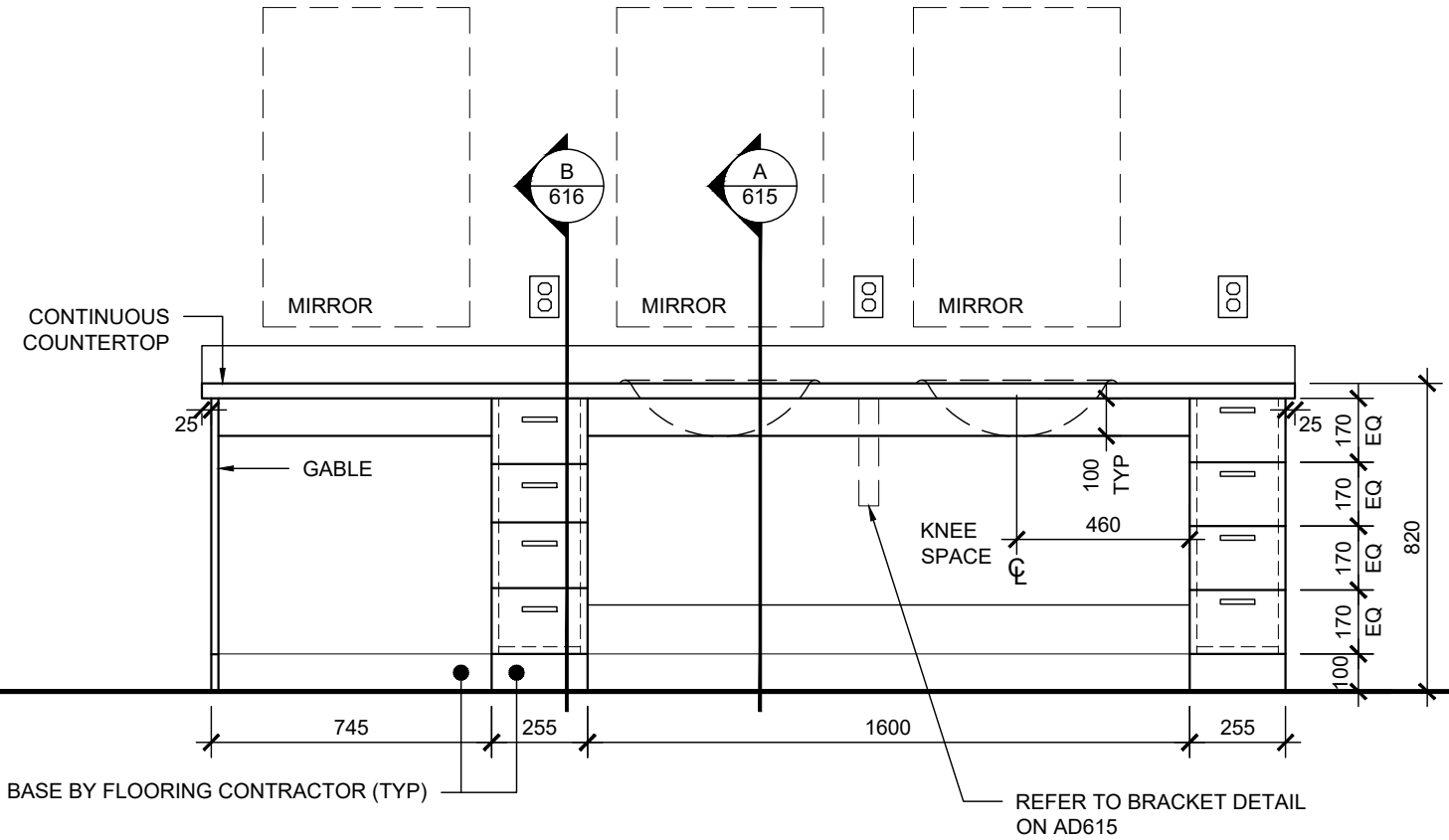
GRGURIC
ARCHITECTS
INCORPORATED
Web: www.2gai.com

AD
613



PLAN VIEW
SCALE 1:20

REFER TO BRACKET DETAIL
ON AD615



ELEVATION
SCALE 1:20

BISHOP TONNOS CSS CLASSROOM RENOVATIONS
100 Panabaker Dr, Ancaster, ON L9G 5E3

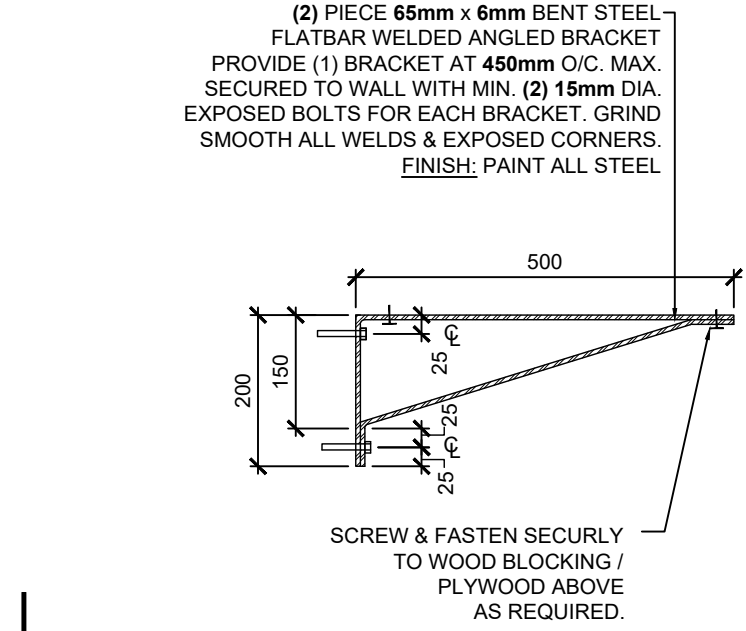
MILLWORK TYPE GS
GROOMING STATION

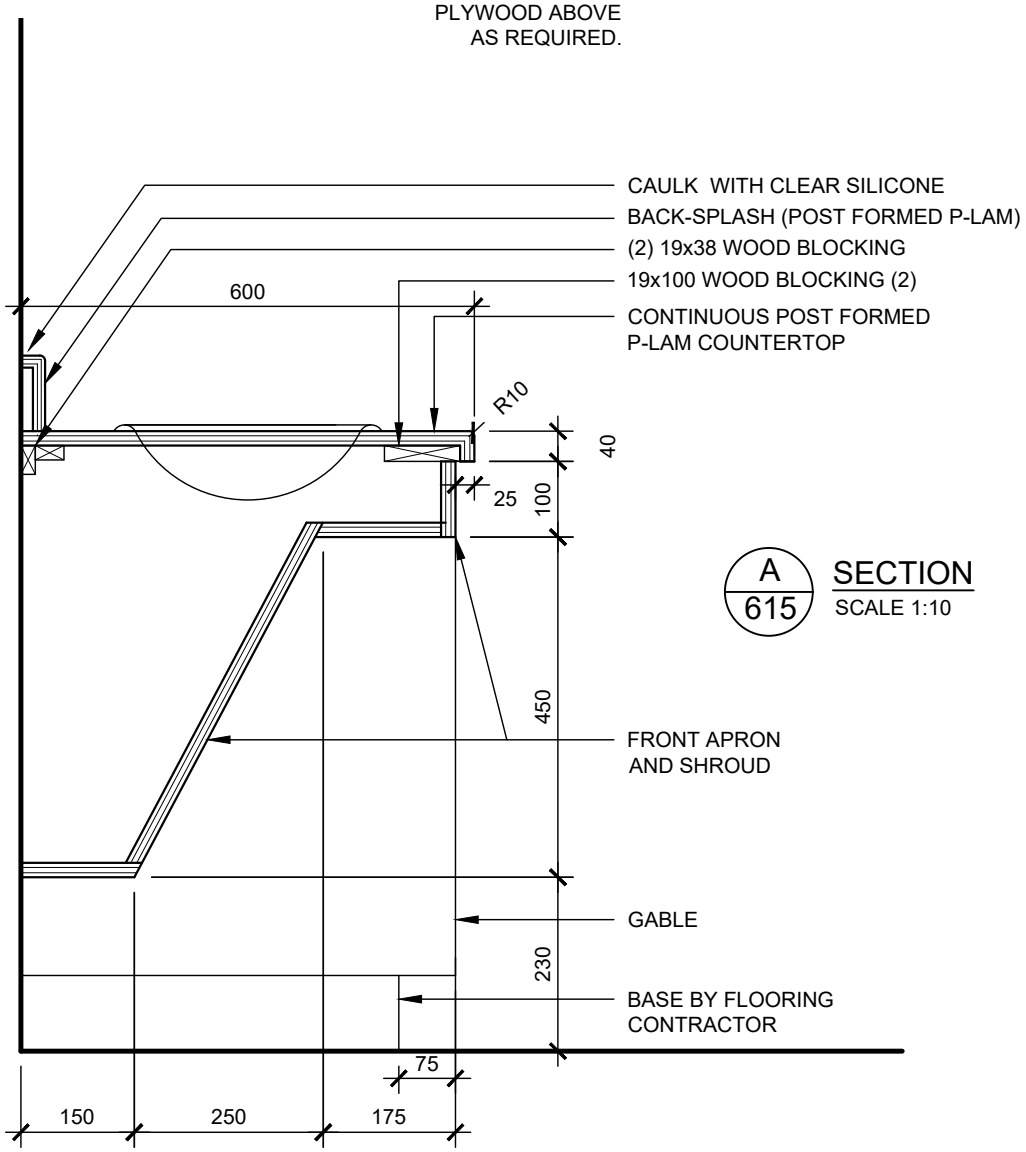
TYPICAL NOTE: MILLWORK IS 19mm CONSTRUCTION UNLESS OTHERWISE NOTED.
REFER TO SPECIFICATIONS FOR MATERIAL TYPES & FINISHES

PROJ:	2024-25
SCALE:	AS NOTED
DRAWN:	AH
DATE:	FEB 2025

GRGURIC
ARCHITECTS
INCORPORATED
Web: www.2gai.com

AD
614





A/615 SECTION
SCALE 1:10

BISHOP TONNOS CSS CLASSROOM RENOVATIONS
100 Panabaker Dr, Ancaster, ON L9G 5E3

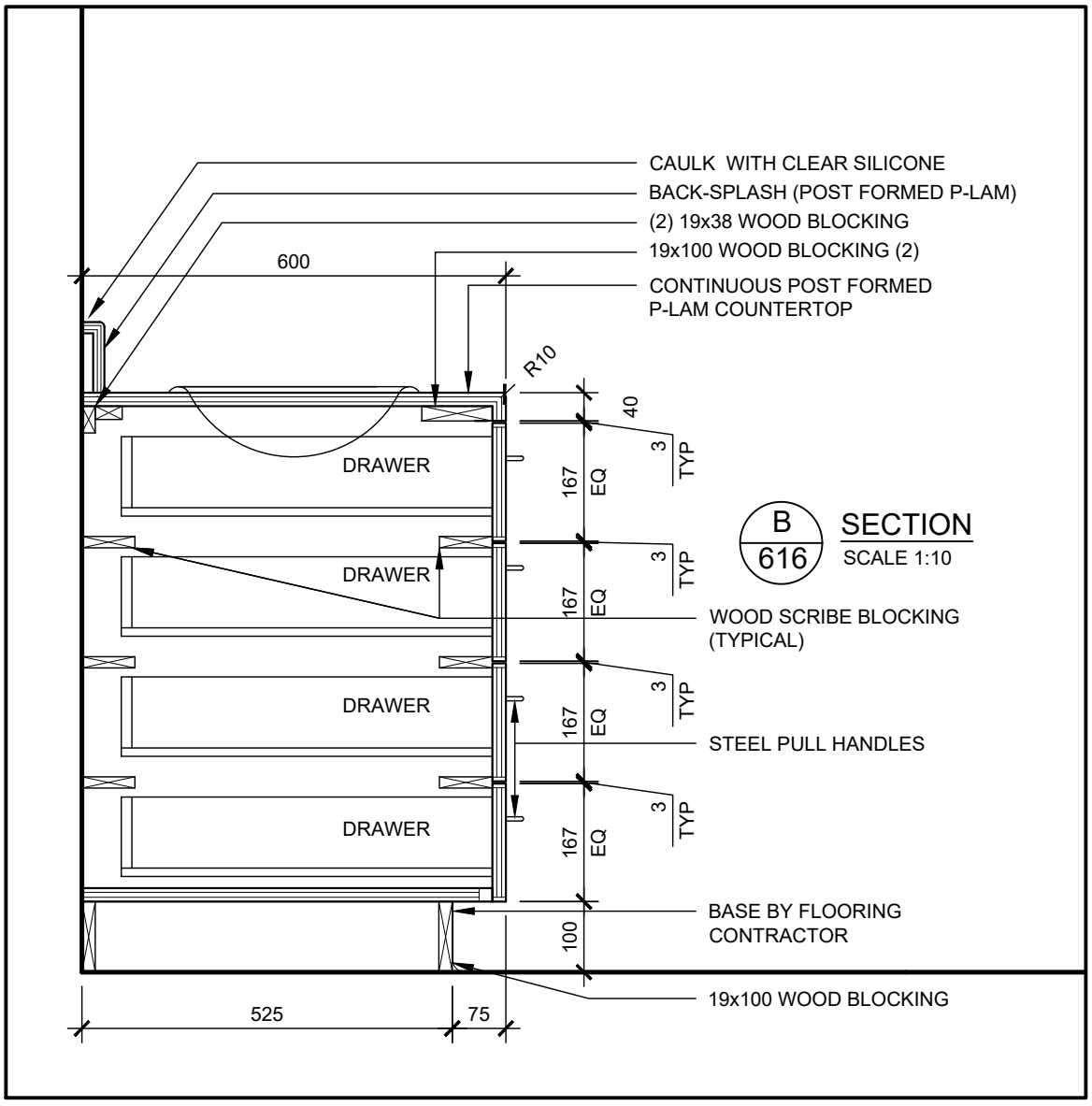
MILLWORK TYPE GS
GROOMING STATION

TYPICAL NOTE: MILLWORK IS 19mm CONSTRUCTION UNLESS OTHERWISE NOTED. REFER TO SPECIFICATIONS FOR MATERIAL TYPES & FINISHES

PROJ:	2024-25
SCALE:	AS NOTED
DRAWN:	AH
DATE:	FEB 2025

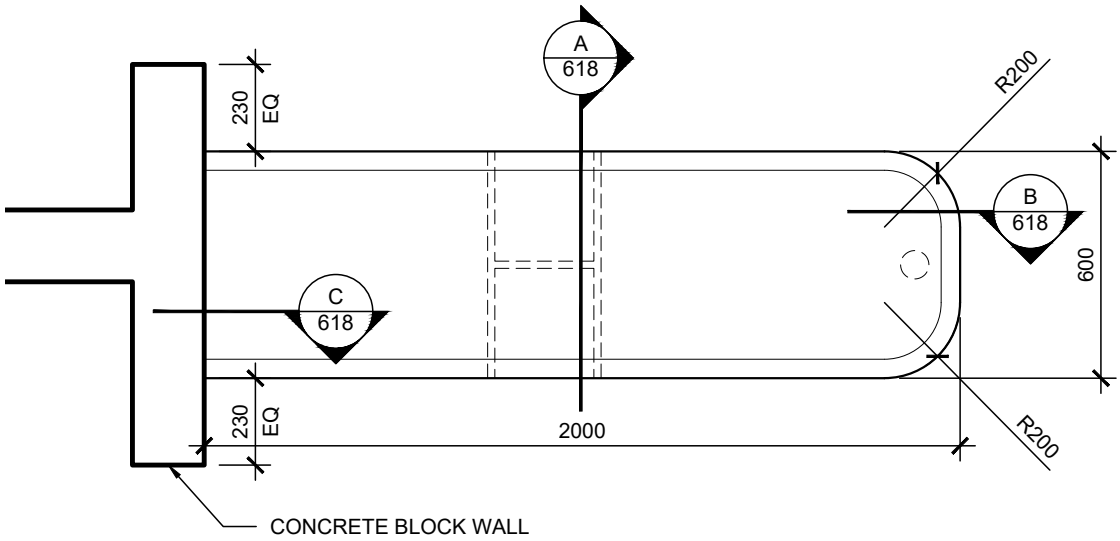
GRGURIC ARCHITECTS INCORPORATED
Web: www.2gai.com

AD 615

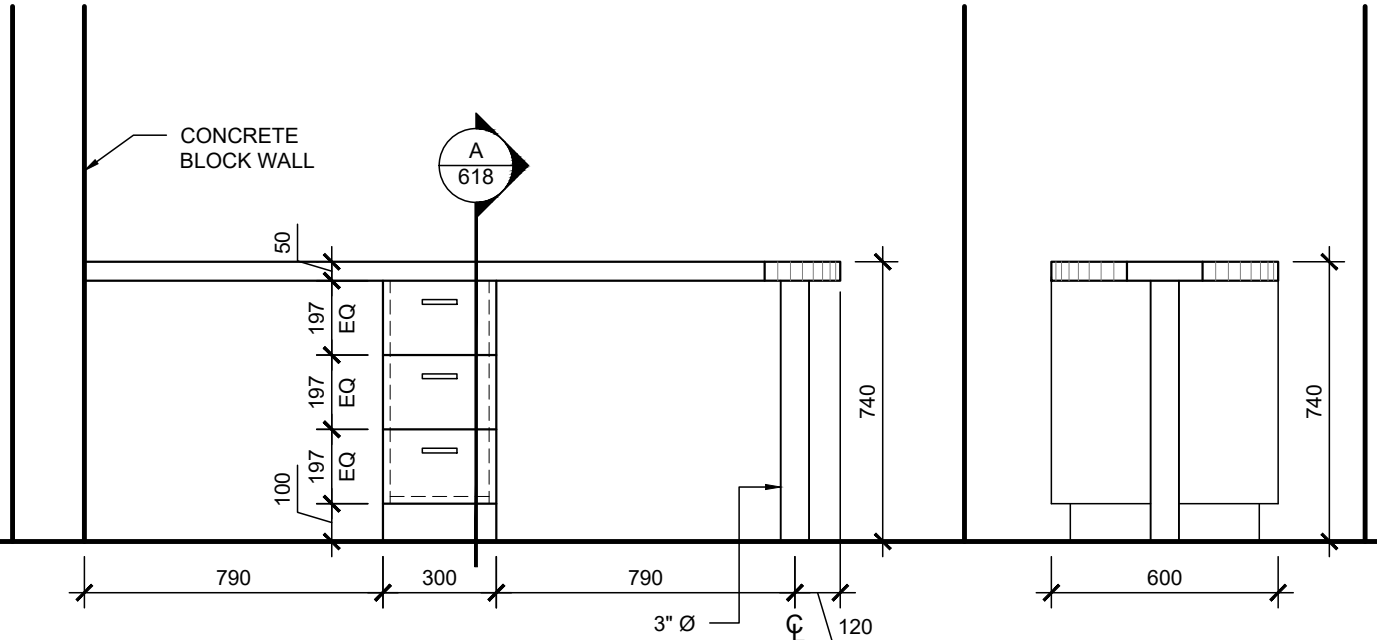


B / 616 SECTION
SCALE 1:10

BISHOP TONNOS CSS CLASSROOM RENOVATIONS 100 Panabaker Dr, Ancaster, ON L9G 5E3 **MILLWORK TYPE GS** **GROOMING STATION** **TYPICAL NOTE:** MILLWORK IS 19mm CONSTRUCTION UNLESS OTHERWISE NOTED. REFER TO SPECIFICATIONS FOR MATERIAL TYPES & FINISHES	PROJ: 2024-25 SCALE: AS NOTED DRAWN: AH DATE: FEB 2025	GRGURIC ARCHITECTS INCORPORATED Web: www.2gai.com	AD 616



PLAN VIEW
SCALE 1:20



ELEVATION
SCALE 1:20

SIDE ELEVATION
SCALE 1:20

BISHOP TONNOS CSS CLASSROOM RENOVATIONS
100 Panabaker Dr, Ancaster, ON L9G 5E3

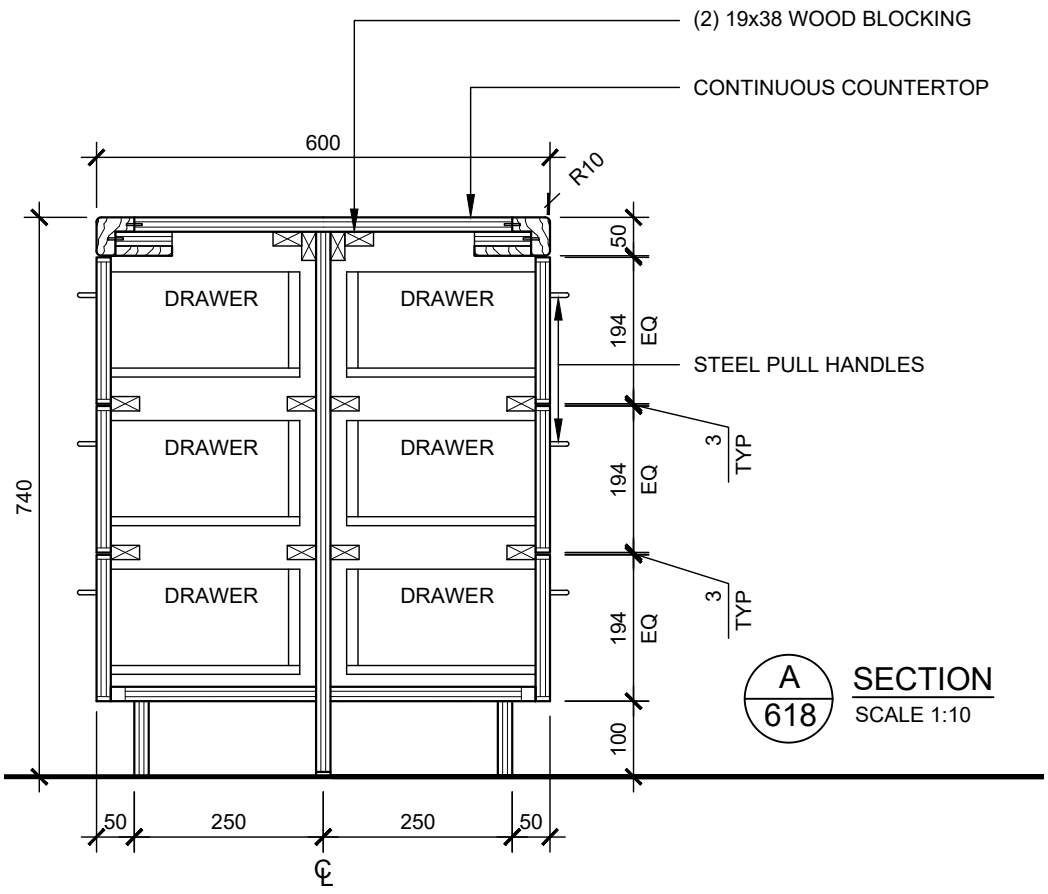
MILLWORK TYPE MS
MANICURE STATION

TYPICAL NOTE: MILLWORK IS 19mm CONSTRUCTION UNLESS OTHERWISE NOTED. REFER TO SPECIFICATIONS FOR MATERIAL TYPES & FINISHES

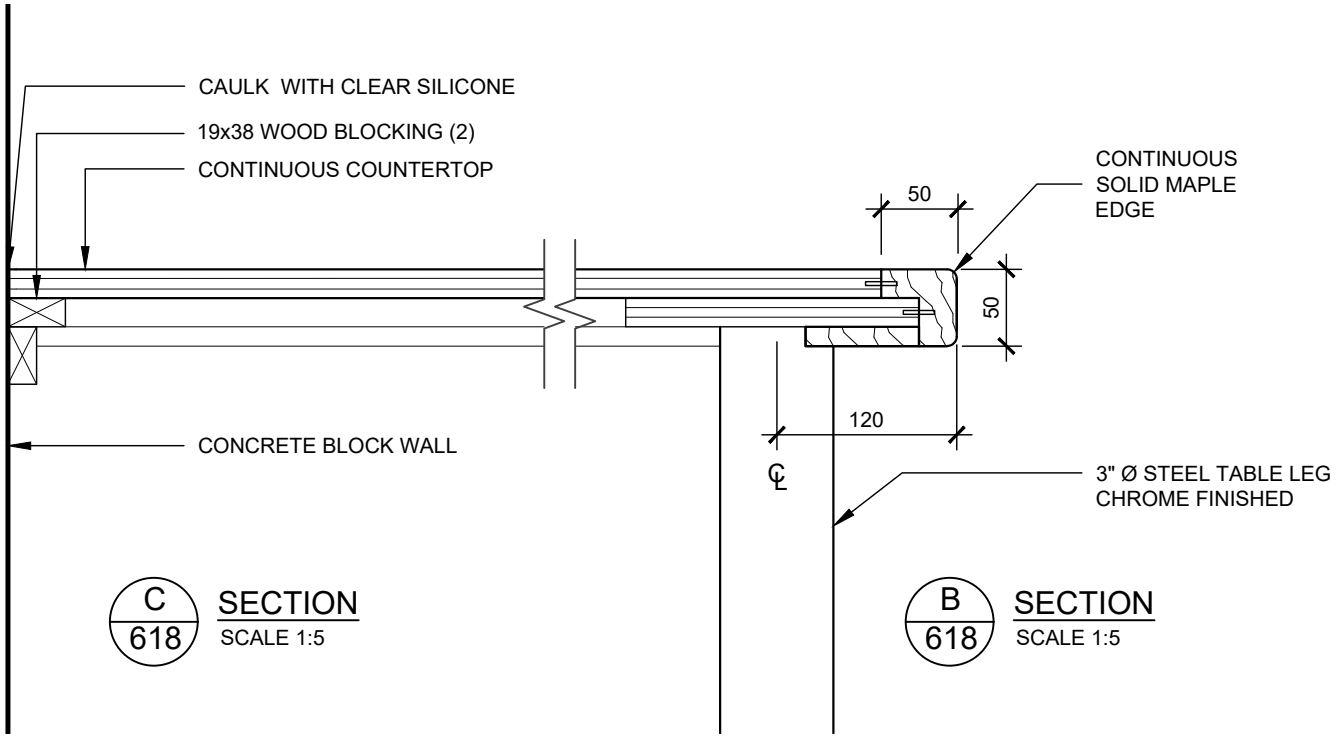
PROJ:	2024-25
SCALE:	AS NOTED
DRAWN:	AH
DATE:	FEB 2025

GRGURIC ARCHITECTS INCORPORATED
Web: www.2gai.com

AD 617



A 618 SECTION
SCALE 1:10



C 618 SECTION
SCALE 1:5

B 618 SECTION
SCALE 1:5

BISHOP TONNOS CSS CLASSROOM RENOVATIONS
100 Panabaker Dr, Ancaster, ON L9G 5E3

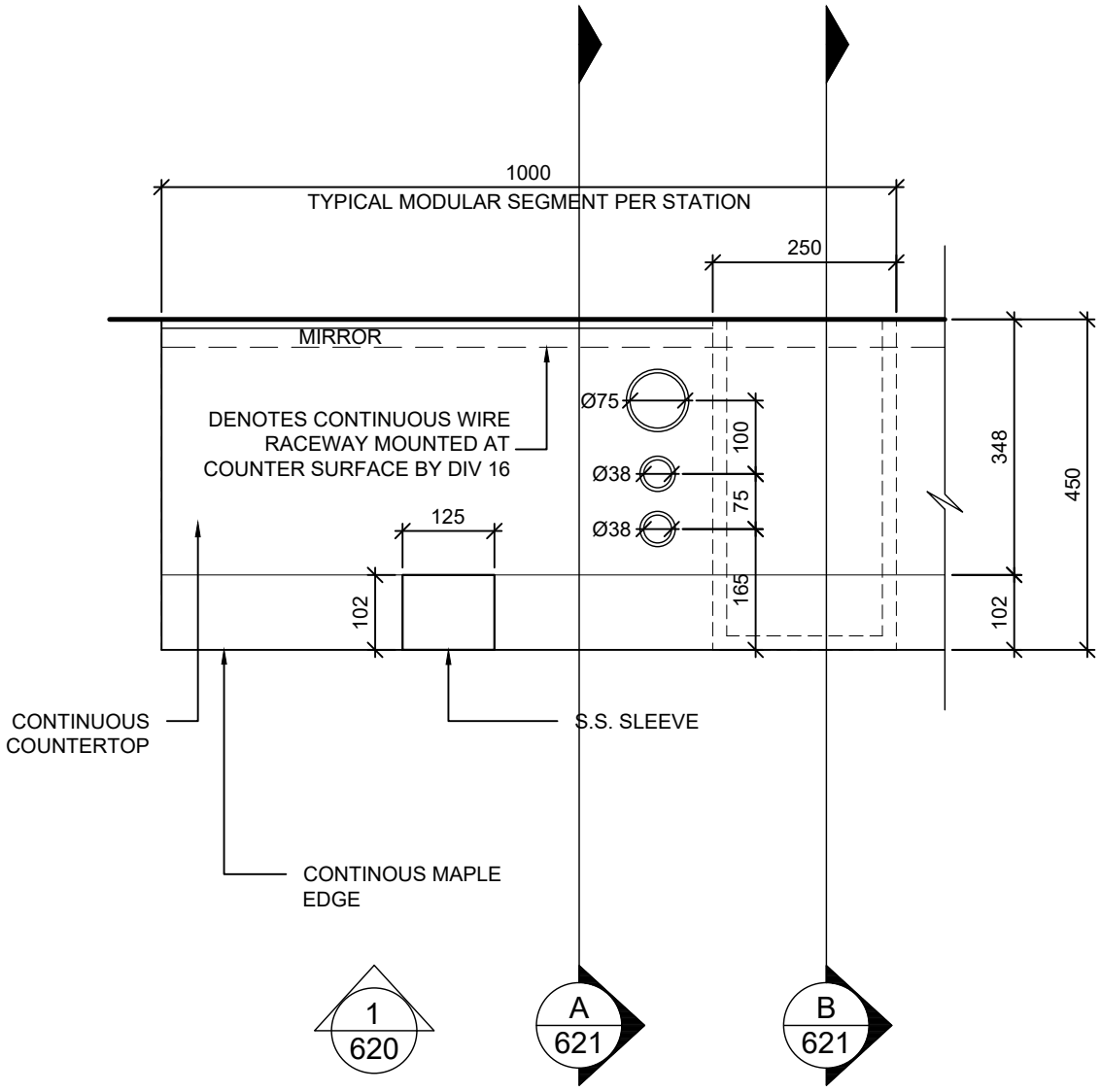
MILLWORK TYPE MS
MANICURE STATION

TYPICAL NOTE: MILLWORK IS 19mm CONSTRUCTION UNLESS OTHERWISE NOTED. REFER TO SPECIFICATIONS FOR MATERIAL TYPES & FINISHES

PROJ:	2024-25
SCALE:	AS NOTED
DRAWN:	AH
DATE:	FEB 2025

GRGURIC ARCHITECTS INCORPORATED
Web: www.2gai.com

AD 618



BISHOP TONNOS CSS CLASSROOM RENOVATIONS
100 Panabaker Dr, Ancaster, ON L9G 5E3

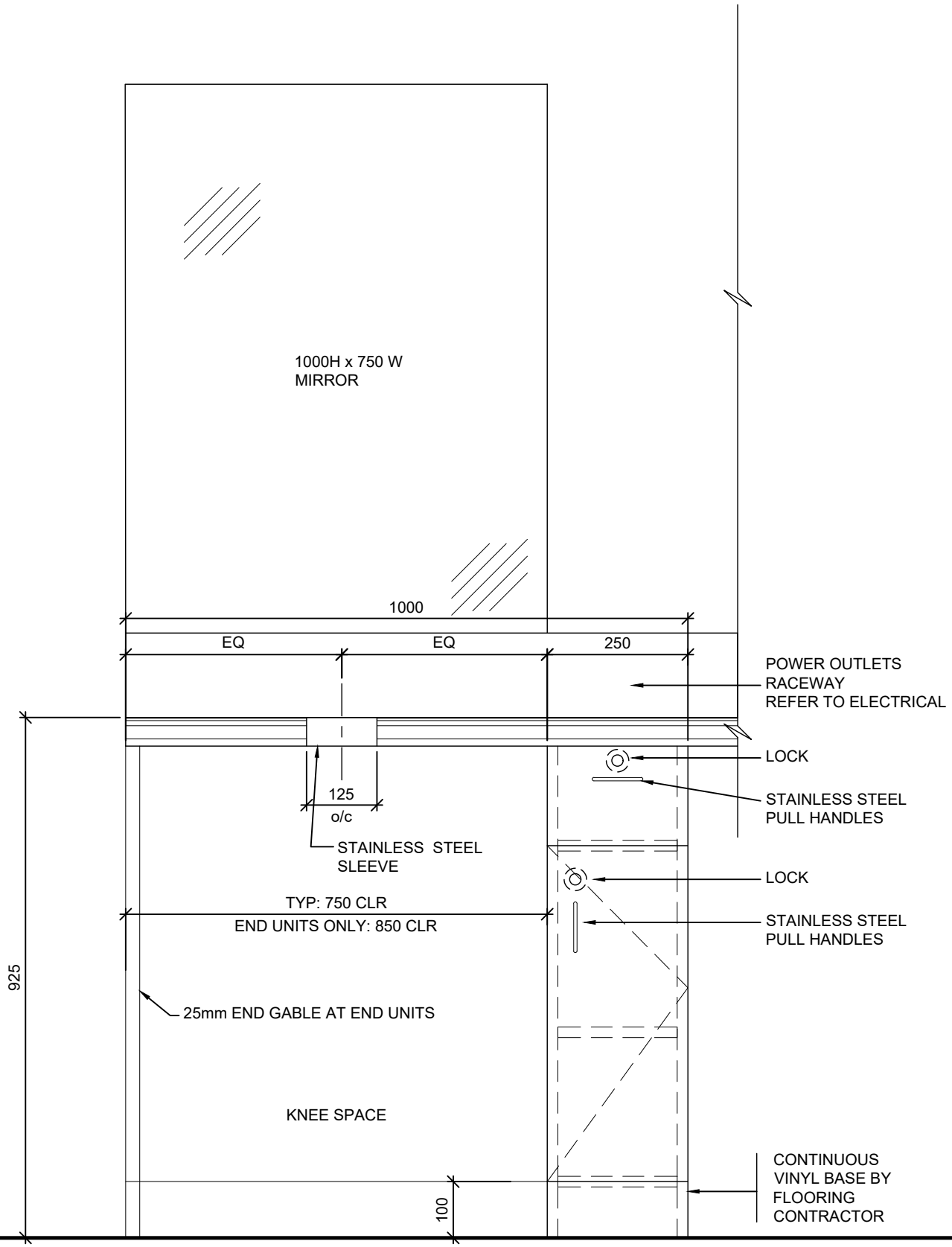
MILLWORK TYPE ST
STYLING STATION

TYPICAL NOTE: MILLWORK IS 19mm CONSTRUCTION UNLESS OTHERWISE NOTED. REFER TO SPECIFICATIONS FOR MATERIAL TYPES & FINISHES

PROJ:	2024-25
SCALE:	AS NOTED
DRAWN:	AH
DATE:	FEB 2025

GRGURIC ARCHITECTS INCORPORATED
Web: www.2gai.com

AD 619



ELEVATION

SCALE 1:10

BISHOP TONNOS CSS CLASSROOM RENOVATIONS

100 Panabaker Dr, Ancaster, ON L9G 5E3

MILLWORK TYPE ST
STYLING STATION

TYPICAL NOTE: MILLWORK IS 19mm CONSTRUCTION UNLESS OTHERWISE NOTED. REFER TO SPECIFICATIONS FOR MATERIAL TYPES & FINISHES

PROJ:	2024-25
SCALE:	AS NOTED
DRAWN:	AH
DATE:	FEB 2025

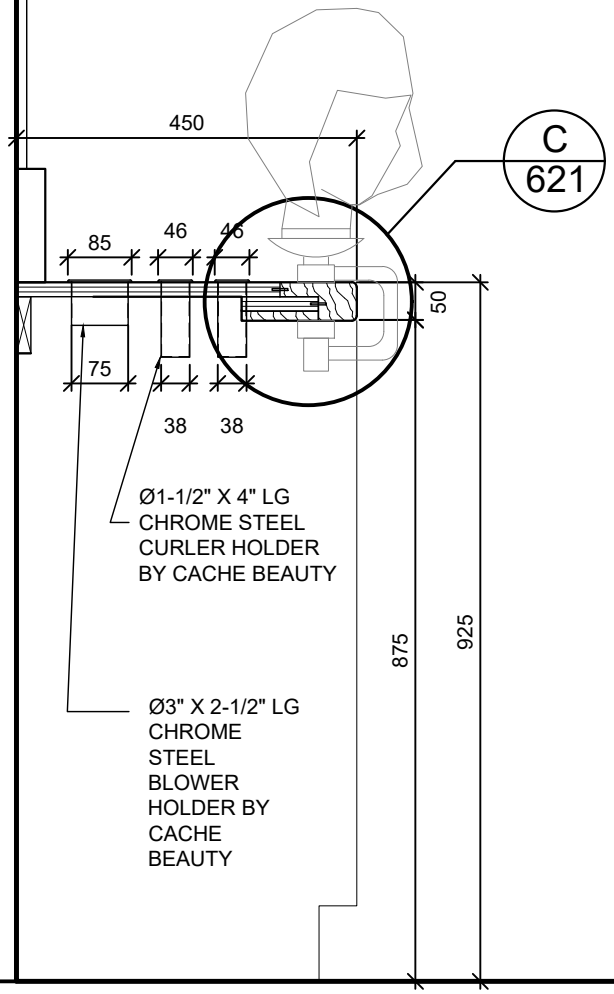
GRGURIC ARCHITECTS INCORPORATED

Web: www.2gai.com

AD 620

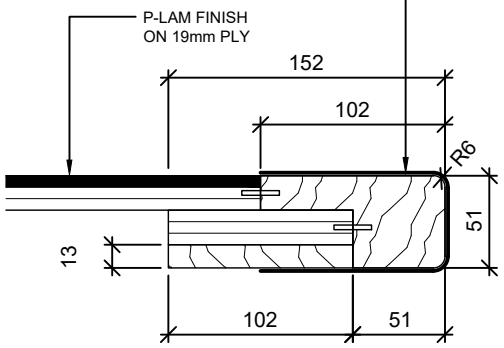
NOTE: CONSTRUCTION TO BE 19MM PARTICLE BOARD WITH PVC EDGING, UNLESS OTHERWISE NOTED.

MIRROR
1000MM HIGH



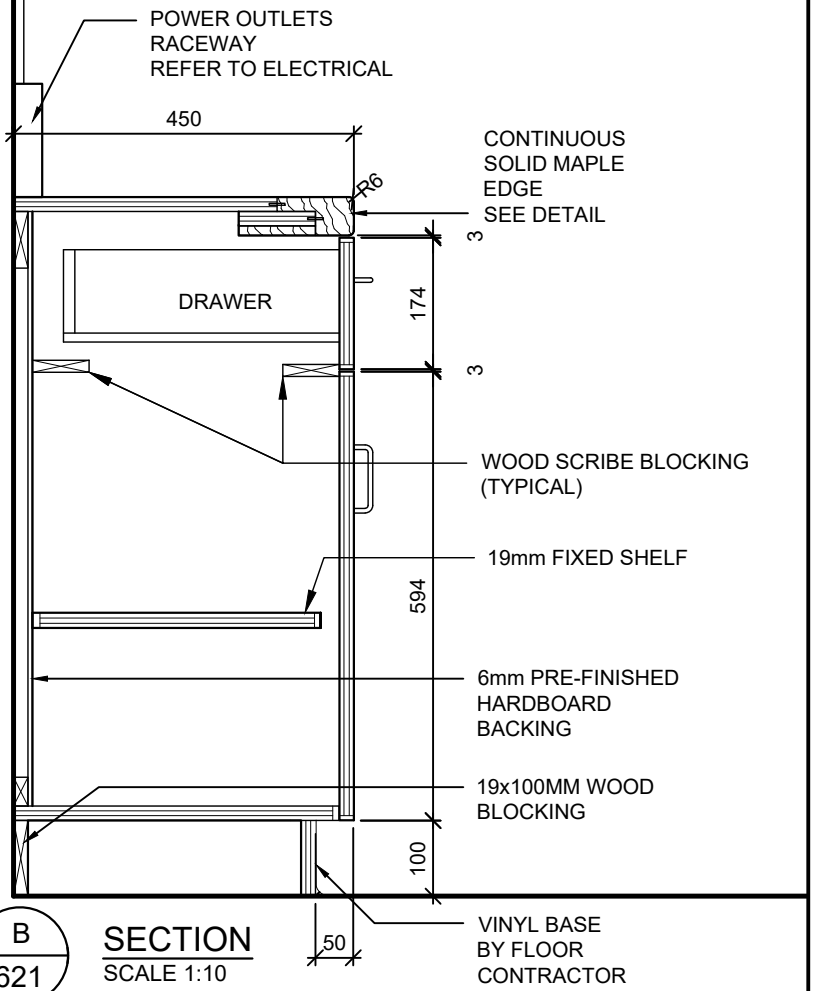
A
621
SECTION
SCALE 1:10

PROVIDE FRICTION FIT 125MM WIDE S.S. SLEEVE CENTRED AT EACH STYLING STATION
REFER TO AD 620
TOTAL QTY: 40



C
621
DETAIL
NTS

MIRROR
1000MM HIGH



B
621
SECTION
SCALE 1:10

BISHOP TONNOS CSS CLASSROOM RENOVATIONS
100 Panabaker Dr, Ancaster, ON L9G 5E3

MILLWORK TYPE ST
STYLING STATION

TYPICAL NOTE: MILLWORK IS 19mm CONSTRUCTION UNLESS OTHERWISE NOTED. REFER TO SPECIFICATIONS FOR MATERIAL TYPES & FINISHES

PROJ:	2024-25
SCALE:	AS NOTED
DRAWN:	AH
DATE:	FEB 2025

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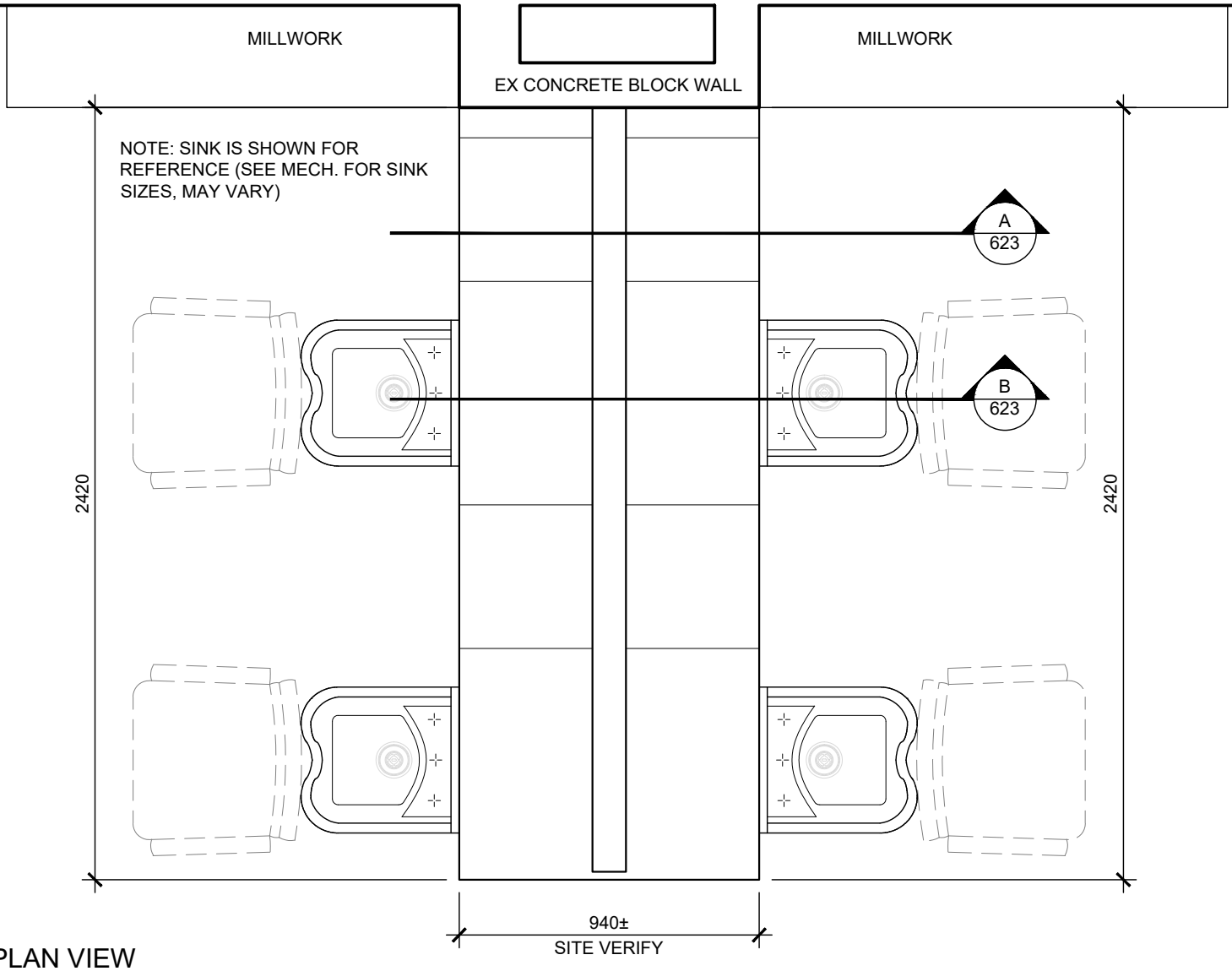
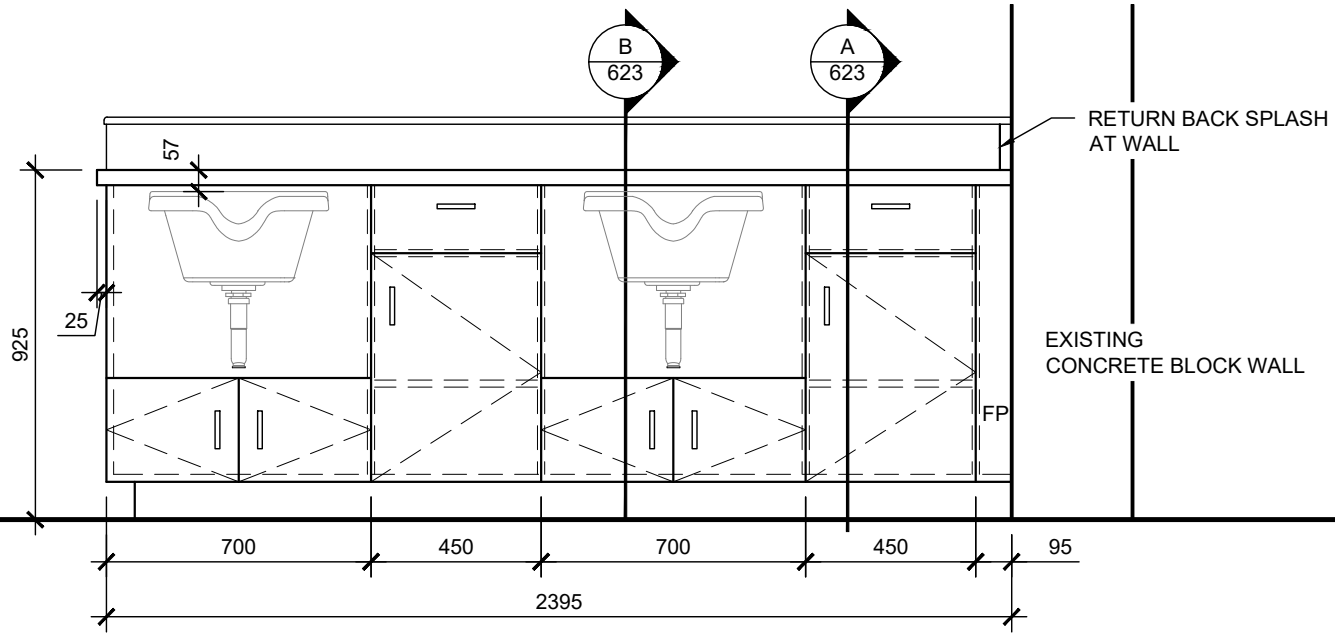
AD
621



PLAN VIEW
SCALE 1:20



ELEVATION
SCALE 1:20

BISHOP TONNOS CSS CLASSROOM RENOVATIONS
100 Panabaker Dr, Ancaster, ON L9G 5E3

MILLWORK TYPE WS
WASH STATION

TYPICAL NOTE: MILLWORK IS 19mm CONSTRUCTION UNLESS OTHERWISE NOTED. REFER TO SPECIFICATIONS FOR MATERIAL TYPES & FINISHES

PROJ:	2024-25
SCALE:	AS NOTED
DRAWN:	AH
DATE:	FEB 2025

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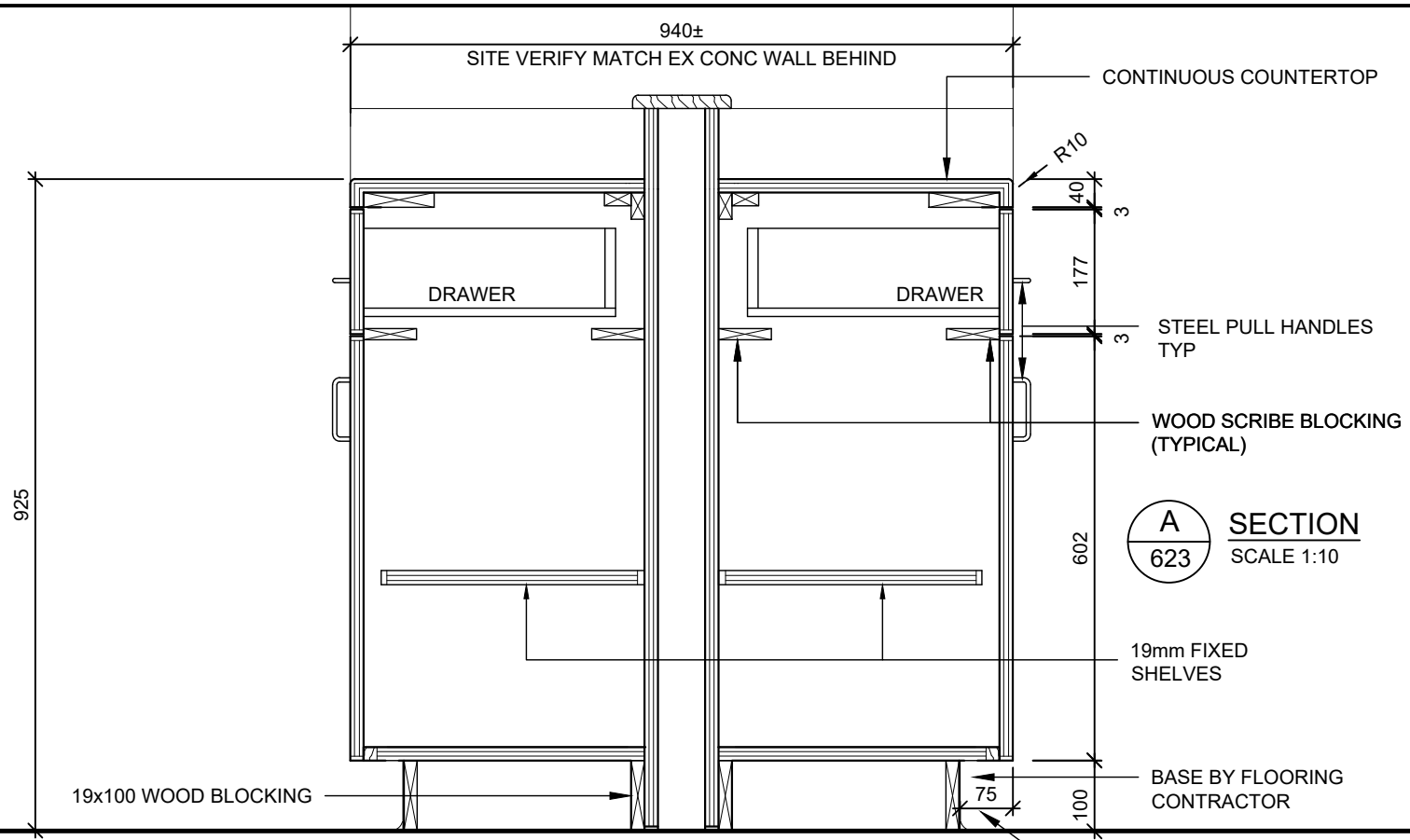
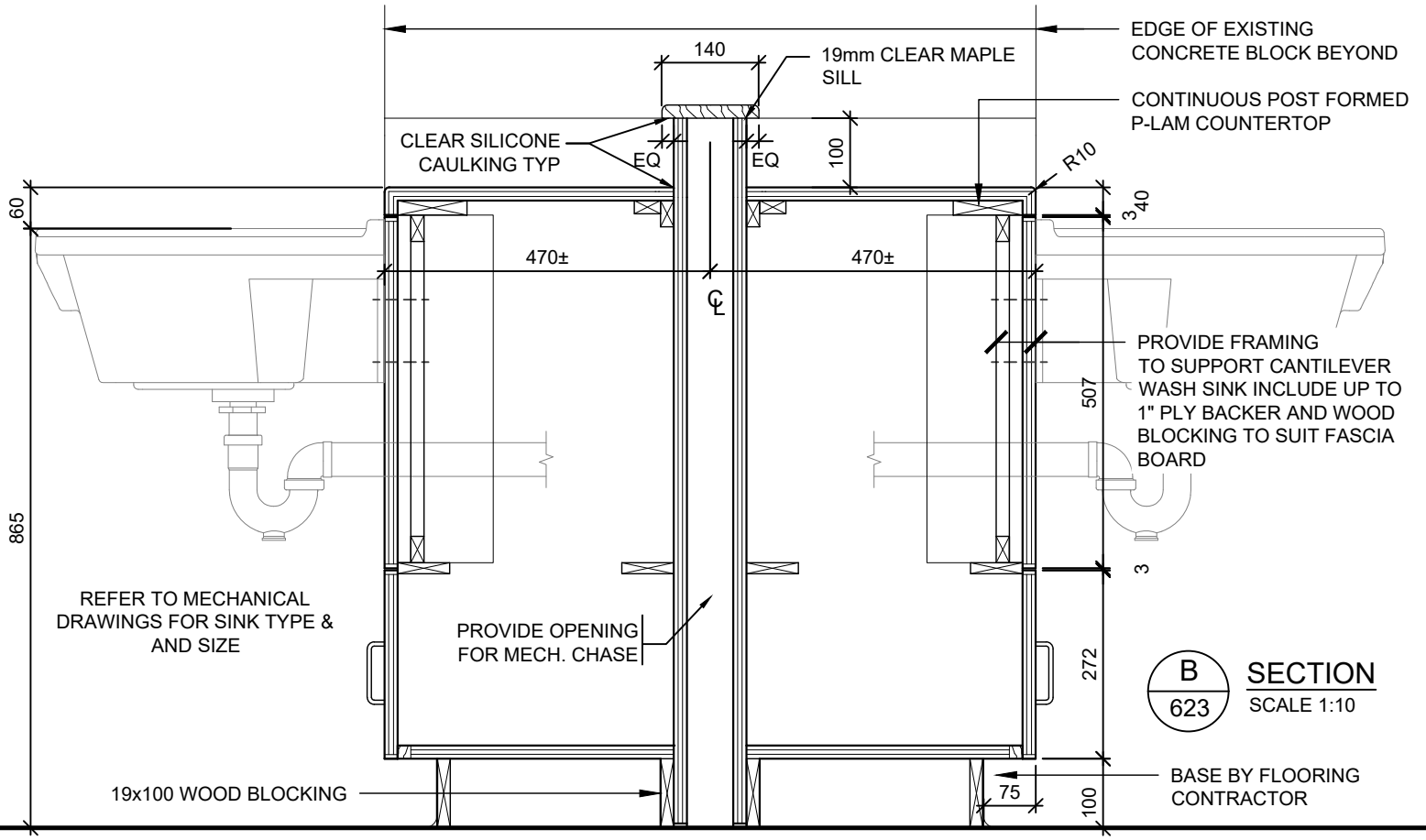
AD 622





BISHOP TONNOS CSS CLASSROOM RENOVATIONS
100 Panabaker Dr, Ancaster, ON L9G 5E3

MILLWORK TYPE WS
WASH STATION

TYPICAL NOTE: MILLWORK IS 19mm CONSTRUCTION UNLESS OTHERWISE NOTED. REFER TO SPECIFICATIONS FOR MATERIAL TYPES & FINISHES

PROJ:	2024-25
SCALE:	AS NOTED
DRAWN:	AH
DATE:	FEB 2025

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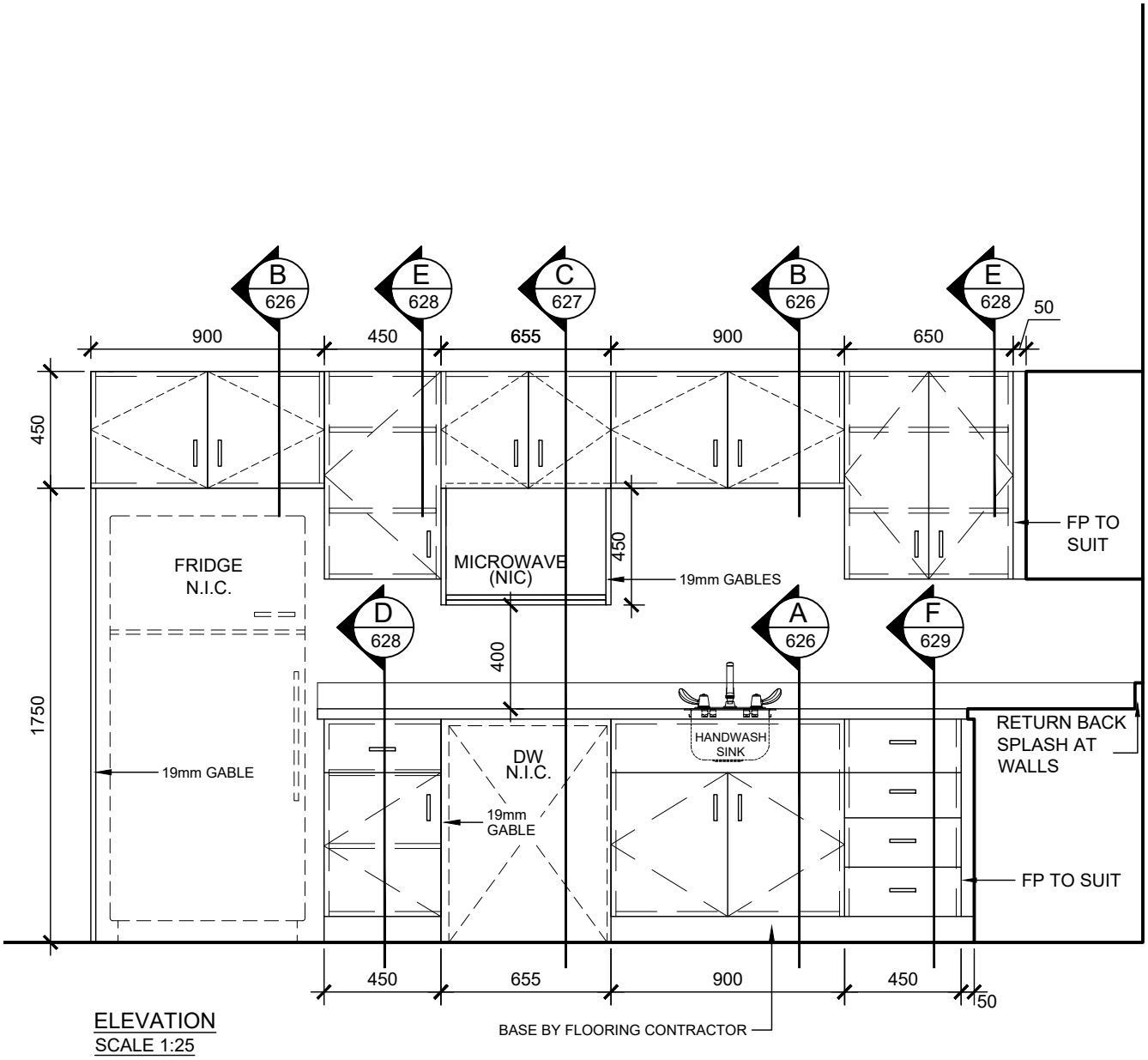
AD 623



ELEVATION
SCALE 1:25

BISHOP TONNOS CSS CLASSROOM RENOVATIONS
100 Panabaker Dr, Ancaster, ON L9G 5E3

MILLWORK TYPE MM-1

(ALTERNATIVE LEARNING CLASSROOM)

TYPICAL NOTE: MILLWORK IS 19mm CONSTRUCTION UNLESS OTHERWISE NOTED. REFER TO SPECIFICATIONS FOR MATERIAL TYPES & FINISHES

PROJ:	2024-25
SCALE:	AS NOTED
DRAWN:	AH
DATE:	FEB 2025

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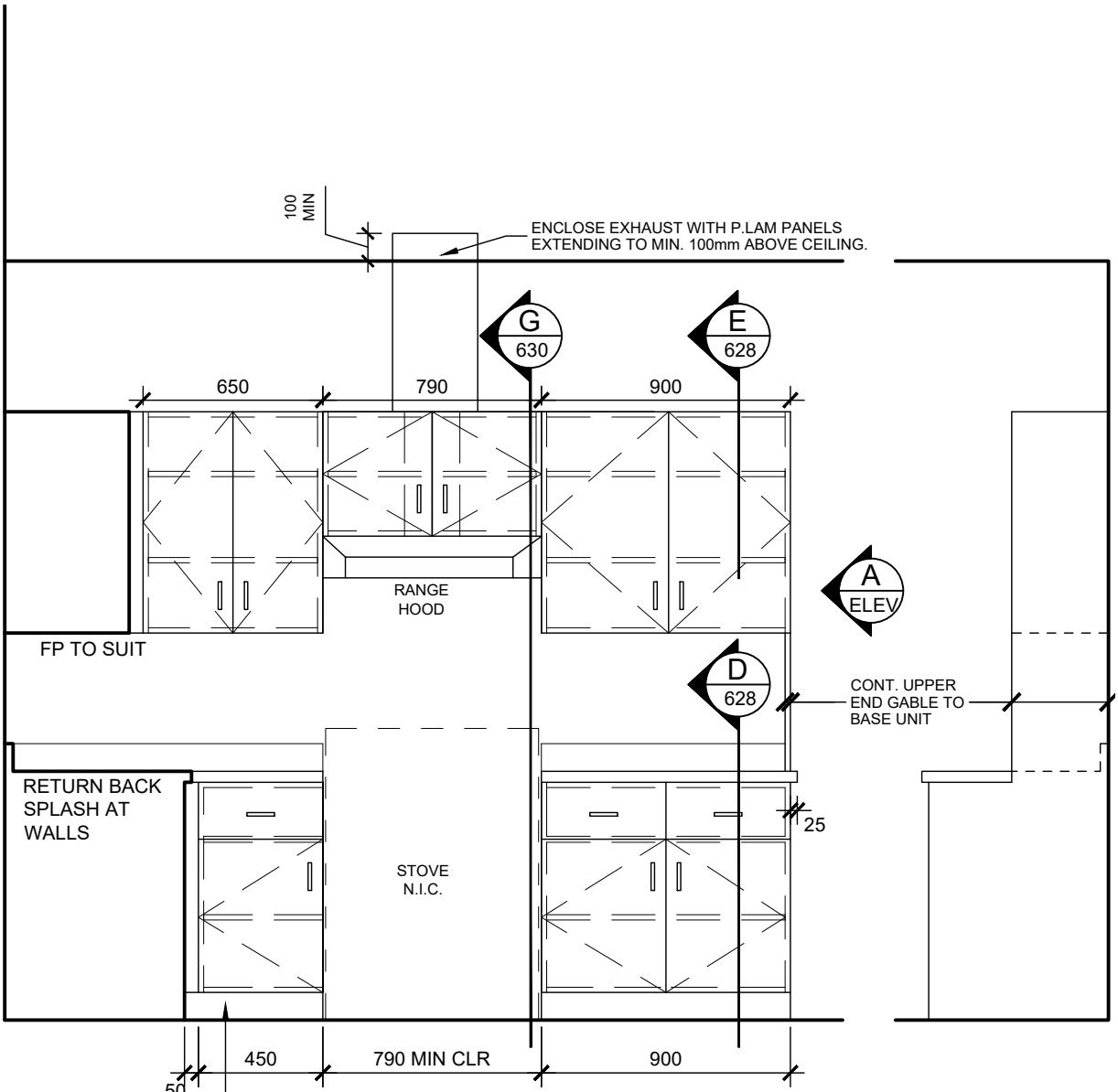
AD 624



ELEVATION
SCALE 1:25

ELEVATION - A
SCALE 1:25

BISHOP TONNOS CSS CLASSROOM RENOVATIONS
100 Panabaker Dr, Ancaster, ON L9G 5E3

MILLWORK TYPE MM-1

(ALTERNATIVE LEARNING CLASSROOM)

TYPICAL NOTE: MILLWORK IS 19mm CONSTRUCTION UNLESS OTHERWISE NOTED. REFER TO SPECIFICATIONS FOR MATERIAL TYPES & FINISHES

PROJ:	2024-25
SCALE:	AS NOTED
DRAWN:	AH
DATE:	FEB 2025

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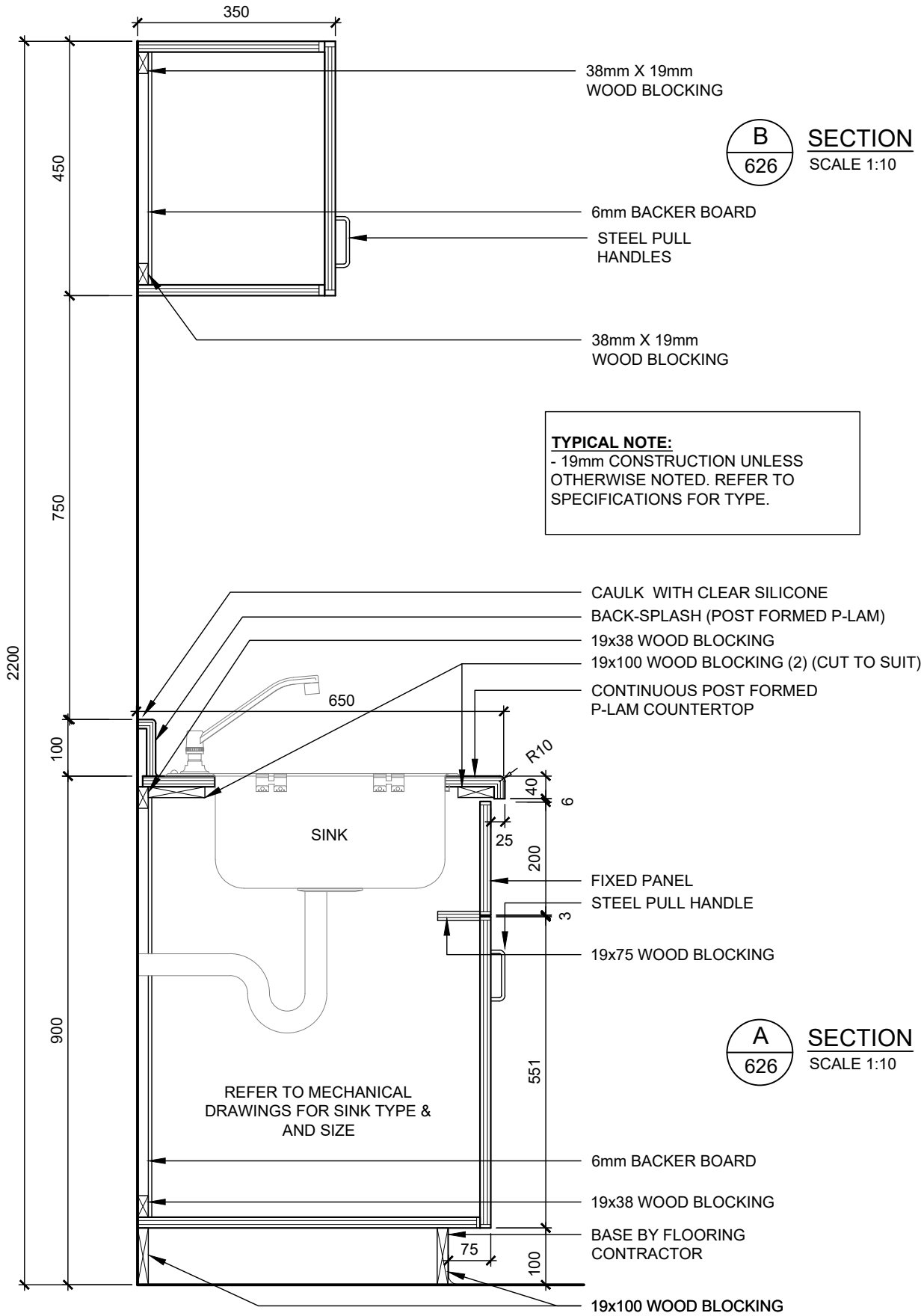
AD 625



TYPICAL NOTE:
- 19mm CONSTRUCTION UNLESS OTHERWISE NOTED. REFER TO SPECIFICATIONS FOR TYPE.

B / 626 SECTION
SCALE 1:10

A / 626 SECTION
SCALE 1:10

BISHOP TONNOS CSS CLASSROOM RENOVATIONS
100 Panabaker Dr, Ancaster, ON L9G 5E3

MILLWORK SECTION DETAIL

TYPICAL NOTE: MILLWORK IS 19mm CONSTRUCTION UNLESS OTHERWISE NOTED. REFER TO SPECIFICATIONS FOR MATERIAL TYPES & FINISHES

PROJ:	2024-25
SCALE:	AS NOTED
DRAWN:	AH
DATE:	FEB 2025

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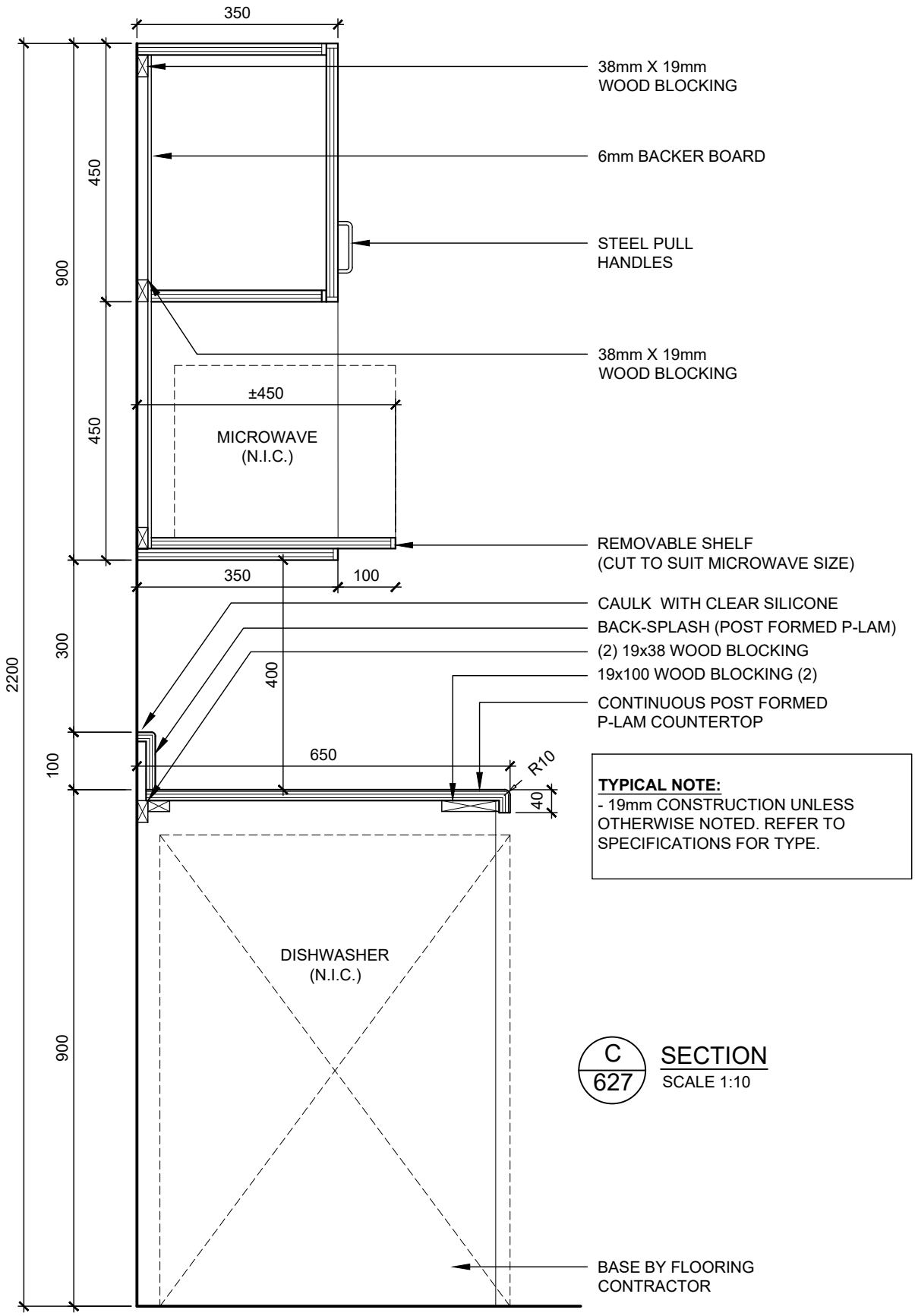
AD 626



TYPICAL NOTE:
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C / 627 SECTION
SCALE 1:10

BISHOP TONNOS CSS CLASSROOM RENOVATIONS
100 Panabaker Dr, Ancaster, ON L9G 5E3

MILLWORK SECTION DETAIL

TYPICAL NOTE: MILLWORK IS 19mm CONSTRUCTION UNLESS OTHERWISE NOTED. REFER TO SPECIFICATIONS FOR MATERIAL TYPES & FINISHES

PROJ:	2024-25
SCALE:	AS NOTED
DRAWN:	AH
DATE:	FEB 2025

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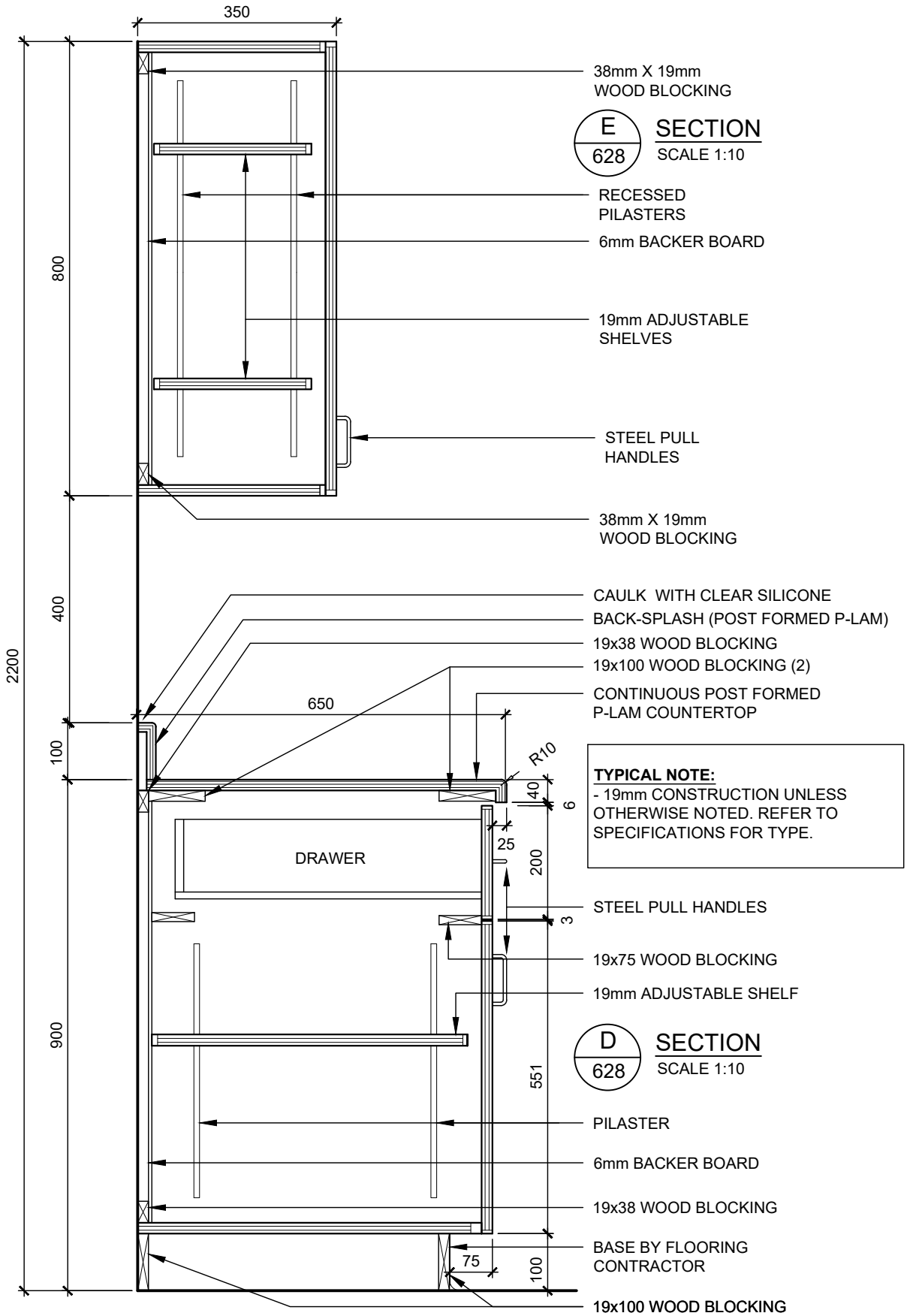
AD 627



BISHOP TONNOS CSS CLASSROOM RENOVATIONS
100 Panabaker Dr, Ancaster, ON L9G 5E3

MILLWORK SECTION DETAIL

TYPICAL NOTE: MILLWORK IS 19mm CONSTRUCTION UNLESS OTHERWISE NOTED. REFER TO SPECIFICATIONS FOR MATERIAL TYPES & FINISHES

PROJ:	2024-25
SCALE:	AS NOTED
DRAWN:	AH
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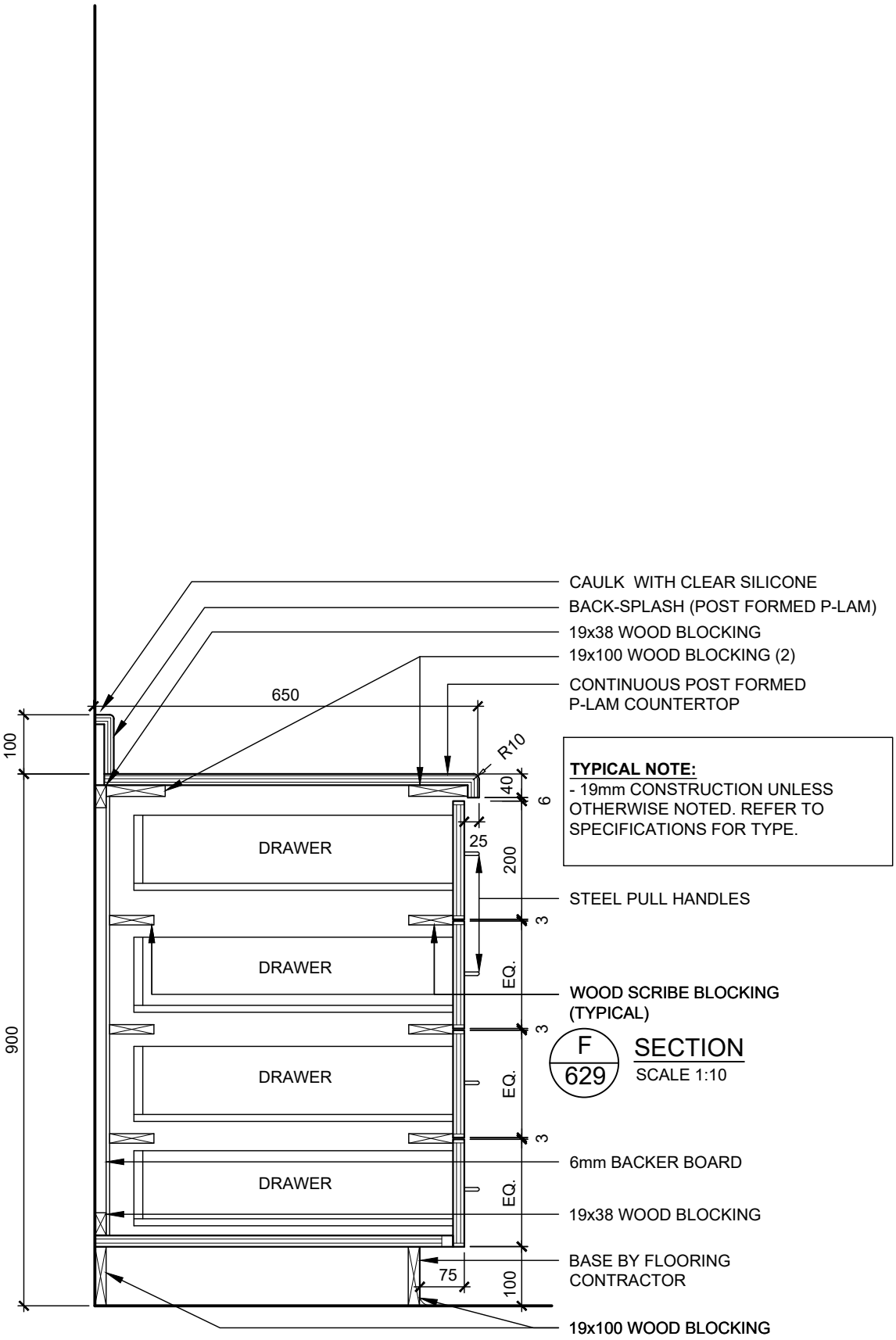
AD 628



BISHOP TONNOS CSS CLASSROOM RENOVATIONS
100 Panabaker Dr, Ancaster, ON L9G 5E3

MILLWORK SECTION DETAIL

TYPICAL NOTE: MILLWORK IS 19mm CONSTRUCTION UNLESS OTHERWISE NOTED. REFER TO SPECIFICATIONS FOR MATERIAL TYPES & FINISHES

PROJ:	2024-25
SCALE:	AS NOTED
DRAWN:	AH
DATE:	FEB 2025

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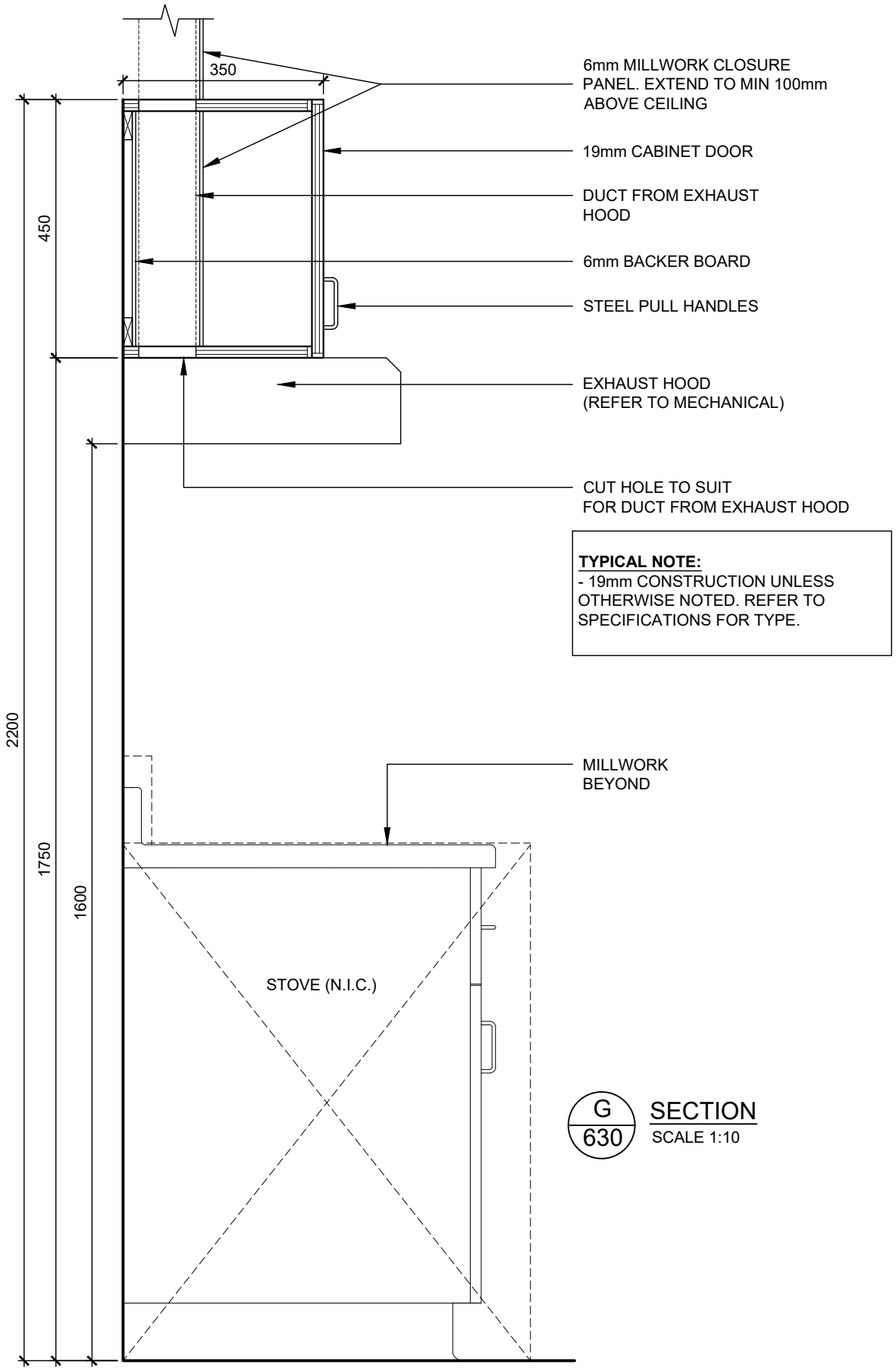
AD 629



TYPICAL NOTE:
- 19mm CONSTRUCTION UNLESS OTHERWISE NOTED. REFER TO SPECIFICATIONS FOR TYPE.

G/630 SECTION
SCALE 1:10

BISHOP TONNOS CSS CLASSROOM RENOVATIONS
100 Panabaker Dr, Ancaster, ON L9G 5E3

MILLWORK SECTION DETAIL

TYPICAL NOTE: MILLWORK IS 19mm CONSTRUCTION UNLESS OTHERWISE NOTED. REFER TO SPECIFICATIONS FOR MATERIAL TYPES & FINISHES

PROJ:	2024-25
SCALE:	AS NOTED
DRAWN:	AH
DATE:	FEB 2025

GRGURIC ARCHITECTS INCORPORATED
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AD 630

1 GENERAL

1.1 REFERENCE STANDARDS

.1 Applicable NFPA standards.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for fire protection system, equipment and accessories. Include product characteristics, performance criteria, physical size, finish and limitations.

.3 Submit drawings stamped and signed by Professional Engineer licensed in Province of Ontario, Canada. Drawings shall be prepared to scale in AutoCAD (DWG) format. Drawings prepared by consultant indicate general intent of the design and proposed locations for reference. Contractor's Fire Protection Engineer shall complete detailed design, calculations, systems layouts, schematics, and riser diagrams in accordance with NFPA 13, 14, 20 or other applicable NFPA standards.

.4 Submittals shall include system schematics, riser diagrams, detailed hydraulic calculations, design criteria and list of assumptions. Provide floor plans indicating zoning, location of all equipment and services, including piping sizes and equipment tags.

.5 Samples:

.1 Submit the following samples:

.1 Firehose nozzles.

.2 Section of hose.

.3 Each type of sprinkler head.

.4 Signs.

.6 Test reports:

.1 Submit certified test reports for standpipe and hose assembly from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.

.2 Submit certified test reports for wet pipe fire protection sprinkler systems from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.

.7 Manufacturers' Instructions:

.1 Provide manufacturer's installation instructions.

.8 Field Quality Control Submittals:

.1 Manufacturer's Field Reports: manufacturer's field reports specified.

.9 Provide submittals for all proposed equipment, including:

.1 Piping system, fittings, and valves for each dry, wet and gas suppression systems.

.2 Water flow and pressure switches.

.3 Sprinkler heads.

.4 Gas suppression system nozzles.

.5 Pre-action, deluge and alarm valves, including panels and devices.

.6 Wiring diagrams and interlocks.

.7 Pressure reducing and regulating assemblies.

.8 Backflow prevention devices.

.9 Fire pumps, jockey pumps and controllers.

.10 Test and drain assemblies.

.11 Fire hose cabinets and hose assemblies.

.12 Gas suppression system cabinets.

.13 Fire extinguishers.

.14 Specialized (kitchen) fire suppression system.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.

.1 Operation and maintenance manual approved by, and final copies deposited with, Owner's Representative and Consultant prior to final inspection.

.2 Operation data to include:

.1 Systems schematics, riser diagrams and controls.

.2 Description of systems and their controls.

.3 Description of operation of systems at various loads together with reset schedules and seasonal variances.

.4 Operation instruction for systems and component.

.5 Description of actions to be taken in event of equipment failure.

.6 Valves schedule and flow diagram.

.7 Colour coding chart.

.3 Maintenance data to 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 datasheets with point of operation as left after commissioning is complete.

.2 Equipment performance verification test results.

.3 Special performance data as specified.

.4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

.5 Manufacturer's catalogue Data, including specific model, type, and size for:

.1 Pipe and fittings.

.2 Alarm valves.

.3 Valves, including gate, check, and globe.

.4 Water motor alarms.

.5 Sprinkler heads.

.6 Pipe hangers and supports.

.7 Pressure or flow switch.

.8 Fire department connections.

.9 Excess pressure pump.

.10 Mechanical couplings.

.6 Drawings:

.1 Sprinkler heads and piping system layout.

.1 Prepare 760 mm by 1,050 mm detail working drawings of system layout in accordance with NFPA 13, “Working Drawings (Plans)”.

.2 Show data essential for proper installation of each system.

.3 Show details, plan view, elevations, and sections of systems supply and piping.

.4 Show piping schematic of systems supply, devices, valves, pipe, and fittings. Show point to point electrical wiring diagrams.

.2 Electrical wiring diagrams.

.7 Design Data:

.1 Calculations of sprinkler system design.

.2 Indicate type and design of each system and certify that each system has performed satisfactorily in the manner intended for not less than 18 months.

.8 Field Test Reports:

.1 Preliminary tests on piping system.

.7 Records:

.1 As-built drawings of each system.

.1 After completion, but before final acceptance, submit complete set of as-built drawings of each system for record purposes. Drawings shall be submitted in AutoCAD 2020 format (.dwg files) and PDF; adhere to Owner’s CAD Guidelines whenever applicable – coordinate with Owner’s representative prior to preparation of as-built drawings.

.2 Submit 760mm by 1,050 mm drawings on reproducible Mylar film with title block similar to full size contract drawings.

.8 Approvals:

.1 Submit 3 copies of draft Operation and Maintenance Manual to Owner’s Representative and Consultant for approval. Submission of individual data will not be accepted unless directed by Consultant.

.2 Make changes as required and re-submit as directed by Owner’s Representative and Consultant.

.9 Contractor’s Fire Protection Engineer Certification

.1 Contractor’s Fire Protection Engineer shall complete periodic field reviews at

their own discretion to witness and certify installation of the systems prior to concealment.

.2 Witness start-up, testing and commissioning of the fire protection systems.

.3 Once Contractor's Fire Protection Engineer is satisfied with the installation, testing and performance of the fire protection systems, submit stamped letter of conformance for each system, including but not limited to:

.1 NFPA 13 – Sprinkler System

.2 NFPA 14 – Standpipe and Fire Hose

.10 Additional data:

.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.2 If grooved piping system is used, contractor shall arrange for quality assurance services of the grooved piping system factory trained personnel to review the installation of the piping system including fittings, couplings, joints. Manufacturer shall use discretion in selecting sample of piping system to be verified. If sample fails, contractor shall complete required corrections and additional inspection shall take place until satisfaction of manufacturer's representative. Provide and include final letter in the closeout manuals.

.11 Operation and Maintenance Manuals:

.1 Provide detailed hydraulic calculations stamped by Engineer licenced in Ontario including summary sheet, and Contractors Material and Test Certificate for aboveground and underground piping and other documentation for incorporation into manual in accordance with NFPA 13, NFPA 14 and Authorities Having Jurisdiction..

1.3 MAINTENANCE MATERIAL SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Furnish spare parts as follows:

.1 One set of packing for each pump.

.2 One casing joint gasket for each size pump.

.3 One glass for each gauge glass.

.4 Sprinkler head cabinet with each type of sprinkler head used in the system, quantity of heads shall be in accordance with NFPA and AHJ.

.3 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 01 78 00 - Closeout Submittals.

.4 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements] [and] [with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

1.5 QUALITY ASSURANCE

.1 Qualifications:

.1 Installer: company or person specializing in standpipe and hose assembly with a minimum 5 years documented experience.

.2 Supply grooved joint couplings, fittings, valves, grooving tools and specialties from a single manufacturer. Use date stamped castings for coupling housings, fittings, valve bodies, for quality assurance and traceability.

2 PRODUCTS

2.1 GENERAL

.1 All equipment and materials shall be certified for fire protection installation in Canada and bear all required listings including ULC.

.2 All materials shall be supplied by single manufacturer.

.3 Provide fully functioning fire suppression system throughout the building or in work areas denoted on the drawings including wet systems in conditioned spaces, dry system in unheated or exterior spaces, pre-action system as noted on drawings, clean agent fire suppression system, standpipe and fire hose systems, portable fire extinguishers.

3 EXECUTION

3.1 GENERAL

.1 Grade fire suppression piping in the direction of drain fittings.

.2 Provide indirect drain of fire protection systems to funnel floor drains.

.3 Provide minimum schedule 10 pipe sleeves and chrome plated escutcheons for all fire protections piping for all penetrations.

.4 All piping, systems and services thru fire rated floor and wall assemblies shall be fire stopped in accordance with CAN4-S115-M85 - Standard Method of Fire Tests of Firestop Systems.

.5 All pipe penetrations thru underground exterior walls shall be sealed with modular link seal assembly.

.6 Provide all required core drilling, scan or x-ray floors and walls prior to drilling to avoid damage of any encased services or rebar. Obtain permission from Structural Engineer prior to any drilling.

3.2 FIELD QUALITY CONTROL

.1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit reports.

.2 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

.1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

END OF SECTION

1 GENERAL

1.1 REFERENCE STANDARDS

.1 National Fire Prevention Association (NFPA)

.1 NFPA 13, Standard for the Installation of Sprinkler Systems.

.2 NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection.

.3 NFPA 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances.

.4 NFPA 25, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.

.3 Underwriter's Laboratories of Canada (ULC)

.1 CAN4 S543-M984, Standard for Internal Lug Quick Connect Couplings for Fire Hose.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 In accordance with Section 21 05 00 – Common Work Results for Fire Suppression.

1.3 CLOSEOUT SUBMITTALS

.1 In accordance with Section 21 05 00 – Common Work Results for Fire Suppression.

1.4 QUALITY ASSURANCE

.1 In accordance with Section 21 05 00 – Common Work Results for Fire Suppression.

1.5 MAINTENANCE MATERIAL SUBMITTALS

.1 Extra Materials:

.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

.2 Provide spare sprinklers and tools in accordance with NFPA 13.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.3 Storage and Protection:

.1 Store materials indoors, in dry location.

.2 Store and protect materials from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

.4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials in accordance with Section 01 74 19 - Waste Management and Disposal.

2 PRODUCTS

2.1 DESIGN REQUIREMENTS

.1 Design automatic wet pipe fire suppression sprinkler systems in accordance with required and advisory provisions of NFPA 13, by pipe schedules for ordinary hazard occupancy.

.2 Include with each system materials, accessories, and equipment inside and outside building to provide each system complete and ready for use.

.3 Design and provide each system to give full consideration to blind spaces, piping, electrical equipment, ducts, and other construction and equipment in accordance with detailed shop drawings.

.4 Locate sprinkler heads in consistent pattern with ceiling grid, lights, and air supply diffusers.

.5 Devices and equipment for fire protection service: ULC approved for use in wet pipe sprinkler systems

.6 Location of Sprinkler Heads:

.1 Locate heads in relation to ceiling and spacing of sprinkler heads not to exceed that permitted by NFPA 13 for each hazard occupancy.

.2 Uniformly space sprinklers on branch.

.7 Water Distribution:

.1 Make distribution uniform throughout the area in which sprinkler heads will open.

.2 Discharge from individual heads in hydraulically most remote area to be 100 % of specified density.

.8 Density of Application of Water:

.1 Size pipe to provide specified density when system is discharging specified total maximum required flow.

.9 Sprinkler Discharge Area:

.1 Area: hydraulically most remote area as defined in NFPA 13

2.2 ABOVE GROUND PIPING SYSTEMS

.1 Provide fittings for changes in direction of piping and for connections.

.1 Making changes in piping sizes through tapered reducing pipe fittings, bushings will not be permitted.

.2 Perform welding in shop; field welding will not be permitted.

.3 Conceal piping in areas with suspended ceiling or drywall ceiling, where possible.

2.3 PIPE, FITTINGS AND VALVES

.1 Pipe:

.1 Ferrous: to NFPA 13

.2 Fittings and joints to NFPA 13:

.1 Ferrous: screwed, welded, flanged or roll grooved.

.1 Grooved joints designed with two ductile iron housing segments, pressure responsive gasket, and zinc-electroplated steel bolts and nuts. Cast with offsetting angle-pattern bolt pads for rigidity and visual pad-to-pad offset contact.

.2 Provide welded, threaded or grooved-end type fittings into which sprinkler heads, sprinkler head riser nipples, or drop nipples are threaded.

.3 Plain-end fittings with mechanical couplings and fittings which use steel gripping devices to bite into pipe when pressure is applied will [not] be permitted.

.4 Rubber gasketted grooved-end pipe and fittings with mechanical couplings are permitted in pipe sizes 32 mm and larger.

.5 Fittings: ULC approved for use in wet pipe sprinkler systems

.6 Ensure fittings, mechanical couplings, and rubber gaskets are supplied by same manufacturer.

.7 Side outlet tees using rubber gasketted fittings are [not] permitted.

.8 Sprinkler pipe and fittings: metal.

.3 Valves:

.1 ULC listed for fire protection service

.2 Gate valves: open by counterclockwise rotation.

.3 Provide rising stem, OS & Y, wall indicator valve beneath each alarm valve in each riser when more than one alarm valve is supplied from same water supply pipe.

.4 Check valves: flanged clear opening swing or spring actuated check type with flanged inspection and access cover plate for sizes 10 cm and larger.

.5 Provide gate valve in piping protecting elevator hoistways, machine rooms, and machinery spaces.

.4 Pipe hangers:

.1 ULC listed for fire protection services in accordance with NFPA

2.4 SPRINKLER HEADS

.1 General: to NFPA 13 and ULC listed for fire services

.2 Sprinkler Head Type:

.1 Type A: upright bronze.

.2 Type B: pendant chrome link and lever type.

.3 Type C: pendant chrome glass bulb type.

.4 Type D: recessed chrome, glass bulb type with ring and cup.

.5 Type E: flush chrome link and lever type.

.6 Type F: side wall chrome link and lever type.

.7 All sprinkler heads shall be quick response type unless otherwise noted on drawings.

.3 Provide nominal 1.2 cm orifice sprinkler heads.

.1 Provide polished chromium-plated pendent sprinklers below suspended ceilings.

.2 Provide corrosion-resistant sprinkler heads and sprinkler head guards in accordance with NFPA 13

.3 Provide sprinkler heads to ensure full coverage of the areas in scope of work. Design drawings indicate proposed layouts for general intent and purposes. Contractor's Fire Protection Engineer shall be responsible for hydraulic calculations and detailed design including locations of sprinkler heads, sizing and layout of the distribution piping, location of supervisory and flow switches.

.4 Deflector: not more than 75 mm below suspended ceilings.

.5 Ceiling plates: not more than 25 mm deep.

.6 Ceiling cups: not permitted.

.4 Sprinkler heads shall be ULC listed for service and use in installed occupancies.

.5 Sprinkler heads installed in locations subjected to damage or vandalism such as mechanical rooms, machinery room, loading dock, gymnasium, outside, stairs, etc shall be complete with listed guards.

2.5 ALARM CHECK VALVE

.1 Alarm check valve to NFPA 13 and ULC listed for fire service

.2 Provide variable pressure type alarm valve complete with retarding chamber, alarm test valve, alarm shutoff valve, drain valve, pressure gauges, accessories, and appurtenances for proper operation of system.

.3 Provide valve complete with internal components that are replaceable without removing the valve from the installed position.

2.6 WATER MOTOR ALARMS

.1 Provide alarms approved weatherproof and guarded type, to sound locally on flow of water in each corresponding sprinkler system.

.2 Mount alarms on outside of outer walls of each building at location as directed.

.3 Provide separate drain piping directly to exterior of building.

2.7 SUPERVISORY SWITCHES

.1 General: to NFPA 13 and ULC listed for fire service

.2 Valves:

.1 Mechanically attached to valve body, with normally open and normally closed contacts and supervisory capability.

.3 Pressure or flow switch type:

.1 With normally open and normally closed contacts and supervisory capability.

.2 Provide switch with circuit opener or closer for automatic transmittal of alarm over facility fire alarm system.

.3 Connect into building fire alarm system.

.4 Alarm actuating device: mechanical diaphragm controlled retard device adjustable from 10 to 60 seconds and instantly recycle.

.4 Pressure alarm switch:

.1 With normally open and normally closed contacts and supervisory capability.

2.8 WATER GONG

.1 To NFPA 13 and ULC listed for fire service. Location as indicated

2.9 FIRE DEPARTMENT CONNECTION

.1 Provide connections approximately 1.5 m above finish grade, location as indicated.

.2 To NFPA 13 and ULC S543 listed, Siamese type.

.3 Polished bronze of approved two-way type with 65mm (NPS 2 1/2) National Standard female hose threads with plug, chain, and identifying fire department connection escutcheon plate.

.4 Thread specifications: compatible with local fire department.

.5 Install a 90-degree elbow with drain connection at the low-point near each fire department connection to allow for system drainage to prevent freezing.

2.10 PRESSURE GAUGES

.1 ULC listed and to Section 23 05 19.13 - Thermometers and Pressure Gauges - Piping Systems.

.2 Maximum limit of not less than twice normal working pressure at point where installed.

2.11 PIPE SLEEVES

.1 Provide pipe sleeves where piping passes through walls, floors, and roofs.

.2 Secure sleeves in position and location during construction.

.3 Provide sleeves of sufficient length to pass through entire thickness of walls, floors, and roofs.

.4 Provide 2.5 cm minimum clearance between exterior of piping and interior of sleeve or core-drilled hole.

.1 Firmly pack space with mineral wool insulation.

.2 Seal space at both ends of sleeve or core-drilled hole with mechanically adjustable segmented elastomeric seal.

.3 In fire walls and fire floors, seal both ends of pipe sleeves or core-drilled holes with ULC listed fill, void, or cavity material

.5 Sleeves in Masonry and Concrete Walls, Floors, and Roofs:

.1 Provide hot-dip galvanized steel sleeves.

.2 Core drilling of masonry and concrete may be provided in lieu of pipe sleeves when cavities in core-drilled hole are completely grouted smooth.

.6 Sleeves in Other Than Masonry and Concrete Walls, Floors, and Roofs:

.1 Provide 0.61 mm thick galvanized steel sheet.

2.12 ESCUTCHEON PLATES

.1 Provide one piece metal plates for piping passing through walls, floors, and ceilings in exposed spaces.

.2 Provide polished chromium-plated finish on copper alloy plates in finished spaces.

.3 Provide paint finish on metal plates in unfinished spaces.

2.13 INSPECTOR'S TEST CONNECTION

.1 Locate inspector's test connection at hydraulically most remote part of each system, provide test connections approximately 3 m above floor for each sprinkler system or portion of each sprinkler system equipped with alarm device.

.2 Provide test connection piping to location where discharge will be readily visible and where water may be discharged without property damage.

.3 Provide discharge orifice of same size as corresponding sprinkler orifice.

2.14 SIGNS

.1 Attach properly lettered Bilingual and approved metal signs to each valve and alarm device to NFPA 13.

.2 Permanently fix hydraulic design data nameplates to riser of each system.

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 datasheet.

3.2 DESIGN

.1 Design, provide, inspect and test fully functioning fire protection system to acceptance in accordance with NFPA 13, NFPA 25, Ontario Building Code, Ontario Fire Code and local bylaws.

.2 System hydraulic calculations and detailed design shall be solely responsibility of the Contractor's Fire Protection Engineer licensed in Ontario. Submit detailed package of stamped submittals to Consultant and AHJ for review and approval.

.3 Site hydraulic data shall be filed verified by Contractor and used by Fire Protection Engineer for hydraulic calculations.

.4 Contractor's Engineer shall conduct field inspection of the existing conditions prior to design.

.5 Contractor's Engineer shall conduct periodic quality assurance review of the progress installation and provide reports noting deficiencies or otherwise confirming compliance with the design intent.

.6 Prior to substantial completion Contractor's Engineer shall provide stamped Letter of Conformance confirming installation meets design intent, NFPA 13 and local codes.

3.3 INSTALLATION

.1 Install piping straight and true to bear evenly on hangers and supports. Do not hang piping from plaster ceilings.

.2 Keep interior and ends of new piping and existing piping thoroughly cleaned of water and foreign matter.

.3 Keep piping systems clean during installation by means of plugs or other approved methods. When work is not in progress, securely close open ends of piping to prevent entry of water and foreign matter.

.4 Inspect piping before placing into position.

.5 Sprinkler heads shall be installed on center or quarter point of long dimension of the ceiling tiles and on center point of long dimension of ceiling tile. Coordinate location of sprinkler heads with other ceiling mounted devices including smoke detectors, lights, diffusers, speakers, wifi modules, etc and install sprinkler heads in symmetry with these devices.

.6 Sprinkler heads shall not be reused.

.7 Do not installed damaged or defective sprinkler heads.

.8 Installation of grooved piping systems shall be in conformance with manufacturer's requirements. Manufacturer's trained personnel shall provide training to contractor's personnel on installation methods of grooved piping systems. Manufacturer's trained personnel shall complete periodic quality assurance inspections to observe progress installation of the piping system and provide reports. A final conformance letter shall be provided certifying that installation of grooved piping system meets manufacturer's requirements.

3.4 ELECTRICAL CONNECTIONS

.1 Provide electrical work associated with this section in accordance with Division 26 requirements.

.2 Provide fire alarm system in accordance with Division 28.

.3 Provide control and fire alarm wiring, including connections to fire alarm systems, in accordance with National Electrical Code.

.4 Provide wiring in rigid metal conduit or intermediate metal conduit.

3.5 DISINFECTION

.1 Disinfect new piping and existing piping.

.2 Fill piping systems with solution containing minimum of 50 parts per million of chlorine and allow solution to stand for minimum of 24 hours.

.3 Flush solution from systems with clean water until maximum residual chlorine content is not greater than 0.2 part per million or residual chlorine content of domestic water supply.

.4 Obtain at least two consecutive satisfactory bacteriological samples from piping, analyzed by certified laboratory, and submit results prior to piping being placed into service.

3.6 CONNECTIONS TO EXISTING WATER SUPPLY SYSTEMS

.1 Notify Contracting Officer in writing at least 15 days prior to connection date.

.2 Use tapping or drilling machine valve and mechanical joint type sleeves for connections to be made under pressure.

.3 Bolt sleeves around main piping.

.4 Bolt valve to branch connection. Open valve, attach drilling machine, make tap, close valve, and remove drilling machine, without interruption of service.

.5 Furnish materials required to make connections into existing water supply systems, and perform excavating, backfilling, and other incidental labour as required.

3.7 FIELD PAINTING

.1 Clean, pretreat, prime, and paint new systems including valves, piping, conduit, hangers, supports, miscellaneous metalwork, and accessories.

.2 Apply coatings to clean, dry surfaces, using clean brushes.

.3 Clean surfaces to remove dust, dirt, rust, and loose mill scale.

.4 Immediately after cleaning, provide metal surfaces with 1 coat of pretreatment primer applied to minimum dry film thickness of 0.3 ml, and one coat of zinc chromate primer applied to minimum dry film thickness of 1.0 ml.

.5 Shield sprinkler heads with protective covering while painting is in progress.

.6 Upon completion of painting, remove protective covering from sprinkler heads.

.7 Remove sprinkler heads which have been painted and replace with new sprinkler heads.

.8 Provide primed surfaces with following:

.1 Piping in Finished Areas:

.1 Provide primed surfaces with 2 coats of paint to match adjacent surfaces.

.2 Provide valves and operating accessories with 1 coat of red alkyd gloss enamel applied to minimum dry film thickness of 1.0 mil.

.3 Provide piping with 50mm wide red enamel bands spaced at maximum of 6 m intervals throughout piping systems.

.2 Piping in Unfinished Areas:

.1 Provide primed surfaces with one coat of red alkyd gloss enamel applied to minimum dry film thickness of 1.0 mil in attic spaces,[spaces above suspended ceilings, crawl spaces, pipe chases, mechanical equipment room, and spaces where walls or ceiling are not painted or not constructed of a prefinished material.

.2 Provide piping with 50 mm wide red enamel spaced at maximum of 6 m intervals.

3.8 FIELD QUALITY CONTROL

.1 Site Test, Inspection:

.1 Perform test to determine compliance with specified requirements in presence of Contractor's Fire Protection Engineer. Owner's Representative or Consultant may chose to witness testing, provide minimum (5) business days' notice prior to tests.

.2 Test, inspect, and approve piping before covering or concealing.

.3 Preliminary Tests:

.1 Hydrostatically test each system at 200 psig for a 2 hour period with no leakage or reduction in pressure.

.2 Flush piping with potable water in accordance with NFPA 13

.3 Piping above suspended ceilings: tested, inspected, and approved before installation of ceilings.

.4 Test alarms and other devices.

.5 Test water flow alarms by flowing water through inspector's test connection. When tests have been completed and corrections made, submit signed and dated certificate in accordance with NFPA 13

.4 Formal Tests and Inspections:

.1 Do not submit request for formal test and inspection until preliminary test and corrections are completed and approved.

.2 Submit written request for formal inspection at least 15 days prior to inspection date.

.3 Repeat required tests as directed.

.4 Correct defects and make additional tests until systems comply with contract requirements.

.5 Furnish appliances, equipment, instruments, connecting devices, and personnel for tests.

.6 Authority of Jurisdiction will witness formal tests and approve systems before they are accepted.

.2 Site Tests:

.1 Field test each fire pump, driver and controllers in accordance with NFPA 20. Testing shall include:

.1 Verification of proper installation, system initiation, system operation, adjustment and fine tuning.

.2 Verification of the sequence of operations and alarm systems.

.2 Testing to be witnessed by Contractor's Fire Protection Engineer and authority having jurisdiction.

.3 Develop detailed instructions for O & M of this installation.

3.9 CLEANING

.1 Clean in accordance with Section 01 74 00 - Cleaning.

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

END OF SECTION

1 GENERAL

1.1 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for all equipment, systems and accessories; include product characteristics, performance criteria, materials, physical size, weights, finishes, listings, approvals, limitations, warranty and lead times.

.3 Shop Drawings:

.1 Submit shop drawings for all plumbing systems, components and equipment, including:

.1 Plumbing fixtures.

.2 Piping system.

.3 Valves and fittings.

.4 Cleanouts.

.5 Floor and roof drains.

.6 Trap seal primers.

.7 Hot water heaters and storage tanks.

.8 Hose bibs.

.9 Pumps, including controls.

.10 Backflow preventers.

.11 Pressure reducing valves.

.12 Water hammer arrestors.

.13 Access panels and doors.

.2 Indicate on drawings:

.1 Mounting arrangements.

.2 Operating and maintenance clearances.

.3 List of accessories and options specific to each equipment.

.3 Shop drawings and product data 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 current model production.

.5 Certification of compliance to applicable codes.

.6 Installation instructions.

1.2 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.

.1 Operation and maintenance manual approved by, and final copies deposited with, Owner's Representative and Consultant before final inspection.

.2 Operation data to include:

.1 Control schematics for systems including environmental controls.

.2 Description of systems and their controls.

.3 Description of operation of systems at various loads together with reset schedules and seasonal variances.

.4 Operation instruction for systems and component.

.5 Description of actions to be taken in event of equipment failure.

.6 Valves schedule and flow diagram.

.7 Colour coding chart.

.8 Testing data (backflow preventer, etc).

.3 Maintenance data to 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 datasheets with point of operation as left after commissioning is complete.

.2 Equipment performance verification test results.

.3 Special performance data as specified.

.4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

.5 Approvals:

.1 Submit 2 copies of draft Operation and Maintenance Manual to Owner's Representative and Consultant for approval. Submission of individual data will not be accepted unless directed by Consultant.

.2 Make changes as required and re-submit as directed by Consultant.

.6 Additional data:

.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

7 Records:

.1 As-built drawings of each system.

.2 After completion, but before final acceptance, submit complete set of as-built drawings of each system for record purposes. Drawings shall be submitted in AutoCAD 2020 format (.dwg files) and PDF; adhere to Owner's CAD Guidelines whenever applicable – coordinate with Owner's representative prior to preparation of as-built drawings.

.3 Submit 760mm by 1,050 mm drawings on reproducible Mylar film with title block similar to full size contract drawings.

.4 Use different colour waterproof ink for each service.

.5 Make available for reference purposes and inspection.

.8 As-built drawings:

.1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings. Contractor shall be responsible for all changes, revisions and updates of the AutoCAD drawings.

.2 Submit to Consultant for approval and make corrections as directed.

.4 Perform testing, adjusting and balancing for HVAC using as-built drawings.

.5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

.9 Submit copies of as-built drawings for inclusion in final TAB report.

1.3 MAINTENANCE MATERIAL SUBMITTALS

.1 Submit in accordance with Section [01 78 00 - Closeout Submittals].

.2 Furnish spare parts as follows:

.1 One set of packing for each pump.

.2 One casing joint gasket for each size pump.

.3 One glass for each gauge glass.

.3 Provide one set of special tools required to service equipment as recommended by manufacturers.

.4 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

2 PRODUCTS

2.1 ACCESS PANELS/DOORS

.1 Provide access panels at all locations of concealed equipment, fittings requiring access for operation, maintenance and repair including but not limited to valves, traps, cleanouts, expansion devices, air vents, water hammer arrestors, trap seal primers, vacuum breakers, plumbing controls.

.2 Access doors shall be located to provide complete access to concealed equipment and devices.

.3 Construction:

.1 Plaster or wet wall: 16 ga steel flush with surface complete with gasket and concealed flange.

.2 Masonry or drywall: 16 ga steel flush with surface complete with gasket and concealed flange.

.4 Finish:

.1 Tiled or marble surfaces: type 304 stainless steel, #4 satin polish.

.2 Other areas: prime coated steel, finished to match adjacent.

.5 Options and accessories:

.1 Continuous concealed hinges.

.2 Adjustable anchoring straps to suit installation.

.3 Mineral wool insulation (for fire rated panels).

.4 Self latching screw driver operated slam latch.

.5 Automatic panel closer.

.6 Inside latch release.

.6 Sizing:

.1 Access panels/doors shall be of adequate size to facilitate access to all components. The following are minimum recommended sizes:

.1 Hand access: 300x300mm (12”x12”)

.2 Body entry access: 600x600mm (24”x24”)

.7 Fire rating

.1 Access doors/panels installed in fire rated floor and wall assemblies shall have similar fire rating and corresponding ULC label.

3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer’s written instructions.

.1 Visually inspect substrate in presence of Departmental Representative and Consultant.

.2 Inform Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed Consultant.

3.2 PAINTING REPAIRS AND RESTORATION

.1 Do painting in accordance with Section 09 91 23 - Interior Painting.

.2 Prime and touch up marred finished paintwork to match original.

.3 Restore to new condition, finishes which have been damaged.

3.3 SYSTEM CLEANING

.1 Clean interior and exterior of all systems including strainers.

.2 Clean all fixtures and accessories.

3.4 FIELD QUALITY CONTROL

.1 Site Tests: conduct tests in accordance with Section 01 45 00 - Quality Control and submit reports to Consultant.

.2 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports to Consultant.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.5 DEMONSTRATION

.1 Owner's Representative or Consultant may use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

.2 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.

.3 Use operation and maintenance manual, as-built drawings, and audio-visual aids as part of instruction materials.

.5 Instruction duration time requirements as specified in appropriate sections.

.6 Contractor shall record these demonstrations on video tape for future reference.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

3.7 PROTECTION

.1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

3.8 CORING

.1 Provide core drilling for installation of plumbing systems.

.2 X-ray or scan floor and wall assemblies prior to core drilling, consult with Consultant on any noted interferences. X-ray shall only be carried out after hours, coordinate with Owner's Representative and provide minimum 10 business days' notice.

.3 Coring and cutting of structural components shall only be completed once approved by Structural Engineer.

.4 Repair adjacent finishes and any damages as a result of this work to satisfaction of Owner's Representative and Consultant.

.5 Verify obstructions and interference on the other side of the floor and wall assemblies prior to coring. If any obstructions are noted, contractor shall locate alternate core locations and propose to Consultant for review and approval. Proceed with coring at alternate locations only once approved by Consultant.

END OF SECTION

1 GENERAL

1.1 REFERENCE STANDARDS

.1 ASTM International (ASTM)

.1 ASTM A126, Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.

.2 ASTM B62, Standard Specification for Composition Bronze or Ounce Metal Castings.

.2 American Water Works Association (AWWA)

.1 ANSI/AWWA C700, Standard for Cold Water Meters-Displacement Type, Bronze Main Case.

.2 ANSI/AWWA C701, Standard for Cold Water Meters-Turbine Type for Customer Service.

.3 ANSI/AWWA C702, Standard for Cold Water Meters-Compound Type.

.3 CSA Group (CSA)

.1 CSA-B64 Series, Backflow Preventers and Vacuum Breakers.

.2 CSA B79, Commercial and Residential Drains and Cleanouts.

.3 CAN/CSA-B356, Water Pressure Reducing Valves for Domestic Water Supply Systems.

.4 Efficiency Valuation Organization (EVO)

.1 International Performance Measurement and Verification Protocol (IPMVP).

.1 IPMVP.

.5 National Research Council Canada (NRC)

.1 National Plumbing Code of Canada (NPC).

.6 Plumbing and Drainage Institute (PDI)

.1 PDI-G101, Testing and Rating Procedure for Grease Interceptors with Appendix of Installation and Maintenance.

.2 PDI-WH201, Water Hammer Arresters Standard.

.7 American National Standards Institute/National Sanitation Foundation (ANSI/NSF).

.1 ANSI/NSF 61, Drinking Water System Components.

.2 ANSI/NSF 372, Drinking Water System Components – Lead Content.

2 PRODUCTS

2.1 FLOOR DRAINS

.1 Floor Drains and Trench Drains: to CSA B79 complete with trap seal primer and venting in accordance with Ontario Building Code Part 7.

.2 FD-1 (general duty): cast iron body round, adjustable head, nickel bronze strainer, integral seepage pan, and clamping collar.

.3 FD-2 (heavy duty): cast iron body, heavy duty non-tilting or hinged lacquered cast iron grate, integral seepage pan and clamping collar.

.4 FFD-1 (combination funnel floor drain): cast iron body with integral seepage pan, clamping

collar, nickel-bronze adjustable head strainer with integral funnel.'

.5 Standard of acceptance: Zurn, J.R. Smith or Watts.

2.2 ROOF DRAINS

.1 RD-1 (standard roof drain): cast iron body with aluminum dome, under-deck clamp to suit roof construction, flashing clamp ring with integral gravel stop.

.3 RD-2 (cornice, sill or canopy drain): cast iron body with cast aluminum dome, strainer and flashing clamp ring.

.4 RD-3 (parapet or scupper drain): cast iron body with aluminum strainer/grate and flashing clamp.

.5 RD-4 (inverted roofing system): cast iron body with aluminum dome, under-deck clamp and sump receiver to suit roof construction, with integral gravel stop and stainless steel drainage grid.

.6 RD-4 (controlled flow): aluminum body, under deck clamp and sump receiver to suit roof construction, flashing clamp ring with integral gravel stop, bearing pan, flow control weir assembly, aluminum dome.

.7 Standard of acceptance: Zurn, J.R. Smith or Watts.

2.3 CLEANOUTS

.1 Cleanout Plugs: heavy cast iron male ferrule with brass screws and threaded brass or bronze plug. Sealing-caulked lead seat or neoprene gasket.

.2 Access Covers:

.1 Wall Access: face or wall type, stainless steel square cover with flush head securing screws, bevelled edge frame complete with anchoring lugs.

.2 Floor Access: round cast iron body and frame with adjustable secured nickel bronze top and:

.1 Plugs: bolted bronze with neoprene gasket.

.2 Cover for Unfinished Concrete Floors: cast iron or nickel bronze round square, gasket, vandal-proof screws.

.3 Cover for Terrazzo Finish: polished nickel bronze or brass with recessed cover for filling with terrazzo, vandal-proof locking screws.

.4 Cover for Tile and Linoleum Floors: polished nickel bronze with recessed cover for linoleum or tile infill, complete with vandal-proof locking screws.

.5 Cover for Carpeted Floors: polished nickel bronze with deep flange cover for carpet infill, complete with carpet retainer vandal-proof locking screws.

.3 Standard of acceptance: Zurn, J.R. Smith or Watts.

2.4 NON-FREEZE WALL HYDRANTS

.1 Surface mount with integral vacuum breaker, 20mm (NPS 3/4) hose outlet, removable operating key, polished bronze finish.

.2 Standard of acceptance: Zurn, J.R. Smith or Watts.

2.5 NON-FREEZE GROUND HYDRANT

.1 Deck type with polished bronze] box with hinged cover, removable operating key, bronze

casing for 2,150 mm ground cover, all-bronze valve body and working parts, 20mm (NPS 3/4) inlet and outlet, anchor flange, membrane clamp.

.2 Standard of acceptance: Zurn, J.R. Smith or Watts.

2.6 WATER HAMMER ARRESTORS

.1 Copper construction, piston type: to PDI-WH201.

.2 Lead free construction.

.3 Standard of acceptance: Zurn or Watts.

2.7 BACKFLOW PREVENTERS

.1 Provide backflow preventers on main incoming water service, interface between potable and non-potable systems and where indicated on drawings in accordance with CAN CSA B64.

.2 Reduced Pressure Principle Assembly (RPZ) – 65mm (NPS 2 1/2) to 250mm (NPS 10)

.1 Construction: lead free construction, 304L stainless steel main body and access covers, EPDM seal ring, Buna Nitrile O-rings and stainless steel sensing line, stainless steel stem (ASTM A 276), EPDM seat disc.

.2 Maximum working pressure and temperature: 1,200 kPa (175 psi) and 60ºC (140ºF).

.3 Class 150 flanged end connections to ASME B16.42.

.4 Flanged end OS&Y gate valves.

.5 Checks and the relief valve shall be accessible for maintenance without removing the device from the line.

.6 Listings and certifications:

.1 ASSE Listed 1013

.2 AWWA Compliant C511 (with gates only), and C550

.3 FM Approved

.4 UL Classified

.5 cUL Classified

.6 CSA Certified

.7 IAPMO Listed

.8 Meets the requirements of NSF/ANSI/CAN 61.

.7 Standard of Acceptance: Zurn or Watts

.3 Double Check Valve Assembly (DCVA) - 65mm (NPS 2 1/2) to 250mm (NPS 10)

.1 Construction: lead free construction, 304L stainless steel main body and access covers, EPDM seal ring, Buna Nitrile O-rings and stainless steel sensing line, stainless steel stem (ASTM A 276), EPDM seat disc.

.2 Maximum working pressure and temperature: 1,200 kPa (175 psi) and 60ºC (140ºF).

.3 Class 150 flanged end connections to ASME B16.42.

.4 Flanged end OS&Y gate valves.

.5 Checks and the relief valve shall be accessible for maintenance without removing the device from the line.

.6 Listings and certifications:

.1 ASSE Listed 1015
.2 AWWA Compliant C510 (with gates only), and C550
.3 FM Approved
.4 UL Classified
.5 cUL Classified
.6 CSA Certified
.7 IAPMO Listed

.7 Standard of Acceptance: Zurn or Watts

2.8 VACUUM BREAKERS

.1 Breakers: to CSA-B64 Series, vacuum breaker atmospheric.

2.9 PRESSURE REGULATORS

.1 Capacity: as indicated.
.1 Inlet pressure: 1,034 kPa (150 psi).
.2 Outlet pressure: 413 kPa (60 psi) or as indicated on drawings.

.2 Up to 40mm (NPS 1-1/2): bronze bodies, screwed: to ASTM B62

.3 50mm (NPS 2) and over: semi-steel bodies, Class 125, flanged: to ASTM A126, Class B.

.4 Semi-steel spring chambers with bronze trim.

2.10 BACKWATER VALVES (BWV)

.1 Coated extra heavy cast iron body with bronze seat, revolving bronze flapper and threaded cover.

.2 Access:
.1 Surface access.
.2 Access pipe with cover: maximum 300 mm depth.
.3 Steel housing with gasketted steel cover.
.4 Concrete access pit with cover, as indicated.

2.11 HOSE BIBBS AND SEDIMENT FAUCETS

.1 Bronze construction complete with integral back flow preventer, hose thread spout, replaceable composition disc, and chrome plated in finished areas.

2.12 WATER MAKE-UP ASSEMBLY

.1 Complete with reduced pressure principle backflow preventer, common pressure gauge on inlet and outlet with isolation valves, pressure reducing valve to CAN/CSA-B356, pressure relief valve on low pressure side and gate valves on inlet and outlet

2.13 WATER METERS

.1 Water meter shall be supplied by municipal water services, size as indicated on drawings. Meter shall be complete with remote readouts and pulse output for integration into Building Automation System (BAS).

.2 Contractor shall be responsible for all costs of obtaining meter including cost of the meter,

transportation, applications.

.3 Meter shall be complete with bypass, drain fittings in accordance with installation details and authorities having jurisdiction.

2.14 TRAP SEAL PRIMERS (TSP)

.1 Single Drain Primer Station

.1 Constructed of C693 Lead Free brass, EPDM E70 O-rings, Dow #7 Silicone, #60 stainless steel mesh screen, stainless steel adjustment screw.

.2 Unit shall be complete with adjusting screw to allow for adjustment for static line pressure.

.3 Operating range: 138 kPa (20 psi) to 552 kPa (80 psi).

.4 Provide shut off valve on inlet and union on outlet for servicing.

.5 Standard of acceptance: Precision Plumbing Products P1-500.

.2 Combined Trap Seal Primer Assembly

.1 Provide when serving multiple drains.

.2 Trap seal assembly shall provide automatic water seal in floor drain traps and shall be complete with atmospheric vacuum breaker, pre-set 24-hour adjustable timer, manual override switch, 120V solenoid valve, 20mm (NPS 3/4) connection, calibrated manifold for equal water distribution, fire rated access door prime coated.

.3 Operating range: 138 kPa (20 psi) to 1,034 kPa (150 psi).

.4 Standard of acceptance: Precision Plumbing Products PT series, model number from PT-4 to PT-12 to suit number of served traps at each location.

2.15 STRAINERS

.1 860 kPa, Y type with 20 mesh, monel, bronze or stainless steel removable screen.

.2 50mm (NPS 2) and under: bronze body, screwed ends, with brass cap.

.3 65mm (NPS 2 1/2) and over: cast iron body, flanged ends, with bolted cap.

2.16 DIELECTRIC UNIONS

.1 Provide on connections between dissimilar metals.

.2 50mm (NPS 2) and under: provide insulating unions.

.3 65mm (NPS 2 1/2) and over: provide insulating flanges.

.4 Isolation shall be provided where piping may come in contact with dissimilar metals including hangers, supports, joists and studs.

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 INSTALLATION

.1 Install in accordance with National Plumbing Code of Canada (NPC), Ontario Building Code Part 7 and local authority having jurisdiction.

.2 Install in accordance with manufacturer's instructions and as specified.

3.3 CLEANOUTS

.1 Install cleanouts at base of soil and waste stacks, and rainwater leaders, at locations required code, and as indicated.

.2 Bring cleanouts to wall or finished floor unless serviceable from below floor.

.3 Building drain cleanout and stack base cleanouts: line size to maximum 100mm (NPS 4).

.4 Cleanouts installed outside shall be encased in concrete and flush with grade.

.5 Unless otherwise noted, cleanout shall not be installed in finished areas.

3.4 NON-FREEZE WALL HYDRANTS

.1 Install 600 mm above finished grade and as indicated.

3.5 NON-FREEZE GROUND HYDRANT

.1 Install with top of box flush with ground and with drainage connection to discharge as indicated.

3.6 WATER HAMMER ARRESTORS

.1 Install on branch supplies to fixtures or group of fixtures and where indicated.

3.7 BACK FLOW PREVENTERS

.1 Install in accordance with CSA-B64 Series, where indicated and elsewhere as required by code

.2 Pipe discharge to terminate over nearest drain.

.3 Ensure adequate service clearance around the backflow prevented in accordance with local codes and CSA-B64.

.4 Flush line thoroughly prior to installation to remove all debris, chips, welding slag and other foreign materials.

.5 Use backflow prevention devices approved for installation in horizontal and vertical installation as specified.

.6 Do not install strainer on backflow preventers serving fire protection systems unless otherwise noted.

.7 OS&Y gate valves of backflow preventers installed on fire protections service shall be electrically supervised and connected to fire alarm system for monitoring and alarming, coordinate installation with Division 26.

3.8 BACKWATER VALVES

.1 Install in main sewer lines, at weeping tile connection in pit provided at building cleanout, at floor drain in elevator pit, at floor drains in critical spaces and where indicated.

3.9 HOSE BIBBS AND SEDIMENT FAUCETS

.1 Install at bottom of risers, at low points to drain systems, and as indicated.

3.10 TRAP SEAL PRIMERS

.1 Install for all floor drains and elsewhere, as indicated.

.2 Install on cold water supply to nearest frequently used plumbing fixture, in concealed space, to approval of Consultant.

.3 Install soft copper tubing to floor drain.

3.11 STRAINERS

.1 Install with sufficient room to remove basket for maintenance.

3.12 GREASE INTERCEPTORS

.1 Install with sufficient space, as indicated, for maintenance.

3.13 WATER METERS

.1 Install water meter provided by local water authority.

.2 Install water meter as indicated.

3.14 WATER MAKE-UP ASSEMBLY

.1 Install on connections to closed loop heating, cooling systems and open loop condenser water systems.

.2 Pipe discharge from relief valve to nearest floor drain.

3.15 START-UP

.1 General:

.1 In accordance with Section 01 91 13 - General Commissioning Requirements: General Requirements, supplemented as specified herein.

.2 Timing: start-up only after:

.1 Pressure tests have been completed.

.2 Disinfection procedures have been completed.

.3 Certificate of static completion has been issued.

.4 Water treatment systems operational.

.3 Provide continuous supervision during start-up.

3.16 TESTING AND ADJUSTING

.1 General:

.1 Test and adjust plumbing specialties and accessories in accordance with Section 01 91 13 - General Commissioning Requirements: General Requirements, supplemented as specified.

.2 Timing:

.1 After start-up deficiencies rectified.

.2 After certificate of completion has been issued by authority having jurisdiction.

.3 Application tolerances:

.1 Pressure at fixtures: +/- 70 kPa.

.2 Flow rate at fixtures: +/- 20%.

.4 Adjustments:

.1 Verify that flow rate and pressure meet design criteria.

.2 Make adjustments while flow rate or withdrawal is (1) maximum and (2) 25% of maximum and while pressure is (1) maximum and (2) minimum.

.5 Floor drains:

.1 Verify operation of trap seal primer.

.2 Prime, using trap primer. Adjust flow rate to suit site conditions.

.3 Check operations of flushing features.

.4 Check security, accessibility, removability of strainer.

.5 Clean out baskets.

.6 Vacuum breakers, backflow preventers, backwater valves:

.1 Test tightness, accessibility for O&M of cover and of valve.

.2 Simulate reverse flow and back-pressure conditions to test operation of vacuum breakers, backflow preventers.

.3 Verify visibility of discharge from open ports.

.4 Provide copy of test certificate to building inspector or AHJ for permit closeout.

.7 Roof drains:

.1 Check location at low points in roof.

.2 Check security, removability of dome.

.3 Adjust weirs to suit actual roof slopes, meet requirements of design.

.4 Clean out sumps.

.5 Verify provisions for movement of roof systems.

.8 Access doors:

.1 Verify size and location relative to items to be accessed.

.9 Cleanouts:

.1 Verify covers are gas-tight, secure, yet readily removable.

.10 Water hammer arrestors:

.1 Verify proper installation of correct type of water hammer arrester.

.11 Wall, ground hydrants:

.1 Verify complete drainage, freeze protection.

.2 Verify operation of vacuum breakers.

.12 Pressure regulators, PRV assemblies:

.1 Adjust settings to suit locations, flow rates, pressure conditions.

.13 Strainers:

.1 Clean out repeatedly until clear.

.2 Verify accessibility of cleanout plug and basket.

.3 Verify that cleanout plug does not leak.

.14 Grease interceptors:

.1 Activate, using manufacturer's recommended procedures and materials.

.15 Hose bibbs, sediment faucets:

.1 Verify that flow and pressure meet design criteria.

.2 Check for leaks, replace compression washer if required.

.16 Hydronic system water Make-up Assembly:

.1 Verify flow, pressure, and connection.

.17 Water meters:

.1 Verify location and accessibility.

.2 Test metre reading accuracy.

3.17 CLOSEOUT ACTIVITIES

.1 Commissioning Reports: in accordance with Section 01 91 13 - General Commissioning Requirements: reports, supplemented as specified.

.2 Training: provide training in accordance with Section 01 91 13 - General Commissioning Requirements: Training of O&M Personnel, supplemented as specified.

3.18 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.19 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by plumbing specialties and accessories installation.

.3 Protect existing floor drains when working in existing space, contractor shall be fully responsible for any damages to existing drainage systems as a result of debris accumulation or dumping of construction waste (concrete, dust, grease, etc). All costs of repairs including but not limited to complete replacement of piping, saw cutting of slab, cutting and patching, restoration work shall be solely responsibility of contractor.

END OF SECTION

1 GENERAL

1.1 REFERENCE STANDARDS

.1 American Society of Mechanical Engineers International (ASME)

- .1 ANSI/ASME B16.15, Cast Cooper Alloy Threaded Fittings, Classes 125 and 250.
- .2 ANSI/ASME B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
- .3 ANSI/ASME B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- .4 ANSI/ASME B16.24, Cast Copper Alloy Pipe Flanges and Flanged Fittings: Class 150, 300, 400, 600, 900, 1500 and 2500.
- .5 ASME B16.26, Cast Copper Alloy Fittings for Flared Copper Tubes.
- .6 ASME B31.9, Building Services Piping.
- .7 ASME B36.19M, Stainless Steel Pipe.

.2 ASTM International (ASTM)

- .1 ASTM A182/A 182M, Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.
- .2 ASTM A269, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
- .3 ASTM A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .4 ASTM A312/A312M, Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
- .5 ASTM A351/A351M, Castings, Austenitic, for Pressure Containing Parts.
- .6 ASTM A403/A403M, Wrought Austenitic Stainless Steel Piping Fittings.
- .7 ASTM A536, Standard Specification for Ductile Iron Castings.
- .8 ASTM B32, Standard Specification for Solder Metal.
- .9 ASTM B42, Seamless Copper Tube, Standard Sizes.
- .10 ASTM B88M, Standard Specification for Seamless Copper Water Tube (Metric).
- .11 ASTM F876, Standard Specification for Crosslinked Polyethylene (PEX) Tubing.
- .12 ASTM F877, Standard Specification for Crosslinked Polyethylene (PEX) Hot and Cold Water Distribution System.

.3 American National Standards Institute/American Water Works Association (ANSI)/(AWWA)

- .1 ANSI/AWWA C111/A21.11, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
- .2 ANSI/AWWA C151/A21.51, Ductile Iron Pipe, Centrifugally Cast, for Water.
- .3 AWWA C904, Crosslinked Polyethylene (PEX) Pressure Pipe, ½ In. (12 mm) through 3 In. (76mm), for Water Service.
- .4 AWWA C651, Disinfecting Water Mains.
- .5 AWWA C213, Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines.

.4 CSA Group (CSA)

.1 CSA B137.5, Crosslinked Polyethylene (PEX) Tubing Systems for Pressure Applications.

.2 CSA B242, Groove and Shoulder Type Mechanical Pipe Couplings.

.5 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC S101, Fire Endurance Tests of Buildings Construction and Materials.

.2 CAN/ULC S102.2, Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings and Miscellaneous Materials and Assemblies.

.3 CAN/ULC S115, Standard Method of Fire Tests of Firestop Systems.

.6 Department of Justice Canada (Jus)

.1 Canadian Environmental Protection Act, 1999, c. 33 (CEPA).

.7 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Safety Data Sheets (SDS).

.8 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).

.1 MSS-SP-67-02a, Butterfly Valves.

.2 MSS-SP-70-06, Grey Iron Gate Valves, Flanged and Threaded Ends.

.3 MSS-SP-71-05, Grey Iron Swing Check Valves, Flanged and Threaded Ends.

.4 MSS-SP-80-03, Bronze Gate, Globe, Angle and Check Valves.

.9 National Research Council (NRC)

.1 National Plumbing Code of Canada (NPC) .

.10 Transport Canada (TC)

.1 Transportation of Dangerous Goods Act, 1992, c. 34 (TDGA).

.11 American National Standards Institute/National Sanitation Foundation (ANSI/NSF).

.1 ANSI/NSF 61, Drinking Water System Components.

.2 ANSI/NSF 372, Drinking Water System Components – Lead Content.

1.2 QUALITY ASSURNACE

.1 A certificate shall be submitted prior to welding of steel piping showing the Welder's certification. The certificate shall be current and no more than one year old. Welder's qualifications shall be in accordance with ASME BPVC Section IX.

.2 All pipe, couplings, fittings, and specialties shall bear the identification of the manufacturer and any markings required by the applicable referenced standards.

2 PRODUCTS

2.1 GENERAL

.1 Material or equipment containing a weighted average of greater than 0.25 percent lead are prohibited in any potable water system intended for human consumption and shall be certified in accordance with NSF 61 or NSF 372.

.2 All components, fittings, fixtures and devices used in potable water systems shall meet the requirements of NSF 61, Section 9.

2.1 UNDERGROUND WATER SERVICE

.1 75 mm (NPS 3) and above: Ductile iron, AWWA C151, 2,413 kPa (350 psig) pressure class, exterior bituminous coating, and cement lined. Bio-based materials shall be utilized when possible. Provide flanged and anchored connection to interior piping.

.2 75 mm (NPS 3) and under: Copper tubing, ASTM B88, Type K, seamless, annealed. Use brazing alloys, AWS A5.8M/A5.8, Classification BCuP.

.3 Flexible Expansion Joint: Ductile iron with ball joints rated for 1,725 kPa (250 psig) working pressure conforming to AWWA C153, capable of deflecting a minimum of 20 degrees in each direction. Flexible expansion joint size shall match the pipe size it is connected to and shall have the expansion capability designed as an integral part of the ductile iron ball castings. Pressure containing parts shall be lined with a minimum of 15 mils of fusion bonded epoxy conforming to the applicable requirements of AWWA C213 and shall be factory tested with a 1500-volt spark test. Flexible expansion joint shall have flanged connections conforming to AWWA C110. Bolts and nuts shall be 316 stainless steel and gaskets shall be neoprene. The flexible expansion fitting shall not expand or exert an axial thrust under internal water pressure. Provide piping joint restraints at each mechanical joint end connection and piping restraints at the penetration of the building wall. The restraints shall be provided to address the developed thrust at the change of piping direction.

2.2 ABOVE GROUND (INTERIOR) WATER PIPING

.1 Copper tube, hard drawn, type K or L to ASTM B88M.

.2 Stainless steel piping: Type 304 or 316 to ASTM A312/A312M and ASME B36.19M.

.3 Stainless steel tubing: Type 304 or 316 to ASTM A269 and ASME B16.19

2.3 FITTINGS

.1 Copper fittings:

.1 Wrought copper or bronze castings conforming to ASME B16.18 and B16.22. Unions shall be bronze, MSS SP-72, MSS SP-110, solder or braze joints. Use 95/5 tin and antimony for all soldered joints.

.2 Bronze pipe flanges and flanged fittings, Class 150 and 300: to ANSI/ASME B16.24.

.3 Cast bronze threaded fittings, Class 125 and 250: to ANSI/ASME B16.15.

.4 50mm (NPS 2) and larger:

.1 ANSI/ASME B16.18 or ANSI/ASME B16.22 roll grooved to CSA B242.

.2 PEX fittings to CSA B137.5 and F1960.

.5 40mm (NPS 1 1/2) and smaller:

.1 Wrought copper to ANSI/ASME B16.22 or cast copper to ANSI/ASME B16.18; with 301 stainless steel internal components and EPDM seals. Suitable for operating pressure to 1,380 kPa.

.2 PEX fittings to CSA B137.5.

.6 Mechanical press-connect fittings for copper pipe and tube are not accepted.

.7 Flanged fittings, bronze, class 150, solder-joint ends conforming to ASME B16.24.

.2 Stainless steel fittings:

.1 Stainless steel butt-welded fittings, Type 316, Schedule 10, conforming to ASME B16.9.

.3 Adapters: Provide adapters for joining pipe or tubing with dissimilar end connections.

.4 Brazing alloy: AWS A5.8M/A5.8, brazing filler metals shall be BCuP series for copper to copper joints and BAg series for copper to steel joints.

2.4 JOINTS

.1 Rubber gaskets, latex-free 1.6 mm thick: to AWWA C111

.2 Bolts, nuts, hex head and washers: to ASTM A307, heavy series

.3 Solder: ASTM B32 alloy type Sb5, HA or HB. Provide non-corrosive flux.

.4 Brazing alloy: AWS A5.8M/A5.8, brazing filler metals shall be BCuP series for copper to copper joints and BAg series for copper to steel joints.

.5 Teflon tape: for threaded joints.

.6 Grooved couplings: designed with angle bolt pads to provide rigid joint, complete with EPDM gasket.

.7 Dielectric connections between dissimilar metals: dielectric fitting, complete with thermoplastic liner.

.7 40mm (NPS 1 1/2) and smaller: PEX fittings to CSA B137.5

.8 NPS 2 and larger: PEX fittings to CSA B137.5 and ASTM F1960. Elbows, adapters, couplings, plugs, tees, multi-port tees and valves

2.5 GATE VALVES

.1 50mm (NPS 2) and under, soldered:

.1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body, screw-in bonnet, solid wedge disc.

.2 65mm (NPS 2 1/2) and over, flanged:

.1 Rising stem: to MSS-SP-70, Class 125, 860 kPa, flat flange faces, cast-iron body, OS&Y bronze trim.

.2 Valves 150mm (NPS 6) and above, installed at 2,440mm (8ft) above floor shall be complete chainwheel operator including sprocket rim, brackets and chain.

2.5 GLOBE VALVES

.1 50mm (NPS 2) and under, soldered:

.1 To MSS-SP-80, Class 125, 860 kPa, bronze body, renewable composition disc, screwed over bonnet.

.2 Lockshield handles: as indicated.

.2 65mm (NPS 2 1/2) and over, flanged:

.1 To MSS-SP-80, Class 150, 1 MPa, bronze body, screwed over bonnet, renewable composition disc.

.2 Lockshield handles: as indicated.

2.6 SWING CHECK VALVES

.1 and under, soldered:

.1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, re-grindable seat.

.2 50mm (NPS 2) and under, screwed:

.1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, re-grindable seat.

.3 65mm (NPS 2 1/2) and over, flanged:

.1 To MSS-SP-71, Class 125, 860 kPa, cast iron body, flat flange faces, regrind seat, bronze disc, bolted cap.

2.7 BALL VALVES

.1 50mm (NPS 2) and under, screwed:

.1 Class 150.

.2 Bronze or Forged Brass body, stainless steel ball, PTFE adjustable packing, brass gland and PTFE seat, steel lever handle.

.2 50mm (NPS 2) and under, soldered:

.1 To ANSI/ASME B16.18, Class 150

.2 Bronze body, stainless steel ball, PTFE adjustable packing, brass gland and PTFE seat, steel lever handle, with NPT to copper adaptors.

2.8 BUTTERFLY VALVES

.1 65mm (NPS 2 1/2) and over, wafer or lug:

.1 To MSS-SP-67, Class 200

.2 Cast iron body, ductile iron chrome plated disc, stainless steel stem, EPT liner.

.3 100mm (4”) and under - lever operated, 150mm (NPS 6) and over - gear operated.

2.9 STRAINER

.1 Provide on high pressure side of pressure reducing valves, on suction side of pumps, on inlet side of indicating and control instruments and equipment subject to sediment damage and where indicated on drawings. Strainer element shall be removable without disconnection of piping, ensure unobstructed access to strainer screen.

.2 Basket or "Y" type with easily removable cover and brass strainer basket.

.3 Body: Less than 75 mm (3 inches), brass or bronze; 75 mm (3 inches) and greater, cast iron or semi-steel.

2.10 WATER HAMMER ARRESTOR

.1 Closed copper tube chamber with permanently sealed 413 kPa (60 psig) air charge above a Double O-ring piston. Two high heat Buna-N 0-rings pressure packed and lubricated with FDA approved silicone compound. All units shall be designed in accordance with ASSE 1010. Access shall be provided where devices are concealed within partitions or above ceilings. Size and install in accordance with PDI-WH 201 requirements. Provide water hammer arrestors at:

.1 All solenoid valves.

2. All groups of two or more flush valves.

3. All quick opening or closing valves.

4. All medical washing equipment.

3 EXECUTION

3.1 APPLICATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

.1 Install in accordance with Provincial Plumbing Code and local authority having jurisdiction.

.2 Install pipe work in accordance with Section 23 05 15 - Common Installation Requirements for HVAC Pipework, supplemented as specified herein.

.3 Assemble piping using fittings manufactured to ANSI and Standard Council of Canada (SCC) standards

.4 Install cold water piping below and away from heating water piping and other hot piping so as to maintain temperature of cold water as low as possible.

.5 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.

.6 Install branch piping for water from the piping system and connect to all fixtures, valves, cocks, outlets, casework, cabinets and equipment, including those furnished by the Government or specified in other sections.

.7 Pipe shall be round and straight. Cutting shall be done with proper tools. Pipe, except for plastic and glass, shall be reamed to remove burrs and a clean smooth finish restored to full pipe inside diameter.

.8 All pipe runs shall be laid out to avoid interference with other work/trades.

.9 Install union and shut-off valve on pressure piping at connections to equipment.

.10 Install chrome plated cast brass escutcheon with set screw at each wall, floor and ceiling penetration in exposed finished locations and within cabinets and millwork.

.11 Grade all lines to facilitate drainage. Provide drain valves at bottom of risers and all low points in system. Design domestic hot and cold-water circulating lines with no traps. Complete field review of all inverts, elevations and pipe sloping prior to beginning any work and advise Consultant of any discrepancies for further action prior to proceeding with work.

.12 Connect branch lines at bottom of main serving fixtures below and pitch down so that main may be drained through fixture. Connect branch lines to top of main serving only fixtures located on floor above.

.13 Buried tubing:

- .1 Lay in well compacted washed sand in accordance with AWWA Class B bedding
- .2 Bend tubing without crimping or constriction. Minimize use of fittings.

.14 Valves

- .1 Isolate equipment, fixtures and branches with ball valves.
- .2 Balance recirculation system using lockshield globe valves. Mark settings and record on as-built drawings on completion.

.15 All exposed piping shall be installed parallel to walls, bulkheads, ceilings in a neat manner. Piping shall be grouped whenever practical.

.16 Only use approved and listed piping and materials thru fire rated separations.

.17 Provide drain valves complete with chain and cap at all low points and at all branch connections to mains to facilitate partial and complete system drainage.

.18 Provide isolation valves at all connections to equipment.

.19 Provide reduced pressure backflow prevention device at all interfaces between potable and non-potable water systems. Install and test all devices in accordance with B64.10, Selection and installation of backflow preventers / Maintenance and field testing of backflow preventers.

3.3 PIPING PENETRATIONS

.1 Firestopping:

.1 Where pipes pass through fire partitions, fire walls, smoke partitions, or floors, install a fire stop that provides an effective barrier against the spread of fire, smoke, and gases.

.2 Completely fill and seal clearances between raceways and openings with the firestopping materials.

.3 Provide fire stop collars for all combustible pipe penetrations thru fire rated floor and wall assemblies.

.4 Firestopping systems shall be tested and listed to CAN/ULC S115, Standard Method of Fire Tests of Firestop Systems.

.5 Firestopping materials shall be free of water-soluble expansions materials.

.6 Firestopping materials shall be provided by single manufacturer. For retrofit applications, contractor shall confirm with the Owner's Representative standard supplier prior to submitting of the submittals.

.2 Waterproofing:

.1 At floor penetrations, completely seal clearances around the pipe and make watertight with sealant. Bio-based materials shall be utilized when possible.

.3 Acoustical sealant:

.1 Where pipes pass through sound rated walls, seal around the pipe penetration with an acoustical sealant that is compliant with ASTM C919.

.4 Flashing:

.1 Provide flashing of all equipment and piping penetrations thru waterproofed walls and roof assemblies.

.2 Retain basebuilding roofing contractor for all modifications of roofing system to preserve warranty, contact Owner's Representative for roofing contractor's information.

.3 Provide flashing for all floor drains in finished areas, extend flashing 300mm (12") on all sides. Secure flashing to drain flashing flange with approved non-metallic waterproofing membrane.

.5 Sleeves:

.1 Provide sleeves for piping penetrations thru floors and walls, complete with adequate reinforcing and sized to allow for movement due to expansion.

.2 Provide minimum 50mm (2") extended sleeves above floors prone to collection of water including but not limited to mechanical rooms, janitor closets, plenums, shafts.

.3 Where passing thru fire rated assemblies, seal space between sleeve and piping with

listed non-combustible insulation to meet fire rating of given assembly.

.4 Provide tight fitting clamps on each side of the sleeve and finish with chrome plated escutcheons at penetrations in finished surfaces and millwork.

.1 Installation:

.1 Install fire and waterproofing materials in accordance with manufacturer's instructions.

.2 Firestopping and waterproofing materials shall be installed by factory trained personnel with a proven track record of minimum 5 years history.

.3 Verify penetrations are properly sized and in suitable condition for application of materials.

.4 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.

.5 Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.

.6 Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.

.7 Do not proceed until unsatisfactory conditions have been corrected.

.8 Seal all holes or voids made by penetrations to ensure an air and water-resistant seal.

.9 Materials shall be applied in adequate temperatures 4ºC (40ºF) and 37ºC (98ºF) or as per manufacturer's instructions.

3.4 PRESSURE TESTS

.1 Test system either in its entirety or in sections. Submit testing plan to Consultant within 10 working days prior to test date.

.2 Potable water: test after installation of piping and domestic water heaters, but before piping is concealed, before covering is applied, and before plumbing fixtures are connected. Fill systems with water and maintain hydrostatic pressure of 1,035 kPa (150 psig) gage for two hours. No decrease in pressure is allowed. Provide a pressure gage with a shutoff and bleeder valve at the highest point of the piping being tested. Pressure gauge shall have 1 psig increments.

.3 All Other Piping Tests: Test new installed piping under 1-1/2 times actual operating conditions and prove tight.

.4 The test pressure shall hold for the minimum time duration required by the applicable plumbing code or authority having jurisdiction.

3.5 FLUSHING AND CLEANING

.1 Flush entire system for 8 h. Ensure outlets flushed for 2 hours. Let stand for 24 hours, then draw one sample off longest run. Submit to testing laboratory to verify that system is clean to Provincial potable water guidelines. Let system flush for additional 2 hours, then draw off another sample for testing.

3.6 STERILIZATION AND DISINFECTION

.1 After tests have been successfully completed, thoroughly flush and sterilize the interior domestic water distribution system in accordance with AWWA C651.

.2 Use liquid chlorine for sterilization, bleed water thru outlets to ensure thorough distribution.

.3 Allow disinfectant in system for 24 hours, ensure outlets are not operated during disinfection period.

.4 Test for chlorine residual at minimum 20% of outlets; ensure disinfectant residual is less than 25mg/L or as per local codes and regulations. Repeat treatment if results are unsatisfactory.

.5 Complete flushing of disinfectant until residual is equal to that of the municipal water supply or 1mg/L, whichever is less.

.6 Obtain samples at least 24 hours following flushing procedures at water entrance and 20% of outlets, complete laboratory analysis in accordance with AWWA C651.

.4 Upon completion, provide laboratory test reports on water quality for Consultant's approval.

3.7 PRE-START-UP INSPECTIONS

.1 Systems to be complete, prior to flushing, testing and start-up.

.2 Verify that system can be completely drained.

.3 Ensure that pressure booster systems are operating properly.

.4 Ensure that air chambers, expansion compensators are installed properly.

3.8 START-UP

.1 Timing: start up after:

.1 Pressure tests have been completed.

.2 Sterilization procedures have been completed.

.3 Certificate of static completion has been issued.

.4 Water treatment systems operational.

.2 Provide continuous supervision during start-up.

.3 Start-up procedures:

.1 Establish circulation and ensure that air is eliminated.

.2 Check pressurization to ensure proper operation and to prevent water hammer, flashing and/or cavitation.

.3 Commission water conditioning systems, where applicable.

.4 Bring HWS storage tank up to design temperature slowly.

.5 Monitor piping systems for freedom of movement, pipe expansion as designed.

.6 Check control, limit, safety devices for normal and safe operation.

.4 Rectify start-up deficiencies.

3.9 PERFORMANCE VERIFICATION

.1 Scheduling:

.1 Verify system performance after pressure and leakage tests and disinfection are completed, and Certificate of Completion has been issued by authority having jurisdiction.

.2 Procedures:

.1 Verify that flow rate and pressure meet Design Criteria.

.2 TAB HWC in accordance with Section 23 05 93 - Testing, Adjusting and Balancing

for HVAC.

.3 Adjust pressure regulating valves while withdrawal is maximum and inlet pressure is minimum.

.4 Sterilize water systems for Legionella control.

.5 Verify performance of temperature controls.

.6 Verify compliance with safety and health requirements.

.7 Check for proper operation of water hammer arrestors. Run 20% of outlets for 10 seconds, then shut of water immediately. If water hammer occurs, replace water hammer arrestor or re-charge air chambers. Repeat for outlets and flush valves.

.8 Confirm water quality consistent with supply standards, and ensure no residuals remain as result of flushing or cleaning.

.3 Reports:

.1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: Reports, using report forms as specified in Section 01 91 13 - General Commissioning (Cx) Requirements: Report Forms and Schematics.

.2 Include certificate of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.

3.10 OPERATION REQUIREMENTS

.1 Co-ordinate operation and maintenance requirements including, cleaning and maintenance of specified materials and products with Section 23 05 15 - Common Installation Requirements for HVAC Pipework.

.2 Operational requirements in accordance with Section 01 47 19 - Sustainable Requirements: Operation, include:

.1 Cleaning materials and schedules.

.2 Repair and maintenance materials and instructions.

3.11 CLEANING

.1 Clean in accordance with Section 01 74 00 - Cleaning.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

END OF SECTION

1 GENERAL

1.1 REFERENCE STANDARDS

.1 ASTM International (ASTM)

.1 ASTM B32, Standard Specification for Solder Metal.

.2 ASTM B306, Standard Specification for Copper Drainage Tube (DWV).

.3 ASTM C564, Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

.5 ASTM D2235, Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.

.6 ASTM D2564, Standard Specification for Solvent Cements for Poly (Vinyl-Chloride) (PVC) Plastic Piping Systems.

.2 CSA Group (CSA)

.1 CSA B67, Lead Service Pipe, Waste Pipe, Traps, Bends and Accessories.

.2 CAN/CSA-B70, Cast Iron Soil Pipe, Fittings and Means of Joining.

.3 CAN/CSA-B125.3, Plumbing Fittings.

.4 CAN/CSA-Series B1800, Thermoplastic Nonpressure Pipe Compendium - B1800 Series.

.3 Green Seal Environmental Standards (GSES)

.1 Standard GS-36-[00], Commercial Adhesives.

.4 National Research Council Canada (NRC)

.1 National Plumbing Code of Canada(NPC).

.5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Safety Data Sheets (SDS).

.6 Canada Green Building Council (CaGBC)

.1 LEED Canada-NC Version 1.0, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum [2007]).

.2 LEED Canada-CI Version 1.0, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.

2 PRODUCTS

2.1 COPPER TUBE AND FITTINGS

.1 Above ground sanitary, storm and vent Type DWV to: ASTM B306

.1 Fittings.

.1 Cast brass: to CAN/CSA-B125.3.

.2 Wrought copper: to CAN/CSA-B125.3.

.2 Solder: lead free to ASTM B32.

2.2 CAST IRON PIPING AND FITTINGS

.1 Buried (inside building) sanitary, storm and vent minimum 80mm (NPS 3) to: CAN/CSA-B70, with one layer of protective coating.

.1 Mechanical joints:

.1 Neoprene or butyl rubber compression gaskets: to CAN/CSA-B70 orASTM C564.

.2 Stainless steel clamps.

.2 Hub and spigot:

.1 Caulking lead: to CSA B67

.2 Cold caulking compounds.

.2 Above ground sanitary, storm, and vent: to CAN/CSA-B70

.1 Hub and spigot:

.1 Caulking lead: to CSA B67

.2 Mechanical joints:

.1 Neoprene or butyl rubber compression gaskets with stainless steel clamps.

2.3 ABS PIPING AND FITTINGS

.1 Buried (inside building) sanitary and storm piping to CAN/CSA-B1800 and CAN/ULC-S102.2, flame spread rating 15.

.1 Fittings: to CAN/CSA-B1800 and CAN/ULC-S102.2, flame spread rating 25.

.2 Joints: to ASTM D2564 solvent cement and primer.

2.4 PVC PIPING AND FITTINGS

.1 Buried (inside building) sanitary and storm piping to CAN/CSA-B1800 gasketed sewer pipe SDR 35.

.1 Fittings: schedule 40 ABS socket type to ASTM D2468 or schedule 80 ABS threaded type to ASTM D2465.

.2 Joints: to ASTM D2564 solvent cement and primer.

.2 Above ground sanitary and storm piping to CAN/CSA-B1800 and CAN/ULC-S102.2 flame spread rating 15.

.1 Fittings: CAN/CSA-B1800, socket type and CAN/ULC-S102.2 flame spread raring 25.

.2 Joints: to ASTM D2564 solvent cement and primer.

3 EXECUTION

3.1 APPLICATION

.1 Manufacturer’s Instructions: comply with manufacturer’s written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

.1 In accordance with Section 23 05 15 - Common installation requirements for HVAC pipework.

.2 Install in accordance with National Plumbing Code, Ontario Building Code Part 7 and local authority having jurisdiction.

.3 Pitch soil and waste piping no less 1/4 inch per foot.

.4 Group piping whenever practical.

.5 Install equipment including backflow preventer, pressure reducing stations and water meters in accordance with manufacturer's instruction, local codes and standards. Provide adequate support, independent of adjacent piping.

.6 Pipe relief valves to nearest floor drain and provide support of discharge line.

.7 Provide sleeves on pipe penetrations thru floors and walls.

.8 Provide pipe hangers and supports in accordance with ASME B13.9 and ASTM F708.

.9 Provide heat tracing of all exterior piping, unless otherwise indicated.

.10 Provide unions and isolation valves at connections to equipment.

.11 Provide spring loaded check valves at discharge of pumps.

.12 Coordinate connections to municipal storm and sanitary piping with Site Servicing contractor. Contractor shall field verify all inverts, pipe routing and sloping prior to any work.

.13 Piping penetrations through exterior walls below grade shall be leak tight and complete with modular link seal assembly.

3.3 TESTING

.1 Pressure test buried systems before backfilling.

.2 Hydraulically test to verify grades and freedom from obstructions.

3.4 PERFORMANCE VERIFICATION

.1 Cleanouts:

- .1 Ensure accessible and that access doors are correctly located.
- .2 Open, cover with linseed oil and re-seal.
- .3 Verify that cleanout rods can probe as far as the next cleanout, at least.

.2 Test to ensure traps are fully and permanently primed.

.3 Storm water drainage:

- .1 Verify domes are secure.
- .2 Ensure weirs are correctly sized and installed correctly.
- .3 Verify provisions for movement of roof system.

.4 Ensure that fixtures are properly anchored, connected to system and effectively vented.

.5 Affix applicable label (storm, sanitary, vent, pump discharge etc.) c/w directional arrows every floor or 4.5 m (whichever is less).

3.05 CLEANING

.1 Clean in accordance with Section 01 74 00 - Cleaning.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with

Section 01 74 19 - Waste Management and Disposal.

END OF SECTION

1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Materials and installation for piping, fittings, equipment used in compressed air systems.

1.2 REFERENCE STANDARDS

.1 American Society of Mechanical Engineers (ASME)

.1 ASME Boiler and Pressure Vessel Code Section VIII Pressure Vessels.

.1 BPVC-VIII B, BPVC Section VIII - Rules for Construction of Pressure Vessels Division 1.

.2 BPVC-VIII-2 B, BPVC Section VIII - Rules for Construction of Pressure Vessels Division 2 - Alternative Rules.

.3 BPVC-VIII-3 B, BPVC Section VIII - Rules for Construction of Pressure Vessels Division 3 - Alternative Rules High Press Vessels.

.2 ASME B16.5, Pipe Flanges and Flanged Fittings.

.3 ASME B16.11, Forged Fittings, Socket-Welding and Threaded.

.2 ASTM International (ASTM)

.1 ASTM A53/A53M, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

.2 ASTM A181/A181M, Standard Specification for Carbon Steel Forgings for General Purpose Piping.

.3 CSA Group (CSA)

.1 CSA B51, Boiler, Pressure Vessel, and Pressure Piping Code.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Safety Data Sheets (SDS).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals in accordance with Division 01.

.2 Product Data:

.1 Submit manufacturer’s printed product literature, specifications and datasheet for piping, fittings and equipment.

.2 Submit WHMIS SDS in accordance with Section [01 47 15 - Sustainable Requirements: Construction] and Section [02 81 00 - Hazardous Materials]. Indicate VOC’s for adhesive and solvents during application and curing.

.3 Shop Drawings:

.1 Submit shop drawings to indicate project layout including layout, dimensions and extent of piping system.

.1 Vertical and horizontal piping locations and elevations and connections details.

.2 Other details including: equipment (compressor) and accessories (valves, fittings, pressure regulators, adapters, etc).

.3 Test Reports: submit certified test reports from approved independent testing

laboratories indicating compliance with specifications for specified performance characteristics and physical properties.

.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Instructions: submit manufacturer's installation instructions.

.6 Closeout Submittals: submit maintenance and engineering data for incorporation into manual specified in Division 01.

1.4 QUALITY ASSURANCE

.1 Pre-Installation Meeting:

.1 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installations in accordance with the project schedule.

.1 Verify project requirements.

.2 Review installation [and substrate] conditions.

.3 Co-ordination with other building subtrades.

.4 Review manufacturer's installation instructions and warranty requirements.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

2 PRODUCTS

2.1 AIR COMPRESSOR

.1 N/A.

2.2 AIR RECEIVER

.1 N/A.

2.3 REFRIGERATED AIR DRYER

.1 N/A.

2.4 CHEMICAL AIR DRYER

.1 N/A.

2.5 PIPING SYSTEM

.1 Piping:

.1 Galvanized steel: to ASTM A53/A53M, schedule 40, Class 125 galvanized cast iron screwed fitting and screwed joints.

.2 Copper: to ASTM B88, type "L" hard drawn seamless copper, complete with forged solder type fittings to suit piping, soldered joints using 95% tin and 5% antimony solder.

.2 Unions:

.1 Screwed steel piping: Malleable iron, galvanized, ground joint, brass to iron or bronze

to bronze seat unions and union elbows with a minimum pressure rating of 1725 kPa (250 psi) steam at 260°C (500°F).

.2 Soldered copper piping: solder-on forged copper or bronze screwed unions suitable in all respects for the application.

.3 Dissimilar metal junctions: use dielectric unions.

2.6 LOW PRESSURE SHUT OFF VALVES

.1 Class 600, 4140 kPa (600 psi) WOG rated full port ball valves, each complete with a forged brass or bronze body with solder joint or screwed joint ends as required, forged brass cap and blowout-proof stem, forged brass chrome plated ball, "Teflon" or "PTEF" seat, and a removable lever handle.

.2 Standard of acceptance: Kits Corporation Code 59 (soldered) or Code 58 (screwed), Apollo Valves #70-200 (soldered) or #70-100 (screwed), Watts Industries Canada Ltd. #FBVS-3 (soldered) or #FVB-3 (screwed) or approved equal.

2.7 HIGH PRESSURE SHUT OFF VALVES

.1 Class 600, 4140 kPa (600 psi) WOG rated screwed bronze valve with PTFE sea, automatic relief vent and removable lever handle.

.2 Standard of acceptance: Apollo Valves #700-100-27 or approved equal.

2.8 COUPLERS/CONNECTORS

.1 Industrial interchange series, full-bore.

.2 Maximum inlet pressure: 1,700 kPa.

.3 Valve seat: moulded nylon.

.4 Body: zinc plated steel.

.5 Threads: NPT.

2.9 DRAIN VALVES

.1 Minimum 2070 kPa (300 psi) water rated, 20 mm (¾") dia. straight pattern full port bronze ball valves, each complete with a threaded outlet suitable for coupling connection of 20 mm (¾") dia. garden hose, and a cap and chain.

.2 Standard of acceptance: Toyo Valve Co. Fig. 5046; Kitz Corporation Code 58CC, Apollo Valves #78-100 or #78-200, Watts Industries (Canada) Ltd. #B6000-CC or approved equal.

2.10 PIPING SYSTEM COMPONENTS

.1 Outlets: DeVair or ARO Fluid Products or approved equivalent, female bayonet lock type quick-connect outlets with exact type and size as directed, each complete with a non-corrosive hose hanger.

.2 Pressure regulators: Watts (CompAir) R119 Series or approved equivalent, adjustable, heavy-duty diaphragm type pressure regulators, each complete with a pressure gauge and a mounting bracket.

.3 Filters: Watts (CompAir) F602 Series or approved equivalent, heavy-duty 40 micron filters, each complete with a zinc bowl with sight glass, internal automatic drain, and mounting bracket.

.4 Combination filter-regulator assemblies: Watts (CompAir) B11 Series or approved equivalent, general purpose filter-regulators, each complete with an adjustable diaphragm type pressure regulator with pressure gauge, a 40 micron filter with zinc bowl, sight glass and automatic drain, and a mounting bracket.

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 datasheet.

3.2 COMPRESSOR STATION

.1 Install on vibration isolators on housekeeping pad as indicated.

3.3 REFRIGERATED AIR DRYER

.1 Install on three-valve bypass.

.2 Install tee connection after dryer for emergency connection to instrument control air system.

3.4 COMPRESSED AIR LINE FILTER

.1 Install on discharge line from refrigerated air dryer.

3.5 MAIN AIR PRESSURE REGULATORS

.1 Install at air compressor station.

.2 Install additional regulators on connections to equipment, at each drop to workstation and where indicated.

3.6 COMPRESSED AIR PIPING CONNECTIONS AND INSTALLATION

.1 Install flexible connections at connections to compressor and other vibration generating equipment.

.2 Install shut-off valves at outlets, major branch lines and in locations as indicated.

.3 Install quick-coupler chucks and pressure gauges on drop pipes.

.4 Install unions to permit removal or replacement of equipment.

.5 Install tees in lieu of elbows at changes in direction of piping. Install plug in open ends of tees.

.6 Grade piping at 1% slope minimum.

.7 Install compressed air trap and pressure equalizing pipe at moisture collecting points. Drain pipe to nearest floor drain.

.8 Make branch connections from top of main.

.9 Install compressed air trap at bottom of risers and at low points in mains, piped to nearest drain. Distance between drain points to be 30 m maximum.

.10 Provide drain from refrigerated air dryer.

.11 Weld steel piping in accordance with Section 23 05 17 - Pipe Welding and;

.1 To ASME code and requirements of authority having jurisdiction

.2 Weld concealed and inaccessible piping regardless of size.

3.7 FIELD QUALITY CONTROL

.1 Site Tests/Inspection:

.1 Testing: pressure test for 4 hours minimum, to 1,100 kPa, with outlets closed and with compressor isolated from system. Pressure drop not to exceed 10 kPa.

.2 Manufacturer's Field Services:

.1 Have manufacturer of products supplied under this Section review work involved in handling, installation/application, protection and cleaning of its products, and submit written reports, in acceptable format, to verify compliance of work with Contract.

.2 Provide manufacturer's field services, consisting of product use recommendations and periodic site visits for inspection of product installation, in accordance with manufacturer's instructions.

.3 Schedule site visits to review work at stages listed:

.1 After delivery and storage of products, and when preparatory work on which work of this Section depends is complete, but before installation begins.

.2 Twice during progress of work at 25% and 60% complete.

.3 Upon completion of Work, after cleaning is carried out.

.3 Obtain reports within 3 days of review and submit immediately to Consultant.

3.8 CLEANING

.1 Refer to Section 23 08 16 - Cleaning and Start-Up of HVAC Piping Systems.

.2 Cleaning: blow out piping to clean interior thoroughly of oil and foreign matter.

.3 Check entire installation is approved by authority having jurisdiction.

.4 Perform cleaning operations as specified and in accordance with manufacturer's recommendations.

.5 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

1 GENERAL

1.1 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for all equipment, systems, accessories and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario, Canada.

.2 Indicate on drawings:

.1 Mounting arrangements.

.2 Operating and maintenance clearances.

.3 Shop drawings and product data 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 current model production.

.5 Certification of compliance to applicable codes.

.6 Equipment lead times.

.7 List of spare parts.

.8 Flow diagrams, controls schematic, wiring diagrams.

.9 Part load (0-100% in 10% increments) and full load efficiencies.

.10 Performance/capacity.

.11 Construction of equipment.

.12 Product warranty.

.4 In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures: use "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

.4 Coordination Shop Drawings:

.1 Submit complete consolidated and coordinated shop drawings for all new systems, and for existing systems that are in the same areas.

.2 The coordination/shop drawings shall include plan views, elevations and sections of all systems in AutoCAD format and shall be on a scale of not less than 1:50. Clearly identify and dimension the proposed locations of the equipment. The drawings shall clearly show locations and adequate clearance for all equipment, piping, valves, control panels and other items. Show the access means for all items requiring access for operations and maintenance.

.3 Provide detailed coordination/shop drawings of all piping and duct systems.

.4 Do not install equipment foundations, equipment or piping until coordination/shop

drawings have been approved.

.5 Rigging Plan:

.1 Provide documentation of the capacity and weight of the rigging and equipment intended to be used. The plan shall include the path of travel of the load, the staging area and intended access, and qualifications of the operator and signal person.

.2 Confirm equipment staging areas and crane locations with the Owner's Representative prior to preparation of the plan.

.3 Indicate extents of the fencing, signage, barrier and temporary provisions on the plans.

.4 Include necessary permitting (road closure, traffic control, etc) for all required rigging and craning of the equipment.

1.2 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for all equipment for incorporation into manual.

.1 Operation and maintenance manual approved by, and final copies deposited with, Owner's Representative and Consultant before final inspection.

.2 Operation data to include:

.1 Control schematics for systems including environmental controls.

.2 Description of systems and their controls.

.3 Description of operation of systems at various loads together with reset schedules and seasonal variances.

.4 Operation instruction for systems and component.

.5 Description of actions to be taken in event of equipment failure.

.6 Valves schedule and flow diagram.

.7 Colour coding chart.

.3 Maintenance data to 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 datasheets with point of operation as left after commissioning is complete.

.2 Equipment performance verification test results.

.3 Special performance data as specified.

.4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

.5 Approvals:

.1 Submit 2 copies of draft Operation and Maintenance Manual Owner's Representative and Consultant for approval. Submission of individual data will not be accepted unless directed by Consultant.

.2 Make changes as required and re-submit as directed by Consultant.

.6 Additional data:

.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.7 Site records:

.1 Consultant will provide 1 set of reproducible mechanical drawings – "Issued for Construction" in AutoCAD 2020 format. Contractor shall be responsible for all revisions, modifications and additions to AutoCAD drawing as required to accurately reflect as-built conditions.

.2 Transfer information weekly to reproducible, revising reproducible to show work as actually installed.

.3 Adhere to Owner's CAD Guidelines, obtain copy of the guidelines from Owner's Representative.

.4 Make drawings available to Owner's Representative and Consultant for reference purposes and inspection.

.8 As-built drawings:

.1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings in AutoCAD 2020 format.

.2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).

.3 Submit to Owner's Representative and Consultant for approval and make corrections as directed.

.4 Perform testing, adjusting and balancing for HVAC using as-built drawings.

.5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

.6 As-built drawings shall be prepared in accordance with Owner's CAD Guidelines, obtain copy of the guidelines from Owner's Representative.

.9 Submit copies of as-built drawings for inclusion in final TAB report.

1.3 MAINTENANCE MATERIAL SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Furnish spare parts as follows:

.1 One set of packing for each pump.

.2 One casing joint gasket for each size pump.

.3 One head gasket set for each heat exchanger.

.4 One glass for each gauge glass.

.5 One filter cartridge for hydronic system and one set of filter media for each filter bank for air systems in addition to final operating set.\

.3 Provide one set of special tools required to service equipment as recommended by manufacturers including but not limited to boiler burner cleaning kit, chiller tube cleaning kit, etc.

.4 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground, indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

1.5 CODES, REGULATIONS AND STANDARDS

.1 All mechanical work shall be in compliance with the latest editions of the applicable codes, regulations and bylaws, including:

.1 Ontario Building Code

.2 Ontario Fire Code

.3 Canadian Standards Association

.4 Canadian Gas Association

.5 ASHRAE

.6 ASME

.7 NFPA

.8 SMACNA

.9 NECB

.10 Local Municipal Bylaws and Regulations

.11 Owner Specific Standards and Guidelines

.2 Refer to Section 01 41 00 – Regulatory Requirements for complete list.

.3 Where discrepancies between contract documents and references codes/standards are identified, Contractor shall request clarification from Consultant prior to proceeding with work.

.4 Referenced codes, standards, regulations and guidelines are noted as a minimum requirement and shall not be used to alter, reduce or modify requirements of the contract documents.

1.6 PERMITS AND APPROVALS

.1 Contractor shall be responsible for all costs associated with permitting and approvals by Authorities Having Jurisdiction (AHJ), including but not limited to:

.1 Application and obtaining of permits

.2 Permit fees

.3 Inspection fees

.4 Demonstration

.2 Contractor shall be responsible for coordinating and scheduling progress inspection prior to work concealment and final acceptance.

.3 Provide sufficient notice for inspections, provide qualified and licensed technicians to demonstrate work to inspectors.

.4 Complete all repairs and adjustments to satisfaction of AHJ and schedule for follow-up inspection as required to complete the project.

.5 Collect and submit all inspection certificates and permit closeout letters for all disciplines, include in closeout manuals.

1.7 TEST REPORTS

.1 Contractor shall complete all required testing as specified in the contract documents.

.2 Provide sufficient notice (minimum 10 working days) to Owner's Representative, Consultant, Commissioning Authority, inspectors and Authorities Having Jurisdiction (AHJ). Tests may be witnessed in their entirety or partially at discretion of these parties.

.3 Make repairs, adjustments and troubleshoot issues when test results are not acceptable.

.4 Submit all test reports for review and approval to the Consultant, including but not limited to:

.1 Pressure testing of piping systems and equipment (boilers, heat exchangers, etc)

.2 Piping flushing, cleaning and chemical treatment

.3 Water and Air Systems Balancing (TAB)

.4 Ductwork and equipment leakage test reports

.5 Equipment start-up reports

.6 Sprinkler system certificates and Contractor's Fire Protection Engineer's NFPA 13 compliance letter

.7 Standpipe system certificates and Contractor's Fire Protection Engineer's NFPA 14 compliance letter

.8 Controls point to point verification report and sensor calibration report

.9 Manufacturer's troubleshooting and service reports documenting encountered issues and corrective steps taken

.10 Approvals by AHJ (TSSA, ESA, etc)

1.8 QUALITY ASSURANCE

.1 All systems shall be safe, reliable, efficient, durable, easily and safely operable and maintainable, easily and safely accessible, and in compliance with applicable codes as specified. All construction personnel shall be experienced and qualified specialists in industrial and institutional HVAC.

.2 Products Criteria:

.1 The design, model and size of each item shall have been in satisfactory and efficient operation on at least three installations for approximately three years. All controllers and software shall be of the latest version with the latest version of the firmware. Refer other specification sections for any exceptions and/or additional requirements.

.2 All items furnished shall be free from defects that would adversely affect the performance, maintainability and appearance of individual components and overall

assembly.

.3 The products and execution of work specified shall conform to the referenced codes and standards as required by the specifications. Local codes and amendments shall be enforced, along with requirements of local utility companies. The most stringent requirements of these specifications, local codes, or utility company requirements shall always apply.

5. Multiple Units: When two or more units of materials or equipment of the same type or class are required, these units shall be of the same manufacturer and model number, or if different models are required they shall be of the same manufacturer and identical to the greatest extent possible (i.e., same model series).

6. Assembled Units: Performance and warranty of all components that make up an assembled unit shall be the responsibility of the manufacturer of the completed assembly.

7. Nameplates: Nameplate bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.

8. Use of asbestos products or equipment or materials containing asbestos is prohibited.

.3 Systems Welding:

.1 All welding shall be completed in accordance with Section 23 05 17 – Pipe Welding.

.2 Submit required certificates, procedures, and credentials prior to any work.

.4 Testing, Adjusting and Balancing:

.1 All systems shall be tested, adjusted and balanced in accordance with Section 23 05 93 – Testing, Adjusting and Balancing for HVAC.

.2 Work shall be completed by certified agencies, submit certificates and credentials for all personnel.

.3 Submit test instrumentation information and calibration certificates prior to any work.

.5 Systems Commissioning

.1 Carry out commissioning of all installed systems and existing systems where new systems are integrated in accordance with Section 01 91 13 – General Commissioning Requirements.

1.9 ALTERNATE EQUIPMENT

.1 The design has been prepared based on the “basis of the design” equipment specified in schedules and specifications. If Contractor substitutes the basis of the design equipment with the approved alternates, the Contractor shall incur all costs associated with the re-design and all aspects of the installation of alternate equipment including, but no limited to delivery of equipment to the proposed location, disassembly/reassembly of equipment, removal or relocation of the existing services, additional electrical, structural, architectural or building envelope work as required to accommodate alternate equipment.

2.1 GENERAL

.1 All materials shall be new in accordance with the specifications of contract documents.

.2 All products shall be listed and approved by relevant authorities.

.3 All equipment and materials shall be transported, stored, craned, rigged and moved in

accordance with manufacturer's instructions; any damages to equipment and/or parts of equipment shall be replaced by Contractor at no cost to Owner.

2.2 ACCESS PANELS/DOORS

.1 Provide access panels at all locations of concealed equipment, fittings requiring access for operation, maintenance and repair including but not limited to balancing dampers, fire dampers, smoke dampers, fire/smoke dampers, motorized dampers, sensors, filters and other components and devices requiring maintenance/service access.

.2 Access doors shall be located to provide complete access to concealed equipment and devices.

.3 Construction:

- .1 Plaster or wet wall: 16 ga steel flush with surface complete with gasket and concealed flange.
- .2 Masonry or drywall: 16 ga steel flush with surface complete with gasket and concealed flange.

.4 Finish:

- .1 Tiled or marble surfaces: type 304 stainless steel, #4 satin polish.
- .2 Other areas: prime coated steel, finished to match adjacent.

.5 Options and accessories:

- .1 Continuous concealed hinges.
- .2 Adjustable anchoring straps to suit installation.
- .3 Mineral wool insulation (for fire rated panels).
- .4 Self latching screw driver operated slam latch.
- .5 Automatic panel closer.
- .6 Inside latch release.

.6 Sizing:

- .1 Access panels/doors shall be of adequate size to facilitate access to all components. The following are minimum recommended sizes:
  - .1 Hand access: 300x300mm (12"x12")
  - .2 Body entry access: 600x600mm (24"x24")

.7 Fire rating

- .1 Access doors/panels installed in fire rated floor and wall assemblies shall have similar fire rating and corresponding ULC label.

3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.

- .1 Visually inspect substrate in presence of Owner's Representative.
- .2 Inform Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

.2 Carry out field inspections of the proposed work and existing conditions affecting work prior to tender submission. Additional inspections may be arranged thru Owner's Representative. No additional costs will be considered for additional work where these conditions would have been discovered by such inspections. Report any potential challenges and issues which may impact proposed work to the Consultant for clarification within Q&A period, during Tender phase.

3.2 PAINTING REPAIRS AND RESTORATION

.1 Do painting in accordance with Section 09 91 23 - Interior Painting.

.2 Prime and touch up marred finished paintwork to match original.

.3 Restore to new condition, finishes which have been damaged.

3.3 SYSTEM CLEANING

.1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

.2 Refer to Section 01 74 00 – Cleaning.

3.4 CLEARANCES

.1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer, codes and bylaws.

.2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer, codes and bylaws without interrupting operation of other system, equipment, components.

.3 Contractor shall coordinate installation of each equipment components with all trades prior to any work to avoid service obstruction to equipment. Any infractions of service clearances be responsibility of the contractor and must be corrected prior to substantial completion.

3.5 DRAINS

.1 Install piping with grade in direction of flow except as indicated.

.2 Install drain valve at low points in piping systems, at equipment and at section isolating valves.

.3 Pipe each drain valve discharge separately to above floor drain.

.1 Discharge to be visible.

.4 Drain valves: 20mm (NPS 3/4) gate or globe valves unless indicated otherwise, with hose end male thread, cap and chain.

3.6 AIR VENTS

.1 Install automatic air vents at all high points in piping systems.

.2 Install isolating valve at each automatic air valve.

.3 Install drain piping to approved location and terminate where discharge is visible.

3.7 DIELECTRIC COUPLINGS

.1 Provide on connections between dissimilar metals.

.2 50mm (NPS 2) and under: provide insulating unions.

.3 65mm (NPS 2 1/2) and over: provide insulating flanges.

.4 Isolation shall be provided where piping may come in contact with dissimilar metals including hangers, supports, joists and studs.

3.8 PIPEWORK INSTALLATION

.1 Install pipework to relevant codes and regulations.

.2 Screwed fittings jointed with Teflon tape.

.3 Protect openings against entry of foreign material.

.4 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.

.5 Assemble piping using fittings manufactured to ANSI standards

.6 Saddle type branch fittings may be used on mains if branch line is no larger than half size of main.

.1 Hole saw (or drill) and ream main to maintain full inside diameter of branch line prior to welding saddle.

.7 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.

.8 Install concealed pipework to minimize furring space, maximize headroom, conserve space.

.9 Slope piping, except where indicated, in direction of flow for positive drainage and venting.

.10 Install, except where indicated, to permit separate thermal insulation of each pipe.

.11 Group piping wherever possible [and as indicated].

.12 Ream pipes, remove scale and other foreign material before assembly.

.13 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.

.14 Provide for thermal expansion as indicated.

.15 Valves:

.1 Install in accessible locations.

.2 Remove interior parts before soldering.

.3 Install with stems above horizontal position unless indicated.

.4 Valves accessible for maintenance without removing adjacent piping.

.5 Install globe valves in bypass around control valves.

.6 Use gate valves at branch take-offs for isolating purposes except where specified.

.7 Install butterfly valves on chilled water and related condenser water systems only.

.8 Install butterfly valves between weld neck flanges to ensure full compression of liner.

.9 Install plug cocks or ball valves for glycol service.

.10 Use chain operators on valves 65mm (NPS 2 1/2) and larger where installed more than 2,400 mm above floor in Mechanical Rooms.

.11 Provide extended valve stems to clear insulation and allow for uncompromised valve operation without damaging insulation.

.16 Check Valves:

.1 Install silent check valves on discharge of pumps and in vertical pipes with downward flow and as indicated.

.2 Install swing check valves in horizontal lines on discharge of pumps and as indicated.

3.9 SLEEVES

.1 General: install where pipes pass through masonry, concrete structures, fire rated assemblies, and as indicated.

.2 Material: schedule 40 black steel pipe.

.3 Construction: use annular fins continuously welded at mid-point at foundation walls and where sleeves extend above finished floors.

.4 Sizes: 6 mm minimum clearance between sleeve and uninsulated pipe or between sleeve and insulation.

.5 Provide minimum 50mm (2") extended sleeves above floors prone to collection of water including but not limited to mechanical rooms, janitor closets, plenums, shafts.

.6 Where passing thru fire rated assemblies, seal space between sleeve and piping with listed non-combustible insulation to meet fire rating of given assembly.

.7 Provide tight fitting clamps on each side of the sleeve and finish with chrome plated escutcheons at penetrations in finished surfaces and millwork.

.8 Before installation, paint exposed exterior surfaces with heavy application of zinc-rich paint to CAN/CGSB-1.181

.6 Sealing:

.1 Foundation walls and below grade floors: fire retardant, waterproof non-hardening mastic.

.2 Elsewhere:

.1 Provide space for fire stopping.

.2 Maintain the fire-resistance rating integrity of the fire separation.

.3 Sleeves installed for future use: fill with lime plaster or other easily removable filler.

.4 Ensure no contact between copper pipe or tube and sleeve.

3.10 ESCUTCHEONS

.1 Install on pipes passing through walls, partitions, floors, and ceilings in finished areas.

.2 Construction: one piece type with set screws.

.1 Chrome or nickel plated brass or type 302 stainless steel.

.3 Sizes: outside diameter to cover opening or sleeve.

.1 Inside diameter to fit around pipe or outside of insulation if so provided.

3.11 PREPARATION FOR FIRE STOPPING

.1 Coordinate the installation of fire stopping around pipes, insulation and adjacent fire separation in accordance with Section 07 84 00 - Fire Stopping.

.2 Pipes subject to movement: conform to fire stop system design listing to ensure pipe movement without damaging fire stopping material or installation.

.3 Insulated pipes: ensure integrity of insulation and vapour barriers.

3.12 FLUSHING OUT OF PIPING SYSTEMS

.1 Flush system in accordance with Section 23 08 16 - Cleaning and Start-Up of HVAC Piping Systems.

.2 Before start-up, clean interior of piping systems in accordance with requirements of Section 01 74 00 - Cleaning supplemented as specified in relevant mechanical sections.

.3 Preparatory to acceptance, clean and refurbish equipment and leave in operating condition, including replacement of filters in piping systems.

.4 Provide minimum 50mm (NPS 2) bypass piping complete with ball valve at the end of each loop or circuit to facilitate complete flushing of piping network. Coordinate locations of the bypasses with the chemical treatment vendor.

.5 Repeat flushing and cleaning of piping systems as required to achieve adequate water quality.

3.13 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK

.1 Advise Consultant minimum 5 working days prior to performance of pressure tests.

.2 Pipework: test as specified in relevant sections of heating, ventilating and air conditioning work.

.3 Maintain specified test pressure without loss for 4 hours minimum unless specified for longer period of time in relevant mechanical sections.

.4 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or media.

.5 Conduct tests in presence of Consultant.

.6 Pay costs for repairs or replacement, retesting, and making good. Consultant to determine whether repair or replacement is appropriate.

.7 Insulate or conceal work only after approval and certification of tests Consultant.

3.14 EXISTING SYSTEMS

.1 Connect into existing piping systems at times approved by Departmental Representative. Provide detailed Methods of Procedures (MOP) for all connections to the existing systems.

.2 Request written approval by Departmental Representative 10 days minimum, prior to commencement of work.

.3 Unless otherwise noted, connections to the existing live piping systems shall be completed via hot tapping means to minimize system shut downs. Pipe freezing shall also be used when isolation valve is not available to prevent disruption of the piping network.

.4 Be responsible for damage to existing plant by this work.

3.15 FIELD QUALITY CONTROL

.1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit reports.

.2 Manufacturer’s Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer’s Field Reports.

.2 Provide manufacturer’s field services consisting of product use recommendations and

periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.15 MECHANICAL AND ELECTRICAL COORDINATION

.1 All motor control centres, starters, power wiring and conduit shall be provided by Division 26.

.2 Where packaged mechanical equipment is shipped with integrated starter, Division 26 shall provide power wiring in conduit. Refer to schedules and relevant specifications for details.

.3 All remote disconnect switches, service receptacles shall be provided by Division 26.

.4 All mechanical control wiring shall be provided by this division, except for life safety and fire alarm systems.

.5 All motors for mechanical systems shall be provided by this division.

.6 Wiring to smoke dampers, combination fire and smoke dampers, damper end switches shall be provided by Division 26.

.7 All relays required for mechanical systems shall be provided by this division.

.8 Electric heat tracing systems for piping systems and basin heaters for cooling tower sumps shall be provided by this division, with power provisions by Division 26.

.9 All relays and mechanical systems shutdowns by fire alarm systems shall be provided by Division 26.

.10 Mechanical contractor shall coordinate with Division 26 for all power requirements to mechanical control systems; Division 26 to provide power wiring and transformer where required.

3.16 DEMONSTRATION

.1 Owner's Representative may use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

.2 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.

.3 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

.4 Instruction duration time requirements as specified in appropriate sections.

.5 Contractor shall record these demonstrations on video tape for future reference.

3.17 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.18 PROTECTION

.1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

END OF SECTION

1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Electrical motors, drives and guards for mechanical equipment and systems.

.2 Supplier and installer responsibility indicated in Motor, Control and Equipment Schedule on electrical drawings and related mechanical responsibility is indicated on Mechanical Equipment Schedule on mechanical drawings.

.3 Control wiring and conduit is specified in Division 26 except for conduit, wiring and connections below 50 V which are related to control systems specified in Division 22 and 23. Refer to Division 26 for quality of materials and workmanship.

.4 Variable Frequency Drives

1.2 REFERENCE STANDARDS

.1 American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)

.1 ASHRAE 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings (IESNA cosponsored; ANSI approved; Continuous Maintenance Standard).

.2 Electrical Equipment Manufacturers' Association Council (EEMAC)

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Safety Data Sheets (SDS).

.4 National Energy Code for Buildings (NECB)

.5 National Electrical Manufacturers Association (NEMA).

.1 NEMA MG-1 National Electrical Manufacturers Association – Motors and Generators.

.6 ANSI/IEEE 112 - Test Procedures for Motors / Generators.

.7 UL 1004 - Motors, Electric.

.8 UL 674 - Motors, Generators, Electric, for Use in Hazardous Locations: Class I, Groups C and D; Class II, Groups E, F, and G.

1.3 QUALITY ASSURANCE

.1 Regulatory Requirements: work to be performed in compliance with Canadian Environmental Protection Act (CEPA), Canadian Environmental Assessment Agency (CEAA), Transportation of Dangerous Goods Act (TDGA) and applicable Provincial regulations.

.2 Motors shall have CSA certification and UL listing.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

2 PRODUCTS

2.1 GENERAL

.1 Motors shall be premium efficiency, in accordance with local Hydro company standards and to ASHRAE 90.1.

.2 Motors not to exceed speeds above 1,800 RPM unless otherwise noted.

.3 Motors shall be located to allow for replacement of bearings.

.4 Provided extended lube lines and alemite fitting outside of fan enclosure to facilitate lubrication.

.5 Motors used for variable speed applications shall be inverted duty rated suitable for operation at variable torque loads over wide speed range.

.6 Motors shall be rated for 1.15 service factor in 40°C (105°F) ambient conditions.

2.2 MOTORS

.1 Provide motors for mechanical equipment as specified.

.2 Motors under 373 W (1/2 HP): speed as indicated, continuous duty, built-in overload protection, resilient mount, single phase, 120 V, unless otherwise specified or indicated.

.3 Motors 373 W (1/2 HP) and larger: EEMAC Class B, squirrel cage induction, speed as indicated, continuous duty, drip proof, ball bearing, maximum temperature rise 40 degrees C, 3 phase, 208 V or 600V, unless otherwise indicated. Confirm electric voltage, phase and starter requirements with Division 26.

.4 Motors shall be Open Drip Proof (ODP) to totally enclosed fan cooled (TEFC) enclosure type.

.5 Standard of Acceptance: Baldor, WEG, US Motors or US Motors.

2.3 TEMPORARY MOTORS

.1 If delivery of specified motor will delay completion or commissioning work, install motor approved by Consultant for temporary use. Work will only be accepted when specified motor is installed.

2.4 BELT DRIVES

.1 Fit reinforced belts in sheave matched to drive. Multiple belts to be matched sets.

.2 Use cast iron or steel sheaves secured to shafts with removable keys unless otherwise indicated.

.3 For motors under 7.5 kW (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 7.5 kW (10 HP) and over: sheave with split tapered bushing and keyway having fixed pitch unless specifically required for item concerned. Provide sheave of correct size to suit balancing.

.5 Correct size of sheave determined during commissioning.

.6 Minimum drive rating: 1.5 times nameplate rating on motor. Keep overhung loads within manufacturer’s design requirements on prime mover shafts.

.7 Motor slide rail adjustment plates to allow for centre line adjustment.

.8 Supply one set of spare belts for each set installed in accordance with Section 01 78 00 -

Closeout Submittals.

2.5 DRIVE GUARDS

.1 Provide removable guards for unprotected drives and unprotected fan inlets/outlets.

.2 Guards for belt drives;

- .1 Expanded metal screen welded to steel frame.
- .2 Minimum 1.2 mm thick sheet metal tops and bottoms.
- .3 38 mm (1.5”) dia holes on both shaft centres for insertion of tachometer.
- .4 Removable for servicing.

.3 Provide means to permit lubrication and use of test instruments with guards in place.

.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 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, 19 mm mesh.
- .2 Net free area of guard: not less than 80% of fan openings.
- .3 Securely fasten in place.
- .4 Removable for servicing.

.7 Guards shall be powder coated and finished painted bright yellow.

2.5 GROUNDING

.1 All motors used in variable speed applications shall be provided with micro fiber shaft grounding ring, AEGIS SGR or equivalent. Ensure shaft is free from debris, coating, paint prior to installation. Install in accordance with manufacturer’s instructions and test for a conductive path to ground using an ohmmeter. Ensure readings are under 1 ohm.

.2 Ground motors to common earth ground with drive with grounding strap according to applicable standards and motor/VFD installation instructions.

2.6 VARIABLE FREQUENCY DRIVED (VFD)

.1 Provide complete variable frequency drives (VFD) for the fans and pumps designated on the schedules to be variable speed. Separate schedules are not issued for the variable frequency drives. Refer to the air handling unit, return fan, cooling tower and pump schedules as applicable. All standard and optional features shall be included within the VFD enclosure. VFD enclosure shall be in heavy gauge metal NEMA 1 enclosure. The entire package shall be UL and CSA approved.

.2 The VFD shall be tested to UL 508C. The appropriate cUL label shall be applied.

.3 The VFD shall convert incoming fixed frequency three-phase AC power into an adjustable frequency and voltage for controlling the speed of three-phase AC motors. The motor current shall closely approximate a sine wave. Motor voltage shall be varied with frequency to maintain desired motor magnetization current suitable for the driven load and to eliminate the need for motor derating.

.4 The VFD shall include an input full-wave bridge rectifier and maintain a fundamental (displacement) power factor near unity regardless of speed or load.

.5 The VFD shall have a dual 5% impedance DC link reactor on the positive and negative rails of the DC bus to minimize power line harmonics and protect the VFD from power line transients.

.6 The VFD's full load output current rating shall meet or exceed NEC Table 430-150. The VFD shall be able to provide full rated output current continuously, 110% of rated current for 60 seconds and 120% of rated torque for up to 0.5 second while starting.

.7 Output power circuit switching shall be able to be accomplished without interlocks or damage to the VFD.

.8 VFD shall contain integral EMI filters to attenuate radio frequency interference conducted to the AC power line.

.9 Supply all VFD with the latest version of firmware, upgrade all existing VFD's in field as required.

.10 All VFDs to be remote mounted on either Unistrut stand or wall. VFDs mounted directly to the motor will not be accepted.

.11 A minimum of Class 20 I2t electronic motor overload protection for single motor applications shall be provided. Overload protection shall automatically compensate for changes in motor speed.

.12 Protection against input transients, loss of AC line phase, output short circuit, output ground fault, over voltage, under voltage, VFD over temperature and motor over temperature. The VFD shall display all faults in plain language. Codes are not acceptable.

.13 Protect VFD from input phase loss. The VFD should be able to protect itself from damage and indicate the phase loss condition. During an input phase loss condition, the VFD shall be able to be programmed to either trip off while displaying an alarm, issue a warning while running at reduced output capacity, or issue a warning while running at full commanded speed. This function is independent of which input power phase is lost.

.14 Drive to be seismic certified. Seismic importance factor of 1.5 rating is required. Rating certification based upon actual shake table test data as defined by ICC AC 156.

.15 Hand, Off and Auto keys shall be provided to start and stop the VFD and determine the source of the speed reference. It shall be possible to either disable these keys or password protect them from undesired operation.

.16 Standard Control and Monitoring Inputs and Outputs:

.1 Four dedicated, programmable digital inputs shall be provided for interfacing with the systems control and safety interlock circuitry.

.2 Two terminals shall be programmable to act as either a digital output or additional digital inputs.

.3 Two programmable relay outputs, Form C 240 V AC, 2 A, shall be provided for remote indication of VFD status. Each relay shall have an adjustable on delay / off delay time.

.4 Two programmable analog inputs shall be provided that can be either direct-or-reverse acting. Each shall be independently selectable to be used with either an analog voltage or current signal.

.5 The maximum and minimum range of each shall be able to be independently scalable from 0 to 10 V dc and 0 to 20 mA.

.6 A programmable low-pass filter for either or both analog inputs must be included to

compensate for noise.

.7 The VFD shall provide front panel meter displays programmable to show the value of each analog input signal for system set-up and troubleshooting,

.17 One programmable analog current output (0/4 to 20 mA) shall be provided for indication of VFD status. This output shall be programmable to show the reference or feedback signal supplied to the VFD and for VFD output frequency, current and power. It shall be possible to scale the minimum and maximum values of this output.

.18 Serial communications - The VFD shall include a standard communications port and capabilities to be connected to the following serial communication protocols at no additional cost and without a need to install any additional hardware or software in the VFD:

.1 BACnet MS/TP, Johnson N2, Siemens P1 and Modbus RTU

.19 Standard of acceptance: Danfoss, ABB.

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 datasheet.

3.2 INSTALLATION

.1 Fasten securely in place.

.2 Make removable for servicing, easily returned into, and positively in position.

.3 Install devices in accordance with manufacturer's recommendations.

.4 Install the drive not more than 10 metres from the motor. The length of wiring connection shall not exceed 10 metres. Provide support for the variable frequency drive in the vicinity of the motor as required. Contractor to provide a written report to the Consultant indicating the lengths of wiring installed between the drive and the driven motor for all systems connected to variable frequency drives.

.5 VFD Start-up - The manufacturer shall provide start-up commissioning of the VFD and its optional circuits by a factory certified service technician who is experienced in start-up and repair services. Sales personnel and other agents who are not factory certified shall not be acceptable as commissioning agents. Start-up services shall include checking for verification of proper operation and installation for the VFD, its options and its interface wiring to the building automation system.

3.3 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Schedule site visits, to review Work and provide reports.

3.4 WARRANTY

.1 The complete VFD shall be warranted by the manufacturer for a period of 24 months from date of shipment. The warranty shall include parts, labour, travel costs and living expenses incurred by the manufacturer to provide factory authorized on-site service. The warranty shall be provided by the VFD manufacturer and not a third party. A written warranty statement shall be provided with the submittals.

.2 The warranty shall include all parts, labour, travel time, and expenses.

3.5 CLEANING

.1 Proceed in accordance with Section 01 74 00 - Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

1 GENERAL

1.1 REFERENCE STANDARDS

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.181, Ready-Mixed Organic Zinc-Rich Coating.

.2 CSA Group (CSA)

.1 CAN/CSA B139, Installation Code for Oil Burning Equipment.

.3 Green Seal Environmental Standards (GSES)

.1 S tandard GS-11, Environmental Standard for Paints and Coatings.

.5 National Research Council Canada (NRC)

.1 National Fire Code of Canada (NFC).

1.2 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials in accordance with Section 01 74 19 - Waste Management and Disposal.

2 PRODUCTS

2.1 MATERIAL

.1 Paint: zinc-rich to CAN/CGSB-1.181

.1 Primers, Paints and Coating: in accordance with manufacturer's recommendations for surface conditions.

2.2 ACCESS PANELS/DOORS

.1 Provide access panels at all locations of concealed equipment, fittings requiring access for operation, maintenance and repair including but not limited to isolation valves, balancing valves, air vents, motorized valves, flow metering devices.

.2 Access doors shall be located to provide complete access to concealed equipment and devices.

.3 Construction:

.1 Plaster or wet wall: 16 ga steel flush with surface complete with gasket and concealed flange.

.2 Masonry or drywall: 16 ga steel flush with surface complete with gasket and concealed flange.

.4 Finish:

.1 Tiled or marble surfaces: type 304 stainless steel, #4 satin polish.

.2 Other areas: prime coated steel, finished to match adjacent.

.5 Options and accessories:

.1 Continuous concealed hinges.

.2 Adjustable anchoring straps to suit installation.

.3 Mineral wool insulation (for fire rated panels).

.4 Self latching screw driver operated slam latch.

.5 Automatic panel closer.

.6 Inside latch release.

.6 Sizing:

.1 Access panels/doors shall be of adequate size to facilitate access to all components. The following are minimum recommended sizes:

.1 Hand access: 300x300mm (12”x12”)

.2 Body entry access: 600x600mm (24”x24”)

.7 Fire rating

.1 Access doors/panels installed in fire rated floor and wall assemblies shall have similar fire rating and corresponding ULC label.

3 EXECUTION

3.1 APPLICATION

.1 Manufacturer’s Instructions: comply with manufacturer’s written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 CONNECTIONS TO EQUIPMENT

.1 In accordance with manufacturer’s instructions unless otherwise indicated.

.2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.

.3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.

3.3 CLEARANCES

.1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer and National Fire Code of Canada or CAN/CSA B139.

.2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer, CAN/CSA B139 or as indicated without interrupting operation of other system, equipment, components.

3.4 DRAINS

.1 Install piping with grade in direction of flow except as indicated.

.2 Install drain valve at low points in piping systems, at equipment and at section isolating valves.

.3 Pipe each drain valve discharge separately to above floor drain.

.1 Discharge to be visible.

.4 Drain valves: 20mm (NPS 3/4) gate or globe valves unless indicated otherwise, with hose end male thread, cap and chain.

3.5 AIR VENTS

.1 Install automatic air vents to at all high points in piping systems.

.2 Install isolating valve at each automatic air valve.

.3 Install drain piping to approved location and terminate where discharge is visible.

.4 Pipe discharge from all relief valves, air vents in glycol systems back to glycol tank.

3.6 DIELECTRIC COUPLINGS

.1 General: compatible with system, to suit pressure rating of system.

.2 Locations: where dissimilar metals are joined.

.3 50mm (NPS 2) and under: isolating unions or bronze valves.

.4 Over 50mm (NPS 2): isolating flanges.

3.7 PIPEWORK INSTALLATION

.1 Install pipework to CAN/CSA B139, CAN/CSA B149 and other applicable standards.

.2 Screwed fittings jointed with Teflon tape.

.3 Protect openings against entry of foreign material.

.4 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.

.5 Assemble piping using fittings manufactured to ANSI standards

.6 Saddle type branch fittings may be used on mains if branch line is no larger than half size of main.

.1 Hole saw (or drill) and ream main to maintain full inside diameter of branch line prior to welding saddle.

.7 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.

.8 Install concealed pipework to minimize furring space, maximize headroom, conserve space.

.9 Slope piping, except where indicated, in direction of flow for positive drainage and venting.

.10 Install, except where indicated, to permit separate thermal insulation of each pipe.

.11 Group piping wherever possible and as indicated.

.12 Ream pipes, remove scale and other foreign material before assembly.

.13 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.

.14 Provide for thermal expansion as indicated.

.15 Valves:

.1 Install in accessible locations.

.2 Remove interior parts before soldering.

.3 Install with stems above horizontal position unless indicated.

.4 Valves accessible for maintenance without removing adjacent piping.

.5 Install globe valves in bypass around control valves.

.6 Use gate or ball valves at branch take-offs for isolating purposes except where specified.

.7 Install butterfly valves on chilled water and related condenser water systems only.

.8 Install butterfly valves between weld neck flanges to ensure full compression of liner.

.9 Install plug cocks or ball valves for glycol service.

.10 Use chain operators on valves 65mm (NPS 2 ½) and larger where installed more than 2,400 mm above floor in Mechanical Rooms.

.16 Check Valves:

.1 Install silent check valves on discharge of pumps and in vertical pipes with downward flow and as indicated.

.2 Install swing check valves in horizontal lines on discharge of pumps and as indicated.

.17 Provide insulation and jacketing in accordance with Section 23 07 19 – HVAC Piping Insulation.

.18 Provide identification of all piping systems and equipment in accordance with Section 23 05 53 – Identification for HVAC Piping and Equipment.

3.8 SLEEVES

.1 General: install where pipes pass through masonry, concrete structures, fire rated assemblies, and as indicated. Provide adequate support and reinforcement at all sleeve locations.

.2 Material: schedule 40 black steel pipe.

.3 Construction: use annular fins continuously welded at mid-point at foundation walls and where sleeves extend above finished floors.

.4 Sizes: 6 mm (1/4 in) minimum clearance between sleeve and uninsulated pipe or between sleeve and insulation. Size to allow for movement fur to expansion.

.5 Installation:

.1 Concrete, masonry walls, concrete floors on grade: terminate flush with finished surface.

.2 Wet floors: terminate 50mm above finished floor c/w floor plate and caulking.

.3 Other floors: terminate 25 mm above finished floor.

.4 Before installation, paint exposed exterior surfaces with heavy application of zinc-rich paint to CAN/CGSB-1.181

.5 Provide chrome plated escutcheons at all penetrations thru finished surfaces or millwork.

.6 Sealing:

.1 Foundation walls and below grade floors: fire retardant, waterproof non-hardening mastic.

.2 Elsewhere:

.1 Provide space for fire stopping.

.2 Maintain the fire-resistance rating integrity of the fire separation.

.3 Sleeves installed for future use: fill with lime plaster or other easily removable filler.

.4 Ensure no contact between copper pipe or tube and sleeve.

3.9 ESCUTCHEONS

.1 Install on pipes passing through walls, partitions, floors, and ceilings in finished areas.

.2 Construction: one piece type with set screws.

.1 Chrome or nickel plated brass or type 302 stainless steel..

.3 Sizes: outside diameter to cover opening or sleeve.

.1 Inside diameter to fit around pipe or outside of insulation if so provided.

3.10 PREPARATION FOR FIRE STOPPING

.1 Coordinate the installation of fire stopping around pipes, insulation and adjacent fire separation in accordance with Section 07 84 00 - Fire Stopping.

.2 Pipes subject to movement: conform to fire stop system design listing to ensure pipe movement without damaging fire stopping material or installation.

.3 Insulated pipes: ensure integrity of insulation and vapour barriers.

3.11 FLUSHING OUT OF PIPING SYSTEMS

.1 Flush system in accordance with Section 23 08 16 - Cleaning and Start-Up of HVAC Piping Systems.

.2 Provide min 65mm (NPS 2 1/2) bypass piping at end of each loop complete with isolation to facilitate thorough cleaning and flushing of the entire system. Coordinate locations of the bypasses with chemical treatment vendor prior to installation.

3.12 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK

.1 Advise Owner’s Representative and Consultant 48 hours minimum prior to performance of pressure tests.

.2 Pipework: test as specified in relevant sections of heating, ventilating and air conditioning work.

.3 Maintain specified test pressure without loss for 4 hours minimum unless specified for longer period of time in relevant mechanical sections.

.4 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or media.

.5 Conduct tests in presence of Owner’s Representative or Consultant.

.6 Pay costs for repairs or replacement, retesting, and making good. Consultant to determine whether repair or replacement is appropriate.

.7 Insulate or conceal work only after approval and certification of tests by Consultant.

3.13 EXISTING SYSTEMS

.1 Connect into existing piping systems at times approved by Owner’s Representative.

.2 Request written approval by Owner’s Representative 10 working days minimum, prior to commencement of work.

.3 Be responsible for damage to existing plant by this work.

3.14 CORING

.1 Provide core drilling for installation of plumbing systems.

.2 X-ray or scan floor and wall assemblies prior to core drilling, consult with Consultant on any noted interferences. X-ray shall only be carried out after hours, coordinate with Owner's Representative and provide minimum 10 business days' notice.

.3 Coring and cutting of structural components shall only be completed once approved by Structural Engineer.

.4 Repair adjacent finishes and any damages as a result of this work to satisfaction of Owner's Representative and Consultant.

.5 Verify obstructions and interference on the other side of the floor and wall assemblies prior to coring. If any obstructions are noted, contractor shall locate alternate core locations and propose to Consultant for review and approval. Proceed with coring at alternate locations only once approved by Consultant.

3.15 PIPING ARRANGEMENT

.1 Location of piping, sleeves, inserts, hangers, and equipment, access provisions shall be coordinated with the work of all trades. The coordination/shop drawings shall be submitted to Consultant for review.

.2 Locate piping, sleeves, inserts, hangers, ductwork and equipment clear of windows, doors, openings, light outlets, receptacles and other services and utilities. Equipment coordination/shop drawings shall be prepared to coordinate proper location and personnel access of all facilities. The drawings shall be submitted to Consultant for review. Follow manufacturer's published recommendations for installation methods not otherwise specified.

3.16 CLEANING

.1 Clean in accordance with Section 01 74 00 - Cleaning.

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

END OF SECTION

1 GENERAL

1.1 REFERENCE STANDARDS

.1 American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME)

.1 ANSI/ASME B31.1, Power Piping.

.2 ANSI/ASME B31.3, Process Piping.

.3 ANSI/ASME Boiler and Pressure Vessel Code:

.1 BPVC 2023 Section I: Power Boilers.

.2 BPVC 2023 Section IV - Heating Boilers.

.3 BPVC 2023 Section V: Nondestructive Examination.

.4 BPVC 2023 Section VIII - Pressure Vessels.

.5 BPVC 2023 Section IX: Welding, Brazing, and Fusing Qualifications.

.2 American National Standards Institute/American Water Works Association (ANSI/AWWA)

.1 ANSI/AWWA C206, Field Welding of Steel Water Pipe.

.3 American Welding Society (AWS)

.1 AWS C1.1M/C1.1, Recommended Practices for Resistance Welding.

.2 AWS W1, Welding Inspection Handbook..

.4 CSA Group (CSA)

.1 CSA W47.1, Certification of Companies for Fusion Welding of Aluminum.

.2 CSA W48, Filler Metals and Allied Materials for Metal Arc Welding.

.3 CSA B51, Boiler, Pressure Vessel and Pressure Piping Code.

.4 CSA-W117.2, Safety in Welding, Cutting and Allied Processes.

.5 CSA W178.1, Certification of Welding Inspection Organizations.

.6 CSA W178.2, Certification of Welding Inspectors.

1.2 QUALITY ASSURANCE

.1 Qualifications:

.1 Welders:

.1 Welding qualifications in accordance with CSA B51.

.2 Use qualified and licensed welders possessing certificate for each procedure performed from authority having jurisdiction.

.3 Submit welder’s qualifications and welding procedures to Consultant withing 15 days of project award and prior to any work.

.4 Each welder to possess identification symbol issued by authority having jurisdiction.

.5 Certification of companies for fusion welding of aluminum in accordance with CSA W47.2.

.2 Inspectors:

.1 Inspectors qualified to CSA W178.2.

.3 Certifications:

.1 Registration of welding procedures in accordance with CSA B51.

.2 Copy of welding procedures available for inspection.

.3 Safety in welding, cutting and allied processes in accordance with CSA-W117.2.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials in accordance with Section 01 74 19 - Waste Management and Disposal.

2 PRODUCTS

2.1 ELECTRODES

.1 Electrodes: in accordance with CSA W48 Series

3 EXECUTION

3.1 APPLICATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 QUALITY OF WORK

.1 Welding: in accordance with ANSI/ASME B31.1, B31.3, ANSI/ASME Boiler and Pressure Vessel Code, Sections I and IX and ANSI/AWWA C206, using procedures conforming to AWS B3.0, AWS C1.1, and special procedures specified elsewhere in Mechanical Division and applicable requirements of provincial authority having jurisdiction.

3.3 INSTALLATION REQUIREMENTS

.1 Identify each weld with welder's identification symbol.

.2 Backing rings:

.1 Where used, fit to minimize gaps between ring and pipe bore.

.2 Do not install at orifice flanges.

.3 Fittings:

.1 50mm (NPS 2) and smaller: install welding type sockets.

.2 Branch connections: install welding tees or forged branch outlet fittings.

3.4 INSPECTION AND TESTS - GENERAL REQUIREMENTS

.1 Review weld quality requirements and defect limits of applicable codes and standards with Owner's Representative before work is started.

.2 Formulate "Inspection and Test Plan" in co-operation with Owner's Representative.

.3 Do not conceal welds until they have been inspected, tested and approved by inspector.

.4 Provide for inspector to visually inspect welds during early stages of welding procedures in accordance with Welding Inspection Handbook. Repair or replace defects as required by codes and as specified.

3.5 SPECIALIST EXAMINATIONS AND TESTS

.1 General:

.1 Perform examinations and tests by specialist qualified to CSA W178.1 and CSA W178.2 and approved by Consultant.

.2 To ANSI/ASME Boiler and Pressure Vessels Code, Section V, CSA B51 and requirements of authority having jurisdiction

.3 Inspect and test welds in accordance with "Inspection and Test Plan" by non-destructive visual examination and magnetic particle (hereinafter referred to as "particle") tests and/or spot or full gamma ray radiographic (hereinafter referred to as "radiography") tests. As per applicable reference standard or as specified.

.2 Hydrostatically test welds to ANSI/ASME B31.1

.3 Visual examinations: include entire circumference of weld externally and wherever possible internally.

.4 Failure of visual examinations:

.1 Upon failure of welds by visual examination, perform additional testing as directed by Consultant of total of up to 15% of welds, selected at random by Consultant by radiographic tests.

.5 Full radiographic tests for steam piping systems.

.1 Spot radiography:

.1 Conduct spot radiographic tests of up to 10% of welds, selected at random by Consultant from welds which would be most difficult to repair in event of failure after system is operational.

.2 Radiographic film:

.1 Identify each radiographic film with date, location, name of welder, and submit to Consultant. Replace film if rejected because of poor quality.

.3 Interpretation of radiographic films:

.1 By qualified radiographer, submit report describing observations and recommendations.

.4 Failure of radiographic tests:

.1 Extend tests to welds by welder responsible when those welds fails tests.

.2 Repair or replace all failed welds, joints as required.

3.6 DEFECTS CAUSING REJECTION

.1 As described in ANSI/ASME B31.1 and ANSI/ASME Boiler and Pressure Vessels Code

.2 In addition, chilled water systems below 1,034 kPa (100 psi):

.1 Undercutting greater than 0.8 mm adjacent to cover bead on outside of pipe.

.2 Undercutting greater than 0.8 mm adjacent to root bead on inside of pipe.

.3 Undercutting greater than 0.8 mm at combination of internal surface and external surface.

.4 Incomplete penetration and incomplete fusion greater than total length of 38 mm in 1500 mm length of weld depth of such defects being greater than 0.8 mm.

.5 Repair cracks and defects in excess of 0.8 mm in depth.

.6 Repair defects whose depth cannot be determined accurately on basis of visual examination or radiographic tests.

3.7 REPAIR OF WELDS WHICH FAILED TESTS

.1 Re-inspect and re-test repaired or re-worked welds at Contractor's expense.

3.8 WELDING SMOKE MANAGEMENT AND RESTRICTIONS

.1 Welding, soldering, cutting, grinding or any other work resulting in fumes, smoke or dust particles inside mechanical plenums or rooms used as a return air plenum for HVAC systems is not permitted during regular hours when HVAC systems are in operation to prevent recirculation of smoke and dust particles. Welding in these areas shall be completed during afterhours, once equipment is shut down. All surfaces must be thoroughly cleaned by qualified personnel using soap and steam prior to reinstating equipment in operation.

.2 Welding in contained spaces such as service shafts, tunnels, crawl spaces, etc shall only be carried out once effective means of smoke evacuation is provided. Contractor shall be responsible for assessing existing site conditions and preparing smoke management plan prior to welding operations, submit plan to Owner's Representative and Consultant for approval prior to any work. These measures may include but not be limited to temporary floor/wall openings, air transfer fans, HEPA filtration and scrubber units, fume extraction equipment, temporary power provisions, temporary generator, hoarding, fencing, fire alarm bypasses, fire watch, etc as required to provide effective management and evacuation of welding fumes.

.3 Contractor shall be responsible for coordinating with welding personnel and other sub-trades to prepare smoke management plant, supply labour and materials for execution.

.4 Contractor shall be solely responsible for all costs associated with the requirements in this section.

3.9 CLEANING

.1 Clean in accordance with Section 01 74 00 - Cleaning.

.2 Waste Management: separate waste materials for reuse and recycling]in accordance with Section 01 74 19 - Waste Management and Disposal.

END OF SECTION

1 GENERAL

1.1 REFERENCE STANDARDS

.1 American Society of Mechanical Engineers (ASME)

.1 ASME Fluid Meter's Handbook: Their Theory and Application, Sixth Edition.

.2 ASME B40.100, Pressure Gauges and Gauge Attachments.

.3 ASME B40.200, Thermometers, Direct Reading and Remote Reading.

1.2 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 61 00 - Common Product Requirements.

.2 Waste Management and Disposal:

.1 Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

2 PRODUCTS

2.1 GENERAL

.1 Meters and gauges shall be selected such that normal operating range is within 40-60% of the gauge scale range.

.2 Air and water metering devices shall be selected to ensure adequate velocity across the meter such that meter accuracy is maintained across entire operating range. Meter accuracy shall be field verified by TAB contractor at 25%, 50%, 75% and 100% of the design air/water flow.

.3 Pressure and thermometer gauges shall have both imperial and metric units.

.4 Provide wells for all gauges and meters.

.5 Refer to schematics and details for location of devices.

2.2 PIPING THERMOMETERS

.1 Thermometers shall be 225mm (9in) scale size with +/- 1 scale division accuracy, dual (Celsius/Fahrenheit) scale, durable cast aluminum case, 304 stainless steel adjustable angle stem, white background with black temperature/scale markings, clear glass window.

.2 Standard of acceptance: Trerice, Winters or Weiss.

2.3 PIPING PRESSURE GAUGES

.1 Pressure gages shall be 115mm (4.5in) diameter dial size, ASME B40.100 Grade 1A, +/- % accuracy, dual (kPa/psi) scale, cast aluminum case, clear glass window, white background with black pressure/scale markings, clear glass window, suitable for maximum 100°C (212°F) service temperature, c/w CRN registration.

.2 Provide impulse dampeners and needle valve upstream of each gauge.

.3 Gauges for fire protection service shall have ULC listing.

.4 Gauges for steam service shall be c/w coil syphons.

.5 Standard of acceptance: Trerice, Winters or Weiss.

2.4 THERMOMETER WELLS

.1 Copper or bronze for copper piping systems.

.2 Brass for steel piping systems.

2.5 FLOW VERIFICATION AND METERING DEVICE

.1 Cabron steel ASTM-120 body and insert, venturi style flow metering device, size to match line size.

.2 Accuracy: +/-3%.

.3 Pressure drop shall not exceed 6 kPa (0.9psi) at design flow.

.4 Pressure/Temperature rating: 1,654kPa (240 psi) / 120°C (250°F).

.5 Standard of acceptance: IMI Flow Design VF.

3 EXECUTION

3.1 GENERAL

.1 Install in accordance with manufacturer's recommendations in easily visible locations.

.2 In locations with difficult access or at heights more than 2.4m above floor, provide remote reading thermometers and pressure gauges.

.3 Protect from damage during installation.

.4 Test and verify operation of all gauges, thermometers and meters.

.5 Accuracy of all flow meters shall be field verified by TAB contractor at 25%, 50%, 75% and 100% of the design flow. Submit report for consultant's review.

3.2 THERMOMETERS

.1 Install in wells on piping systems as noted on schematics, details and at inlet/outlets of:

- .1 Boilers
- .2 Chillers – on both condenser and chilled water sides
- .3 Heating and cooling coils
- .4 Heat exchangers
- .5 Energy transfer stations
- .6 Fluid coolers
- .7 At locations of sensors

.2 Provide stem extensions for installations on insulated piping systems.

3.3 PRESSURE GAUGES

.1 Install in piping systems as noted on schematics, details and as follows:

- .1 At each pump – suction upstream of strainer, suction downstream of strainer, discharge
- .2 Upstream and downstream of PRV's

.3 Inlet and outlet of heating and cooling coils

.4 Differential pressure station

.5 Inlet and outlet of boilers

.6 Inlet and outlet of chillers – on condenser and chilled water sides

.7 Inlet and outlet of heat exchangers

.8 Across strainer/filter assemblies

3.4 INSTALLATION OF DIFFERENTIAL PRESSURE TAPS AND PIPING

.1 Differential pressure taps horizontal and level with each other to within +/- 1.5 mm.

.2 Tubing: straight, supported throughout its length, sloped 5%-10% upward to main for drainage and venting, without air pockets, with blowdown valves at bottom.

3.5 INSTALLATION OF TRANSMITTERS NOT FORMING INTEGRAL PART OF PRIMARY ELEMENT

.1 Mount on pipe stand installed and located to ensure no damage by passing traffic.

3.6 INSTALLATION OF SIGNAL TRANSMISSION CABLE

.1 Ground shielding at one point only.

.2 Protect against RF interference.

.3 Cross electrical cables, conduits at 90 degrees leaving at least 150 mm space between.

3.7 START-UP

.1 Manufacturer’s representative shall carry out start-up and commissioning of all metering devices and BTU/energy meters.

.2 Submit report for Consultant’s review.

END OF SECTION

1 GENERAL

1.1 REFERENCE STANDARDS

.1 American Society of Mechanical Engineers (ASME)

.1 ASME B31.1, Power Piping.

.2 ASTM International (ASTM)

.1 ASTM A125, Standard Specification for Steel Springs, Helical, Heat-Treated.

.2 ASTM A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.3 ASTM A563, Standard Specification for Carbon and Alloy Steel Nuts.

.4 ASTM A653 G90 SS Gr. 33 - Specification for Steel Sheet, Zinc Coated (Galvanized) by the Hot Dipped Process

.5 ASTM B633 - Specification for Electrodeposited Coatings of Zinc on Iron and Steel

.6 ASTM A 123/A 123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

.7 ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip Galvanized) on Iron and Steel Hardware

.8 ASTM D 1929 - Standard Test Method for Determining Ignition Temperature of Plastics

.3 Factory Mutual (FM)

.4 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)

.1 MSS SP58, Pipe Hangers and Supports - Materials, Design and Manufacture.

.2 MSS SP69, Pipe Hangers and Supports - Selection and Application.

.3 MSS SP89, Pipe Hangers and Supports - Fabrication and Installation Practices.

.6 National Research Council Canada (NRC)

.1 National Plumbing Code of Canada (NPC).

.7 Underwriter's Laboratories of Canada (ULC).

.8 NFPA

.1 NFPA 13, Standard for the Installation of Sprinkler Systems

.9 Canadian Standards Association

.1 CSA B139, Installation code for oil-burning equipment.

.2 CSA B149.1, Natural has and propane installation code.

2 PRODUCTS

2.1 SYSTEM DESCRIPTION

.1 Design Requirements:

.1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.

.2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP58.

.3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.

.4 Design hangers and supports to support systems under conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.

.5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP58.

.2 Performance Requirements:

.1 Design supports, platforms, catwalks, hangers to withstand seismic events in accordance with the requirements of the Provincial Building Code.

2.2 GENERAL

.1 Fabricate hangers, supports and sway braces in accordance with MSS SP58. ANSI B31.1 and

.2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

.3 Provide dielectric insulation at all points of contact between dissimilar metals.

2.4 PIPE HANGERS

.1 Finishes:

.1 Pipe hangers and supports: galvanized or painted with zinc-rich paint after manufacture.

.2 Use hot dipped galvanizing process.

.3 Ensure steel hangers in contact with copper piping are epoxy coated.

.2 Upper attachment structural: suspension from lower flange of I-Beam:

.1 Cold piping 50mm (NPS 2) maximum: malleable iron C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip.

.1 Rod: 13 mm UL listed and FM approved.

.2 Cold piping 65mm (NPS 2 1/2) or greater, hot piping: malleable iron beam clamp, eye rod, jaws and extension with carbon steel retaining clip, tie rod, nuts and washers, UL listed and FM approved to MSS-SP58 and MSS-SP69.

.3 Upper attachment structural: suspension from upper flange of I-Beam:

.1 Cold piping 50mm (NPS 2) maximum: ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, UL listed and FM approved to MSS SP69.

.2 Cold piping 65mm (NPS 2 1/2) or greater, hot piping: malleable iron top-of-beam jaw-clamp with hooked rod, spring washer, plain washer and nut UL listed and FM approved.

.4 Upper attachment to concrete:

.1 Ceiling: carbon steel welded eye rod, clevis plate, clevis pin and cotters with weldless forged steel eye nut. Ensure eye 6 mm minimum greater than rod diameter.

.2 Concrete inserts: wedge shaped body with knockout protector plate UL listed and FM approved to MSS SP69

.5 Hanger rods: threaded rod material to MSS SP58:

.1 Ensure that hanger rods are subject to tensile loading only.

.2 Provide linkages where lateral or axial movement of pipework is anticipated.

.3 Do not use 22 mm or 28 mm rod.

.7 Pipe attachments: material to MSS SP58:

.1 Attachments for steel piping: carbon steel galvanized.

.2 Attachments for copper piping: copper plated black steel.

.3 Use insulation shields for hot pipework.

.4 Oversize pipe hangers and supports.

.8 Adjustable clevis: material to MSS SP69 UL listed and FM approved, clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.

.1 Ensure “U” has hole in bottom for riveting to insulation shields.

.9 Yoke style pipe roll: carbon steel yoke, rod and nuts with cast iron roll, to MSS SP69

.10 U-bolts: carbon steel to MSS SP69 with 2 nuts at each end to ASTM A563

.1 Finishes for steel pipework: galvanized.

.2 Finishes for copper, glass, brass or aluminum pipework: galvanized, with formed portion plastic coated epoxy coated.

.11 Pipe rollers: cast iron roll and roll stand with carbon steel rod to MSS SP69.

2.5 RISER CLAMPS

.1 Steel or cast iron pipe: galvanized carbon steel to MSS SP58, type 42, UL listed and FM approved.

.2 Copper pipe: carbon steel copper plated to MSS SP58, type 42.

.3 Bolts: to ASTM A307.

.4 Nuts: to ASTM A563.

2.6 INSULATION PROTECTION SHIELDS

.1 Insulated cold piping:

.1 64 kg/m^3 density insulation plus insulation protection shield to: MSS SP69, galvanized sheet carbon steel. Length designed for maximum 3 m span.

.2 Insulated hot piping:

.1 Curved plate 300 mm long, with edges turned up, welded-in centre plate for pipe sizes NPS 12 and over, carbon steel to comply with MSS SP69.

2.7 CONSTANT SUPPORT SPRING HANGERS

.1 Springs: alloy steel to ASTM A125, shot peened, magnetic particle inspected, with +/-5% spring rate tolerance, tested for free height, spring rate, loaded height and provided with Certified Mill Test Report (CMTR)

.2 Load adjustability: 10% minimum adjustability each side of calibrated load. Adjustment without special tools. Adjustments not to affect travel capabilities.

.3 Provide upper and lower factory set travel stops.

.4 Provide load adjustment scale for field adjustments.

.5 Total travel to be actual travel + 20%. Difference between total travel and actual travel 25

mm minimum.

.6 Individually calibrated scales on each side of support calibrated prior to shipment, complete with calibration record.

2.8 VARIABLE SUPPORT SPRING HANGERS

.1 Vertical movement: 13 mm minimum, 50 mm maximum, use single spring pre-compressed variable spring hangers.

.2 Vertical movement greater than 50 mm: use double spring pre-compressed variable spring hanger with 2 springs in series in single casing.

.3 Variable spring hanger complete with factory calibrated travel stops. Provide certificate of calibration for each hanger.

.4 Steel alloy springs: to ASTM A125, shot peened, magnetic particle inspected, with +/-5 % spring rate tolerance, tested for free height, spring rate, loaded height and provided with CMTR.

2.9 EQUIPMENT SUPPORTS

.1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel meeting requirements. Submit detailed calculations with shop drawings stamped by licensed Engineer in Province of Ontario.

2.10 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

.1 Provide templates to ensure accurate location of anchor bolts.

2.11 HOUSE-KEEPING PADS

.1 Provide 100 mm high concrete housekeeping pads for base-mounted equipment; size pads 150 mm larger than equipment; chamfer pad edges.

.2 Provide elevated pads for air handling systems where required to ensure proper p-trap construction, coordinate with sub-trades prior pad pouring.

2.12 OTHER EQUIPMENT SUPPORTS

.1 Fabricate equipment supports from structural grade steel.

.2 Submit detailed calculations with shop drawings stamped by licensed Engineer in Province of Ontario.

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 datasheet.

3.2 INSTALLATION

.1 Install in accordance with:

.1 Manufacturer's instructions and recommendations.

.2 Vibration Control Devices:

.1 Install on piping systems at pumps, boilers, chillers, cooling towers, and as indicated.

.3 Clamps on riser piping:

.1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.

.2 Bolt-tightening torques to industry standards.

.3 Steel pipes: install below coupling or shear lugs welded to pipe.

.4 Cast iron pipes: install below joint.

.4 Clevis plates:

.1 Attach to concrete with 4 minimum concrete inserts, one at each corner.

.5 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.

.6 Use approved constant support type hangers where:

.1 Vertical movement of pipework is 13 mm or more,

.2 Transfer of load to adjacent hangers or connected equipment is not permitted.

.7 Use variable support spring hangers where:

.1 Transfer of load to adjacent piping or to connected equipment is not critical.

.2 Variation in supporting effect does not exceed 25 % of total load.

3.03 HANGER SPACING

.1 Plumbing piping: to Ontario Building Code.

.2 Fire protection: to NFPA and Ontario Fire Code.

.3 Gas and fuel oil piping: up to 12mm (NPS 1/2): every 1.8 m.

.4 Copper piping: up to 12mm (NPS 1/2): every 1.5 m.

.5 Flexible joint roll groove pipe: in accordance with table below for steel, but not less than one hanger at joints. Table listings for straight runs without concentrated loads and where full linear movement is not required.

.6 Within 300 mm (12in) of each elbow.

Maximum Pipe Size: NPS	Maximum Pipe Size: mm	Maximum Spacing Steel	Maximum Spacing Copper
up to 1-1/4	32	2.4 m	1.8 m
1-1/2	40	3.0 m	2.4 m
2	50	3.0 m	2.4 m
2-1/2	65	3.7 m	3.0 m
3	75	3.7 m	3.0 m
3-1/2	-	3.7 m	3.3 m
4	100	3.7 m	3.6 m
5	-	4.3 m	-
6	150	4.3 m	-
8	200	4.3 m	-
10	250	4.9 m	-
12	300	4.9 m	-

.7 Pipework greater than NPS 12: to MSS SP69

3.4 HANGER INSTALLATION

.1 Install hanger so that rod is vertical under operating conditions.

.2 Adjust hangers to equalize load.

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

3.5 HORIZONTAL MOVEMENT

.1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4 degrees from vertical.

.2 Where horizontal pipe movement is less than 13 mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

3.6 FINAL ADJUSTMENT

.1 Adjust hangers and supports:

.1 Ensure that rod is vertical under operating conditions.

.2 Equalize loads.

.2 Adjustable clevis:

.1 Tighten hanger load nut securely to ensure proper hanger performance.

.2 Tighten upper nut after adjustment.

.3 C-clamps:

.1 Follow manufacturer’s recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.

.4 Beam clamps:

.1 Hammer jaw firmly against underside of beam.

3.08 CLEANING

.1 Clean in accordance with Section 01 74 00 - Cleaning.

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

END OF SECTION

1 GENERAL

1.1 REFERENCE STANDARDS

.1 Canadian Gas Association (CGA)

.1 CSA/CGA B149.1, Natural Gas and Propane Installation Code.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.60, Interior Alkyd Gloss Enamel.

.2 CAN/CGSB-24.3, Identification of Piping Systems.

.3 National Fire Protection Association (NFPA)

.1 NFPA 13, Standard for the Installation of Sprinkler Systems.

.2 NFPA 14, Standard for the Installation of Standpipe and Hose Systems.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product data to include paint colour chips, other products specified in this section.

.3 Samples:

.1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

.2 Samples to include nameplates, labels, tags, lists of proposed legends.

2 PRODUCTS

2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

.1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.

.2 Lettering and numbers raised or recessed.

.3 Information to include, as appropriate:

.1 Equipment: manufacturer's name, model, size, serial number, capacity.

.2 Motor: voltage, Hz, phase, power factor, duty, frame size.

2.2 SYSTEM NAMEPLATES

.1 Colours:

.1 Hazardous: red letters, white background.

.2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).

.2 Construction:

.1 3 mm thick laminated plastic, matte finish, with square corners, letters accurately aligned and machine engraved into core.

.3 Sizes:

.1 Conform to following table:

Size # mm	Sizes (mm)	No. of Lines	Height of Letters (mm)
1	10 x 50	1	3
2	13 x 75	1	5
3	13 x 75	2	3
4	20 x 100	1	8
5	20 x 100	2	5
6	20 x 200	1	8
7	25 x 125	1	12
8	25 x 125	2	8
9	35 x 200	1	20

.2 Use maximum of 25 letters/numbers per line.

.4 Locations:

.1 Terminal cabinets, control panels: use size #5.

.2 Equipment in Mechanical Rooms: use size # 9.

.3 Rooftop/outdoor equipment: use size#9.

.4 Equipment concealed above ceiling or inside walls: use size#2 secured to ceiling or wall.

.5 Equipment elsewhere: sizes as appropriate.

2.3 EXISTING IDENTIFICATION SYSTEMS

.1 Apply existing identification system to new work.

.2 Where existing identification system does not cover for new work, use identification system specified this section.

.3 Before starting work, obtain written approval of identification system from Owner's Representative and Consultant.

2.4 PIPING SYSTEMS GOVERNED BY CODES

.1 Identification:

.1 Natural and propane gas: to CSA/CGA B149.1. Piping shall be painted in yellow colour with markers indicating service ("natural gas" or "propane gas") and service pressure ("XX psi" or "XX in w.c."). Paint shall encompass entire surface area of the pipe, apply paint prior to installation at roof level. All piping installed at roof level and other exterior areas shall be weatherproof.

.2 Sprinklers: to NFPA 13.

.3 Standpipe and hose systems: to NFPA 14.

2.5 IDENTIFICATION OF PIPING SYSTEMS

.1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise

.2 Pictograms:

.1 Where required: Workplace Hazardous Materials Information System (WHMIS) regulations.

.3 Legend:

.1 Block capitals to sizes and colours listed in CAN/CGSB 24.3

.4 Arrows showing direction of flow:

.1 Outside diameter of pipe or insulation less than 75 mm: 100 mm long x 50 mm high.

.2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.

.3 Use double-headed arrows where flow is reversible.

.5 Extent of background colour marking:

.1 To full circumference of pipe or insulation.

.2 Length to accommodate pictogram, full length of legend and arrows.

.6 Materials for background colour marking, legend, arrows:

.1 Pipes and tubing 20 mm and smaller: waterproof and heat-resistant pressure sensitive plastic marker tags.

.2 Other pipes: pressure sensitive vinyl with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous operating temperature of 150 degrees C and intermittent temperature of 200 degrees C.

.7 Colours and Legends:

.1 Where not listed, obtain direction from Owner's Representative and Consultant.

.2 Colours for legends, arrows: to following table:

Background Colour:	Legend, Arrows:
Yellow	BLACK
Green	WHITE
Red	WHITE

.3 Background colour marking and legends for piping systems:

Contents	Background colour marking	Legend
Raw water	Green	RAW WATER
River water	Green	RIVER WATER
Sea water	Green	SEA WATER
City water	Green	CITY WATER
Treated water	Green	TREATED WATER
Brine	Green	BRINE
Condenser water supply	Green	COND. WTR. SUPPLY
Condenser water return	Green	COND. WTR. RETURN
Chilled water supply	Green	CH. WTR. SUPPLY
Chilled water return	Green	CH. WTR. RETURN
Hot water heating supply	Yellow	HEATING SUPPLY
Hot water heating return	Yellow	HEATING RETURN
High temp HW Htg. supply	Yellow	HTHW HTG. SUPPLY
High temp HW Htg. return	Yellow	HTHW HTG. RETURN
Make-up water	Yellow	MAKE-UP WTR

Contents	Background colour marking	Legend
Boiler feed water	Yellow	BLR. FEED WTR
Steam [_____]kPa	Yellow	[_____] kPa STEAM
Steam condensate (gravity)	Yellow	ST.COND.RET (GRAVITY)
Steam condensate (pumped)	Yellow	ST.COND.RET (PUMPED)
Safety valve vent	Yellow	STEAM VENT
Intermittent blow-off	Yellow	INT. BLOW-OFF
Continuous blow-off	Yellow	CONT. BLOW-OFF
Chilled drinking water	Green	CH. DRINK WTR
Drinking water return	Green	CH. DRINK WTR. CIRC
Domestic hot water supply	Green	DOM. HW SUPPLY
Dom. HWS recirculation	Green	DOM. HW CIRC
Domestic cold water supply	Green	DOM. CWS
Waste water	Green	WASTE WATER
Contaminated lab waste	Yellow	CONT. LAB WASTE
Acid waste	Yellow	ACID WASTE (add source)
Storm water	Green	STORM
Sanitary	Green	SAN
Plumbing vent	Green	SAN. VENT
Refrigeration suction	Yellow	REF. SUCTION
Refrigeration liquid	Yellow	REF. LIQUID
Refrigeration hot gas	Yellow	REF. HOT GAS
No. [_____] fuel oil suction	Yellow	# [_____] FUEL OIL
No. [_____] fuel oil return	Yellow	# [_____] FUEL OIL
Engine exhaust	Yellow	ENGINE EXHAUST
Lubricating oil	Yellow	LUB. OIL
Hydraulic oil	Yellow	HYDRAULIC OIL
Gasoline	Yellow	GASOLINE
Natural gas	to Codes	
Propane	to Codes	
Gas regulator vents	to Codes	
Distilled water	Green	DISTILL. WTR
Demineralized water	Green	DEMIN. WATER
Chlorine	Yellow	CHLORINE
Nitrogen	Yellow	NITROGEN
Oxygen	Yellow	OXYGEN
Compressed air (<700kPa)	Green	COMP. AIR [_____] kPa
Compressed air (>700kPa)	Yellow	COMP. AIR [_____] kPa
Vacuum	Green	VACUUM
Fire protection water	Red	FIRE PROT. WTR
Sprinklers	Red	SPRINKLERS

Contents	Background colour marking	Legend
Carbon dioxide	Red	CO2
Instrument air	Green	INSTRUMENT AIR

2.6 IDENTIFICATION DUCTWORK SYSTEMS

.1 50 mm (2 inch) high stencilled letters and directional arrows 150 mm (6 inch) long x 50 mm (2 inch) high.

.2 Colours: back, or co-ordinated with base colour to ensure strong contrast.

.3 Identification to include air flow type (supply air, exhaust air, return air, etc), airflow direction and associated system (RTU-X, AHU-X, EF-X, SF-X, RF-X, etc).

2.7 VALVES, CONTROLLERS

.1 Brass tags with 12 mm stamped identification data filled with black paint.

.2 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, location of tagged item.

2.8 CONTROLS COMPONENTS IDENTIFICATION

.1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.

.2 Inscriptions to include function and (where appropriate) fail-safe position.

.3 Provide label on ceiling tile or access door to identify each control valves and devices.

2.9 CONCEALED DEVICES

.1 Provide 25mm (1 inch) high nameplates for all devices and equipment concealed above ceiling (plaster, t-bar, etc) and within walls or chases.

.2 Labels shall be color coded for each system's type as follows:

.1 Red – fire and fire/smoke dampers

.2 Yellow – HVAC terminals (VAV, fan powered boxes, coils, etc), devices (fans, dampers, etc), control and isolation valves

.3 Green – plumbing and drainage

.3 Confirm colours and locations with Owner's Representative prior to installation.

2.10 SYSTEM DIAGRAMS

.1 Provide one A1 size (841x594mm) laminated color control system diagram on 12mm thick backboard for each mechanical system including heating water, chilled water, condenser water, glycol, air handling.

.2 Install system diagram inside mechanical room or control room, confirm location with Owner's representative prior to installation.

2.11 LANGUAGE

.1 Identification in English.

3 EXECUTION

3.1 TIMING

.1 Provide identification only after painting has been completed.

3.2 INSTALLATION

.1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.

.2 Provide ULC and CSA registration plates as required by respective agency.

3.3 NAMEPLATES

.1 Locations:

.1 In conspicuous location to facilitate easy reading and identification from operating floor.

.2 Standoffs:

.1 Provide for nameplates on hot and/or insulated surfaces.

.3 Protection:

.1 Do not paint, insulate or cover.

3.4 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

.1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: at not more than 17 m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.

.2 Adjacent to each change in direction.

.3 At least once in each small room through which piping or ductwork passes.

.4 On both sides of visual obstruction or where run is difficult to follow.

.5 On both sides of separations such as walls, floors, partitions.

.6 Where system is installed in pipe chases, ceiling spaces, galleries, confined spaces, at entry and exit points, and at access openings.

.7 At beginning and end points of each run and at each piece of equipment in run.

.8 At point immediately upstream of major manually operated or automatically controlled valves, and dampers. Where this is not possible, place identification as close as possible, preferably on upstream side.

.9 Identification easily and accurately readable from usual operating areas and from access points.

.1 Position of identification approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

3.5 VALVES, CONTROLLERS

.1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed “S” hooks.

.2 Install one copy of flow diagrams, valve schedules mounted in frame behind non-glare glass where directed by Consultant. Provide one copy (reduced in size if required) in each operating and maintenance manual.

.3 Number valves in each system consecutively.

3.6 CLEANING

.1 Proceed in accordance with Section 01 74 00 - Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

1 GENERAL

1.1 SUMMARY

.1 TAB is used throughout this Section to describe the process, methods and requirements of testing, adjusting and balancing for HVAC.

.2 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do other work as specified in this section.

1.2 REFERENCE STANDARDS

.1 American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE):

.1 Handbook, HVAC Applications ASHRAE Handbook, Chapter 39, Testing, Adjusting, and Balancing and Chapter 49, Sound and Vibration Control

.2 Standard 111, Measurement, Testing, Adjusting and Balancing of Building HVAC Systems

.2 National Environmental Balancing Bureau (NEBB):

.1 Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems.

.2 Procedural Standards for the Measurement of Sound and Vibration.

.3 Standard for Whole Building Technical Commissioning of New Construction.

.3 Sheet Metal and Air Conditioning Contractors National Association (SMACNA):

.1 HVAC SYSTEMS Testing, Adjusting and Balancing TABB- TAB Procedural Guide.

1.3 QUALIFICATIONS OF TAB PERSONNEL

.1 Submit to Consultant within 90 days of award of contract the following information on TAB agency:

.1 Names of personnel responsible for TAB, their qualifications and experience

.2 Certificates of calibration for all test equipment, must be valid within 3 months of the TAB activities.

.3 TAB procedures

.4 Sample TAB report and forms

.2 Provide documentation confirming qualifications, successful experience.

.3 TAB: performed in accordance with the requirements of standard under which TAB Firm's qualifications are approved:

.1 Associated Air Balance Council, (AABC)National Standards for Total System Balance, MN-1.

.2 National Environmental Balancing Bureau (NEBB) TABES, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems.

.3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC Systems - Testing, Adjusting and Balancing.

.4 Recommendations and suggested practices contained in the TAB Standard: mandatory.

.5 Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.

.6 Use TAB Standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.

.7 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.

.8 TAB Standard quality assurance provisions such as performance guarantees form part of this contract.

.1 For systems or system components not covered in TAB Standard, use TAB procedures developed by TAB Specialist.

.2 Where new procedures, and requirements, are applicable to Contract requirements have been published or adopted by body responsible for TAB Standard used (AABC, NEBB, or TABB), requirements and recommendations contained in these procedures and requirements are mandatory.

.9 Qualifications

.1 TAB agency and lead technician shall be AABC or NEBB certified, in good standing and valid certificates for the duration of the entire project.

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 to meet specified performance requirements and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.

.3 Balance water and air systems and equipment to regulate flow rates to match design.

.4 Adjust and balance domestic cold, hot and recirculation systems.

.5 Carry out equipment and duct leakage testing.

.6 Establish differential pressure setpoint(s) for all hydronic systems and static pressure setpoint(s) for all air systems, coordinate setpoints with controls contractor.

.7 Test and verify accuracy of all air and water metering devices across entire operating range and at minimum at 25%, 50%, 75% and 100% of the design flows. Provide report to Consultant. Where accuracy does not match specified tolerances, coordinate with the respective contractor or manufacturer to arrange for calibration or replacement of devices as required. Re-test devices following repairs, calibration or replacement to verify accuracy.

.8 Test and adjust minimum outdoor air damper to match specified air flows for each system, coordinate setpoints with controls contractor.

.9 Provide final marking on permanent labels of final settings and corresponding values (flows, pressure, etc) of all HVAC systems.

.10 Carry out intermediate test(s) and final test as required, provide reports to Consultant.

1.5 CO-ORDINATION

.1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule 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.

.3 Ensure cleaning of the systems has been completed and all air system filter media and

water systems strainers, suctions guides have been replaced with clean units.

1.6 PRE-TAB REVIEW

.1 Review Contract Documents before project construction is started and confirm in writing to Consultant adequacy of provisions for TAB and other aspects of design and installation pertinent to success of TAB.

.2 Review specified standards and report to Consultant in writing proposed procedures which vary from standard.

.3 During construction, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.

1.7 START-UP

.1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.

.2 Follow special start-up procedures specified elsewhere in Division 23.

1.8 OPERATION OF SYSTEMS DURING TAB

.1 Operate systems for length of time required for TAB and as required Owner for verification of TAB reports.

1.9 START OF TAB

.1 Notify Owner's Representative and Consultant minimum 10 working days prior to start of TAB.

.2 Start TAB when building is essentially completed, including:

.3 Installation of ceilings, doors, windows, other construction affecting TAB.

.4 Application of weatherstripping, sealing, and caulking.

.5 Pressure, leakage, other tests specified elsewhere Division 23.

.6 Provisions for TAB installed and operational.

.7 Start-up, verification for proper, normal and safe operation of 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, smoke, volume control dampers installed and open.
  - .6 Coil fins combed, clean.
  - .7 Access doors, installed, closed.
  - .8 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.
.7 Bypass valves in closed position.
.8 Verify expansion tank charge pressure and ensure tank is not waterlogged.
.9 Verify pressure reducing valve settings.
.10 Verify system is free of air and air vents are installed and properly operating.

1.10 APPLICATION TOLERANCES

.1 Do TAB to following tolerances of design values:

.1	Air handling units, exhaust fans:	plus 10%, minus 0%
.2	Hydronic systems:	plus 10%, minus 5%
.3	Exhaust hoods:	plus 10%, minus 0%
.4	Minimum outside air:	plus 10%, minus 0%
.5	Grilles, diffusers, registers:	plus 10%, minus 5%
.5	Terminal units:	plus 10%, minus 5%

1.11 INSTRUMENTS

.1 Prior to TAB, submit to Consultant list of instruments 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.

1.12 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit, prior to commencement of TAB:

.2 Proposed methodology and procedures for performing TAB if different from referenced standard.

1.13 PRELIMINARY TAB REPORT

.1 Submit for checking and approval of Consultant, prior to submission of formal TAB report, sample of rough TAB sheets. Include:

.1 Details of instruments used.
.2 Details of TAB procedures employed.
.3 Calculations procedures.
.4 Summaries.

1.14 TAB REPORT

.1 Format in accordance with referenced standard.

.2 TAB report to show results in SI units and to include:

.1 Air Systems

.1 Project record drawings.

.2 System schematics.

.3 Fan curves and operating conditions plotted, include fan speed, kW, Amps, Voltage

.4 Instrumentation procedures

.5 Static profile for each air handling system

.6 Distribution air flows (registers, grilles, terminal units, mains and duct branch to each zone)

.7 Coils entering and leaving dry bulb and wet bulb temperatures

.8 Outside, return, supply, exhaust air flows for each air handling system in various modes of operation including economizer off (min OA), economizer on (max OA)

.9 Verification of all air flow metering devices accuracy at 25%, 50%, 75% and 100% of the design air volumes

.10 Verification of all temperature, humidity and CO2 sensors accuracy

.11 Description of noted, corrected and uncorrected deficiencies and applicable explanatory comments on the test results and variance between the design and actual values. Include recommendations for further action.

.2 Water Systems

.1 Project record drawings.

.2 System schematics.

.3 Pump curves and operating conditions plotted, include fan speed, kW, Amps, Voltage

.4 Instrumentation procedures

.5 Distribution water flows (terminal units, main – primary/secondary loops, each zone connected to secondary loop,)

.6 Flow and pressure differential at each equipment (boiler, chiller, cooling tower, heat exchanger).

.7 Secondary loop differential pressure and bypass control valve differential pressure setpoints.

.8 Differential pressure across system components including strainers, air separators, control valves and major equipment (chillers, boilers, heat exchangers)

.9 Verification of all water temperature and differential pressure sensors accuracy

.10 Verification of all water flow metering devices at 25%, 50%, 75% and 100% of the design air volumes

.11 Description of noted, corrected and uncorrected deficiencies and applicable explanatory comments on the test results and variance between the design and actual values. Include recommendations for further action.

.3 Submit 6 copies of TAB Report to Consultant for verification and approval, in English in D-ring binders and PDF soft copy (via email), complete with index tabs.

2 PRODUCTS

2.1 NOT USED

.1 Not used.

3 EXECUTION

3.1 VERIFICATION

.1 Reported results subject to verification by Consultant.

.2 Provide personnel and instrumentation to verify up to 30% of reported results.

.3 Number and location of verified results as directed by Consultant.

.4 Pay costs to repeat TAB as required to satisfaction of Consultant.

3.2 SETTINGS

.1 After TAB is completed to satisfaction of Consultant, replace drive guards, close access doors, lock devices in set positions, ensure sensors are at required settings.

.2 Permanently mark settings to allow restoration at any time during life of facility. Do not eradicate or cover markings.

3.3 COMPLETION OF TAB

.1 TAB considered complete when final TAB Report received and approved by Consultant.

3.4 AIR AND WATER SYSTEMS

.1 Standard: TAB to most stringent of AABC, NEBB or SMACNA.

.2 Do TAB of systems, equipment, components, controls specified Division 23.

.4 Measurements: to include as appropriate for systems, equipment, components, controls: air/water velocity, static pressure, flow rates, pressure drop (or loss), temperatures (dry bulb, wet bulb, dewpoint), duct cross-sectional area, RPM, electrical power, voltage, noise, vibration.

.7 Locations of systems measurements to include as appropriate: main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

3.5 OTHER TAB REQUIREMENTS

.1 General requirements applicable to work specified this paragraph:

.1 Qualifications of TAB personnel: as for air systems specified this section.

.2 Quality assurance: as for air systems specified this section.

.2 Laboratory fume hoods:

.1 Standard: Treasury Board of Canada Handbook of Occupational Health and safety, 4th edition and applicable Provincial standards.

.2 TAB procedures: as described in standard.

.3 Building pressure conditions:

.1 Adjust HVAC systems, equipment, controls to ensure specified pressure conditions during winter, summer design conditions at all times.

.4 Zone pressure differences:

.1 Adjust HVAC systems, equipment, controls to establish specified air pressure differentials, with systems in every possible combinations of normal operating modes.

.5 Smoke management systems:

.1 Test for proper operation of all smoke and fire dampers, interlock with fan systems, sensors, detectors, installed as component parts of air systems specified Division 23.

.6 Measurement of noise and vibration from equipment specified in Division 23.

3.5 PHASING

.1 TAB activities to follow project with areas shall be completed per the project phasing. Upon completion of the project all areas shall have been tested and balanced per the contract documents.

.2 Systems serving areas outside of the project scope shall not be adversely affected. Provide measure existing parameters to document system capacity of these areas.

3.6 POST-OCCUPANCY TAB

.1 Measure DBT, WBT (or %RH), air velocity, air flow patterns, NC levels, in occupied zone areas as directed by Owner's Representative or Consultant.

.2 Participate in systems checks twice during Warranty Period as follows:

.1 First check: approximately 3 months after acceptance

.2 Second check: within 1 month of termination of Warranty Period

.3 Complete necessary adjustments of systems as required to meet design operating conditions, submit proposed measures and adjustments to Consultant for review and approval prior to implementation.

END OF SECTION

1 GENERAL

1.1 REFERENCE STANDARDS

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

.1 NSI/ASHRAE/IESNA 90.1, SI; Energy Standard for Buildings Except Low-Rise Residential Buildings.

.2 ` ASTM International (ASTM)

.1 ASTM B209M, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).

.2 ASTM C335, Standard Test Method for Steady State Heat Transfer Properties of Pipe Insulation.

.3 ASTM C411, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

.4 ASTM C449/C449M, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.

.5 ASTM C547, Standard Specification for Mineral Fiber Pipe Insulation.

.6 ASTM C553, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

.7 ASTM C612, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

.8 ASTM C795, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

.9 ASTM C921, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

.10 ASTM C1136, Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.

.11 ASTM C1290, Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts.

.12 ASTM C1338, Test Method for Determining Fungi resistance of Insulation Materials and Facings

.13 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

.3 Canadian General Standards Board (CGSB)

.1 CGSB 51-GP-52Ma, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

.4 Green Seal Environmental Standards (GSES)

.1 Standard GS-36, Commercial Adhesives.

.5 South Coast Air Quality Management District (SCAQMD), California State

.1 SCAQMD Rule 1168, Adhesive and Sealant Applications.

.6 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (2005).

.7 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S102, Method of Test for Surface Burning Characteristics of Building

Materials and Assemblies.

.2 CAN/ULC-S701, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.2 DEFINITIONS

.1 For purposes of this section:

.1 ”CONCEALED” - insulated mechanical services and equipment in suspended ceilings and non-accessible chases and furred-in spaces.

.2 ”EXPOSED” - means “not concealed” as previously defined.

.3 Insulation systems - insulation material, fasteners, jackets, and other accessories.

.2 TIAC Codes:

.1 CRD: Code Round Ductwork,

.2 CRF: Code Rectangular Finish.

1.4 QUALITY ASSURANCE

.1 Qualifications:

.1 Installer: specialist in performing work of this section, and have at least 3 years successful experience in this size and type of project, qualified to standards, member of TIAC.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer’s name, address and ULC markings.

2 PRODUCTS

2.1 FIRE AND SMOKE RATING

.1 To CAN/ULC-S102:

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.2 INSULATION

.1 Glass fiber insulation with integrated vapour barrier, minimum thickness as scheduled in PART 3.

.2 Thermal conductivity (”k” factor) not to exceed 0.042 W/m/°C at 24°C mean temperature when tested in accordance with ASTM C335.

.3 TIAC Code C-1: Rigid mineral fibre board to ASTM C612, with factory applied vapour retarder jacket to CGSB 51-GP-52 Ma (as scheduled in PART 3 of this Section)

.4 TIAC Code C-2: Mineral fibre blanket to ASTM C553 faced with factory applied vapour retarder jacket to CGSB 51-GP-52 Ma (as scheduled in PART 3 of this section)

.1 Mineral fibre: to ASTM C553

.2 Jacket: to CGSB 51-GP-52 Ma

.3 Maximum “k” factor: to ASTM C553

.5 Insulating materials shall be free of asbestos, lead, mercury or mercury compounds.

.6 Standard of acceptance: Johns Manville Microlite FSK, Owens Corning FRK or approved equivalent.

2.4 JACKETS

.1 Canvas:

.1 220 gm/m^2 cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921

.2 Lagging adhesive: compatible with insulation.

.1 Maximum VOC limit 50 g/L

.3 Aluminum:

.1 To ASTM B209 with or without moisture barrier as scheduled in PART 3 of this section.

.2 Thickness: 0.50 mm sheet.

.3 Finish: Corrugated.

.4 Jacket banding and mechanical seals: 19 mm wide, 0.5 mm thick stainless steel.

.4 Stainless steel:

.1 Type: 304 or 316 stainless steel.

.2 Thickness: 0.50 mm sheet.

.3 Finish: Corrugated.

.4 Jacket banding and mechanical seals: 19 mm wide, 0.5 mm thick stainless steel.

2.5 ACOUSTIC DUCT LINING

.1 Rigid fiber glass board meeting or exceeding ASTM C1071 Type II duct liner requirements.

.2 Sound absorption coefficient (NRC) of minimum 0.75 for 25mm (1 in) thick lining as tested in accordance with ASTM C423 and ASTM E795.

.3 Thermal conductance of 1.31 W/m^2 °C (0.23 BTU/hr ft^2 °F).

.4 Adhesive to ASTM C916.

.5 Standard of acceptance: Johns Manville Linacoustic R-300, Owens Corning QUIETR or approved equivalent.

2.5 ACCESSORIES

.1 Vapour retarder lap adhesive:

.1 Water based, fire retardant type, compatible with insulation.

.1 Maximum VOC limit 50 g/L.

.2 Indoor Vapour Retarder Finish:

.1 Vinyl emulsion type acrylic, compatible with insulation.

.3 Insulating Cement: hydraulic setting on mineral wool, to ASTM C449

.4 ULC Listed Canvas Jacket:

.1 220 gm/m^2 cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.

.5 Outdoor Vapour Retarder Mastic:

.1 Vinyl emulsion type acrylic, compatible with insulation.

.2 Reinforcing fabric: Fibrous glass, untreated 305 g/m^2.

.6 Tape: self-adhesive, aluminum, reinforced, 75 mm wide minimum.

.7 Contact adhesive: quick-setting

.1 Maximum VOC limit 50 g/L.

.8 Canvas adhesive: washable.

.1 Maximum VOC limit 50 g/L.

.9 Tie wire: 1.5 mm stainless steel.

.10 Banding: 19 mm wide, 0.5 mm thick stainless steel.

.11 Facing: 25 mm stainless steel hexagonal wire mesh stitched on both faces of insulation.

.12 Fasteners: 4 mm diameter pins with 35 mm diameter clips, length to suit thickness of insulation.

3 EXECUTION

3.1 APPLICATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

.2 Provide thermal insulation on ductwork distribution as noted on plans and as follows:

.1 Outdoor air intake – all ductwork shall be thermally insulated, including plenums

.2 Exhaust air – insulate first 3m (10 ft) from wall or roof penetration.

.3 Supply/return air – insulate all ductwork passing through unconditioned spaces and plenums.

.4 ERV – insulate entire length of outdoor and exhaust air ductwork between outside wall or roof and ERV unit.

3.2 PREINSTALLATION REQUIREMENTS

.1 Pressure test ductwork systems complete, witness and certify.

.2 Ensure surfaces are clean, dry, free from foreign material.

3.3 INSTALLATION

.1 Install in accordance with TIAC National Standards

.2 Apply materials in accordance with manufacturers instructions and as indicated.

.3 Use 2 layers with staggered joints when required nominal thickness exceeds 75 mm.

.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.

.1 Ensure hangers, and supports are outside vapour retarder jacket.

.5 Hangers and supports in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

.1 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.

.6 Fasteners: install at 300 mm on centre in horizontal and vertical directions, minimum 2 rows each side.

.7 Where a vapor retarder is specified, seal tears, punctures and other penetrations of the duct wrap facing using one of the above methods to provide a vapor tight system.

.8 Upon completion of insulation work and before operation is to commence, visually inspect the work and verify that it has been correctly installed.

.9 Check the duct system to ensure that there are no air leaks through joints.

.10 Open all system dampers and turn on fans to blow all scraps and other loose pieces of material out of the duct system. Allow for a means of removal of such material.

.11 Replace damaged insulation, which cannot be satisfactorily repaired, including insulation with duct liner damage and moisture- saturated insulation.

.12 The insulation contractor shall advise the general and/or the mechanical contractor as to requirements for protection of the insulation work during the remainder of the construction period, to avoid damage and deterioration of the finished insulation work.

.13 Duct liner shall be installed in accordance with manufacturer's instructions and NAIMA Fibrous Glass Duct Liner Installation Standard.

3.4 DUCTWORK INSULATION SCHEDULE

.1 Insulation types and thicknesses: conform to following table:

	TIAC Code	Vapour Retarder	Thickness (mm)
Rectangular cold and dual temperature supply air ducts	C-1	Yes	50
Round cold and dual temperature supply air ducts	C-2	yes	50
Rectangular warm air ducts	C-1	No	25
Round warm air ducts	C-1	no	25
Supply, return and exhaust ducts exposed in space being served			none
Outside air ducts to mixing plenum	C-1	Yes	25
Mixing plenums	C-1	Yes	25
Exhaust duct between dampers and louvres	C-1	No	25
Rectangular ducts outside	C-1	Yes	50
Round ducts outside	C-1	Yes	50
Acoustically lined ducts	[none]		

.2 Exposed round ducts 600 mm and larger, smaller sizes where subject to abuse:

.1 Use TIAC code C-1 insulation, scored to suit diameter of duct

.1 Finishes: conform to following table:

	TIAC Code	
	Rectangular	Round
Indoor, concealed	none	none

	TIAC Code	
	Rectangular	**Round**
Indoor, exposed within mechanical room	CRF/1	CRD/2
Indoor, exposed elsewhere	CRF/2	CRD/3
Outdoor, exposed to precipitation	CRF/3	CRD/4
Outdoor, elsewhere	CRF/4	CRD/5

3.5 CLEANING

.1 Clean in accordance with Section 01 74 00 - Cleaning.

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

1 GENERAL

1.1 REFERENCE STANDARDS

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

.1 ASHRAE Standard 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings (IESNA co-sponsored; ANSI approved; Continuous Maintenance Standard).

.2 ASTM International (ASTM)

.1 ASTM B209M, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate (Metric).

.2 ASTM C335, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.

.3 ASTM C411, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

.4 ASTM C449/C449M, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.

.5 ASTM C533, Calcium Silicate Block and Pipe Thermal Insulation.

.6 ASTM C547, Mineral Fiber Pipe Insulation.

.7 ASTM C795, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

.8 ASTM C921, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

.9 ASTM C1136, Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.

.3 Canadian General Standards Board (CGSB)

.1 CGSB 51-GP-52Ma, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

.2 CAN/CGSB-51.53, Poly (Vinyl Chloride) Jacketting Sheet, for Insulated Pipes, Vessels and Round Ducts

.4 Department of Justice Canada (Jus)

.1 Canadian Environmental Assessment Act (CEAA), 1995, c. 37.

.2 Canadian Environmental Protection Act (CEPA), 1999, c. 33.

.3 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

.5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Safety Data Sheets (SDS).

.6 Manufacturer’s Trade Associations

.1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards.

.7 Underwriters’ Laboratories of Canada (ULC)

.1 CAN/ULC-S102, Surface Burning Characteristics of Building Materials and Assemblies.

.2 CAN/ULC-S701, Thermal Insulation, Polystyrene, Boards and Pipe Covering.

.3 CAN/ULC-S702, Thermal Insulation, Mineral Fibre, for Buildings.

.4 CAN/ULC-S702.2, Thermal Insulation, Mineral Fibre, for Buildings, Part 2: Application Guidelines.

1.2 DEFINITIONS

.1 For purposes of this section:

.1 ”CONCEALED” - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.

.2 ”EXPOSED” - will mean “not concealed” as specified.

.2 TIAC:

.1 CRF: Code Rectangular Finish.

.2 CPF: Code Piping Finish.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer’s printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.3 Shop Drawings:

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.4 Samples:

.1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit for approval: complete assembly of each type of insulation system, insulation, coating, and adhesive proposed. Mount sample on 12 mm plywood board. Affix label beneath sample indicating service.

.5 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties, and have listings of the agencies and standards of this specification.

.2 Instructions: submit manufacturer’s installation instructions.

1.4 QUALITY ASSURANCE

.1 Qualifications:

.2 Installer: specialist in performing work of this Section, and have at least 3 years successful experience in this size and type of project, qualified to standards of TIAC.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with manufacturer’s written instructions and Section 01 61 00 - Common Product Requirements.

.2 Deliver, store and handle materials in accordance with manufacturer’s written

instructions.

.3 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.2 Storage and Protection:

.1 Protect from weather, construction traffic.

.2 Protect against damage.

.3 Store at temperatures and conditions required by manufacturer.

.3 Waste Management and Disposal:

.1 Waste Management and Disposal: separate waste materials for reuse, and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

.2 Place excess or unused insulation and insulation accessory materials in designated containers.

.3 Divert unused metal materials from landfill to metal recycling facility.

.4 Dispose of unused adhesive material at official hazardous material collections site.

2 PRODUCTS

2.1 GENERAL

.1 Fire and smoke rating shall be in accordance with CAN/ULC-S102 and as follows:

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

.2 Insulating materials including coatings, adhesives and sealers shall have UV protection and waterproof construction.

.3 Oversize insulation for all heat traced piping, valves and specialties.

.4 Provide thermal insulation at all contacts between surfaces prone to condensation and other building materials (for example, between chilled water heat exchanger base and concrete pad) to prevent thermal bridging.

2.3 INSULATION

.1 Mineral fibre specified includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24°C (75°F) mean temperature when tested in accordance with ASTM C335

.3 TIAC Code A-1: rigid moulded mineral fibre without factory applied vapour retarder jacket.

.1 Mineral fibre: to CAN/ULC-S702 and ASTM C547.

.2 Maximum "k" factor: to CAN/ULC-S702

.4 TIAC Code A-3: rigid moulded mineral fibre with factory applied vapour retarder jacket.

.1 Mineral fibre: to CAN/ULC-S702 and ASTM C547.

.2 Jacket: to CGSB 51-GP-52 Ma

.3 Maximum "k" factor: to CAN/ULC-S702 and ASTM C547.

.5 TIAC Code C-2: mineral fibre blanket faced with factory applied vapour retarder jacket (as scheduled in PART 3 of this section).

.1 Mineral fibre: to CAN/ULC-S702 and ASTM C547.
.2 Jacket: to CGSB 51-GP-52 Ma
.3 Maximum “k” factor: to CAN/ULC-S702 and ASTM C547.

.6 TIAC Code A-6: flexible unicellular tubular elastomer
.1 Insulation: with vapour retarder jacket.
.2 Jacket: to CGSB 51-GP-52 Ma
.3 Maximum “k” factor at 24°C (75°F) mean temperature:
.1 25mm (1 in) and under: 0.0354 W/mK (0.245 BTU in/hr sq ft)
.2 32mm (1-1/2 in) to 50mm (2 in): 0.040 W/mK (0.28 BTU in/hr sq ft)
.4 Certified by manufacturer: free of potential stress corrosion cracking corrodants.
.5 Adhesive shall be supplied by manufacturer.

.7 TIAC Code A-2: rigid moulded calcium silicate in sections and blocks, and with special shapes to suit project requirements
.1 Insulation: to ASTM C533.
.2 Maximum “k” factor: to ASTM C533.
.3 Design to permit periodic removal and re-installation.
.4 Do not use calcium silicate on aluminum or stainless steel piping.

2.4 INSULATION SECUREMENT

.1 Tape: self-adhesive, aluminum, reinforced, 50 mm (2 in) wide minimum.
.2 Contact adhesive: quick setting.
.3 Canvas adhesive: washable.
.4 Tie wire: 1.5 mm (1/16 in) diameter stainless steel.
.5 Bands: stainless steel, 19mm wide (3/4 in), 0.5 mm (1/64 in) thick.

2.5 CEMENT

.1 Thermal insulating and finishing cement:
.1 Air drying on mineral wool, to ASTM C449/C449M.

2.6 VAPOUR RETARDER LAP ADHESIVE

.1 Water based, fire retardant type, compatible with insulation.

2.7 INDOOR VAPOUR RETARDER FINISH

.1 Vinyl emulsion type acrylic, compatible with insulation.

2.8 OUTDOOR VAPOUR RETARDER FINISH

.1 Vinyl emulsion type acrylic, compatible with insulation.
.2 Reinforcing fabric: fibrous glass, untreated 305 g/m^2.

2.9 JACKETS

.1 Polyvinyl Chloride (PVC):

.1 One-piece moulded type and sheet to CAN/CGSB-51.53 with pre-formed shapes as required.

.2 Colours: to match adjacent finish paint or as directed by Consultant.

.3 Minimum service temperatures: -20 degrees C.

.4 Maximum service temperature: 65 degrees C.

.5 Moisture vapour transmission: 0.02 perm.

.7 Fastenings:

.1 Use solvent weld adhesive compatible with insulation to seal laps and joints.

.2 Tacks.

.3 Pressure sensitive vinyl tape of matching colour.

.8 Special requirements:

.1 Indoor: use PVC or canvas.

.2 Outdoor: use aluminum or stainless steel.

.2 Canvas:

.1 220 gm/m^2 cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921

.2 Lagging adhesive: compatible with insulation.

.4 Aluminum:

.1 To ASTM B209

.2 Thickness: 0.50 mm (1/64 in) sheet.

.3 Finish: corrugated

.4 Joining: longitudinal and circumferential slip joints with 50 mm (2 in) laps.

.5 Fittings: 0.5 mm thick die-shaped fitting covers with factory-attached protective liner.

.6 Metal jacket banding and mechanical seals: stainless steel, 19 mm (3/4 in) wide, 0.5 mm (1/64 in) thick at 300 mm (12 in) spacing.

.5 Stainless steel:

.1 Type: 304 or 316.

.2 Thickness: 0.25 mm

.3 Finish: smooth.

.4 Joining: longitudinal and circumferential slip joints with 50 mm (2 in) laps.

.5 Fittings: 0.5 mm thick die-shaped fitting covers with factory-attached protective liner.

.6 Metal jacket banding and mechanical seals: stainless steel, 19 mm (3/4 in) wide, 0.5 mm thick at 300 mm (12 in) spacing.

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 datasheet.

3.2 PRE-INSTALLATION REQUIREMENT

.1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified.

.2 Surfaces clean, dry, free from foreign material.

.3 Ensure heat tracing system has been installed, where specified, prior to installation of insulation.

3.3 INSTALLATION

.1 Install in accordance with TIAC National Standards

.2 Apply materials in accordance with manufacturers instructions and this specification.

.3 Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm (3in).

.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.

.1 Install hangers, supports outside vapour retarder jacket.

.5 Supports, Hangers:

.1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.

.6 Ensure installation of the insulation permits operation of all devices, including valve handles.

3.4 REMOVABLE, PRE-FABRICATED, INSULATION AND ENCLOSURES

.1 Application: at expansion joints, valves, flow measuring elements, strainers, balancing valves, control valves, flanges, unions at equipment and other specialties requiring access.

.2 Design: to permit movement of expansion joint and to permit periodic removal, replacement, servicing and inspection without damage to adjacent insulation.

.3 Insulation:

.1 Insulation, fastenings and finishes: same as system.

.2 Jacket: PVC (indoor), aluminum or stainless steel (outdoor).

3.5 INSTALLATION OF ELASTOMERIC INSULATION

.1 Insulation to remain dry. Overlaps to manufacturers instructions. Ensure tight joints.

.2 Provide vapour retarder as recommended by manufacturer.

3.6 PIPING INSULATION SCHEDULES

.1 Insulation thickness shall comply with Ashrae 90.1 requirements.

.2 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.

.3 TIAC Code: A-1.

.1 Securements: 18 ga stainless steel wire on centre.

.2 Seals: lap seal adhesive, lagging adhesive.

.3 Installation: TIAC Code 1501-H.

.4 TIAC Code: A-3.

.1 Securements: Tape at 300 mm (12 in) on centre.

.2 Seals: VR lap seal adhesive, VR lagging adhesive.

.3 Installation: TIAC Code: 1501-C.

.5 TIAC Code: A-6.

.1 Securements: in accordance with manufacturer's instructions.

.2 Seals: lap seal adhesive, lagging adhesive.

.3 Installation: TIAC Code: 1501-CA.

.6 TIAC Code: C-2 with vapour retarder jacket.

.1 Securements: 18 ga stainless steel wire on centre.

.2 Seals: lap seal adhesive, lagging adhesive.

.3 Installation: TIAC Code: 1501-C.

.7 TIAC Code: A-2.

.1 Securements: 18 ga stainless steel wire on centre.

.2 Seals: lap seal adhesive, lagging adhesive.

.3 Installation: TIAC Code: 1501-H.

.8 Thickness of insulation as listed in following table.

.1 Run-outs to individual units and equipment not exceeding 4000 mm long.

.2 Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.

Application	°C	TIAC code	Pipe sizes (NPS) and insulation thickness (mm)					
			Run out	to 1	1 1/4 to 2	2 1/2 to 4	5 to 6	8 & over
Steam	up to 175	[A-1]	38	50	65	75	90	90
Steam, Saturated and Super heated	over 175	[A-1]	38	65	65	75	90	90
Condensate Return	60 - 94	[A-1]	25	38	38	38	38	38
Pumped Condensate return	up to 94	[A-1]	25	38	38	38	38	38
Boiler Feed Water		[A-1]	25	25	25	25	25	25
Hot Water Heating	60 - 94	[A-1]	25	38	38	38	38	38
Hot Water Heating	up to 59	[A-1]	25	25	25	25	38	38
Glycol Heating	60 - 94	[A-1]	25	38	38	38	38	38
Glycol Heating	up to 59	[A-1]	25	25	25	25	38	38
Domestic HWS		[A-1]	25	25	25	38	38	38
Chilled Water	4 - 13	[A-3]	25	25	25	25	25	25
Chilled Water or Glycol	below 4	[A-3]	25	25	38	38	38	38
Chilled Water Pump Casing	4 - 13	[A-3]	25	25	25	25	25	32
Condenser Water			25	25	25	25	38	38

Application	°C	TIAC code	Pipe sizes (NPS) and insulation thickness (mm)					
			Run out	to 1	1 1/4 to 2	2 1/2 to 4	5 to 6	8 & over
Outdoors [1]								
Condenser Water Indoors			Not Required	Not Required	Not Required	Not Required	Not Required	Not Required
Refrigerated Drinking Water		[A-3]	25	25	25	25	25	25
Domestic CWS		[A-3]	25	25	25	25	25	25
Domestic CWS with vapour retarder		[C-2]	25	25	25	25	25	25
Refrigerant liquid	4 - 13	[A-6]	25	25	25	25	25	25
Refrigerant hot gas and suction	below 4	[A-6]	25	25	38	38	38	38
RWL and RWP		[C-2]	25	25	25	25	25	25
Cooling Coil cond. drain		[C-2]	25	25	25	25	25	25
Diesel generator exhaust system		[A-2]	38	65	65	75	90	90

1 – insulation shall be applied only if the piping system is heat traced

.9 Finishes:

.1 Exposed indoors: canvas or PVC, white finish – confirm with consultant for each project.

.2 Exposed in mechanical rooms: canvas or PVC, white finish – confirm with consultant for each project.

.3 Concealed, indoors: canvas on valves, fittings. No further finish.

.4 Use vapour retarder jacket on TIAC code A-3 insulation compatible with insulation

.5 Outdoors: water-proof aluminum or stainless steel jacket. Complete insulation and jacketing following heat tracing system installation and verification (where specified). Provide “Heat Tracing – Do Not Step On Piping” for all exposed heat traced piping in addition to standard identification.

.6 Finish attachments: SS bands, at 150 mm on centre. Seals: closed.

.7 Installation: to appropriate TIAC code CRF/1 through CPF/5.

3.8 CLEANING

.1 Proceed in accordance with Section 01 74 00 - Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

.3 Clean any dirt, deposits or debris from all insulation jacketing due to construction prior to project handover.

END OF SECTION

1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Procedures and cleaning solutions for cleaning mechanical piping systems.

.3 Related Requirements

.1 Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

.2 Section 23 21 13 - Hydronic Systems.

.3 Section 23 25 00 - HVAC Water Treatment.

.4 Section 23 05 15 - Common Installation Requirements for HVAC Pipework.

1.2 REFERENCE STANDARDS

.1 ASTM International (ASTM)

.1 ASTM E202, Standard Test Methods for Analysis of Ethylene Glycols and Propylene Glycols.

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Safety Data Sheets (SDS).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, limitations, proposed chemical solutions for each system, cleaning procedures.

.2 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

.1 Instructions: submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

.1 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 61 00 - Common Product Requirements.

.2 Waste Management and Disposal:

.1 Waste Management and Disposal: separate waste materials for reuse, and recycling in accordance with Division 01.

2 PRODUCTS

2.1 CLEANING SOLUTIONS

.1 Tri-sodium phosphate: 0.40 kg per 100 L water in system.

.2 Sodium carbonate: 0.40 kg per 100 L water in system.

.3 Low-foaming detergent: 0.01 kg per 100 L water in system.

.4 Coordinate all materials and procedures with basebuilding water treatment provider.

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 datasheet.

3.2 CLEANING HYDRONIC AND STEAM SYSTEMS

.1 Timing: systems operational, hydrostatically tested and with safety devices functional, before cleaning is carried out.

.2 Cleaning Agency:

.1 Retain qualified water treatment specialist to perform system cleaning.

.2 Where Owner has a contract with water treatment provider, retain basebuilding water treatment vendor for all cleaning work. Obtain contact information from Owner.

.3 Install instrumentation such as flow meters, orifice plates, pitot tubes, flow metering valves only after cleaning is certified as complete by water treatment specialist.

.4 Cleaning procedures:

.1 Provide detailed report outlining proposed cleaning procedures at least 4 weeks prior to proposed starting date. Report to include:

.1 Cleaning procedures, flow rates, elapsed time.

.2 Chemicals and concentrations used.

.3 Inhibitors and concentrations.

.4 Specific requirements for completion of work.

.5 Special precautions for protecting piping system materials and components.

.6 Complete analysis of water used to ensure water will not damage systems or equipment.

.7 Sample photos for each system of the initial water quality, interim water quality observed during cleaning work and final water quality.

.5 Conditions at time of cleaning of systems:

.1 Systems: free from construction debris, dirt and other foreign material.

.2 Control valves: operational, fully open to ensure that terminal units can be cleaned properly.

.3 Strainers: clean prior to initial fill.

.4 Install temporary filters on pumps not equipped with permanent filters.

.5 Install pressure gauges on strainers to detect plugging.

.6 Report on Completion of Cleaning:

.1 When cleaning is completed, submit report, complete with certificate of compliance with specifications of cleaning component supplier.

.7 Hydronic Systems:

.1 Fill system with water, ensure air is vented from system.

.2 Fill expansion tanks 1/3 to 1/2 full, charge system with compressed air to at least 35 kPa (5 psi) - does not apply to diaphragm type expansion tanks.

.3 Use water meter to record volume of water in system to +/- 0.5%.

.4 Add chemicals under direct supervision of chemical treatment supplier.

.5 Closed loop systems: circulate system cleaner at 60°C (140°F) for at least 36 hours. Drain as quickly as possible. Refill with water and inhibitors. Test concentrations and adjust to recommended levels.

.6 Flush velocity in system mains and branches to ensure removal of debris. System pumps may be used for circulating cleaning solution provided that velocities are adequate.

.7 Add chemical solution to system.

.8 Establish circulation, raise temperature slowly to maximum design 82°C (180°F) minimum. Circulate for minimum of 12 hours, ensuring flow in all circuits. Remove heat, continue to circulate until temperature is below 38°C (100°F). Drain as quickly as possible. Refill with clean water. Circulate for a minimum of 6 hours at design temperature. Drain and repeat procedures specified above. Flush through low point drains in system. Refill with clean water adding to sodium sulphite (test for residual sulphite).

.9 Repeat cleaning procedures as required to achieve adequate water quality.

.8 Glycol Systems:

.1 In addition to procedures specified above perform specified procedures.

.2 Test to prove concentration will prevent freezing to minus 40°C (- 40°F). Test inhibitor strength and include in procedural report. Refer to ASTM E202

.9 Steam Systems: in addition to general requirements as specified above, perform following:

.1 Remove internal components of steam traps until flushing and warm-up have been completed.

.2 Open drip points to atmosphere. If needed for protection of personnel or environment, install flexible hose and direct discharge to safe location.

.3 Starting at drip point closest to source, verify removal of condensate, then re-install steam trap internal parts. Repeat sequence down the line.

.4 Water hammer: determine source and eliminate cause.

.10 Steam boilers:

.1 Isolate boilers from piping system.

.2 Fill to normal operating level. Add cleaner. Fire to 50% of design operating steam pressure. Maintain for a minimum of 24 hours, during which blow down boiler every 4 hours including water columns, controls, skimmer lines and valves, test cocks, blowdown valves. Add water to return to operating level.

.3 Allow boiler to cool, then drain, flush and inspect.

.4 Reconnect to piping system.

.5 Refill boiler with clean softened water and immediately add chemical inhibitors.

.6 Apply heat slowly and raise to normal design operating steam pressure. Maintain for a minimum of 4 hours.

.7 Discharge condensate from steam system to sewer for 96 hours after initial operation. During this period continue chemical treatment of boilers with inhibitors to ensure complete removal of oils, grease and millscale from steam and condensate return piping steam.

.8 Drain steam condensate until it is clean and free from suspended matter. Ensure proper operation of steam traps.

.9 Allow boiler to cool, drain, open inspection ports and wash out with clean water.

.10 If boiler is not used immediately, refill with softened water, add sodium sulphite, bring up to pressure. Test for residual sulphite.

.11 After cleaning is completed and system is filled, perform relevant start-up procedures as specified for hydronic systems:

3.3 START-UP OF HYDRONIC SYSTEMS

.1 After cleaning is completed and system is filled:

.1 Establish circulation and expansion tank level, set pressure controls.

.2 Ensure air is removed.

.3 Check pumps to be free from air, debris, possibility of cavitation when system is at design temperature.

.4 Dismantle system pumps used for cleaning, inspect, replace worn parts, install new gaskets and new set of seals.

.5 Clean out strainers repeatedly until system is clean.

.6 Commission water treatment systems as specified in Section 23 25 00 - HVAC Water Treatment and as directed by Commissioning Authority.

.7 Check water level in expansion tank with cold water with circulating pumps OFF and again with pumps ON.

.8 Repeat with water at design temperature.

.9 Check pressurization to ensure proper operation and to prevent water hammer, flashing, cavitation. Eliminate water hammer and other noises.

.10 Bring system up to design temperature and pressure slowl over a 48 hour period.

.11 Perform TAB as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

.12 Adjust pipe supports, hangers, springs as necessary.

.13 Monitor pipe movement, performance of expansion joints, loops, guides, anchors.

.14 If sliding type expansion joints bind or if bellows type expansion joints flex incorrectly, shut down system, re-align, repeat start-up procedures.

.15 Re-tighten bolts using torque wrench, to compensate for heat-caused relaxation. Repeat several times during commissioning.

.16 Check operation of drain valves.

.17 Adjust valve stem packings as systems settle down.

.18 Fully open balancing valves (except those that are factory-set).

.19 Check operation of over-temperature protection devices on circulating pumps.

.20 Adjust alignment of piping at pumps to ensure flexibility, adequacy of pipe movement, absence of noise or vibration transmission.

3.4 CLEANING

.1 Proceed in accordance with Section 01 74 00 - Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

1 GENERAL

1.1 REFERENCE STANDARDS

.1 ASTM International (ASTM)

- .1 ASTM A480/A480M, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
- .2 ASTM A635/A635M, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Alloy, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability, General Requirements for.
- .3 ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc Coated

.2 Green Seal Environmental Standards (GS)

- .1 GS-36, Standard for Adhesives for Commercial Use.

.3 National Fire Protection Association (NFPA)

- .1 NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems.
- .2 NFPA 90B, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.
- .3 NFPA 96, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

.4 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

- .1 SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- .2 SMACNA HVAC Air Duct Leakage Test Manual.
- .3 IAQ Guideline for Occupied Buildings Under Construction.

1.2 RELATED REQUIREMENTS

.1 07 84 00 - Fire Stopping

.2 23 05 29 - Hangers and Supports for HVAC Piping and Equipment

.3 23 05 00 – Common Work Results for HVAC

.4 23 01 31 - Air Duct Cleaning for HVAC Systems

.4 23 05 94 - Pressure Testing of Ducted Air Systems

.5 23 05 53 - Identification for HVAC Piping and Equipment

.6 23 05 93 - Testing, Adjusting and Balancing for HVAC

.7 23 05 94 – Pressure Testing of Ducted Air Systems

.8 23 07 13 – Duct Insulation

.9 23 33 00 – Air Duct Accessories

.10 23 33 14 – Dampers – Balancing

.11 23 33 15 – Dampers – Operating

.12 23 33 16 – Dampers – Fire and Smoke

.13 23 33 46 – Flexible Ducts

.14 23 33 53 – Duct Liners

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for ductwork distribution system including ductwork, dampers, accessories. Include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit drawings for duct distribution system and accessories, including:

.1 Rectangular and round ductwork system

.2 Duct liner

.3 Sealants and gaskets

.4 Access doors

.5 Dampers - balancing, back draft, motorized

.6 Hangers and supports

.7 Fire dampers, fire doors, and smoke dampers with installation instructions

.8 Sound attenuators, including pressure drop and acoustic performance

.9 Flexible ducts and clamps, with manufacturer's installation instructions

.10 Flexible connections

.11 Instrument test fittings

.12 Duct system insulation

.13 Duct system identification

.4 Test and Evaluation Reports:

.1 Certification of Ratings:

.1 Catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

.5 Construction IAQ Management Plan:

.1 Submit Indoor Air Quality (IAQ) Plan for construction and pre-occupancy phases of building.

.2 During construction meet or exceed the requirements of SMACNA IAQ Guideline for Occupied Buildings Under Construction.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect metal ducts from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

2 PRODUCTS

2.1 SEAL CLASSIFICATION

.1 Classification as follows:

Maximum Pressure Pa	SMACNA Seal Class
500 (2 in w.c.)	A
250 (1 in w.c.)	A
125 (0.5 in w.c.)	A

.2 Seal classification:

.1 Class A: longitudinal seams, transverse joints, duct wall penetrations and connections made airtight with sealant and tape. All connections shall be sealed, including but not limited to spin-ins, taps, branch connections, access doors, access panels, duct connections to equipment.

.2 Class B: longitudinal seams, transverse joints and connections made airtight with sealant, tape or combination thereof.

.3 Class C: transverse joints and connections made air tight with gaskets, sealant or combination thereof.

.4 Sealing that would void product listings is not required.

.5 Spiral lock seams shall not be insulated.

2.2 SEALANT

.1 Sustainability Characteristics:

.1 Adhesives and sealants: VOC limit 30 g/L maximum.

.2 Sealant: oil resistant, water borne, polymer type flame resistant duct sealant. Temperature range of minus 30°C (-22°F) to plus 93°C (200°F).

2.3 TAPE

.1 Tape: polyvinyl treated, open weave fiberglass tape, 50 mm wide.

2.4 DUCT LEAKAGE

.1 In accordance with SMACNA HVAC Air Duct Leakage Test Manual.

.2 All ductwork located outdoors or any ductwork designer to operate in excess of 3” of water column shall be leak tested.

.3 No less than 25% of the total duct shall be tested, sections to be tested shall be selected by Engineer. Contractor to allow for all required access including scaffolds, platforms, lift to perform leak testing.

.4 Positive pressure leak testing is acceptable for negative pressure ductwork.

.5 The maximum permitted duct leakage shall be as follows:

$$L_{max} = C_L \times P^{0.65}$$

Where

Lmax = maximum permitted leakage, CFM per 100 ft^2 of duct surface area

C_L = 4, duct leakage class, CFM per 100 ft^2 of duct surface area per in. of water $^{0.65}$

P = test pressure, which shall be equal to the design duct pressure class rating, in. of water

2.5 FITTINGS

.1 Fabrication: to SMACNA.

.2 Radiused elbows:

.1 Rectangular: centreline radius of 1.5 times width of duct.

.2 Round: smooth radius or centreline radius of 1.5 times diameter.

.3 Mitred elbows, rectangular:

.1 To 400 mm: with single thickness turning vanes.

.2 Over 400 mm: with double thickness turning vanes.

.4 Branches:

.1 Rectangular main and branch: with radius on branch 1.5 times width of duct or 45 degrees entry on branch.

.2 Round main and branch: enter main duct at 45 degrees with conical connection.

.3 Provide volume control damper in branch duct near connection to main duct.

.4 Main duct branches: with splitter damper.

.5 Transitions:

.1 Diverging: 20 degrees maximum included angle.

.2 Converging: 30 degrees maximum included angle.

.6 Offsets:

.1 Full radiused elbows as required.

.7 Obstruction deflectors: maintain full cross-sectional area.

.1 Maximum included angles: as for transitions.

2.6 FIRE STOPPING

.1 Retaining angles around duct, on both sides of fire separation in accordance with Section 07 84 00 - Fire Stopping.

.2 Coordinate with 07 84 00 - Fire Stopping to ensure fire stopping materials and installation does not distort duct.

2.7 GALVANIZED STEEL

.1 Lock forming quality: to ASTM A653/A653M, Z90 zinc coating.

.2 Thickness, fabrication and reinforcement: to SMACNA.

.3 Joints: to SMACNA, proprietary manufactured duct joint. Proprietary manufactured flanged duct joint to be considered to be a class A seal.

2.8 STAINLESS STEEL

.1 To ASTM A480/A480M, Type 304.

.2 Finish: number 4.

.3 Thickness, fabrication and reinforcement: to SMACNA.

.4 Joints: to SMACNA, to be continuous inert gas welded.

2.9 ALUMINUM

.1 To SMACNA, aluminum type: 3003-H-14.

.2 Thickness, fabrication and reinforcement: to SMACNA.

.3 Joints: to SMACNA, be continuous weld.

2.10 BLACK STEEL

.1 To ASTM A635/A635M

.2 Thickness: 1.2 mm or as indicated.

.3 Fabrication: ducts and fittings to SMACNA.

.4 Reinforcement: as indicated.

.5 Joints: continuous weld.

2.11 KITCHEN EXHAUST SYSTEMS

.1 Construct in accordance with NFPA 96.

.2 Material: Type 304 stainless steel.

.3 Thickness: 1.61 mm (16 ga).

.4 Fabrication: to NFPA 96.

.5 Flanges: provide gasketed flanges at connection to kitchen exhaust hood and appliances.

.6 Drainage: provide gasketed cleanouts at every 3m (10ft), thickness and materials of the cleanouts shall match ductwork.

.7 Grease filters: to Section 23 38 13 - Commercial Kitchen Hoods.

2.12 EXTERIOR DUCTWORK

.1 All exterior ductwork shall be of watertight construction, insulation, membrane and jacketing materials shall be suitable for exterior use.

.2 Slope top of duct to prevent ponding of water.

.3 All curbs shall be at minimum 400mm (16 in) high, unless otherwise noted.

.4 Provide unistrut duct support system for all exterior ductwork.

2.12 HANGERS AND SUPPORTS

.1 Hangers and Supports: in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

.1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct.

.1 Maximum size duct supported by strap hanger: 500.

.2 Hanger configuration: to SMACNA.
.3 Hangers: galvanized]steel angle with galvanized steel rods to SMACNA as follows:

Duct Size	Angle Size	Rod Size
(mm)	(mm)	(mm)
up to 750	25 x 25 x 3	6
751 to 1050	40 x 40 x 3	6
1051 to 1500	40 x 40 x 3	10
1501 to 2100	50 x 50 x 3	10
2101 to 2400	50 x 50 x 5	10
2401 and over	50 x 50 x 6	10

.4 Upper hanger attachments:
  .1 For concrete: manufactured concrete inserts.
  .2 For steel joist: manufactured joist clamp.
  .3 For steel beams: manufactured beam clamps.
.5 Provide saddles at all hangers and supports installed on insulated duct systems.

3 EXECUTION

3.1 GENERAL

.1 Do work in accordance with referenced standards.
.2 Do not break continuity of insulation vapour barrier with hangers or rods.
  .1 Insulate strap hangers 100 mm beyond insulated duct, Ensure diffuser is fully seated.
.3 Support risers in accordance with ASHRAE, SMACNA and as indicated.
.4 Install breakaway joints in ductwork on sides of fire separation.
.5 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.
.6 Manufacture duct in lengths and diameter to accommodate installation of acoustic duct lining.
.7 All duct sizes are clear inside dimensions, oversize ductwork where interior lining is specified as required to meet required clear inside dimensions.
.8 Provide fire dampers at penetrations thru all fire rated floors and walls assemblies. Damper shall not restrict free duct area. Provide access panels for all fire and fire & smoke dampers for inspection and maintenance purposes.
.9 Provide turning vanes in accordance with SMACNA, where installation of full radius or smooth elbows is not practical.
.10 Provide slopped floors, floor drains c/w trap seals in outside air plenums/sections and humidifier sections, terminate with air gap to nearest floor drain.
.11 Design drawings indicate general proposed duct routing and do not indicate offsets, fittings, adapters, etc. Contractor shall supply all required devices for a fully functioning system.
.12 Provide flexible connections at all connections to fans.

.13 Provide access panels at all balancing, fire, fire & smoke and motorized damper locations to permit inspection and maintenance.

3.2 HANGERS

.1 Strap hangers: install in accordance with SMACNA.

.2 Angle hangers: complete with locking nuts and washers.

.3 Hanger spacing: in accordance with SMACNA and as follows:

Duct Size	Spacing
(mm)	(mm)
to 1500	3000
1501 and over	2500

3.3 WATERTIGHT DUCT

.1 Provide watertight duct for:

- .1 Dishwasher exhaust.
- .2 Fresh air intake.
- .3 Minimum 3,000 mm from duct mounted humidifier in all directions.
- .4 Exterior ductwork.
- .5 As indicated.

.2 Form bottom of horizontal duct without longitudinal seams.

- .1 Weld joints of bottom and side sheets.
- .2 Seal other joints with duct sealer.

.3 Slope horizontal branch ductwork toward exterior louvres c/w weep holes.

- .1 Slope header ducts down toward risers.

.4 Fit base of riser with 150 mm deep drain sump and 32 mm drain connected, with deep seal trap and valve, trap primer and discharging to open funnel drain.

3.4 KITCHEN EXHAUST SYSTEMS

.1 Install to NFPA 96 and as indicated.

3.5 SEALING AND TAPING

.1 Apply sealant in accordance with SMACNA and to manufacturer's recommendations.

.2 Bed tape in sealant and recoat with minimum of 1 coat of sealant to manufacturers recommendations.

3.6 LEAKAGE TESTS

.1 In accordance with SMACNA HVAC Duct Leakage Test Manual.

.2 Do leakage tests in sections.

.3 Make trial leakage tests as instructed to demonstrate workmanship.

.4 Do not install additional ductwork until trial test has been passed.

.5 Test section minimum of 30 m long with not less than three branch takeoffs and two 90 degrees elbows.

.7 Complete test before performance insulation or concealment Work and submit to Consultant for review and approval.

3.7 TESTING, ADJUSTING AND BALANCING

.1 In accordance with Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

3.8 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

.3 Carry out cleaning in accordance with Section 23 01 31 - Air Duct Cleaning for HVAC Systems.

END OF SECTION

1 GENERAL

1.1 REFERENCE STANDARDS

.1 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

.1 SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

.2 SMACNA IAQ Guideline for Occupied Buildings under Construction.

.2 National Fire Protection Association (NFPA)

.1 NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems.

.2 NFPA 90B, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.

.3 NFPA 96, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

.3 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S110, Standard Methods of Tests for Air Ducts.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for air duct accessories and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Indicate:

.1 Flexible connections.

.2 Duct access doors.

.3 Turning vanes.

.4 Instrument test ports.

.5 Thermal properties.

.6 Friction loss.

.7 Acoustical loss.

.8 Leakage.

.9 Fire rating.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect air duct accessories from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

2 PRODUCTS

2.1 GENERAL

.1 Manufacture in accordance with SMACNA - HVAC Duct Construction Standards.

2.2 FLEXIBLE CONNECTIONS

.1 Frame: 75mm (3") wide, 24 gauge galvanized sheet metal frame with fabric clenched by means of double locked seams.

.2 Material:

.1 Fire resistant, self-extinguishing, woven fiberglass, minimum 0.61mm thickness, temperature rated at minus 40°C to plus 120°C, density of 1.3 kg/m^2.

.2 Listings: UL, NFPA 701

.3 Standard of acceptance: Duro Dyne Durolon, Ductmate PROflex or approved equivalent.

2.3 ACCESS DOORS IN DUCTS

.1 Non-Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame.

.2 Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame and 25 mm thick rigid glass fibre insulation.

.3 Gaskets: neoprene.

.4 Hardware:

.1 Up to 300 x 300 mm: two sash locks complete with safety chain.

.2 301 to 450 mm: four sash locks complete with safety chain.

.3 451 to 1000 mm: piano hinge and minimum two sash locks.

.4 Doors over 1000 mm: piano hinge and two handles operable from both sides.

.5 Hold open devices.

.6 300 x 300 mm glass viewing panels.

2.4 TURNING VANES

.1 Factory or shop fabricated double thickness with trailing edge, to recommendations of SMACNA.

2.5 INSTRUMENT TEST

.1 1.6mm thick steel zinc plated after manufacture.

.2 Cam lock handles with neoprene expansion plug and handle chain.

.3 28 mm minimum inside diameter. Length to suit insulation thickness.

.4 Neoprene mounting gasket.

2.6 SPIN-IN COLLARS

.1 Conical galvanized sheet metal spin-in collars with lockable butterfly damper.

.2 Sheet metal thickness to co-responding round duct standards.

3 EXECUTION

3.1 INSTALLATION

.1 Flexible Connections:

.1 Install in following locations:

.1 Inlets and outlets to supply air units and fans.

.2 Inlets and outlets of exhaust and return air fans.

.3 As indicated.

.2 Length of connection: 100 mm.

.3 Minimum distance between metal parts when system in operation: 75 mm.

.4 Install in accordance with recommendations of SMACNA

.5 When fan is running:

.1 Ducting on sides of flexible connection to be in alignment.

.2 Ensure slack material in flexible connection.

.2 Access Doors and Viewing Panels:

.1 Locations:

.1 Fire and smoke dampers.

.2 Control and backdraft dampers.

.3 Devices requiring maintenance.

.4 Required by code.

.5 Reheat coils (locate on both sides of coil)

.6 Bottom of duct risers.

.7 Elsewhere as indicated.

.8 Airflow stations (locate on both sides of device)

.9 Smoke and heat detectors (locate upstream of the device)

.3 Instrument Test Ports:

.1 General:

.1 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions

.2 Locate to permit easy manipulation of instruments.

.3 Install insulation port extensions as required.

.4 Locations:

.1 For traverse readings:

.1 Ducted inlets to roof and wall exhausters.

.2 Inlets and outlets of other fan systems.

.3 Main and sub-main ducts.

.4 And as indicated.

.2 For temperature readings:

.1 At outside air intakes.

.2 In mixed air applications in locations as approved by Consultant.

.3 At inlet and outlet of coils.

.4 Downstream of junctions of two converging air streams of different temperatures.

.5 And as indicated.

.4 Turning Vanes:

.1 Install in accordance with recommendations of SMACNA.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

END OF SECTION

1 GENERAL

1.1 REFERENCE STANDARDS

.1 Sheet Metal and Air Conditioning National Association (SMACNA)

.1 SMACNA HVAC Duct Construction Standards, Metal and Flexible.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for dampers and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for dampers for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect dampers from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

2 PRODUCTS

2.1 GENERAL

.1 Manufacture to SMACNA standards

2.2 SINGLE BLADE DAMPERS

.1 Fabricate from same material as duct, but one sheet metal thickness heavier. V-groove stiffened.

.2 Size and configuration to recommendations of SMACNA, except maximum height 100 mm.

.3 Locking quadrant with shaft extension to accommodate insulation thickness.

.4 Inside and outside nylon or bronze end bearings.

.5 Channel frame of same material as adjacent duct, complete with angle stop.

2.3 MULTI-BLADED DAMPERS

.1 Factory manufactured of material compatible with duct.

.2 Opposed blade: configuration, metal thickness and construction to recommendations of SMACNA

.3 Maximum blade height: 100mm.

.4 Bearings: self-lubricating nylon.

.5 Linkage: shaft extension with locking quadrant.

.6 Channel frame of same material as adjacent duct, complete with angle stop.

.7 Maximum leakage: not to exceed 2% at 500Pa (2" w.c.)

3 EXECUTION

3.1 INSTALLATION

.1 Install balancing damper at all branch locations to permit for full balancing of the system. Coordinate location of all balancing damper with TAB contractor prior to ductwork installation.

.2 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.

.3 Locate balancing dampers in each branch duct, for supply, return and exhaust systems.

.4 Runouts to registers and diffusers: install single blade damper located as close as possible to main ducts.

.5 Dampers: vibration free.

.6 Ensure damper operators are observable and accessible.

.7 Corrections and adjustments as noted by Consultant.

.8 Provide extended shaft linkage for all installation on insulated ductwork.

.9 Provide min 300x300mm access panel at all balancing damper locations when installed above drywall/gypsum ceilings.

3.2 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

END OF SECTION

1 GENERAL

1.1 REFERENCE STANDARDS

.1 ASTM International (ASTM)

.1 ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process.

1.2 RELATED REQUIREMENTS

.1 23 33 00 - Air Duct Accessories

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer’s instructions, printed product literature and data sheets for dampers and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for [dampers] for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer’s written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer’s name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground, indoors, in dry location and in accordance with manufacturer’s recommendations in clean, dry, well-ventilated area.

.2 Store and protect dampers from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

2 PRODUCTS

2.1 MULTI-LEAF DAMPERS [LIGHT DUTY]

.1 Unless otherwise indicated, dampers shall be opposed blade for modulating operation and parallel blade for 2-position (open/close) operation.

.2 Extruded aluminum (6063-T5) damper frame shall not be less than 0.080” (2.03 mm) in thickness. Damper frame shall be 4” (101.6 mm) deep x 1" (25.4 mm), with duct mounting flanges on both sides of frame. Damper frame shall have a 2" (50.8 mm) mounting flange on the rear of the damper, when installed as Extended Rear Flange install type. Frame to be assembled using zinc-plated steel mounting fasteners. Welded frames shall not be

acceptable.

.3 Blades shall be maximum 6" (152.4 mm) deep extruded aluminum (6063-T5) air-foil profiles with a minimum wall thickness of 0.06" (1.52mm). Aluminum end caps shall be press fitted to blade ends, in order to seal hollow interior and reduce air leakage rates. All blades shall be symmetrically pivoted.

.4 Blade seals shall be extruded silicone, secured in an integral slot within the aluminum blade extrusions and shall be mechanically fastened to prevent shrinkage and movement over the life of the damper. Adhesive or clip-on type blade seals will not be approved.

.5 Frame seals shall be extruded silicone, secured in an integral slot within the aluminum frame extrusions and shall be mechanically fastened to prevent shrinkage and movement over the life of the damper. Metallic compression type jamb seals will not be approved.

.6 Bearings shall be a dual bearing system composed of a celcon inner bearing (fixed around a 7/16" (11.11 mm) aluminum hexagon blade pivot pin), rotating within a polycarbonate outer bearing inserted in the frame. Single axle bearing, rotating in an extruded or punched hole shall not be acceptable. Bearings are to be maintenance-free, requiring no lubrication.

.7 Hexagonal control shaft shall be 7/16" (11.11 mm). It shall have an adjustable length and shall be an integral part of the blade axle. A field-applied control shaft shall not be acceptable. All parts shall be zinc-plated steel.

.8 Linkage hardware shall be aluminum and corrosion-resistant zinc-plated steel, installed in the frame side, out of the airstream, and accessible after installation. Linkage hardware shall be complete with cup-point trunnion screws to prevent linkage slippage and a Celcon bearing between moving parts to reduce wear and increase longevity. Linkage that consists of metal rubbing metal will not be approved.

.9 Dampers shall be designed for operation in temperatures ranging from -40°F (-40°C) to 212°F (100°C).

.10 Dampers shall be AMCA rated for Leakage Class 1A at 1 in. w.g. (0.25 kPa) static pressure differential. Standard air leakage data to be certified under the AMCA Certified Ratings Program.

.11 Dampers shall be custom made to required size, with blade stops not exceeding 1¼" (31.7 mm) in height. The blade stop shall be a continuous and integral part of the head/sill. Welded and caulked blade stops shall not be acceptable.

.12 Unless otherwise noted, dampers shall be installed in flanged to duct configuration. For installations on existing duct distribution or equipment, Contractor shall be responsible for confirming damper configuration and fastening prior to preparation of the submittals.

.13 Damper actuator – to be provided by Controls Contractor, refer to Division 25 for more information.

.14 Standard of Acceptance: Tamco Air Foil Series 1500, Ruskin CD50 Series or Alumavent 3160 Series.

2.2 MULTI-LEAF DAMPERS [HEAVY DUTY – THERMALLY INSULATED]

.1 All dampers exposed to outdoor air shall be thermally insulated and in accordance with this section.

.2 Extruded aluminum (6063-T5) damper frame shall not be less than 0.080" (2.03 mm) in thickness. Damper frame shall be 4" (101.6 mm) deep x 1" (25.4 mm), with duct mounting flanges on both sides of frame. Damper frame shall have a 2" (50.8 mm) mounting flange on the rear of the damper, when installed as Extended Rear Flange install type. Frame to be assembled using zinc-plated steel mounting fasteners. Welded frames shall not be

acceptable.

.3 Blades shall be maximum 6" (152.4 mm) deep extruded aluminum (6063-T5) air-foil profiles with a minimum wall thickness of 0.06” (1.52mm). Blades shall be internally insulated with expanded polyurethane foam and shall be thermally broken. Complete blade shall have an insulating factor of R-2.29. All blades shall be symmetrically pivoted.

.4 Blade seals shall be extruded EPDM, secured in an integral slot within the aluminum blade extrusions and shall be mechanically fastened to prevent shrinkage and movement over the life of the damper. Adhesive or clip-on type blade seals will not be approved.

.5 Frame seals shall be extruded silicone, secured in an integral slot within the aluminum frame extrusions and shall be mechanically fastened to prevent shrinkage and movement over the life of the damper. Metallic compression type jamb seals will not be approved.

.6 Bearings shall be a dual bearing system composed of a Celcon inner bearing (fixed around a 7/16" (11.11 mm) aluminum hexagon blade pivot pin), rotating within a polycarbonate outer bearing inserted in the frame. Single axle bearing, rotating in an extruded or punched hole shall not be acceptable. Bearings are to be maintenance-free, requiring no lubrication.

.7 Hexagonal control shaft shall be 7/16" (11.11 mm). It shall have an adjustable length and shall be an integral part of the blade axle. A field-applied control shaft shall not be acceptable. All parts shall be zinc-plated steel.

.8 Linkage hardware shall be aluminum and corrosion-resistant zinc-plated steel, installed in the frame side, out of the airstream, and accessible after installation. Linkage hardware shall be complete with cup-point trunnion screws to prevent linkage slippage and a Celcon bearing between moving parts to reduce wear and increase longevity. Linkage that consists of metal rubbing metal will not be approved.

.9 Dampers shall be designed for operation in temperatures ranging from -40°F (-40°C) to 212°F (100°C).

.10 Dampers shall be AMCA rated for Leakage Class 1A at 1 in w.g. (0.25 kPa) static pressure differential. Standard air leakage data to be certified under the AMCA Certified Ratings Program.

.11 Dampers shall be custom made to required size, with blade stops not exceeding 1¼” (31.7 mm) in height. The blade stop shall be a continuous and integral part of the head/sill. Welded and caulked blade stops shall not be acceptable.

.12 Unless otherwise noted, dampers shall be installed in flanged to duct configuration. For installations on existing duct distribution or equipment, Contractor shall be responsible for confirming damper configuration and fastening prior to preparation of the submittals.

.13 Damper actuator – to be provided by Controls Contractor, refer to Division 25 for more information.

.14 Unless otherwise indicated, dampers shall be opposed blade for modulating operation and parallel blade for 2-position (open/close) operation.

.15 Standard of Acceptance: Tamco Air Foil Series 9000, Ruskin CD40X2 Series or Alumavent 3960 Series.

2.03 BACK DRAFT DAMPERS

.1 Extruded aluminum (6063-T5) medium-duty backdraft damper frame shall not be less than 0.060” (1.52 mm) in thickness. Frame shall be 2.5” (63.5 mm) deep x 5/8" (15.9 mm), with duct mounting flanges on both sides of frame. Frame shall have a 17/8" (47.6 mm) mounting flange on either the front or rear of the damper, when ordered as either Front

Flange or Rear Flange install type. Frame to be assembled using zinc-plated steel mounting fasteners. Welded frames shall not be acceptable.

.2 Blades shall be maximum 5” (127 mm) deep extruded aluminum (6063-T5) profiles and shall not be less than .060"(1.52 mm) in thickness.

.3 Blade seals shall be extruded silicone, secured in an integral slot within the aluminum blade extrusions and shall be mechanically fastened to prevent shrinkage and movement over the life of the damper. Adhesive or clip-on type blade seals will not be approved.

.4 Frame seals shall be extruded silicone, secured in an integral slot within the aluminum frame extrusions and shall be mechanically fastened to prevent shrinkage and movement over the life of the damper. Frames without seals will not be approved. Metallic compression type jamb seals will not be approved.

.5 Maintenance-free bearings system shall be composed of a ½" (12.7 mm) aluminum pivot point rotating in a Celcon bearing.

.6 Linkage system shall consist of hard alloy aluminum (6005-T6) crank arms fastened to aluminum pivot rods and shall be secured within a channel running along top of blades. Large diameter 11/32" (8.73 mm) hard alloy aluminum (6065-T6) linkage rod shall connect the crank arms by means of a zinc-plated steel trunnion. Linkage that consists of metal rubbing metal will not be approved.

.7 Trunnions shall be zinc-plated steel to provide a hard, smooth and long-lasting rotating surface for the bearing and shall be secured to the linkage by cup-point screws to prevent linkage slippage.

.8 Backdraft dampers shall be designed for operation in temperatures ranging between -40°F (-40°C) and 212°F (100°C).

.9 Air leakage for backdraft dampers with a width and height of 24" (610 mm) or greater shall not exceed 6.93 cfm/ft² (35.20 l/s/m²) against 1 in. w.g. (0.25 kPa) differential static pressure. Air leakage for backdraft dampers with a width or height of less than 24" (610 mm) sahll not exceed 11.38 cfm/ft² (57.81 l/s/m²) against 1 in. w.g. (0.25 kPa) differential static pressure. Standard air leakage data to be certified under the AMCA Certified Ratings Program.

.10 Backdraft dampers shall be custom manufactured to required size, without blanking off free area.

.11 Backdraft dampers with dimensions greater than maximum section size shall be manufactured in multiple sections. Multiple sections are not interlinked or connected. To install, each section must be individually fastened to a structural frame prepared on site.

.12 Unless otherwise noted, dampers shall be installed in flanged to duct configuration. For installations on existing duct distribution or equipment, Contractor shall be responsible for confirming damper configuration and fastening prior to preparation of the submittals.

.13 Standard of Acceptance: Tamco Series 7000, Ruskin CBD6 Series or Alumavent 1200 Series.

3 EXECUTION

3.1 INSTALLATION

.1 Install where indicated.

.2 Install in accordance with recommendations of SMACNA and manufacturer’s instructions

.3 Seal multiple damper modules with silicon sealant.

.4 Install access door adjacent to each damper. See Section 23 33 00 - Air Duct Accessories.

.5 Ensure dampers are observable and accessible.

.6 Install dampers tightly within ductwork distribution and provide airtight seal.

.7 Maintain access to damper linkages and actuators.

3.2 BACKDRAFT DAMPERS

.1 Provide backdraft dampers at all exhaust and relief air openings and at exhaust fans where control dampers are not specified.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

END OF SECTION

1 GENERAL

1.1 REFERENCE STANDARDS

.1 National Fire Protection Association (NFPA)

.1 NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems.

.2 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S112, Standard Test Method of Fire Test of Fire Damper Assemblies.

.2 CAN/ULC-S112.2, Standard Method of Fire Test of Ceiling Fire Stop Flap Assemblies.

.3 ULC-S505, Standard for Fusible Links for Fire Protection Service.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for [fire and smoke dampers] and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Indicate the following:

.1 Fire dampers.

.2 Smoke dampers.

.3 Fire stop flaps.

.4 Operators.

.5 Fusible links.

.6 Design details of break-away joints.

.3 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for fire and smoke dampers for incorporation into manual.

1.4 MAINTENANCE MATERIAL SUBMITTALS

.1 Extra Materials:

.1 Submit maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

.2 Provide:

.1 6 fusible links of each type.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory

packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect fire and smoke dampers from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

2 PRODUCTS

2.1 FIRE DAMPERS

.1 Fire dampers: arrangement Type B or Type C with no part of blade or damper frame in air stream, listed and bear label of ULC, meet requirements of provincial fire authority, authorities having jurisdiction and NFPA 90A. Fire damper assemblies fire tested in accordance with CAN/ULC-S112.

.2 Mild steel, factory fabricated for fire rating requirement to maintain integrity of fire wall and/or fire separation.

.1 Fire dampers: minimum 1-1/2 hour fire rated or as required to meet rating of the fire rated assembly.

.2 Fire dampers: automatic operating type and have dynamic rating suitable for maximum air velocity and pressure differential to which it will be subjected.

.3 Top hinged: offset, multi-blade hinged or interlocking type; roll door type; guillotine type; sized to maintain full duct cross section.

.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. ULC approved fusible link assembly shall be rated at 74°C (165°F) for all supply, return and exhaust air streams.

.5 40 x 40 x 3 mm retaining angle iron frame, on full perimeter of fire damper, on both sides of fire separation being pierced.

.6 Equip fire dampers with steel sleeve or frame installed disruption ductwork or impair damper operation.

.7 Equip sleeves or frames with perimeter mounting angles attached on both sides of wall or floor opening. Construct ductwork in fire-rated floor-ceiling or roof-ceiling assembly systems with air ducts that pierce ceiling to conform with ULC.

.8 Design and construct dampers to not reduce duct or air transfer opening cross-sectional area.

.9 Dampers shall be installed so that the centerline of the damper depth or thickness is located in the centerline of the wall, partition of floor slab depth or thickness.

.10 Unless otherwise indicated, the installation details given in SMACNA Install Fire Damp HVAC and in manufacturer's instructions for fire dampers shall be followed.

2.2 SMOKE DAMPERS

.1 Smoke Dampers: to be ULC and labelled

.2 Normally closed reverse action smoke vent (S/D-RASV): folding blade type, opening by gravity upon detection of smoke, and/or from remote alarm signaling device actuated by an

electro thermal link] [as indicated]. Two flexible stainless steel blade edge seals to provide required constant sealing pressure.

.3 Normally open smoke/seal (S/D-SSSD): folding blade type, closing when actuated by means of electro thermal link and/or from remote alarm signaling device. Blade edge seals of flexible stainless steel to provide required constant sealing pressure. Provide stainless steel negator springs with locking devices to ensure positive closure for units mounted horizontally in vertical ducts, ULC and labelled.

.4 Motorized (S/D-M): folding blade type, normally open with power on. When power is interrupted damper shall close automatically. Both damper and damper operator shall be ULC listed and labelled.

.5 Electro thermal link (S/D-ETL): dual responsive fusible link which melts when subjected to local heat of 74°C (165°F) and from external electrical impulse of low power and short duration; ULC and labelled.

2.3 COMBINATION FIRE AND SMOKE DAMPERS

.1 Damper: similar to smoke dampers specified above.

.2 Combined actuator: electrical control system actuated from smoke sensor or smoke detection system and from fusible link.

2.4 FIRE STOP FLAPS

.1 Fire smoke flaps: ULC listed and labelled and fire tested in accordance with CAN/ULC-S112.2

.2 Construct of minimum 1.5 mm thick sheet steel with 1.6 mm thick non-asbestos ULC listed insulation and corrosion-resistant pins and hinges

.3 Flaps held open with fusible link conforming to ULC-S505 and close at 74°C (165°F).

3 EXECUTION

3.1 INSTALLATION

.1 Install in accordance with NFPA 90A and in accordance with conditions of ULC listing

.2 Maintain integrity of fire separation.

.3 After completion and prior to concealment obtain approvals of complete installation from authority having jurisdiction.

.4 Install access door adjacent to each damper.

.5 Coordinate installation of fire stopping with Section 07 84 00 - Fire Stopping.

.6 Ensure access doors/panels, fusible links, damper operators are easily observed and accessible.

.7 Install break-away joints of approved design on each side of fire separation.

3.2 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

END OF SECTION

1 GENERAL

1.1 REFERENCE STANDARDS

.1 American National Standards Institute/Air Movement and Control Association (ANSI/AMCA)

.1 ANSI/AMCA Standard 99, Standards Handbook.

.2 ANSI/ASHRAE 51 (ANSI/AMCA 210), Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.

.3 ANSI/AMCA Standard 300, Reverberant Room Method for Sound Testing of Fans.

.4 ANSI/AMCA Standard 301, Methods for Calculating Fan Sound Ratings from Laboratory Test Data.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for [roof and wall exhausters] and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Include:

.1 Fan performance curves showing specified point of operation.

.2 Sound rating data.

.3 Weight and dimensional data.

.4 Electrical data and schematics.

.5 Accessories (dampers, speed controllers, curb, disconnect switch, etc).

2 PRODUCTS

2.1 APPROVED MANUFACTURER

1.Greenheck
2. Loren cook
3.Penbarry

2.2 SYSTEM DESCRIPTION

.1 Performance Requirements:

.1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards in force. Provide confirmation of testing.

.2 Capacity: as indicated on drawing schedules.

.2 Statically and dynamically balanced. Constructed to ANSI/AMCA Standard 99

.3 Sound ratings: comply with ANSI/AMCA Standard 301, tested to ANSI/AMCA Standard 300. Unit shall bear AMCA certified sound rating seal.

.4 Performance ratings: based on tests performed in accordance with ANSI/AMCA Standard 210, unit to bear AMCA certified rating seal.

.5 Bearings: sealed lifetime ball bearings or heavy duty grease lubricated ball or roller bearings of self aligning type with oil retaining, dust excluding seals and a certified minimum rated life of 100,000 hours.

2.3 ROOF EXHAUSTERS

.1 Centrifugal or axial direct driven or V-belt as noted on schedules.

.1 Housings: spun aluminum complete with resilient mounted motor and fan.

.2 Impeller: aluminum non-overloading.

.3 Adjustable motor sheave.

.4 12mm mesh 2.0 mm diameter aluminum birdscreen.

.5 Motorized gasketed aluminum backdraft dampers.

.6 Disconnect switch within fan housing.

.7 Continuous curb gaskets, stainless steel securing bolts and screws, and special mated sound insulating 400 mm high curbs where indicated. Hinge curb plate for access to internals for maintenance.

.2 Sound curbs: of same manufacturer as fan and built to suit model specified.

2.4 WALL EXHAUSTERS

.1 Centrifugal or axial direct driven or V-belt as noted on schedules.

.1 Spun aluminum housings, complete with resilient mounted motor and fan.

.2 12 mm mesh 2.0 mm diameter aluminum birdscreen.

.3 Motorized gasketted aluminum backdraft dampers.

.4 Disconnect switch within fan housing.

.5 Stainless steel securing bolts and screws.

.2 Housings:

.1 Provide with rubber or neoprene grommets for wiring passages, integral attachment collar, or angle ring mounted to mating flanged wall sleeve with full gasketting.

.2 Discharge pattern: away from building.

3 EXECUTION

3.1 INSTALLATION

.1 Install in accordance with manufacturer’s instructions.

.2 Provide weather resistance special nameplate on each fan, indicating:

.1 Fan tag.

.2 Served area(s) or system.

.3 Power source.

.3 All roofing modifications, curb flashing and seal shall be basebuilding roofing vendor.

3.2 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

END OF SECTION

1 GENERAL

1.1 REFERENCE STANDARDS

.1 ASTM International (ASTM)

.1 ASTM E90, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

.2 National Fire Protection Association (NFPA)

.1 NFPA 96, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

.3 National Research Council Canada (NRC)

.1 National Building Code of Canada (NBC).

.5 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for louvers, intakes and vents and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Indicate following:

.1 Pressure drop.

.2 Face area.

.3 Free area.

.4 Construction.

.5 Finishes.

.3 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.4 Test Reports: submit certified data from independent laboratory substantiating acoustic and aerodynamic performance to ASTM E90.

2 PRODUCTS

2.1 SYSTEM DESCRIPTION

.1 Performance Requirements:

.1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards.

2.2 GRAVITY ROOF OUTSIDE AIR INTAKES AND RELIEF VENTS

.1 Factory manufactured aluminum, hinged at curb line.

.1 Complete with integral birdscreen of 2.7 mm diameter stainless steel wire. Use 12 mm mesh on exhaust and 19 mm mesh on intake.

.2 Vertical or Horizontal backdraft dampers on 4 faces.

.3 Maximum throat velocity: 3.3 m/s intake.

.4 Maximum loss through unit: 15 Pa exhaust static pressure.

.5 Maximum velocity through damper area: 1.5 m/s.

.6 Shape: as indicated.

2.3 GOOSENECK HOODS

.1 Thickness: to SMACNA.

.1 Kitchen: to NFPA 96

.2 Elsewhere: to SMACNA.

.2 Fabrication: to SMACNA.

.1 Kitchen: to NFPA 96

.2 Elsewhere: to SMACNA.

.3 Joints: to SMACNA and proprietary manufactured duct joint. Proprietary manufactured flanged duct joint considered class A seal.

.4 Supports: as indicated.

.5 Complete with integral birdscreen of 2.7 mm diameter stainless steel wire. Use 12 mm mesh on exhaust and 19 mm mesh on intake.

.6 Horizontal backdraft dampers on 4 faces.

2.4 FIXED LOUVRES - ALUMINUM

.1 Construction: welded with exposed joints ground flush and smooth.

.2 Material: extruded aluminum alloy 6063-T5.

.3 Blade: stormproof pattern with centre watershed in blade, reinforcing bosses and maximum blade length of 1,500 mm.

.4 Frame, head, sill and jamb: 150 mm deep one piece extruded aluminum, minimum 3 mm thick with approved caulking slot, integral to unit.

.5 Mullions: at 1,500 mm maximum centres.

.6 Fastenings: stainless steel SAE-194-8F with SAE-194-SFB nuts and resilient neoprene washers between aluminum and head of bolt, or between nut, ss washer and aluminum body

.7 Screen: 12 mm exhaust, 19 mm intake mesh, 2 mm diameter wire aluminum birdscreen on inside face of louvres in formed U-frame.

.8 Finish: factory applied enamel, anodized. Colour: to Consultant’s approval, submit samples of available finishes within shop drawing submittals.

2.5 FIXED LOUVRES

.1 General: copper in welded steel frame, complete with anchors.

.2 Blades:

.1 24 ounce cold rolled copper set at 45 degrees, Z-shaped with drip lips.

.2 Stormproof design for outside air intakes.

.3 Maximum length without mullions of same material: 1,250 mm.

.3 Frame: galvanized structural steel, welded construction. Paint welds after construction.

.4 Screen: 12 mm exhaust, 19 mm intake mesh, 2 mm diameter wire aluminum birdscreen on inside face of louvres in formed U-frame.

.5 Finish: factory applied enamel, anodized. Colour: to Consultant's approval, submit samples of available finishes within shop drawing submittals.

2.6 ADJUSTABLE LOUVRES

.1 Construction: welded with exposed joints ground flush and smooth.

.2 Material: extruded aluminum alloy 6063-T5.

.3 Blade: stormproof pattern with centre watershed in blade, reinforcing bosses and maximum blade length of 1,500 mm.

.4 Frame, head, sill and jamb: 150 mm deep one piece extruded aluminum, minimum 3 mm thick with approved caulking slot, integral to unit.

.5 Mullions: at 1,500 mm maximum centres.

.6 Fastenings: stainless steel SAE-194-8F with SAE-194-SFB nuts and resilient neoprene washers between aluminum and head of bolt, or between nut, ss washer and aluminum body

.7 Screen: 12 mm exhaust, 19 mm intake mesh, 2 mm diameter wire aluminum birdscreen on inside face of louvres in formed U-frame.

.8 Finish: factory applied enamel, anodized. Colour: to Consultant's approval, submit samples of available finishes within shop drawing submittals.

3 EXECUTION

3.1 INSTALLATION

.1 In accordance with manufacturer's and SMACNA recommendations

.2 Reinforce and brace as indicated.

.3 Anchor securely into opening. Seal with caulking to ensure weather tightness.

3.2 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

END OF SECTION

NAME OF PRACTICE: GRGURIC ARCHITECTS INCORPORATED
CERTIFICATE OF PRACTICE NUMBER: 4760
CONTACT: **JOHN GRGURIC**
28 KING STREET EAST, UNIT B, STONEY CREEK, ON L8G 1J8
TEL: 905-664-8737

NAME OF PROJECT:
BISHOP TONNOS CSS CLASSROOM RENOVATIONS

LOCATION:
100 Panabaker Dr, Ancaster, ON L9G 5E3

Item	Ontario's 2024 Building Code Data Matrix Parts 3 or 9			OBC Reference: References are to Division B unless noted [A] for Division A or [C] for Division C	
1	Project Description: Renovation to existing classrooms to suit new activities. Mechanical and electrical work to suit.	☐ New ☐ Addition ■ Alteration ☐ Change of Use	■ Part 11 / 11.1 to 11.4 / ☐ Part 10	■ Part 3 [A] 1.1.2.	☐ Part 9 1.1.2 [A] & 9.10.1.3
2	Major Occupancy(s)	**ASSEMBLY, GROUP A, DIVISION 2 - SECONDARY SCHOOL**		3.1.2.1.(1)	9.10.2
3	Building Area **EXISTING BUILDING**	Existing **9,525.11 m²** New **0 m²** Approximate Area of Renovation **252 m²**		1.4.1.2.[A]	1.4.1.2.[A]
4	Gross Area **EXISTING BUILDING**	Existing **16,278.38 m²** New **0 m²**		1.4.1.2.[A]	1.4.1.2.[A]
5	Number of storeys **2 (Existing)**	Above grade **2**	Below grade **1**	1.4.1.2.[A] & 3.2.1.1	1.4.1.2.[A] & 9.10.4
6	Number of Streets/ Fire Fighter Access	**1 (Existing)**		3.2.2.10 & 3.2.5	9.10.20.
7	Building Classification	**3.2.2.24. GROUP A, DIVISION 2, UP TO 6 STOREYS, ANY AREA, SPRINKLERED**		3.2.2.20.-.83	9.10.2.
8	Sprinkler System Proposed **EXISTING**	■ entire building ☐ selected compartments ☐ selected floor areas ☐ basement ■ in lieu of roof rating ☐ not required		3.2.2.20.-.83 3.2.1.5. 3.2.2.17. INDEX	9.10.8.2 INDEX
9	Standpipe required	☐ Yes ■ No (EXISTING)		3.2.9	N/A
10	Fire Alarm required	■ Yes ☐ No (EXISTING)		3.2.4	9.10.18
11	Water Service/Supply is Adequate	■ Yes ☐ No		3.2.5.7.	N/A
12	High Building	☐ Yes ■ No		3.2.6	N/A
13	Permitted Construction Actual Construction	☐ Combustible permitted ☐ Non-combustible required ■ Both ☐ Combustible ☐ Non-combustible ■ Both		3.2.2.20.-.83 & 3.2.1.4.	9.10.6
14	Mezzanine(s) Area m²	32.65 EXISTING		3.2.1.1.(3)-(8)	9.10.4.1
15	Occupant load based on 1st Floor 2nd Floor	☐ m² /person ■ design of building Occupancy **N/A** Load **N/A** persons Occupancy **N/A** Load **N/A** persons **NO PROPOSED CHANGE TO THE OCCUPANT LOAD**		3.1.17	9.9.1.3
16	Barrier-free Design	■ Yes ☐ No (Explain)		3.8	9.5.2
17	Hazardous Substances	☐ Yes ■ No		3.3.1.2. & 3.3.1.19	9.10.1.3(4)
18	Required Fire Resistance Rating (FRR) (Fire separation to be reinstated)	Horizontal Assemblies FRR (Hours) / Listed Design No. or Description (SB-2) Floors **1** Hours Roof **0** Hours Mezzanine **1** Hours FRR of Supporting Members / Listed Design No. or Description (SB-2) Floors **1** Hours Roof **0** Hours Mezzanine **1** Hours		3.2.2.20.-.83 & 3.2.1.4	9.10.8. 9.10.9.
20	Plumbing Fixture Requirements *OCCUPANT LOAD DOES NOT REQUIRE AN INCREASE IN FIXTURES.			Building Code Reference: ■ Part 3 ☐ Part 9	

Occupant Load	BC Table Number	Fixtures Required	Fixtures Provided	3.7.4.	9.31.
N/A					
N/A					

Ontario Building Code Data Matrix Part 11 -- Renovation of Existing Building

				Building Code Reference
11.1	Existing Building classification:	Describe Existing Use: **ASSEMBLY, GROUP A, DIVISION 2** Construction Index: Hazard Index: ■ Not Applicable (no major change of occupancy)		11.2.1 T 11.2.1.1A T 11.2.1.1B to N
11.2	Alteration to Existing Building is:	Basic Renovation ■ Extensive Renovation ☐		11.3.3.1 11.3.3.2
11.3	Reduction in Performance Level:	Structural: ■ No ☐ Yes By Increase in occupant load: ■ No ☐ Yes By change of major occupancy: ■ No ☐ Yes Plumbing: ■ No ☐ Yes Sewage System: ■ No ☐ Yes		11.4.2 11.4.2.1 11.4.2.2 11.4.2.3 11.4.2.4 11.4.2.5
11.4	Compensating Construction:	Structural: ■ No ☐ Yes (explain Increase in occupant load: ■ No ☐ Yes (explain) Change of major occupancy: ■ No ☐ Yes (explain) Plumbing: ■ No ☐ Yes (explain) Sewage system: ■ No ☐ Yes (explain)		11.4.3 11.4.3.2 11.4.3.3 11.4.3.4 11.4.3.5 11.4.3.6
11.5	Compliance Alternatives Proposed:	■ No ☐ Yes (give number [s])		11.4.2

HWCDSB BISHOP TONNOS HS CLASSROOM RENOVATIONS

100 Panabaker Dr, Ancaster, ON L9G 5E3

Hamilton-Wentworth Catholic District School Board

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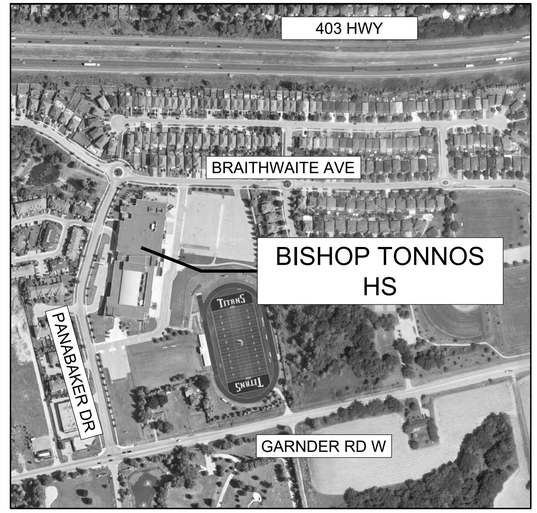


LOCATION MAP
N.T.S.

DRAWING LIST:

ARCHITECTURAL

A 0.00	COVER SHEET & OBC MATRIX
A 1.00	FIFTH FLOOR PLAN
A 1.10	SIXTH FLOOR PLAN
A 1.20	INTERIOR ELEVATIONS AND DOOR SCHEDULE
A 1.30	

MECHANICAL

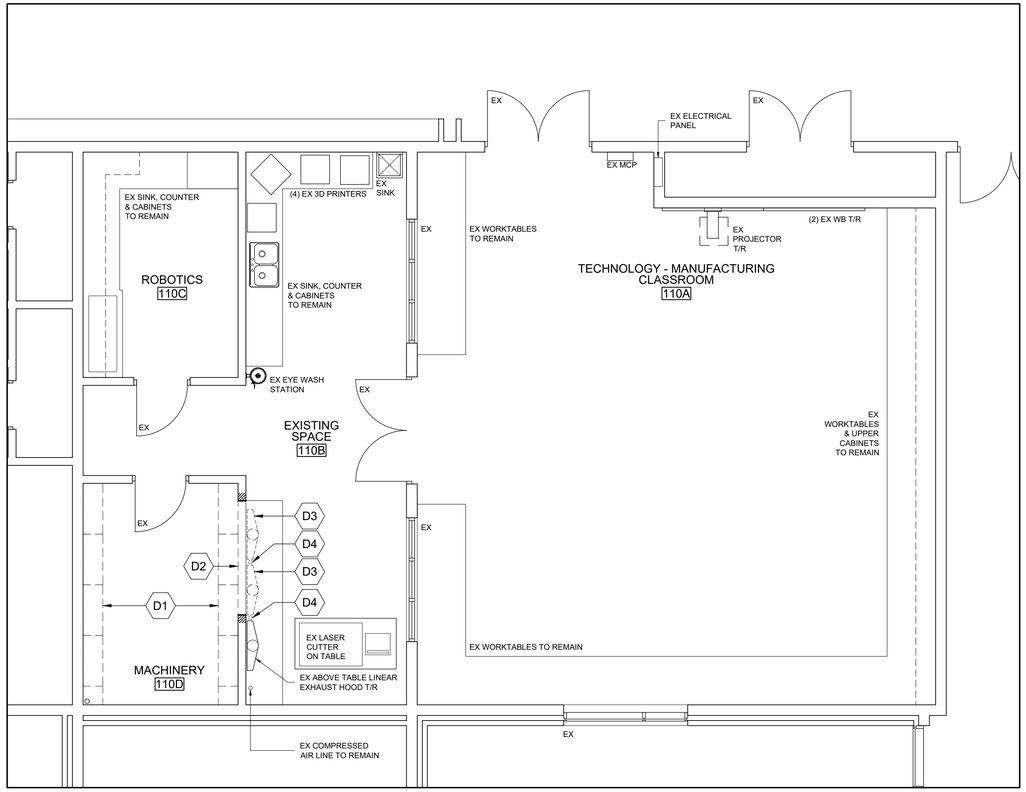
M1.01	DETAILS (1), DRAWING LIST & LEGEND
M1.02	DETAILS (2)
M1.03	SCHEDULES
M1.04	KEY PLAN AND SCOPE OF WORK AREA
M2.01	TECH. MANUF. CLASSROOM 110 PLUMBING DEMOLITION
M2.02	TECH. MANUF. CLASSROOM 110 PLUMBING MODIFICATION
M2.03	ALTERNATE LEARNING CLASSROOM 120 PLUMBING MODIFICATION
M2.04	COSMETOLOGY CLASSROOM 207 PLUMBING DEMOLITION
M2.05	COSMETOLOGY CLASSROOM 207 PLUMBING MODIFICATION
M2.06	FIRST FLOOR COSMETOLOGY CLASSROOM 207 PLUMBING DEMOLITION
M2.07	FIRST FLOOR COSMETOLOGY CLASSROOM 207 PLUMBING MODIFICATION
M3.01	TECH. MANUF. CLASSROOM 110 HVAC DEMOLITION
M3.02	TECH. MANUF. CLASSROOM 110 HVAC MODIFICATION
M3.03	ALTERNATE LEARNING CLASSROOM 120 PLUMBING DEMOLITION
M3.04	ALTERNATE LEARNING CLASSROOM 120 PLUMBING MODIFICATION
M3.05	COSMETOLOGY CLASSROOM 207 HVAC DEMOLITION
M3.06	COSMETOLOGY CLASSROOM 207 HVAC MODIFICATION
M4.01	TECH. MANUF. CLASSROOM 110 FIRE DEMOLITION
M4.02	TECH. MANUF. CLASSROOM 110 FIRE MODIFICATION
M4.03	ALTERNATE LEARNING CLASSROOM 120 FIRE DEMOLITION
M4.04	ALTERNATE LEARNING CLASSROOM 120 FIRE MODIFICATION
M4.05	COSMETOLOGY CLASSROOM 207 FIRE DEMOLITION
M4.06	COSMETOLOGY CLASSROOM 207 FIRE MODIFICATION

ELECTRICAL

E1.0	ELECTRICAL SPECIFICATIONS
E1.1	ELECTRICAL NOTES
E1.2	ELECTRICAL LEGEND AND LUMINAIRE SCHEDULE
E2.0	OVERALL FLOOR PLAN
E2.1	LIGHTING DEMOLITION
E2.2	LIGHTING NEW INSTALLATION
E3.1	POWER & SYSTEMS DEMOLITION
E3.2	POWER & SYSTEMS NEW INSTALLATION
E4.1	ELECTRICAL DETAILS

PROJECT NUMBER
2024-25

SHEET NUMBER
A 0.00



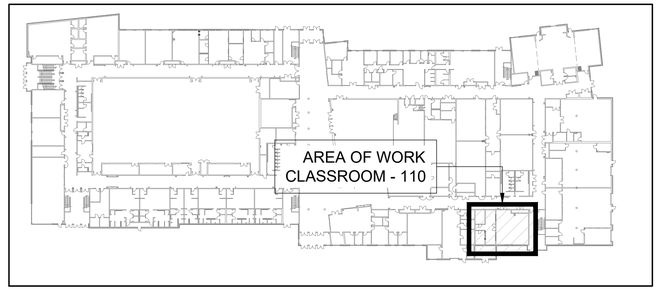
3 A1.00 TECH. MANUF. CLASSROOM DEMOLITION PLAN

SCALE: 1:50

GRAPHIC RCP LEGEND

- REFER TO MECHANICAL AND ELECTRICAL DRAWINGS FOR ACTUAL FIXTURE SHOWN
- MECHANICAL AND ELECTRICAL ITEMS SHOWN, I.E. LIGHT FIXTURES, ETC.
ARE FOR REFERENCE ONLY AND ARE NOT INCLUSIVE.
REFER TO MECHANICAL AND ELECTRICAL DRAWINGS FOR ALL RELATED WORK.
-REFER TO ARCHITECTURAL NOTES

- 2'x4' ACT TO BE REMOVED
- EXISTING 2'X4' ACT TO REMAIN
- DENOTES 2'X4' ACT REPLACEMENT
- REMOVED R/A GRILLE
- R/A GRILLE
- REMOVED S/A GRILLE
- S/A GRILLE
- RELOCATED LIGHT FIXTURE, 2'x4'
- EX. LIGHT FIXTURE, 2'x4'
- EX. LIGHT FIXTURE, 1'x4'
- EX. POT LIGHT FIXTURE
- EX. SPRINKLER HEAD



GROUND FLOOR - KEYPLAN

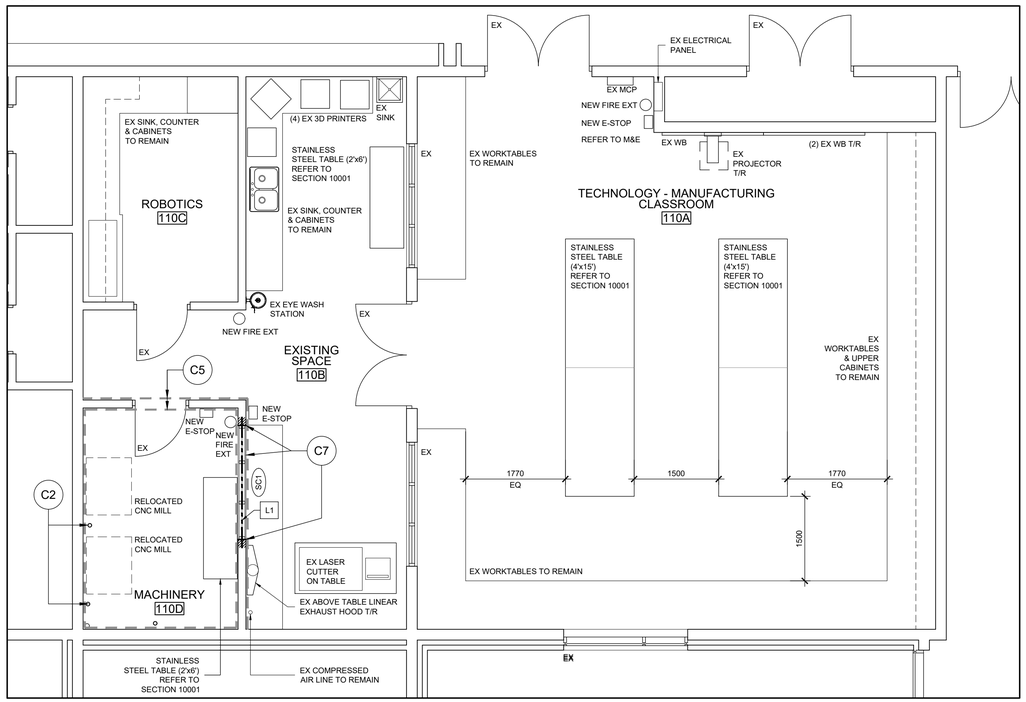
NTS

DEMOLITION NOTES

- D1 REMOVE AND DISCARD EXISTING MILLWORK.
GC TO COORDINATE ALL WALL PATCHING AND FILLING OF FASTENER HOLES AS NEEDED OVER THE EXTENT OF REMOVED MILLWORK
- D2 CUT NEW OPENING IN EXISTING CONCRETE BLOCK WALL TO SUIT NEW SCREEN
REFER TO LINTEL SCHEDULE. REFER TO NOTE C7
- D3 REMOVE LINEAR EXHAUST HOODS
REFER TO MECHANICAL
- D4 REMOVE COMPRESSED AIR LINES
REFER TO MECHANICAL

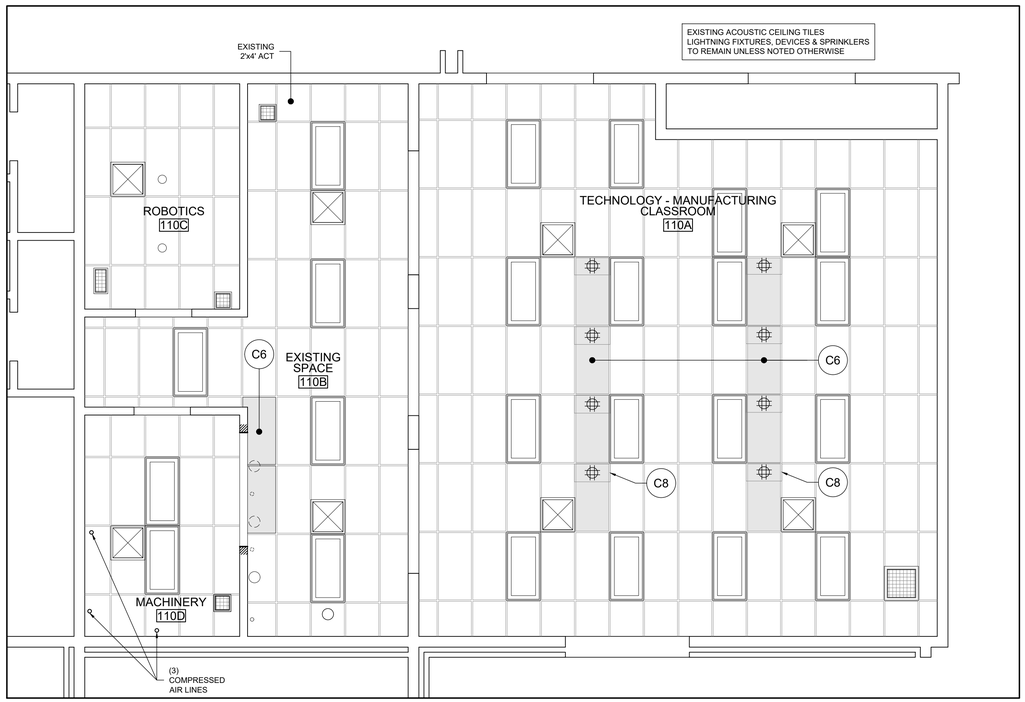
CONSTRUCTION NOTES

- C1 PROVIDE NEW E-STOP AND NEW FIRE EXTINGUISHER
- C2 PROVIDE NEW AIRLINES.
REFER TO MECHANICAL.
- C3 PROVIDE NEW RIGID EXHAUST DUCT TO CEILING.
REFER TO MECHANICAL.
- C4 PROVIDE NEW COMPRESSED AIR LINES
REFER TO MECHANICAL
- C5 DASHED LINE DENOTES EXTENT OF NEW PAINT APPLICATION
- C6 SHADE DENOTES EXTENT OF EXISTING ACT TO BE REMOVED AND REPLACED WITH NEW
- C7 PROVIDE NEW BULLNOSED CONCRETE BLOCK AT NEW WINDOW JAMBS AND NEW BULLNOSED CONCRETE SILL BLOCK AT NEW WINDOW SILL
- C8 GENERAL CONTRACTOR TO COORDINATE WITH ELECTRICAL SUBCONTRACTOR THE INSTALLATION OF THE CEILING MOUNTED POWER REELS AND ASSOCIATED PLENUM BOX HOUSING UNITS AT EACH LOCATION AS SHOWN. ALONG THIS ROW OF 4 POWER REELS, PROVIDE MODIFICATION ADJUSTMENTS TO THE MOUNTING OF THESE BOXES AND HANGER RODS, TO AVOID THE EXISTING DUCT INTERFERENCE ABOVE THIS LOCATION. MODIFICATIONS INCLUDE THE INSTALLATION OF UNISTRUT CHANNEL OR ANGLE SEGMENTS ON TOP OF EACH REEL BOX, TO ALLOW OFFSET HANGER MOUNTING, WHILE MAINTAINING THE LOCATION OF EACH BOX WITHIN THE EXISTING CEILING GRID AS SHOWN. SITE VERIFY.



1 A1.00 TECH. MANUF. CLASSROOM FLOOR PLAN

SCALE: 1:50



2 A1.00 TECH. MANUF. CLASSROOM REFLECTED CEILING PLAN

SCALE: 1:50

Hamilton-Wentworth Catholic District School Board

LEGEND

ACT	ACOUSTIC CEILING TILE
BB	BLACKBOARD
EX	EXISTING ITEM
EXT	EXTINGUISHER
GYP	GYPSUM
MCP	MODULAR CONTROL PANEL
MIN	MINIMUM
NIC	NOT IN CONTRACT
SIM	SIMILAR
TB	TACKBOARD
T/R	TO REMAIN
WB	WHITEBOARD

NO	REVISIONS	DATE
2	ISSUED FOR TENDER	2025-03-24
1	ISSUED FOR BUILDING PERMIT	2025-03-13

BISHOP TONNOS CSS CLASSROOM RENOVATIONS

100 Panabaker Dr, Ancaster, ON L9G 5E3

TECHNOLOGY MANUFACTURING CLASSROOM 110

GRGURIC ARCHITECTS INCORPORATED

28 KING STREET EAST, UNIT B
STONEY CREEK, ONTARIO, L8G 1J8
Tel. 905-664-8735 Fax. 905-664-8737
Web: www.2gai.com

SCALE: AS NOTED	PROJECT: 2024-25
START DATE: FEB 2025	
DRAWN DW/AH	DRAWING: A1.00
CHECKED W.P.	
PRINT DATE	03/24/25

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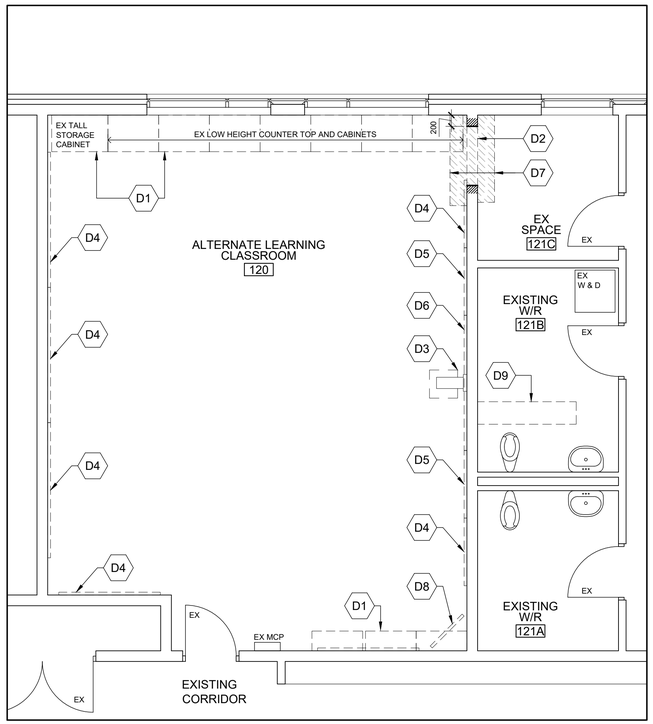
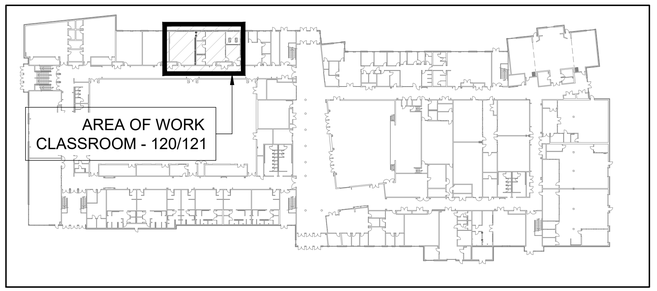


3 A1.10 ALTERNATE LEARNING CLASSROOM DEMOLITION PLAN

SCALE: 1:50

GENERAL NOTES

1. COORDINATE AND VERIFY WITH THE OWNER ALL ITEMS TO BE SALVAGED, MOVED & STORED PRIOR TO DEMOLITION.
2. CAUSE NO DAMAGE TO EXISTING CONSTRUCTION TO REMAIN. TAKE CARE NOT TO ENCROACH ON ADJACENT OCCUPIED AREAS OR AREAS NOT WITHIN THE SCOPE OF WORK. PROTECT ALL EXISTING FINISHES, DOORS, FRAMES. ETC. WHICH ARE TO REMAIN. PATCH AND MAKE GOOD ALL EXISTING ADJACENT SURFACES FINISHES & MATERIALS WHERE DISTURBED BY NEW CONSTRUCTION AT NO EXTRA COST TO THE PROJECT.
3. IF CONTRACTOR ENCOUNTERS ANY SUSPECTED ASBESTOS CONTAINING MATERIALS (ACM) MATERIALS, THEY ARE TO ADVISE ARCHITECT & CLIENT IMMEDIATELY FOR FURTHER CONFIRMATION & INSTRUCTIONS.
4. ALL PATCHING AND REPAIRING OF SURFACES ARE NOT NECESSARILY SHOWN. PATCH AND REPAIR ALL EXISTING SURFACES SCHEDULED TO RECEIVE NEW FINISHES TO THAT ALL SURFACES WHEN COMPLETE RESEMBLE A NEW INSTALLATION.
5. CONTRACTOR TO ALLOW FOR PATCHING AND REPAIR AND REFINISHING OF ALL EXISTING ADJACENT MATERIALS, SURFACES & FINISHES.
6. CONTRACTOR TO ALLOW FOR PATCHING AND REPAIR OF ADJACENT MATERIALS AT ALL ELECTRICAL LIGHTING, EQUIPMENT, CONDUIT, RACEWAYS, MECHANICAL PLUMBING, PIPING, ETC. TO BE REMOVED, RELOCATED, REPLACED, INSTALLED. REFER TO ELECTRICAL DRAWINGS. PREPARE ALL SURFACES FOR NEW FINISHES.
7. CONTRACTOR IS RESPONSIBLE FOR PROTECTING ALL EXISTING FLOOR FINISHES TO REMAIN, WALLS AND WALL MOUNTED EQUIPMENT FOR THE DURATION OF THE PROJECT.
8. REFER TO MECHANICAL, AND ELECTRICAL DOCUMENTS FOR ASSOCIATED DEMOLITION.
9. WHERE EXISTING SURFACES ARE DISTURBED DUE TO DEMOLITION OR ALTERATIONS, AND NOT REQUIRED TO BE COVERED WITH NEW FINISHES, SUCH SURFACES SHALL BE MADE GOOD TO MATCH EXISTING ADJACENT MATERIALS AND FINISHES.
10. MAKE GOOD ALL MATERIALS AND FINISHES WHERE DISTURBED AND WHERE ALTERATIONS OCCUR. REFER TO ALL DOCUMENTS FOR EXTENT OF WORK REQUIRED. MAKING GOOD INCLUDES ALL WORK ASSOCIATED WITH THE REMOVAL OF EXISTING AND INSTALLATION OF NEW SERVICES, ETC. (EXAMPLES: PLUMBING / HEATING MODIFICATIONS IN EXISTING BUILDING, INSTALLATION OF NEW DUCTS IN EXISTING BUILDING, ETC.)
11. WHERE EXISTING WALLS, PARTITIONS / FURRINGS, BUILDING FITMENTS, HOUSEKEEPING PADS, ETC., ARE BEING REMOVED, MAKE GOOD SUBSTRATES TO RECEIVE NEW SPECIFIED MATERIALS AND FINISHES.
12. TRANSITIONS BETWEEN NEW AND EXISTING FLOOR FINISHES TO BE MADE SMOOTH AND CONTINUOUS. GRIND EXISTING FLOOR SLAB ACROSS DOOR THRESHOLDS TO SUIT THICKNESS OF NEW MATERIALS AND ENSURE NEW MATERIAL IS INSTALLED FLUSH WITH EXISTING.
13. CONTRACTOR IS RESPONSIBLE FOR SWEEPING THE SITE DAILY AND CONDUCTING A FINAL CLEANING AT THE END OF THE PROJECT. THE FINAL CLEANING INCLUDES A COMPLETE PRE-MOVE CLEANING; WIPING DOWN ALL WALLS, ALL NEW FIXTURES AND MILLWORK, ALL NEW DOOR FRAMES AND SILLS, SWEEPING AND MOPPING THE FLOORS. THE CONTRACTOR WILL PROVIDE ALL EQUIPMENT NECESSARY TO CLEAN THE SITE PRIOR TO CLIENT OCCUPANCY. THE CONTRACTOR WILL NOT BE PERMITTED TO USE CLIENTS CARE TAKING TOOLS AND EQUIPMENT; MOPS, BROOMS, BAGS, BINS, ETC.
14. ALL EXISTING VISIBLE PROTRUSIONS, ANCHORS, REBAR, GLUES & ADHESIVES ETC. AT PARTITION WALL OR FLOOR REMOVAL NOTED ON DEMOLITION PLAN ARE TO BE REMOVED / GRINDED DOWN COMPLETELY AT EXISTING CONCRETE SLAB ON GRADE TO REMAIN AT ALL AREAS IN SCOPE OF WORK. POUR LEVELING CONCRETE SLURRY COAT WHERE NEEDED TO FILL ANY VOIDS OR DEPRESSIONS AND ENSURE FLOORING IS FLUSH THROUGHOUT. ENSURE SUB-FLOOR SURFACE IS MADE COMPLETELY LEVEL & SMOOTH AND CLEANED OF ALL IMPERFECTIONS TO ALLOW FOR INSTALLATION OF NEW FLOOR FINISHES AS PER SCHEDULE.
15. GENERAL CONTRACTOR IS TO REVIEW ALL EXISTING WALL MOUNTED COMPONENTS TO BE REMOVED OR RELOCATED AND PROVIDE WALL PATCHING AND FASTENER HOLE FILLING TO RESTORE WALL SURFACES AT THESE LOCATIONS.



GROUND FLOOR - KEYPLAN

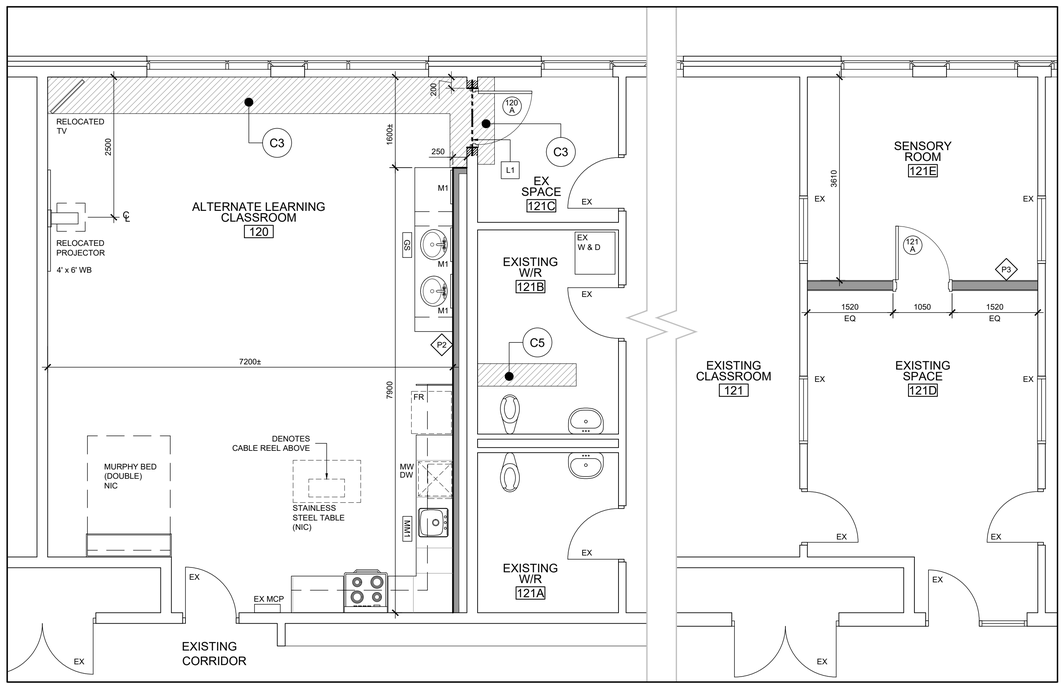
NTS

DEMOLITION NOTES

- D1 REMOVE AND DISCARD EXISTING MILLWORK. GC TO COORDINATE ALL WALL PATCHING AND FILLING OF FASTENER HOLES HAS NEEDED OVER THE EXTENT OF REMOVED MILLWORK
- D2 CUT NEW OPENING IN EXISTING CONCRETE BLOCK WALL TO SUIT NEW DOOR. REFER TO LINTEL SCHEDULE
- D3 RELOCATE EXISTING PROJECTOR. REFER TO ELECTRICAL
- D4 REMOVE EXISTING TACKBOARDS. RETURN TO THE OWNER
- D5 REMOVE EXISTING BLACKBOARDS. RETURN TO THE OWNER
- D6 REMOVE EXISTING WHITEBOARD. RETURN TO THE OWNER
- D7 REMOVE AND DISCARD EXISTING VCT FLOORING AND RB. GRIND CONCRETE FLOORS AND MAKE READY TO RECEIVE NEW FINISH
- D8 RELOCATE EX TV. REFER TO ELECTRICAL
- D9 PROVIDE SLAB ON GRADE CUTTING AND REMOVAL FOR NEW SANITARY. ALLOW FOR REMOVAL OF EXISTING GRANULAR BELOW SLAB AT REQUIRED. REFER TO MECHANICAL DRAWINGS. ALLOW FOR UP TO 180mm EXISTING SLAB THICKNESS.

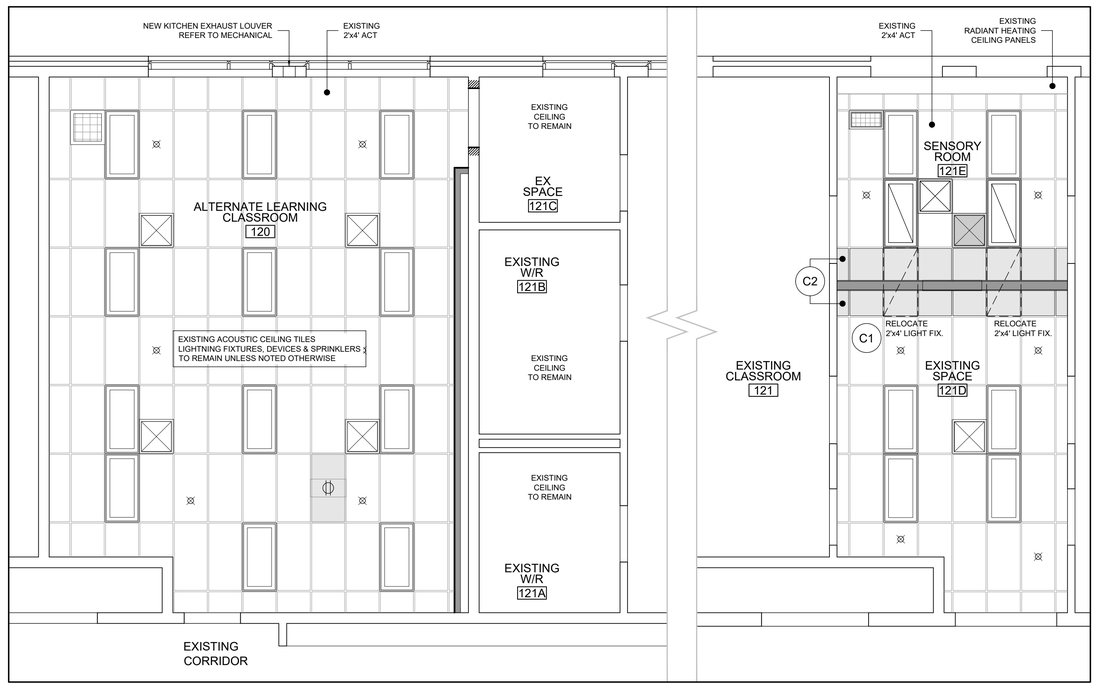
CONSTRUCTION NOTES

- C1 REMOVE AND MODIFY EXISTING ACT AND T-BAR AS REQUIRED TO SUIT NEW PARTITION
- C2 SHADED AREA DENOTES EXTENT OF ACT & CROSS-T'S TO BE REMOVED TO FACILITATE NEW PARTITION INSTALLATION. INFILL AND RESTORE WITH NEW ACT
- C3 ALLOW FOR NEW VCT AND RB OVER EXTENT OF REMOVED MILLWORK
- C4 INSTALL NEW VCT AND RB ALLOW FOR AREA OF 300mm DEPTH ON EACH SIDE OF THE WALL
- C5 PROVIDE NEW 25 MPA POURED CONCRETE FLOOR WITH 6x6 6x6 WWF . THICKNESS OF NEW FLOOR TO MATCH EX FLOOR SLAB (ALLOW FOR UP TO 180mm). MESH TO HAVE MINIMUM 25mm COVER. PROVIDE VCT IN NEW FLOORING TO MATCH EX. PROVIDE 400mm LG 10M DOWELS AT 400mm O/C. EPOXY EMBED DOWELS 100mm INTO EX FLOOR SLAB. PATCH AND REPAIR VCT TO MATCH EXISTING



1 A1.10 ALTERNATE LEARNING CLASSROOM FLOOR PLAN

SCALE: 1:50



2 A1.10 ALTERNATE LEARNING CLASSROOM REFLECTED CEILING PLAN

SCALE: 1:50

Hamilton-Wentworth Catholic District School Board

LEGEND

ACT	ACOUSTIC CEILING TILE
BB	BLACKBOARD
D	DRYER
EX	EXISTING ITEM
GYP	GYPSUM
MCP	MODULAR CONTROL PANEL
MIN	MINIMUM
NIC	NOT IN CONTRACT
RB	RUBBER BASE
SIM	SIMILAR
TB	TACKBOARD
VCT	VINYL COMPOSITE TILE
W	WASHER
WB	WHITEBOARD

NO	REVISIONS	DATE
2	ISSUED FOR TENDER	2025-03-24
1	ISSUED FOR BUILDING PERMIT	2025-03-13

BISHOP TONNOS CSS CLASSROOM RENOVATIONS

100 Panabaker Dr, Ancaster, ON L9G 5E3

ALTERNATE LEARNING CLASSROOM 120

GRGURIC ARCHITECTS INCORPORATED

28 KING STREET EAST, UNIT B
STONEY CREEK, ONTARIO, L8G 1J8
Tel. 905-664-8735 Fax. 905-664-8737
Web: www.2gai.com

SCALE: AS NOTED	PROJECT: 2024-25
START DATE: FEB 2025	
DRAWN DW/AH	DRAWING: A1.10
CHECKED W.P.	
PRINT DATE	03/24/25

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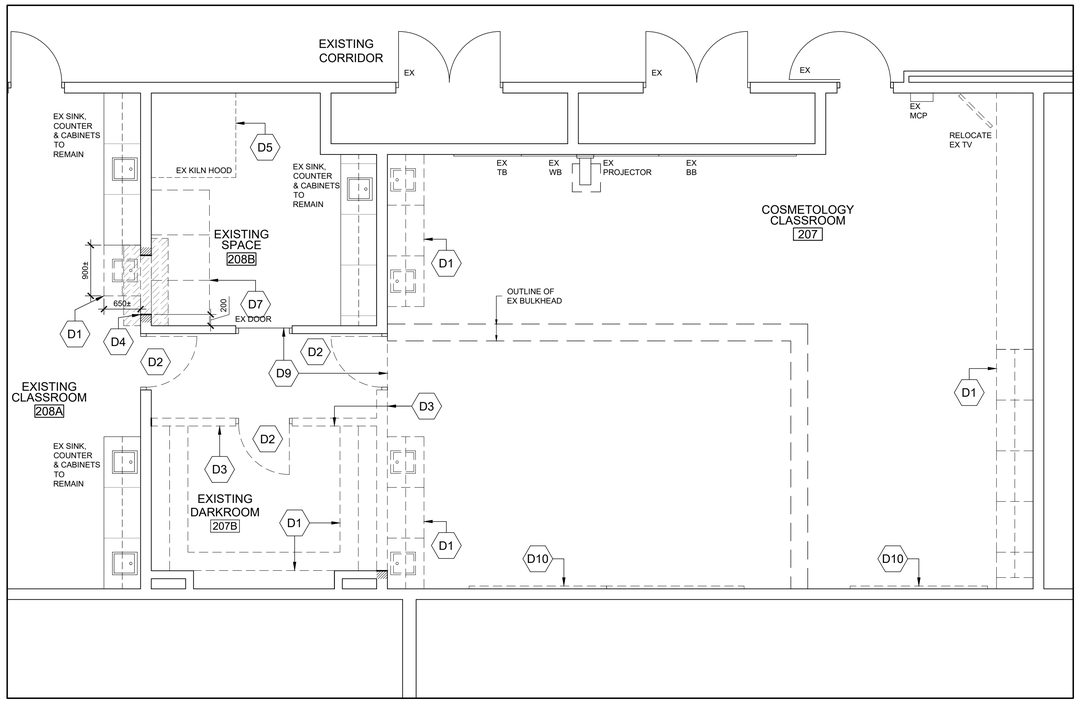
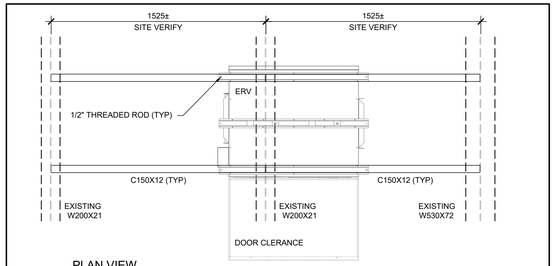


2 A1.20 COSMETOLOGY CLASSROOM DEMOLITION PLAN

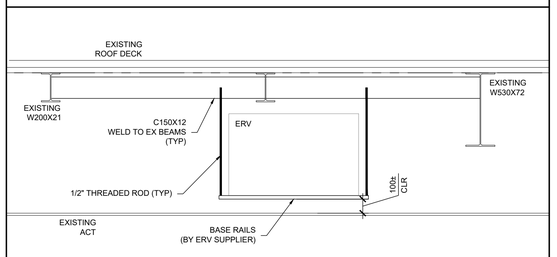
SCALE: 1:50

LINTEL SCHEDULE

TYPE	DESCRIPTION	REMARKS	
L-1	W200x27 + 8mm PLATE AT BOTTOM FLANGE WIDTH TO SUIT	150mm MINIMUM BEARING LENGTH	



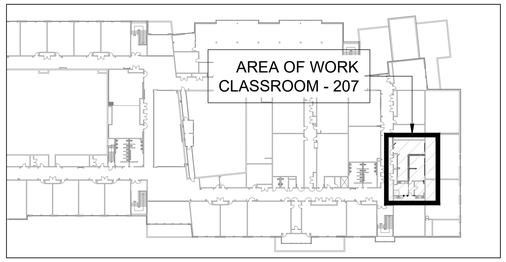
PLAN VIEW



SECTION

4 A1.20 ERV SUPPORT DETAILS

NTS



SECOND FLOOR - KEYPLAN

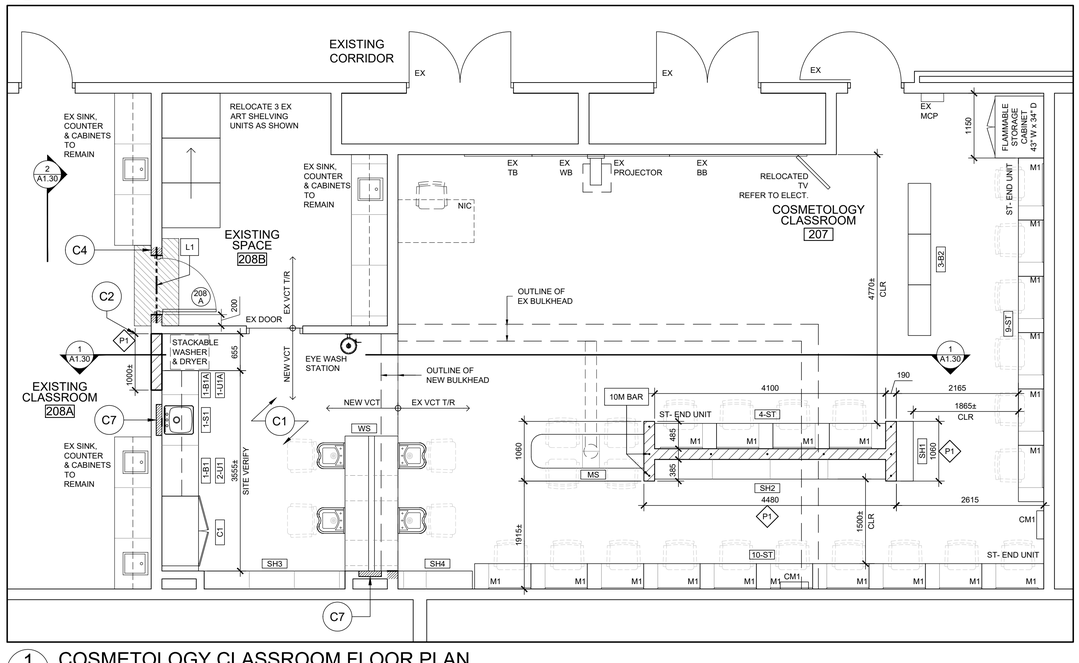
NTS

DEMOLITION NOTES

- D1 REMOVE AND DISCARD EXISTING MILLWORK (LOWER, UPPER CABINET AND SINKS. REFER TO MECHANICAL)
- D2 REMOVE AND DISCARD EXISTING DOOR AND FRAME IN ITS ENTIRETY
- D3 REMOVE EXISTING CONCRETE BLOCK WALL IN ITS ENTIRETY IN THE NOTED AREAS
- D4 CUT NEW OPENING IN EXISTING CONCRETE BLOCK WALL TO SUIT NEW DOOR REFER TO STRUCTURAL
- D5 REMOVE AND DISCARD EX KILN HOOD IN ITS ENTIRETY. REFER TO MECHANICAL
- D6 REMOVE AND DISCARD EX ACOUSTIC CEILING TILES AND T-BAR GRID IN THE NOTED AREA OF WORK REFER TO MECHANICAL AND ELECTRICAL
- D7 RELOCATE EX ART SHELVING UNITS
- D8 REMOVE DIFFUSER AND GRILLE. REFER TO MECHANICAL
- D9 REMOVE AND DISCARD EXISTING VCT FLOORING. GRIND CONCRETE FLOORS AND MAKE READY TO RECEIVE NEW FINISH
- D10 REMOVE EXISTING TACK BOARD RETURN TO THE OWNER
- D11 REMOVE AND DISCARD EXISTING TRACK LIGHTS REFER TO ELECTRICAL

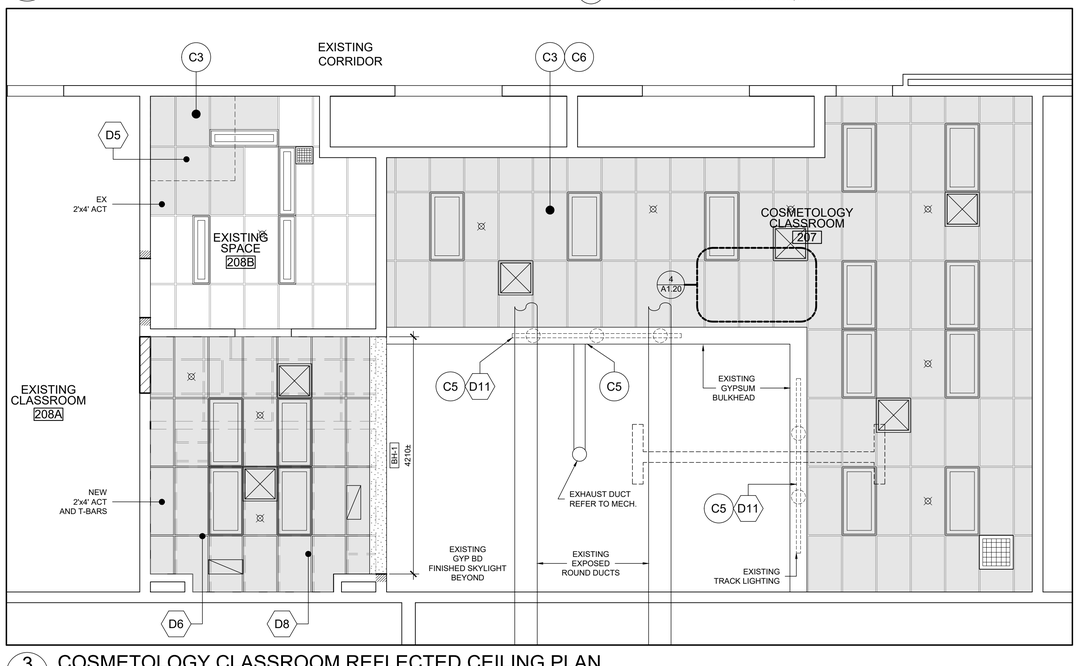
CONSTRUCTION NOTES

- C1 NEW VCT FLOOR FINISH
- C2 INFILL EXISTING DOORWAY OPENING WITH 190mm CONCRETE BLOCK (±1000x2200mm)
- C3 SHADE DENOTES EXTENT OF EXISTING ACT TO BE REMOVED AND REPLACED WITH NEW
- C4 REPAINT ENTIRE WEST WALL TO U/S OF CEILING OR SKYLIGHT BULKHEAD
- C5 PATCH AND PANT TOUCH-UP WHERE EXISTING FIXTURES ARE REMOVED OR WHERE NEW FIXTURES ARE INSTALLED
- C6 OVER THE SAME EXTENT OF NOTED CEILING TILE REPLACEMENT, ALLOW FOR TEMPORARY REMOVAL OF EXISTING T-BAR AS NEEDED TO FACILITATE NEW HVAC INSTALLATION AND REINSTALL SAME. ALL EXISTING LIGHTING AND DEVICES TO REMAIN AND TEMPORARILY SUPPORT IN PLACE AS NEEDED.
- C7 CUT EXISTING NLB CONCRETE BLOCK WALL TO SUIT NEW PLUMBING ROUGH-INS PATCH AND RESTORE WALL. ALLOW FOR 1 sqm OF CUT AREA. REFER TO MECHANICAL



1 A1.20 COSMETOLOGY CLASSROOM FLOOR PLAN

SCALE: 1:50



3 A1.20 COSMETOLOGY CLASSROOM REFLECTED CEILING PLAN

SCALE: 1:50

Hamilton-Wentworth Catholic District School Board

LEGEND

ACT	ACOUSTIC CEILING TILE
BB	BLACKBOARD
BD	BOARD
D	DRYER
ERV	ENERGY RECOVERY VENTILATOR
EX	EXISTING ITEM
GYP	GYPSUM
MCP	MODULAR CONTROL PANEL
M1	MIRROR
MC1	WALL MOUNTED CONVEX MIRROR
MIN	MINIMUM
NIC	NOT IN CONTRACT
SIM	SIMILAR
TB	TACKBOARD
T/R	TO REMAIN
VCT	VINYL COMPOSITE TILE
W	WASHER
WB	WHITEBOARD

NO	REVISIONS	DATE
2	ISSUED FOR TENDER	2025-03-24
1	ISSUED FOR BUILDING PERMIT	2025-03-13

BISHOP TONNOS CSS CLASSROOM RENOVATIONS

100 Panabaker Dr, Ancaster, ON L9G 5E3

COSMETOLOGY CLASSROOM 207

GRGURIC ARCHITECTS INCORPORATED

28 KING STREET EAST, UNIT B
STONEY CREEK, ONTARIO, L8G 1J8
Tel. 905-664-8735 Fax. 905-664-8737
Web: www.2gai.com

SCALE: AS NOTED	PROJECT: 2024-25
START DATE: FEB 2025	
DRAWN DW/AH	DRAWING: A1.20
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PRINT DATE	03/24/25

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ROOM FINISH SCHEDULE

ROOM NO.	ROOM NAME	FLOOR FINISH	BASE	WALL		CEILING			REMARKS
				MAT'L	FINISH	MAT'L.	FINISH	HEIGHT	
110B	EXISTING SPACE	EX	EX	EX	PAINT	ACT	ACT-1	2800mm	
110D	MACHINERY	EX	EX	EX	PAINT	EX	EX	±2800mm	
120	ALTERNATE LEARNING CLASSROOM	EX/VCT	EX/RB	EX/GYP	PAINT	EX	EX	±2800mm	
121B	EXISTING W/R	EX/VCT	EX/RB	EX	EX	EX	EX	±2800mm	
121C	EXISTING SPACE	EX/VCT	EX/RB	EX/GYP	PAINT	EX	EX	±2800mm	
121D	EXISTING SPACE	EX/VCT	EX/RB	EX/GYP	PAINT	ACT	ACT-1	±2800mm	
121E	SENSORY ROOM	EX/VCT	EX/RB	EX/GYP	PAINT	ACT	ACT-1	±2800mm	
207	COSMETOLOGY CLASSROOM	EX/VCT	EX/RB	EX	PAINT	ACT	ACT-1	VARIES	
208A	EXISTING CLASSROOM	EX/VCT	EX/RB	EX	PAINT	EX	EX	VARIES	

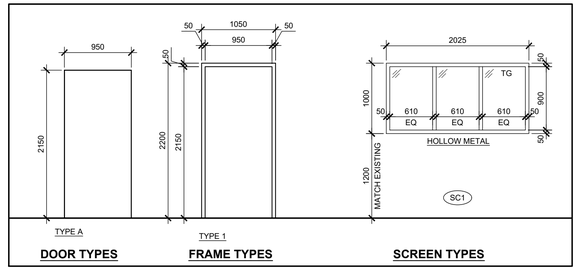
DOOR SCHEDULE

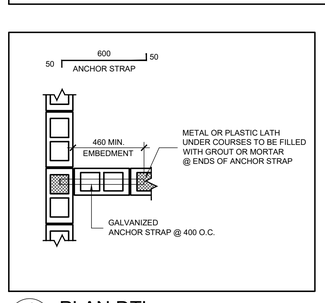
ROOM NAME	DOOR NO.	DOORS								FRAMES			REMARKS
		WIDTH	HEIGHT	THK.	FIRE	TYPE	MAT'L	FINISH	GLASS	TYPE	MAT'L	FINISH	
ALTERNATE LEARNING CLASSROOM	120 A	950	2150	44	-	A	HM	PAINT	-	1	HM	PAINT	
SENSORY ROOM	121 A	950	2150	44	-	A	HM	PAINT	-	1	HM	PAINT	
EXISTING CLASSROOM	208 A	950	2150	44	-	A	HM	PAINT	-	1	HM	PAINT	

INTERIOR WALL PARTITION TYPES

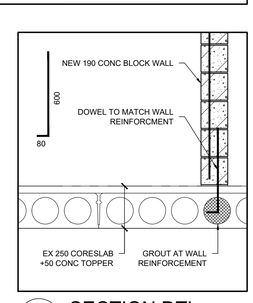
NO.	DESCRIPTION	REMARKS
P1	- 190mm CONC. BLOCK - BULLNOSE BLOCKS AT ALL EXPOSED CORNERS	• PARTIAL HEIGHT PARTITION • 2200mm TO TOP OF WALL • INFILL AT EXISTING DOOR OPENING REFER TO TYPICAL STRUCTURAL DETAILS **(NON- LOAD BEARING)** - BLOCK COMP. STRENGTH = 15 MPa - 10M @ 1000 O.C MAX VERTICAL (REFER TO FLOOR PLAN 1/A1.20 FOR LOCATION OF VERTICAL REBAR) - HEAVY DUTY BLOCK-LOK TRUSS / LADDER AT EVERY SECOND COURSE
P2	- 92mm x 41mm METAL STUD -16mm GYPSUM BOARD	EXTEND PARTITION TO UNDERSIDE OF ACT CEILING TIE BACK O ADJACENT BLOCK WALL AS NEEDED
P3	- 152mm x 41mm METAL STUD -16mm GYPSUM BOARD BOTH SIDES	EXTEND PARTITION TO UNDERSIDE OF STRUCTURE ABOVE

1. FULLY GROUT ALL REINFORCED CORES.
2. ALL WALLS NOTED FULLY GROUTED ARE TO BE 100% FILLED WITH GROUT.
3. CO-ORDINATE ALL WALL OPENINGS WITH ARCH DRAWINGS AND MECHANICAL CONTRACTOR.
4. PROVIDE ADDITIONAL BAR/MATCHING WALL REINF. SIZE FULL HEIGHT @ WALL ENDS. INTERSECTIONS AND OPENINGS UNLESS OTHERWISE NOTED ON DRAWINGS.
5. PROVIDE STANDARD TENSION SPLICES FOR ALL HORIZONTAL AND VERTICAL WALL REINFORCEMENT.
6. ALL BARS CONNECTING BETWEEN FLOORS TO BE TIED TOGETHER (REFER TO SECTION DETAILS).
7. SOLD FILLED VOIDS TO BE MADE WITH 20MPa FLOWABLE GROUT (MORTAR FILL NOT PERMITTED).
8. PROVIDE DOWELS FROM THE FOOTING TO WALLS ABOVE TO MATCH VERTICAL WALL REINFORCEMENT.
9. THE INTERSECTION (CORNER JOINTS) OF ALL MASONRY WALLS SHALL BE TOOTHED.
10. THE INTERSECTION ("T" JOINTS) OF ALL MASONRY SHALL BE TOOTHED OR CONTINUOUSLY REINFORCED WITH JOINT REINFORCEMENT.

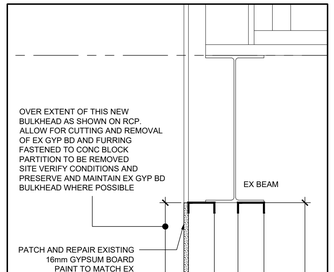




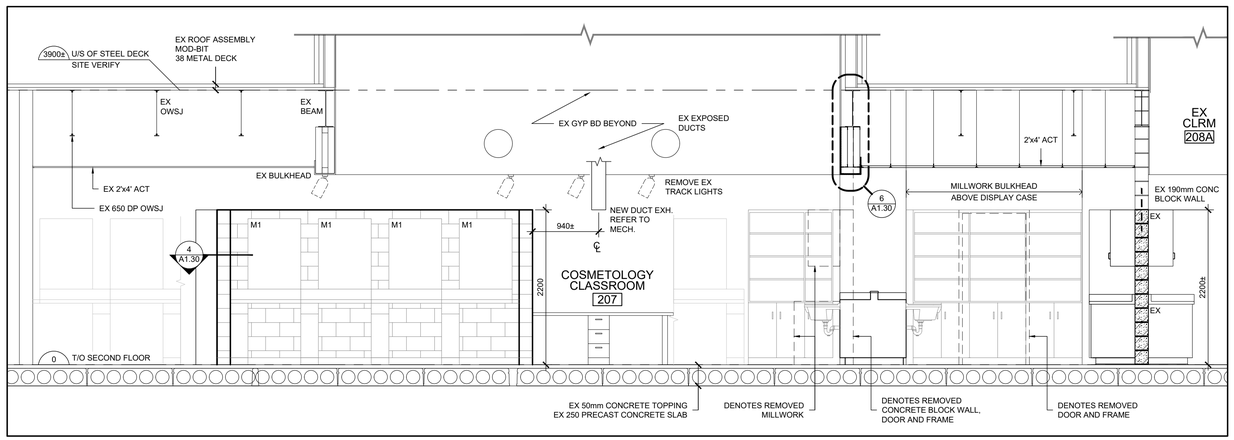
4 A1.30 PLAN DTL
SCALE: 1:20



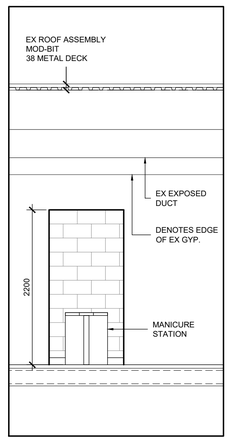
5 A1.30 SECTION DTL
SCALE: 1:20



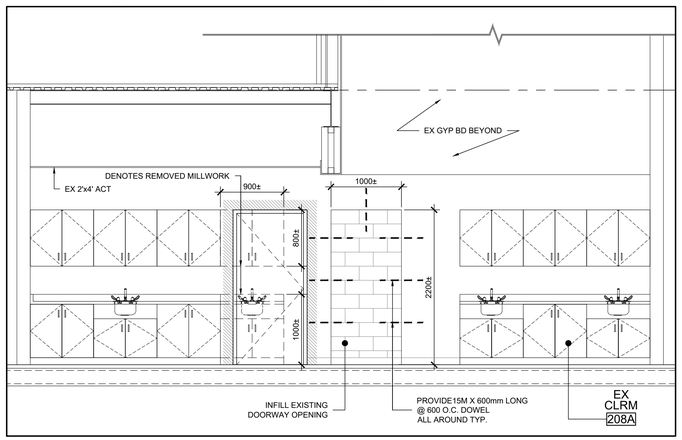
6 A1.30 BULKHEAD-1 SECTION DTL
SCALE: 1:10



1 A1.30 PARTIAL BUILDING SECTION
SCALE: 1:40



2 A1.30 PARTIAL BUILDING SECTION
SCALE: 1:40



3 A1.30 PARTIAL BUILDING SECTION
SCALE: 1:40

Hamilton-Wentworth Catholic District School Board

LEGEND

ACT ACOUSTIC CEILING TILE
CLRM CLASSROOM
DP DEEP
EX EXISTING ITEM
EXH EXHAUST
GYP GYPSUM
HM HOLLOW METAL
M1 MIRROR
MIN MINIMUM
NIC NOT IN CONTRACT
RB RUBBER BASE
SIM SIMILAR
VCT VINYL COMPOSITE TILE

NO	REVISIONS	DATE
2	ISSUED FOR TENDER	2025-03-24
1	ISSUED FOR BUILDING PERMIT	2025-03-13

BISHOP TONNOS CSS CLASSROOM RENOVATIONS

100 Panabaker Dr, Ancaster, ON L9G 5E3

OBC MATRIX, SECTIONS AND SCHEDULES

GRGURIC ARCHITECTS INCORPORATED
28 KING STREET EAST, UNIT B
STONEY CREEK, ONTARIO, L8G 1J8
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Web: www.2gai.com

SCALE: AS NOTED	PROJECT: 2024-25
START DATE: FEB 2025	
DRAWN DW/AH	DRAWING: A1.30
CHECKED W.P.	
PRINT DATE	03/24/25

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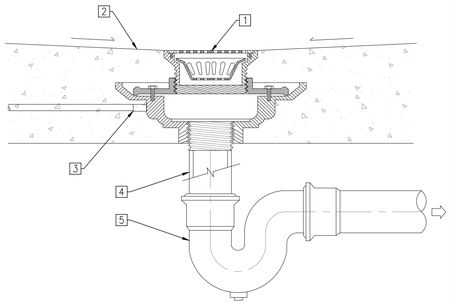
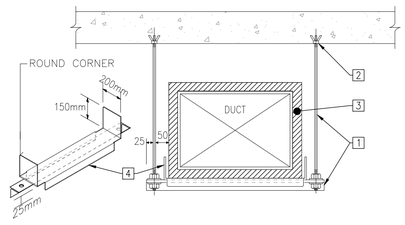
DETAIL 1 – FLOOR DRAIN

NOT TO SCALE



1. ADJUSTABLE STRAINER
2. FINISHED FLOOR, SLOPING AND WATER PROOFING AS SPECIFIED
3. TRAP SEAL PRIMER CONNECTION, PROVIDE TRAP SEAL PRIMER STATION C/W PIPING
4. CAST IRON CONNECTION TO SUIT P–TRAP SIZE
5. CAST IRON P–TRAP C/W CLEANING EYE

DETAIL 2 – DUCT HANGER



1. PROVIDE THREADED RODS AND ANGLE SUPPORT AS FOLLOWS

DUCT SIZE (mm)	ANGLE SIZE (MM)	ROD SIZE (MM)
UP TO 750	25 X 25 X 3	6
751 TO 1500	40 X 40 X 3	10
1501 TO 2100	50 X 50 X 3	10
2101 TO 2400	50 X 50 X 5	10
2401 AND OVER	50 X 50 X 6	10

2. SUPPORT UPPER HANGER FROM STRUCTURE AS FOLLOWS:

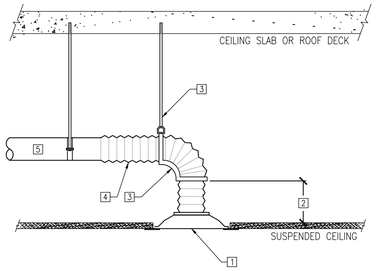
CONCRETE:	MANUFACTURED CONCRETE INSERTS
STEEL JOIST:	MANUFACTURED JOIST CLAMP
STEEL BEAM:	MANUFACTURED BEAM CLAMP

3. DUCT INSULATION, WHERE SPECIFIED.
4. PROVIDE 20 GAUGE GALVANIZED STEEL SUPPORT BELOW ALL INSULATED DUCTWORK.

GENERAL NOTES:
1. ALL STEEL SUPPORTS SHALL BE PAINTED WITH ZINC RICH PAINT. PROVIDE PAINT TO MATCH CEILING FINISHES (FINAL FINISH TO BE APPROVED BY CONSULTANT OR ARCHITECT) IN ALL EXPOSED AREAS.
2. HANGER SPACING SHALL BE IN ACCORDANCE WITH SMACNA AND AT MINIMUM EVERY 3m FOR DUCTS WIDTHS UNDER 1,500mm AND EVERY 2.5m FOR DUCTS WIDTHS ABOVE 1,500mm.

DETAIL 3 – DIFFUSER INSTALLATION

NOT TO SCALE



1. CEILING DIFFUSER OR GRILLE, SEE SCHEDULED FOR TYPES. PROVIDE ALL REQUIRED HARDWARE FOR MOUNTING IN VARIOUS CEILING TYPES TO SUIT EACH AREA OF WORK. INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
2. MINIMUM VERTICAL STRAIGHT RUN UPSTREAM OF DIFFUSER SHALL BE EQUIVALENT TO 1xD, PROVIDE 3xD WHERE CEILING PLENUM ALLOWS. INSTALL SUPPORTS TO PREVENT DAMAGE TO FLEXIBLE DUCT.
3. RIGID ELBOW SUPPORT – 'THERMAFLEX FLEXFLOW ELBOW' OR EQUIVALENT, SUSPEND FROM CEILING STRUCTURE.
4. FLEXIBLE DUCT, MAXIMUM LENGTH NOT TO EXCEED 1.8m (6FT).
5. RIGID DUCT, PROVIDE SECURE CONNECTION WITH FLEXIBLE DUCT. MAINTAIN ALIGNMENT WITH FLEXIBLE DUCT AND SUPPORT FROM STRUCTURE IN ACCORDANCE WITH SMACNA.

NOTE: THERMAL INSULATION ON RIGID OR FLEXIBLE DUCTWORK NOT SHOWN, PROVIDE IN ACCORDANCE WITH THE SPECIFICATIONS.

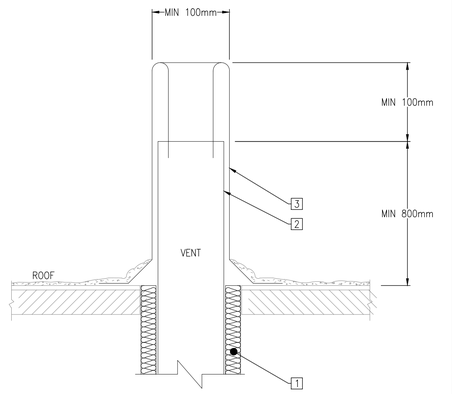
DRAWING LIST

LEGEND

SYMBOL	DESCRIPTION
	EXISTING TO BE REMOVED
	EXISTING TO REMAIN
	NEW WORK
	DOMESTIC COLD WATER (DCW)
	DOMESTIC HOT WATER (DHW)
	DOMESTIC HOT WATER RECIRC. (DHWR)
SAN	SANITARY DRAIN (BELOW GRADE)
SAN	SANITARY DRAIN (ABOVE GRADE)
TW	TEMPERED WATER
	PIPE DOWN
	PIPE UP
RD	ROOF DRAIN
FD	FLOOR DRAIN
FFD	FUNNEL FLOOR DRAIN
	P–TRAP
	END CAP
	PIPING BREAK/CONTINUATION
	CLEANOUT – FLOOR
	CLEANOUT – PLUG
	FLANGED UNION
	ISOLATION VALVE
	PUMP
SG	SUCTION GUIDE
	BALANCING VALVE
	CHECK VALVE
	PRESSURE REDUCING VALVE
	STRAINER
	PRESSURE RELIEF VALVE
LW	LOW WATER CUT OFF
FS	FLOW SWITCH
AV	MANUAL AIR VENT
AAV	AUTOMATIC AIR VENT
T	TEMPERATURE GAUGE
P	PRESSURE GAUGE
NG	NATURAL GAS REGULATOR
	BACKFLOW PREVENTER (DOUBLE CHECK VALVE ASSEMBLY)
	BACKFLOW PREVENTER (REDUCED PRESSURE ZONE ASSEMBLY)
AFF	ABOVE FINISHED FLOOR
BDD	BACK DRAFT DAMPER
CO	CLEANOUT
CTE	CONNECT TO EXISTING
FF	FINISHED FLOOR LEVEL
FD	FLOOR DRAIN
FFD	FLOOR FUNNEL DRAIN
FD	HUB DRAIN
VFD	VARIABLE FREQUENCY DRIVE
TYP	TYPICAL
EDH	ELECTRIC DUCT HEATER
EW	EYE WASH
	RETURN/EXHAUST DUCT UP
	RETURN/EXHAUST DUCT DOWN
	SUPPLY DUCT UP
	SUPPLY DUCT DOWN
	INTERNALLY LINED DUCT
	THERMALLY INSULATED DUCT
	DUCT ACCESS PANEL
	FIRE RESISTANT WRAP
	SQUARE CONE/PLAQUE DIFFUSER
	RETURN GRILLE
	AIRFLOW DIRECTION
BD	BALANCING DAMPER
	FIRE DAMPER
	FIRE AND SMOKRE DAMPER
M	MOTORIZED DAMPER
	SPRINKLER HEAD, PENDENT SEMI–RECESSED
	SPRINKLER HEAD, UPRIGHT EXPOSED
	SPRINKLER HEAD, CONCEALED
T	TEMPERATURE SENSOR
FE	FIRE EXTINGUISHER

DETAIL 4 – PLUMBING VENT

NOT TO SCALE

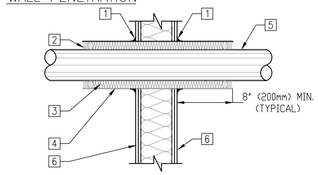


1. INSULATE FIRST 3m (10FT) OF VENT PIPE
2. VENT STACK, SIZE AND QUANTITY TO COMPLY WITH OBC PART 7
3. FLASHING BY BASEBUILDING ROOFING CONTRACTOR

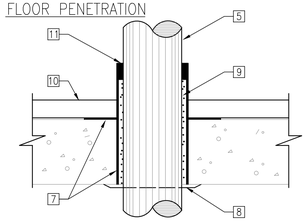
DETAIL 5 – DUCT OR PIPE FIRE STOP

NOT TO SCALE

WALL PENETRATION



FLOOR PENETRATION

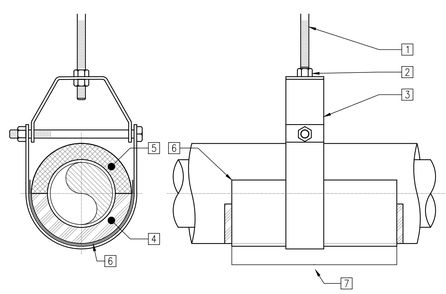


1. SEALANT. CONNECT TO STUD WITH "L" BRACKET IF NECESSARY (BOTH SIDES)
2. BACKER ROD & SEALANT
3. 13 (1/2") RIGID FIBERGLASS INSULATION
4. SHEET METAL SLEEVE (SCHEDULE 10 STEEL)
5. DUCT OR PIPE
6. WALL (TYPE VARIES – FOR CAVITY WALL USE SPLIT SLEEVE)
7. PIPE SLEEVE WITH ANCHOR RING
8. PIPE ESCUTCHEON PLATE
9. FIRE–STOPPING MATERIAL
10. FINISHED FLOOR
11. NON–HARDENING SEALANT

NOTE: FOR DUCT PENETRATIONS THRU FIRE WALL ASSEMBLY, PROVIDE FIRE DAMPER (NOT SHOWN). REFER TO PLANS FOR LOCATIONS AND SPECIFICATIONS/DETAILS FOR REQUIREMENTS.

DETAIL 6 – PIPE HANGER

NOT TO SCALE



1. THREADED HANGER ROD
2. LOCK NUTS
3. HEAVY DUTY CLEVIS HANGER, SIZE FOR OUTSIDE PIPE INSULATION.
4. HIGH–DENSITY CALCIUM SILICATE INSULATION INSTALLED ON PIPE BOTTOM, TO MATCH OR EXCEED LENGHT OF SADDLE.
5. PIPE INSULATION C/W JACKETING AND INSULATION AS SPECIFIED
6. GALVANIZED PIPE SADDLE, MINIMUM 16 GAUGE THICKNESS. REQUIRED ONLY FOR THE INSULATED PIPE.
7. SADDLE SHALL EXTEND MINIMUM 2 PIPE INSULATION DIAMETERS

HANGER ROD SIZES				
PIPE SIZES	UP TO 50	65–80	100–125	150–300
HANGER ROD DIAMETER	10ø	15ø	18ø	22ø

MAXIMUM HANGER SPACING(*)												
NPS (mm)	25	32	40	50	65	80	100	125	150	200	250	300
SPACING (m)	2	2	2.5	3	3	3.5	4	4.5	5	5.5	6.5	7

(*) THE SPACING APPLY ONLY FOR THE WELDED AND FLANGED PIPING. FOR THE GROOVED PIPING (WHERE PERMITTED BY SPECIFICATIONS), EACH PIPE SECTION SHALL BE SUPPORTED INDEPENDENTLY BEFORE GROOVE CONNECTORS ARE INSTALLED.

Hamilton-Wentworth Catholic District School Board

NO	REVISIONS	DATE
2	ISSUED FOR TENDER	2025-03-21
1	ISSUED FOR BUILDING PERMIT	2025-03-13

LICENSED PROFESSIONAL ENGINEER
MAR 21,2025
D. BEREZOWSKI
100227287
PROVINCE OF ONTARIO

DYNAMIS ENGINEERING INC
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www.dynamiseng.com

BISHOP TONNOS CSS CLASSROOM RENOVATIONS

100 Panabaker Dr, Ancaster, ON L9G 5E3

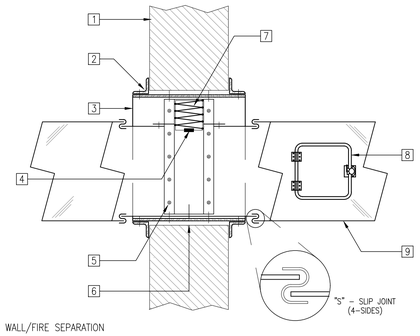
DETAILS (1), DRAWING LIST & LEGEND

GRGURIC ARCHITECTS INCORPORATED
28 KING STREET EAST, UNIT B
STONEY CREEK, ONTARIO, L8G 1J8
Tel. 905-664-8735 Fax. 905-664-8737
Web: www.2gai.com

SCALE: N.T.S.	PROJECT: 2024-25
START DATE: FEB 2025	
DRAWN NC	DRAWING: M1.01
CHECKED DB	
PRINT DATE	

DETAIL 7 – DUCT PENETRATION C/W FIRE DAMPER

NOT TO SCALE

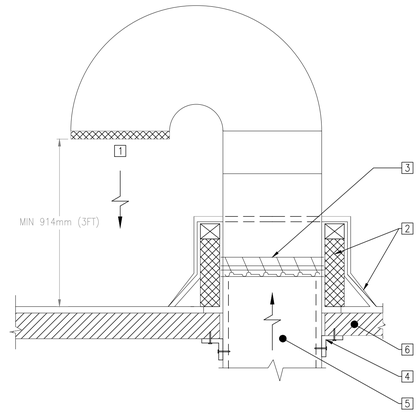


1. WALL/FIRE SEPARATION
2. STEEL RETAINING ANGLES 38x38x3mm; ALL AROUND 4–SIDES. FASTEN TO COLLAR ONLY.
3. COLLAR
4. FUSIBLE LINK (71°C)
5. FIRE DAMPER SECURED TO COLLAR ALL AROUND.
6. MAINTAIN MIN. 6mm EXPANSION CLEARANCE ALL AROUND (SEE NOTE #3)
7. TYP. CURTAIN; GALVANIZED STEEL INTERLOCKING BLADES
8. AIR TIGHT ACCESS DOOR, c/w PIANO HINGE & SASH LOCK. MOUNT ON SIDE OR BOTTOM OF DUCT
9. DUCT THROUGH FIRE SEPARATION WALL.

NOTES:
1. FRAME, BLADES, AND COLLAR SHALL BE Min. 14 Ga (2.0mm thk) GALV. STEEL CONSTRUCTION.
2. FOLLOW MANUFACTURER'S INSTRUCTIONS FOR THE INSTALLATION OF FIRE DAMPERS.
3. STANDARD OF ACCEPTANCE: RUSKIN MANUFACTURING, OR NAILOR INDUSTRIES INC.
4. DO NOT SEAL AROUND RETAINING ANGLES w FIRESTOP CAULKS and/or PUTTYS. DO NOT FILL ANNULAR SPACE (EX–PANSION VOID) WITH FIRESTOP MATERIAL.
5. HORIZONTAL INSTALLATION SIMILAR, c/w STAINLESS STEEL CLOSURE SPRING.
6. SUBMIT SHOP DRAWINGS TO THE ENGINEER FOR REVIEW PRIOR TO INSTALLATION.

DETAIL 8 – EXHAUST AIR GOOSENECK TERMINATION

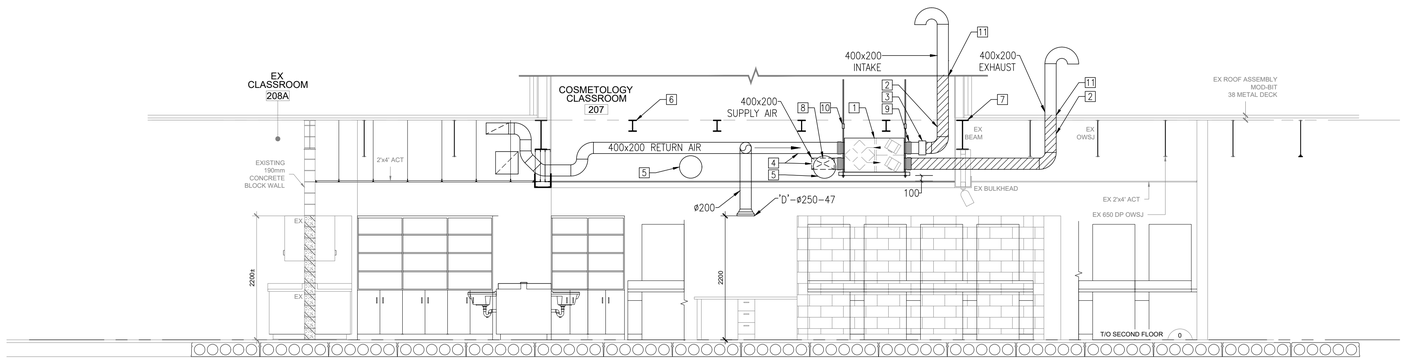
NOT TO SCALE



1. HEAVY DUTY STAINLESS STEEL BIRD SCREEN, INSTALL AT DUCT FLANGE WITH REMOVABLE HARDWARE
2. INSULATED ROOF CURB TO SUIT ROOF CONSTRUCTION, ROOFING MEMBRANE, FLASHING AND ALL OTHER ROOFING WORK BY BASEBUILDING ROOFING CONTRACTOR
3. BACKDRAFT DAMPER TO SUIT DUCT SIZE
4. ANGLE SUPPORTS C/W FASTENERS AND CAULKING
5. EXHAUST AIR DUCTWORK C/W INSULATION AS SPECIFIED, SEE PLANS FOR SIZES AND ROUTING.
6. FINISHED ROOFING

DETAIL 9 – COSMETOLOGY ROOM CEILING SPACE

NOT TO SCALE



1. ERV UNIT. REFER TO SPECIFICATION, SCHEDULE FOR PERFORMANCE AND PLANS FOR LOCATION.
2. OUTDOOR AIR INTAKE AND EXHAUST AIR DUCTWORK UP TO ROOF, ALL DUCT IN CEILING PLENUM SHALL BE C/W THERMAL INSULATION. TERMINATE WITH GOOSENECK, REFER TO DETAILS FOR MORE INFORMATION.
3. ELECTRIC DUCT HEATER, COORDINATE INSTALLATION WITH ELECTRICAL DIVISION.
4. PROVIDE NEW DUCTWORK DISTRIBUTION FOR THE ERV UNIT. SEE PLANS FOR MORE INFORMATION.
5. EXISTING ø400 SUPPLY AND RETURN AIR DUCTWORK, REWORK DUCTWORK AND PROVIDE OFFSETS TO CLEAR NEW ERV DUCT DISTRIBUTION. REFER TO FLOOR PLANS FOR MORE INFORMATION.
6. EXISTING W200x21 STRUCTURAL BEAM, COORDINATE EXACT LOCATIONS ON SITE.
7. EXISTING W530x72 STRUCTURAL BEAM, COORDINATE EXACT LOCATIONS ON SITE.
8. ERV 400x200 SUPPLY DUCT TO BE CONNECTED WITH FCU RETURN. SEE PLANS FOR MORE INFORMATION.
9. PROVIDE FLEXIBLE CONNECTORS ON ALL DUCT CONNECTION TO AND FROM ERV UNIT.
10. SUSPEND UNIT FROM STRUCTURE C/W SPRING HANGERS.
11. PROVIDE NEW OPENINGS IN ROOF, WATERPROOF OPENING AND PROVIDE COUNTER FLASHING. ALL ROOFING WORK BY BASEBUILING ROOFING CONTRACTOR.

Hamilton-Wentworth Catholic District School Board

NO	REVISIONS	DATE
2	ISSUED FOR TENDER	2025-03-21
1	ISSUED FOR BUILDING PERMIT	2025-03-13

LICENSED PROFESSIONAL ENGINEER
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DETAILS (2)

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SCALE: N.T.S.	PROJECT: 2024-25
START DATE: FEB 2025	
DRAWN NC	DRAWING: M1.02
CHECKED DB	
PRINT DATE	

PLUMBING FIXTURE SCHEDULE

TAG	FIXTURE	SPECIFICATION	PLUMBING SERVICES			
			DCW ø(mm)	DHW ø(mm)	SAN ø(mm)	VENT ø(mm)
S-1	LAVATORY COUNTER MOUNTED	BASIN: AMERICAN STANDARD 9495 001, CADET COUNTER MOUNTED, CENTER HOLE ONLY, 17-3/8" LONG X 11"" FRONT TO BACK X 5-1/4" DEEP (441MM X 279MM X 133 MM) DEEP, VITREOUS CHINA, SELF RIMMING OVAL, TWO REAR OVERFLOW HOLES. FAUCET: MOEN MODEL 8884, VANDAL RESISTANT, METERING FAUCET, 0.95 LITERS (/.25 GALLONS) PER CYCLE, P-TRAP, DRAIN, CHROME PLATED BRASS DECK PLATE, CHROME PLATED ANGLE VALVES, THERMOSTATIC MIXING VALVE MOEN MODEL 104451.	15	15	40	40
S-2	KITCHEN SINK	BASIN: FRANKE LBS6807-2-3 SINGLE BOWL STAINLESS STEEL KITCHEN SINK, 3 HOLE, 8" (203MM) CENTERS, 20-1/2" X 20" X 7" (521MM X 508MM X 178MM) DEEP, COUNTER MOUNTED, BACK LEDGE, GRADE 18-8 TYPE 302 STAINLESS STEEL, DOUBLE COMPARTMENT, SATIN FINISHED RIM AND BOWL, WITH SPILLWAY, SELF-RIMMING, WITH CRUMB CUP STRAINERS, SOUND DEADENING AND MOUNTING KIT, STRAINER, 1-1/2" (38MM) 302 S.S. VANDAL-RESISTANT, OPEN GRID, P-TRAP, SUPPLIES WITH ANGLE STOPS, ESCHUTCHEONS AND METAL FLEXIBLE RISERS. FAUCET: MOEN MODEL 8712 SINGLE HANDLE KITCHEN FAUCET, LEVER STYLE HANDLE WITH HOT AND COLD INDICATORS, MAX 8.3L/MIN (2.2 GPM) FLOW, 300MM (12") SPOUT, VANDAL RESISTANT SCREWS.	15	15	40	40
S-3	SHAMPOO BOWL WALL MOUNTED	BASIN: WILLOUGHBY INDUSTRIES WSB-1911-SHF-BG BLACK GRANITE (BG) SHAMPOO BOWL 18" (450MM) WIDE, 2 HOLE, 4" (102MM) CENTERS, 18" X 19-1/2" X 9-1/8" (450MM X 487MM X 228MM) DEEP, COUNTER MOUNTED. FAUCET: HOSE, BELVEDERE WHIZ SHAMPOO, 42" LENGTH, ANGLED HOSE GUIDE, SHAMPOO BOWL, VACUUM BREAKER, ANTI-SIPHON, FAUCET, SINGLE LEVER MIXER, SHAMPOO – ENCORE #KL12-Y001	15	15	40	40
EW-1	EYE WASH WALL MOUNTED	EYE WASH – WALL MOUNTED, PLASTIC BOWL G1814P. SPRAY HEAD ASSEMBLY C/W FLIP TOP DUST COVER, INTERNAL FLOW CONTROL AND FILTER. 11-3/4"ø ORANGE ABS PLASTIC. MOUNTING: HEAVY DUTY CAST ALUMINUM WALL BRACKET WITH CORROSION RESISTANT POWDER COATED FINISH.	--	15	32	--
FRL-1	COMPRESSED AIR FILTER, REGULATOR AND LUBRICATOR COMBINATION	3-PIECE MODULAR MOUNTED PARTICULATE FILTER, REGULATOR, MIST STYLE LUBRICATOR. PORT SIZE 3/4"ø (20ømm), GAUGE PORT 1/4" (8mm), DRAIN OPTION: AUTO, MAX. INLET PRESSURE (PSIG/BAR): 205/17. OPERATING TEMPERATURES (°C): -25 – 65.5. BODY MATERIAL: ALUMINUM. BOWL MATERIAL: POLY CARBONATE, ALUMINUM. SEAL MATERIAL: NITRILE.				
W	WASHER	BY OTHERS	15	15	40	40
DW	DISHWASHER	BY OTHERS	--	15	40	40

EXHAUST FAN SCHEDULE

TAG	SERVICE	LOCATION	MANUFACTURER	MODEL	PERFORMANCE		MOTOR			WEIGHT (KG)	NOTES
					AIR FLOW (L/s)	ESP (Pa)	W	RPM	POWER		
CBF-12	MANUFACTURING ROOM	MECHANICAL ROOM	GREENHECK	CSP-A1050	377	160	467	1070	120/1/60	27.5	PROVIDE REQUIRED DUCT TRANSITIONS AND FITTINGS IN ACCORDANCE WITH MANUFACTURER'S INSTALLATION, RECONNECT TO EXISTING BAS SYSTEM, HOA SWITCH.
EF-1	KITCHEN RANGE HOOD	120	BROAN	43000	50	62.5	207	–	120/1/60	–	PROVIDE REQUIRED DUCT TRANSITIONS AND FITTINGS IN ACCORDANCE WITH MANUFACTURER'S INSTALLATION INSTRUCTIONS.

GRILLES, REGISTERS AND DIFFUSERS

TAG	MANUFACTURER	MODEL	TYPE	SIZE (mm)	FINISH	MOUNTING	ACCESSORIES
A	EH PRICE	SCD-80D	SQUARE CONE DIFFUSER, NEW	600x600	WHITE (B12)	T-BAR / GYPSUM BOARD / DRYWALL	–
B		80 SERIES	EGG CRATE GRILLE, NEW	AS INDICATED	WHITE (B12)	T-BAR/ GYPSUM BOARD/ DRYWALL	SURFACE MOUNT, ALUMINUM CORE
C		610Z	LOUVERED GRILLE	AS INDICATED	WHITE (B12)	DUCT MOUNTED	–
D		RSG	ROUND GRILLE	ø250	WHITE (B12)	DUCT MOUNTED	SINGLE DEFLECTION, 1" SPACING
E	REVERSOMATIC	–	KITCHEN EXHAUST LOUVER	AS INDICATED	SINGLE EXTRUDED ALUMINUM GRILLE	SEAMLESS FLANGE MOUNTING	INSECT SCREEN
F	–	–	SQUARE CONE DIFFUSER, EXISTING	600x600	–	T-BAR / GYPSUM BOARD/ DRYWALL	–
G	–	–	EGG CRATE GRILLE, EXISTING	AS INDICATED	–	T-BAR / GYPSUM BOARD / DRYWALL	–
H	–	–	4 SLOT – LINEAR SLOT DIFFUSER, EXISTING	1800x200	–	T-BAR / GYPSUM BOARD / DRYWALL	–

DESIGNATION ON DRAWINGS: A-'B'-C-D
(A) – QUANTITY OF DIFFUSERS/GRILLES
(B) – TAG OF DIFFUSER/GRILLE
(C) – SIZE OF GRILLE OR DIFFUSER NECK
(D) – AIR QUANTITY IN L/s

ENERGY RECOVERY VENTILATOR SCHEDULE

TAG	SERVICE	LOCATION	MANUFACTURER	MODEL	FILTERS	HEAT RECOVERY		PERFORMANCE (PER FAN)		ELECTRICAL				DIMENSIONS WxLxH (mm)	WEIGHT (KG)	NOTES
						SENSIBLE EFFICIENCY (%)	TOTAL EFFICIENCY WINTER/SUMMER (%)	AIR FLOW (L/s)	ESP (PA)	POWER (V/PH/Hz)	INPUT WATTS	MCA	MOPD			
ERV-1	207	OPEN CEILING	ALDES	E650L-Fi-EC-N	2x ALUMINUM MERV 8 2x HIGH EFFICIENCY	58	54/42	260	250	208/1/60	198	3.4	15	816x1380x606	90	– 6kW SLIP-IN DUCT HEATER C/W AUTO AND MANUAL CUT-OUTS, TRANSFORMER WITH FUSIBLE LINK, AIR FLOW SENSOR, INTERLOCK TERMINAL STRIP, SCR CONTROL, THERMOSTAT, DOOR INTERLOCK WITH DISCONNECT SWITCH.

EXISTING FAN COIL UNIT SCHEDULE

TAG	MODEL	L/s	ESP	COOLING					HEATING					ELECTRICAL	NOTES
				ROWS	L/s	PD (m)	TH (kW)	PIPE CONN.	ROWS	L/s	PD (m)	TH (kW)	PIPE CONN.		
FA	BVW 36	566	125	1	0.404	1.55	11.43	ø32	1	0.221	1.16	15.12	ø25	208/3	–
FB	BVW 48	755	125	1	0.549	1.80	15.24	ø32	1	0.252	046	17.94	ø32	208/3	–
FD	BVW 24	377	125	1	0.259	1.10	7.33	ø32	1	0.139	0.61	11.64	ø25	120/1	–
FE	DVW 400	190	125	1	0.126	2.25	3.52	ø20	1	0.126	0.18	6.74	ø20	120/1	–

Hamilton-Wentworth Catholic District School Board

NO	REVISIONS	DATE
2	ISSUED FOR TENDER	2025-03-21
1	ISSUED FOR BUILDING PERMIT	2025-03-13

LICENSED PROFESSIONAL ENGINEER
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BISHOP TONNOS CSS
CLASSROOM
RENOVATIONS

100 Panabaker Dr, Ancaster, ON L9G 5E3

SCHEDULES

GRGURIC ARCHITECTS INCORPORATED
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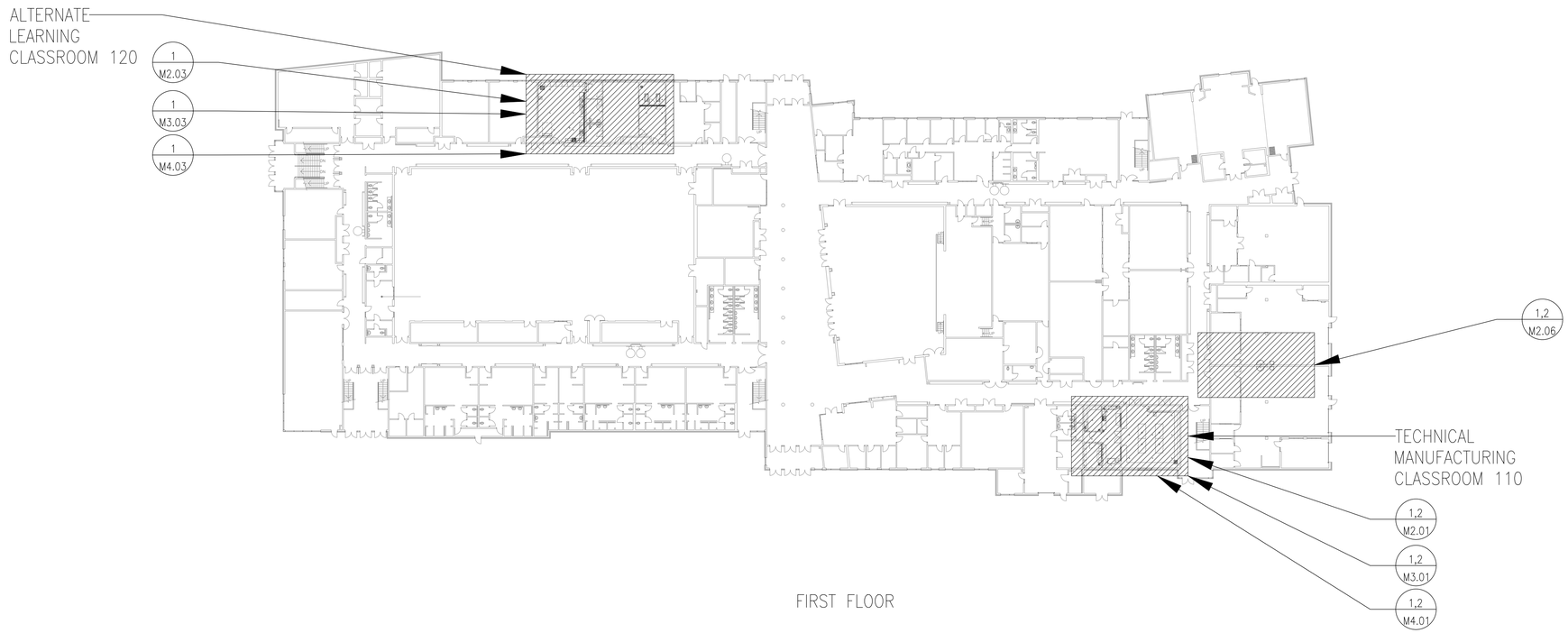
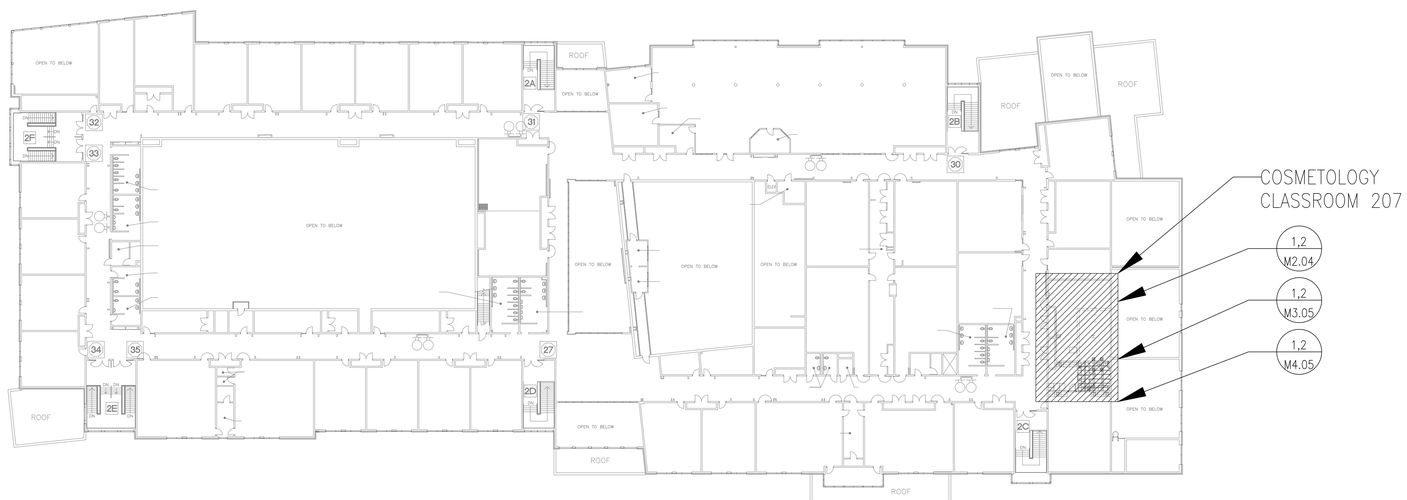
SCALE: N.T.S.	PROJECT: 2024-25
START DATE: FEB 2025	
DRAWN NC	DRAWING: M1.03
CHECKED DB	
PRINT DATE	



FIRST FLOOR



SECOND FLOOR

Hamilton-Wentworth
Catholic District School Board

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2	ISSUED FOR TENDER	2025-03-21
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LICENSED PROFESSIONAL ENGINEER
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KEY PLAN AND SCOPE
OF WORK AREA

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SCALE: N.T.S.	PROJECT: 2024-25
START DATE: FEB 2025	
DRAWN NC	DRAWING: M1.04
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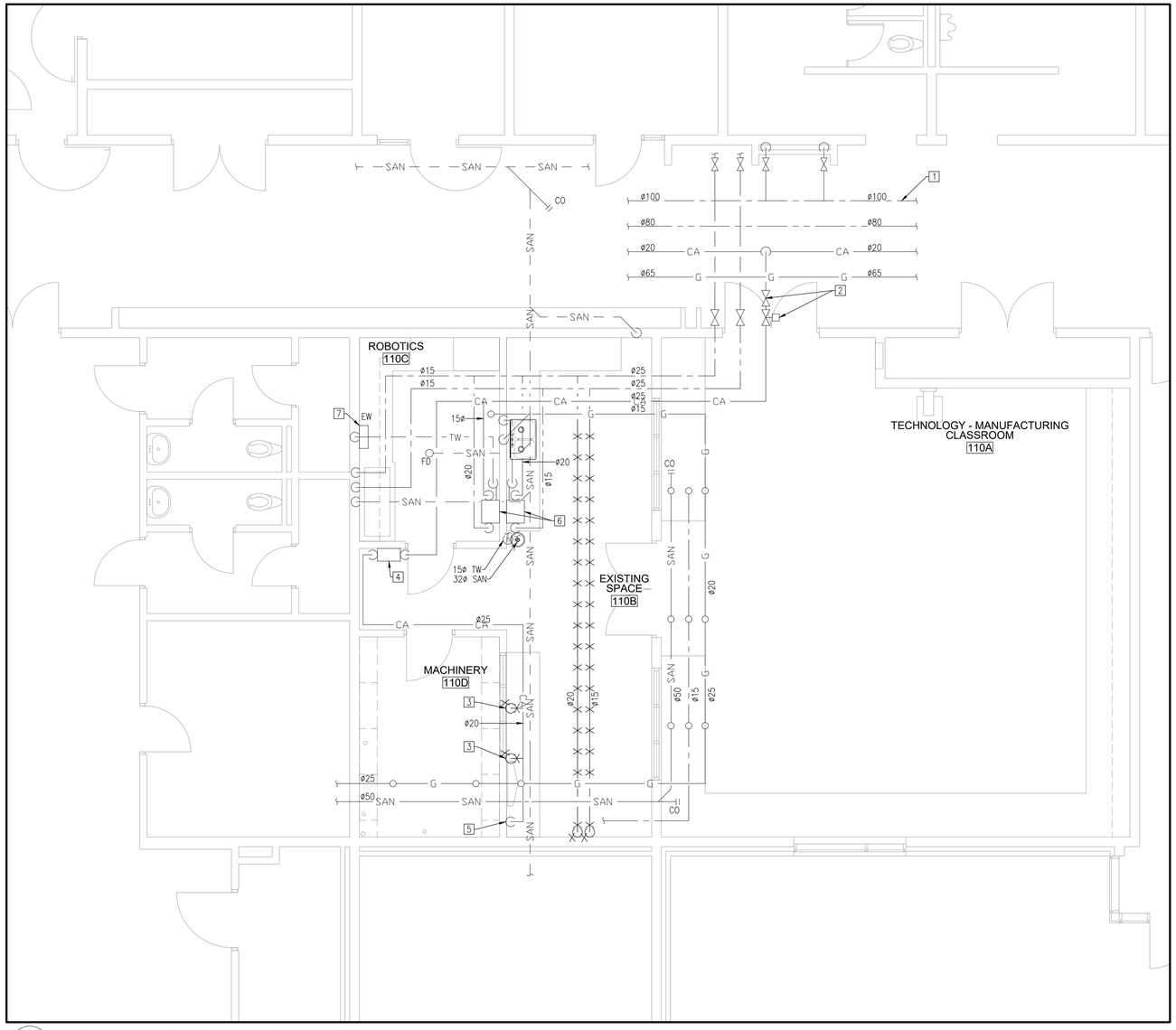

1 M2.01 TECH. MANUF. CLASSROOM 110 - PLUMBING DEMOLITION

SCALE: 1:50

REFERENCE NOTES

1. EXISTING PIPING TO REMAIN. SHOWN FOR REFERENCE ONLY.
2. SHUT OFF MAIN COMPRESSED AIR PRIOR ANY DEMOLITION WORK. 2-WAY CONTROL VALVE TO REMAIN.
3. DEMOLISH COMPRESSED AIR DROP DOWN TO COUNTER, CAP PIPING AT MAIN IN CEILING SPACE.
4. EXISTING COMBINATION FILTER, REGULATOR AND LUBRICATOR TO REMAIN.
5. EXISTING COMPRESSED AIR DROP TO REMAIN.
6. EXISTING THERMOSTATIC MIXING VALVE TO REMAIN.
7. EXISTING EMERGENCY EYE WASH TO REMAIM.

Hamilton-Wentworth
Catholic District School Board

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LICENSED PROFESSIONAL ENGINEER
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TECH. MANUF.
CLASSROOM 110
PLUMBING DEMOLITION

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SCALE: 1:50	PROJECT: 2024-25
START DATE: FEB 2025	
DRAWN NC	DRAWING: M2.01
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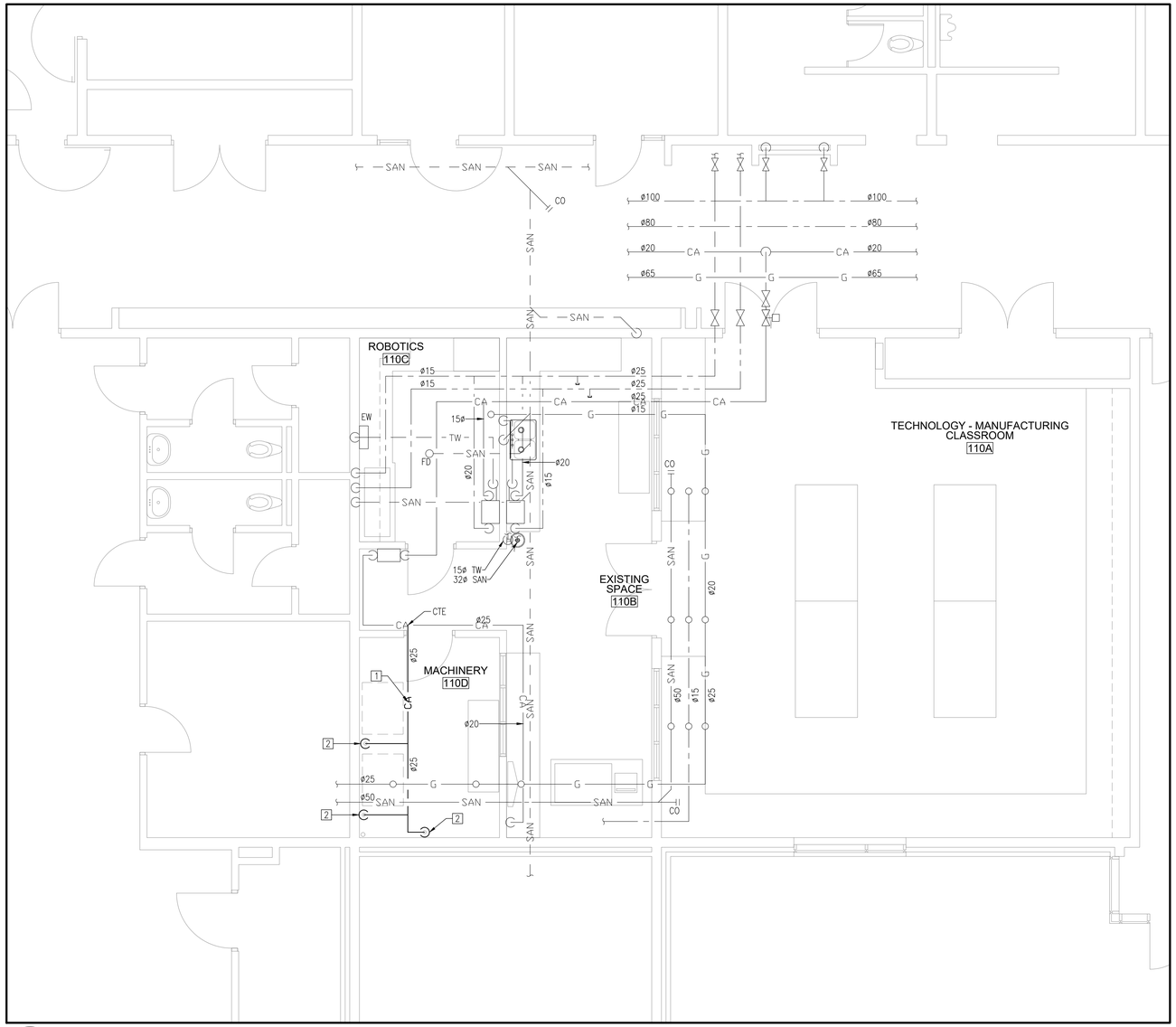
PRINT DATE	



1 M2.02 TECH. MANUF. CLASSROOM 110 - PLUMBING MODIFICATION
SCALE: 1:50

REFERENCE NOTES

1. PROVIDE NEW COMPRESSED AIR PIPING, CONNECT TO EXISTING AS INDICATED. PROVIDE ALL REQUIRED FITTINGS, TRANSITION AND MODIFY PIPING TO SUIT.
2. PROVIDE ø20 DROP AT 900mm ABOVE FINISHED FLOOR LEVEL C/W BALL VALVE AND QUICK CONNECT FITTING.

Hamilton-Wentworth
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LICENSED PROFESSIONAL ENGINEER
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TECH. MANUF.
CLASSROOM 110
PLUMBING
MODIFICATION

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SCALE: 1:50	PROJECT: 2024-25
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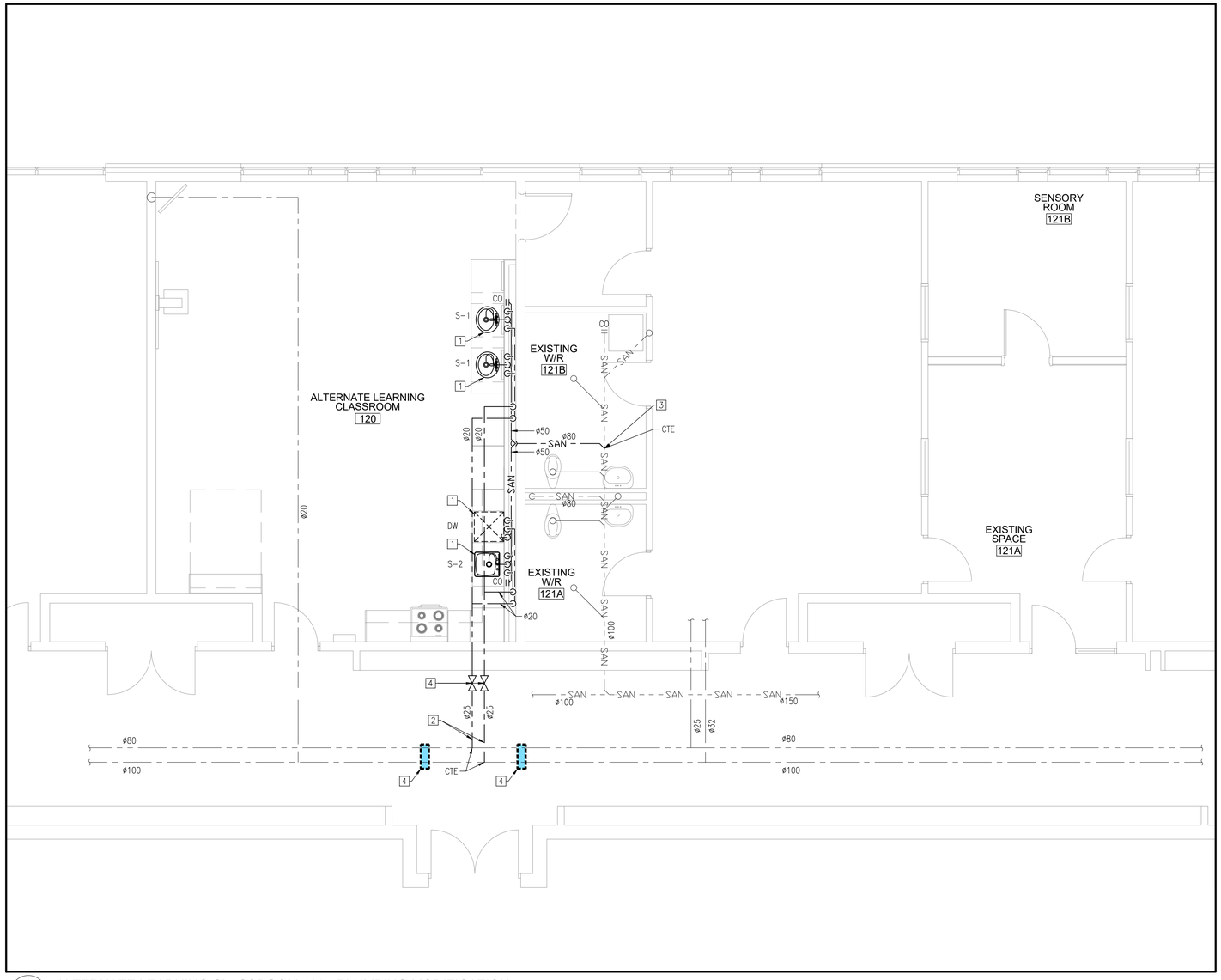

1 M2.03 ALTERNATE LEARNING CLASSROOM 120 - PLUMBING MODIFICATION
SCALE: 1:50

REFERENCE NOTES

1. PROVIDE NEW PLUMBING FIXTURE C/W ACCESSORIES, REFER TO SCHDULES FOR SERVICES SIZING AND MORE INFORMATION. PROVIDE NEW DOMESTIC HOT WATER, COLD WATER AND SANITARY PIPING AND CONNECT TO THE EXISTING DISTRIBUTION AS SHOWN (TYP. FOR ALL). LOCATION OF ALL EXISTING SERVICES IS SHOWN FOR REFERENCE ONLY. CONTRACTOR TO FIELD VERIFY ALL LOCATIONS. CONTRACTOR TO COMPLETE CCTV INSPECTION FOR ALL UNDERGROUND SANITARY PIPING TO VERIFY ROUTING, SIZE AND INVERT, REPORT RESULTS OF INVESTIGATION TO ENGINEER.
2. PROVIDE NEW DCW AND DHW PIPING C/W ISOLATION, CONNECT TO EXISTING DISTRIBUTION AS INDICATED.
3. CUT SLAB AND PROVIDE NEW SANITARY AND VENT PIPING CONNECT TO EXISTING BASE BUILDING PIPELINE AS INDICATED. THE EXACT LOCATION OF THE TIE IN TO THE EXISTING SANITARY TO BE VERIFIED ON SITE. PROVIDE VENTING OF ALL NEW FIXTURES IN ACCORDANCE WITH OBC PART 7. REPAIR SLAB TO MATCH BASE BUILDING CONSTRUCTION.
4. FREEZE MAIN DOMESTIC COLD/WATER PIPING IN CORRIDOR AS REQUIRED TO CONNECT NEW DOMESTIC COLD/HOT WATER BRANCH PIPING TO MAINS. REPAIR INSULATION ON EXISTING PIPING UPON COMPLETION OF WORK.

Hamilton-Wentworth Catholic District School Board

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LICENSED PROFESSIONAL ENGINEER
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ALTERNATE LEARNING CLASSROOM 120 PLUMBING MODIFICATION

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START DATE: FEB 2025	
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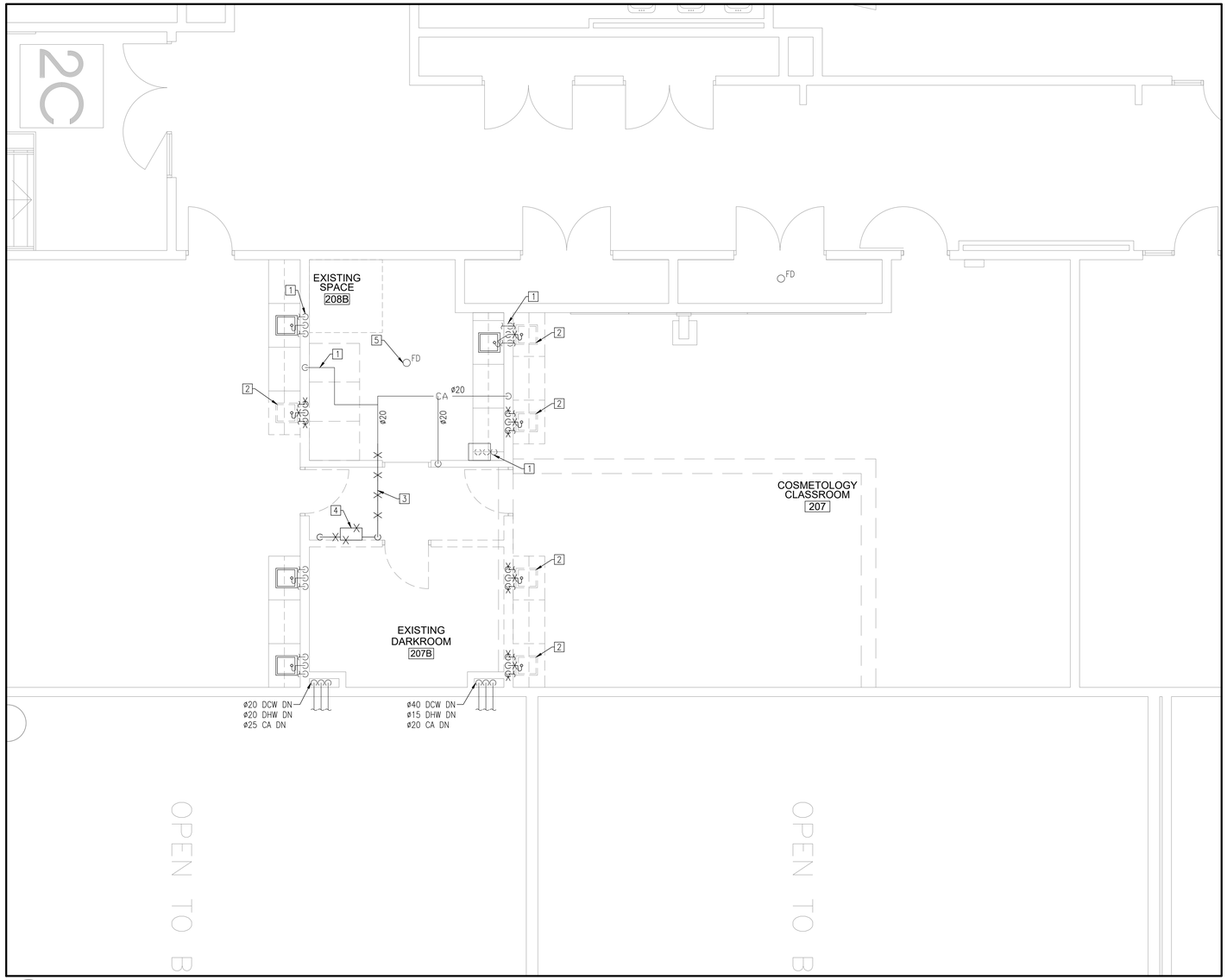

1 M2.04 COSMETOLOGY CLASSROOM 207 - PLUMBING DEMOLITION
SCALE: 1:50

REFERENCE NOTES

1. EXISTING PIPING TO REMAIN. SHOWN FOR REFERENCE ONLY.
2. REMOVE EXISTING PLUMBING FIXTURES ALONG WITH ASSOCIATED PIPING, VALVES, HANGERS, SUPPORTS, ACCESSORIES, TYPICAL FOR ALL. CUT BACK PLUMBING SERVICES AND CAP AT MAIN BRANCH IN SHAFT OR WALL.
3. DEMOLISH COMPRESSED AIR CONNECTION ALONG WITH ASSOCIATED PIPING, VALVES, HANGERS, SUPPORTS, ACCESSORIES. CUT BACK PIPING AND CAP AT MAIN IN CEILING SPACE. SEE DRAWING M2.04 FOR COMPRESSED AIR SHUT-OFF.
4. DEMOLISH COMBINATION FILTER, REGULATOR AND LUBRICATOR C/W VALVES, SUPPORTS, ACCESSORIES. REFER TO MODIFICATION FOR MORE INFORMATION.
5. EXISTING FLOOR DRAIN TO REMAIN. PROTECT DURING CONSTRUCTION. CARRY OUT CLEANING AND FLUSHING FOLLOWING COMPLETION OF WORK. PROVIDE CCTV CAMERA SCOPING REPORT FOR ENGINEER'S REVIEW.

NOTE:
- REFER TO M2.06 PLAN FOR FIRST FLOOR CEILING SPACE PLUMBING DEMOLITION FOR MORE INFORMATION.

Hamilton-Wentworth Catholic District School Board

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LICENSED PROFESSIONAL ENGINEER
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COSMETOLOGY CLASSROOM 207 PLUMBING DEMOLITION

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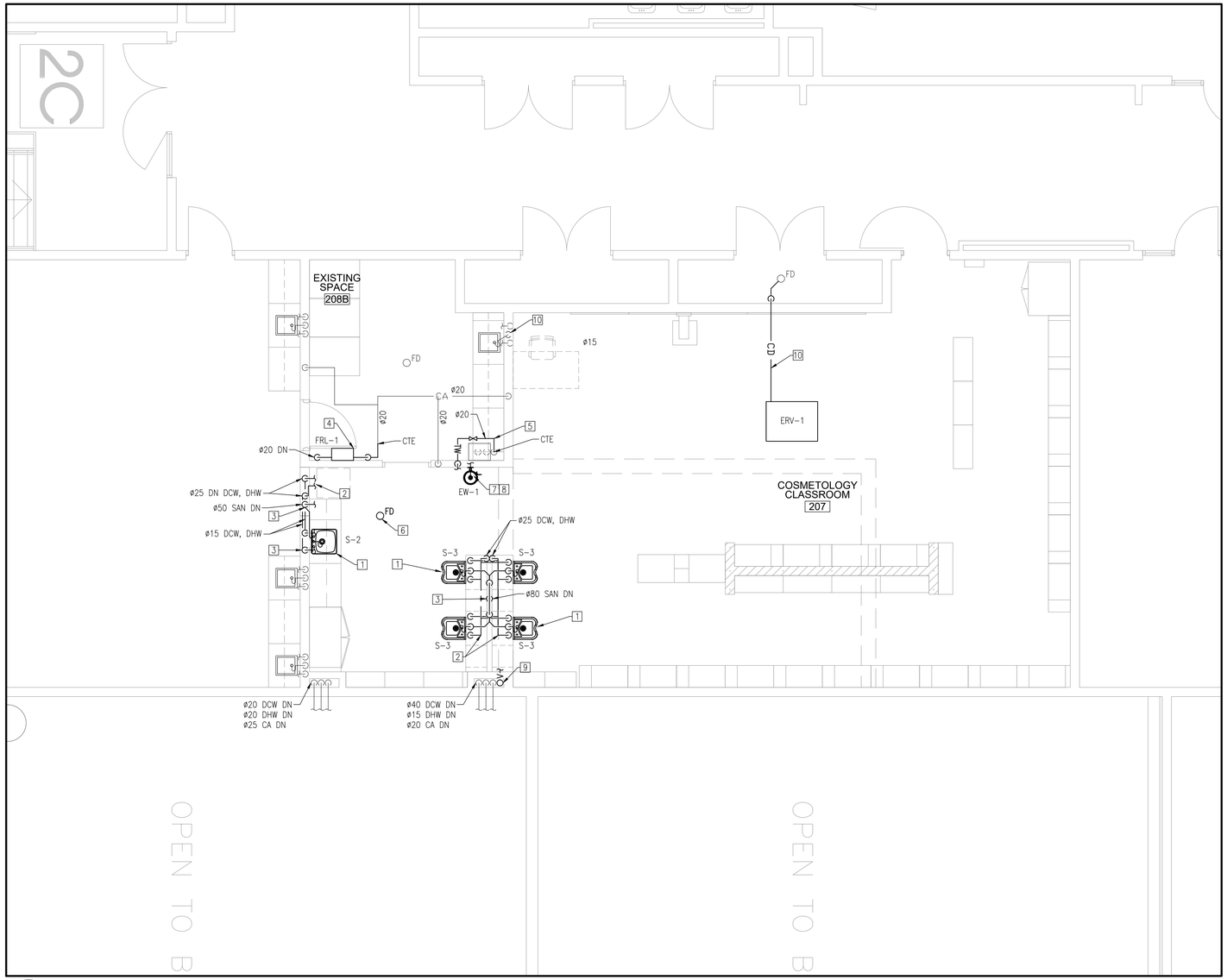

1 M2.05 COSMETOLOGY CLASSROOM 207 - PLUMBING MODIFICATION
SCALE: 1:50

REFERENCE NOTES

1. PROVIDE NEW PLUMBING FIXTURE C/W ACCESSORIES, REFER TO SCHDULES FOR SERVICES SIZING AND MORE INFORMATION. PROVIDE NEW DOMESTIC HOT WATER, COLD WATER AND SANITARY PIPING AND CONNECT TO THE EXISTING DISTRIBUTION AS SHOWN (TYP. FOR ALL). LOCATION OF ALL EXISTING SERVICES IS SHOWN FOR REFERENCE ONLY. CONTRACTOR TO FIELD VERIFY ALL LOCATIONS. CONTRACTOR TO COMPLETE CCTV INSPECTION FOR ALL UNDERGROUND SANITARY PIPING TO VERIFY ROUTING, SIZE AND INVERT, REPORT RESULTS OF INVESTIGATION TO ENGINEER.
2. PROVIDE NEW DCW AND DHW PIPING TO FIXTURES. REFER TO SCHEDULE FOR PIPING SIZES CONNECTION.
3. PROVIDE NEW SANITARY AND VENT PIPING CONNECT TO EXISTING BASE-BUILDING PIPELINE AS INDICATED C/W HANGER. THE EXACT LOCATION OF THE TIE IN TO THE EXISTING SANITARY TO BE VERFIED ON SITE, PROVIDE VENTING OF ALL NEW FIXTURES IN ACCORDANCE WITH OBC PART 7.
4. PROVIDE NEW COMBINATION FILTER, REGULATOR AND LUBRICATOR ASSEMBLY COMPLETE WITH QUICK CONNECT COUPLING, MOUNT ON WALL EXPOSED, APPROXIMATELY 1200MM ABOVE FINISHED FLOOR LEVEL. REFER TO SCHEDULE FOR MORE INFORMATION.
5. PROVIDE NEW TEMPERED WATER PIPING AS INDICATED. PROVIDE NEW ISOLATION VALVE FOLLOWING NEW CONNECTION. LOCATE VALVES TO ENSURE ACCESSIBILITY. SHUT OFF TEMPERED WATER REGULATOR PRIOR ANY WORK.
6. PROVIDE NEW FLOOR DRAIN C/W P-TRAP AND TRAP SEAL PRIMER, REFER TO DETAILS FOR INSTALLATION.
7. INSTALL NEW EMERGENCY EYE WASH, REFER TO SCHEDULE FOR MORE INFORMATION.
8. PROVIDE NEW DRAIN PIPE FOR EMERGENCY EYE WASH. TAP TO EXISTING TO REMAIN SINK.
9. PROVIDE ø32 CIRCUIT VENT TO FIXTURES AND TERMINATE AT ROOF LEVEL AS PER DETAILS. PLACE VENT PIPE INSIDE THE EXISTING FURRING AS INDICATED.
10. EXTEND ø20 CONDENSATE DRAIN LINE AND TERMINATE WITH AIR GAP IN CLOSET FLOOR DRAIN AS INDICATED.

NOTE:
- REFER TO M2.07 PLAN FOR FIRST FLOOR PLUMBING MODIFICATION FOR MORE INFORMATION.

Hamilton-Wentworth Catholic District School Board

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LICENSED PROFESSIONAL ENGINEER D. BEREZOWSKI 100227871 PROVINCE OF ONTARIO MAR 21,2025

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BISHOP TONNOS CSS CLASSROOM RENOVATIONS

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COSMETOLOGY CLASSROOM 207 PLUMBING MODIFICATION

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SCALE: 1:50	PROJECT: 2024-25
START DATE: FEB 2025	
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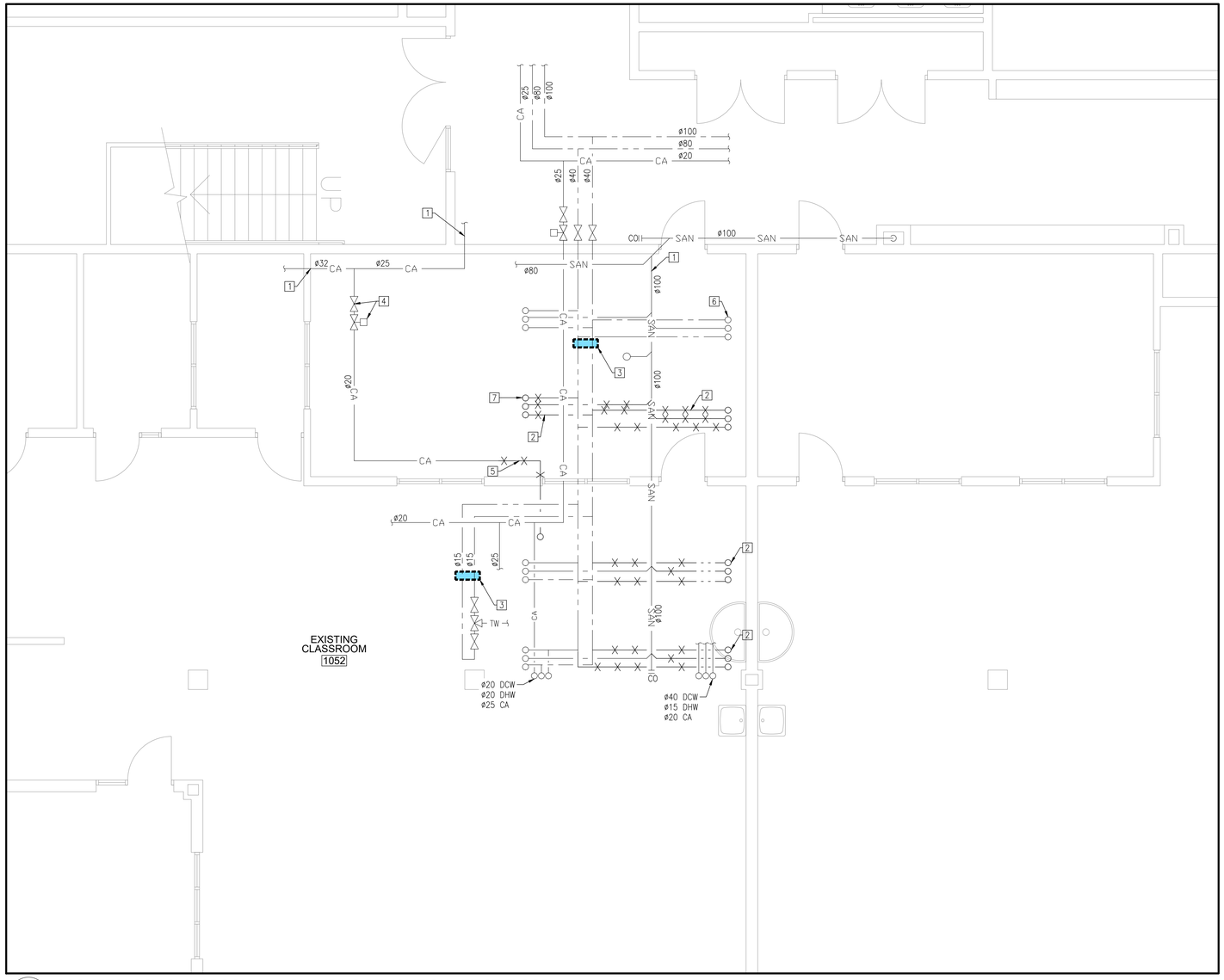

1 M2.06 COSMETOLOGY CLASSROOM 207 - PLUMBING DEMOLITION - FIRST FLOOR

SCALE: 1:50

REFERENCE NOTES

1. EXISTING PIPING TO REMAIN. SHOWN FOR REFERENCE ONLY.
2. DEMOLISH DCW, DHW, SANITARY PIPING AS INDICATED ALONG WITH ASSOCIATED VALVES, HANGERS, SUPPORTS, ACCESSORIES, TYPICAL FOR ALL. CUT BACK PLUMBING SERVICES AND CAP AT MAIN BRANCH IN CEILING SPACE.
3. FREEZE BRANCH PIPING TO COSMETOLOGY ROOM IN CEILING SPACE. CAP DEMOLISHED BRANCHES OF DCW AND DHW PIPING TO MAIN PIPE.
4. SHUT OFF MAIN COMPRESSED AIR PRIOR ANY DEMOLITION WORK. 2-WAY CONTROL VALVE TO REMAIN.
5. DEMOLISH COMPRESSED AIR CONNECTION ALONG WITH ASSOCIATED PIPING, VALVES, HANGERS, SUPPORTS AND ACCESSORIES AS INDICATED.
6. ø15 DCW AND DHW AND ø40 SAN EXISTING PIPE RISE UP AND SERVE SINK IN ROOMS 207 AND 2019 (TYPICAL OF 8).
7. REPAIR ANY UNUSED SLAB OPENING TO MATCH BASE BUILDING CONSTRUCTION (TYPICAL).

Hamilton-Wentworth
Catholic District School Board

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LICENSED PROFESSIONAL ENGINEER
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FIRST FLOOR
COSMETOLOGY
CLASSROOM 207
PLUMBING DEMOLITION

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START DATE: FEB 2025	
DRAWN NC	DRAWING: M2.06
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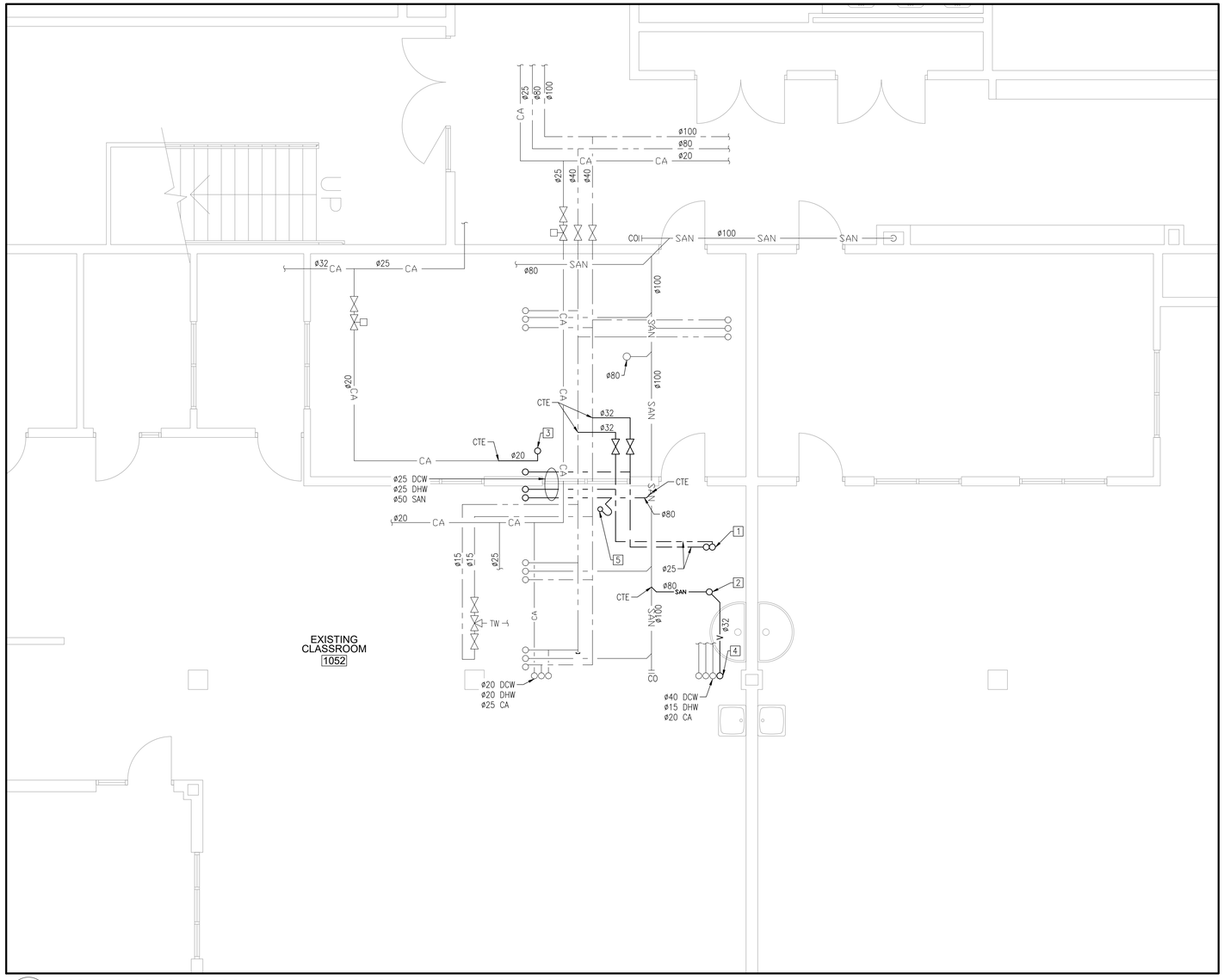
PRINT DATE	



1 M2.07 COSMETOLOGY CLASSROOM 207 - PLUMBING MODIFICATION - FIRST FLOOR

SCALE: 1:50

REFERENCE NOTES

1. PROVIDE NEW DCW AND DHW PIPING. REFER TO SCHEDULE FOR PIPING SIZES CONNECTION. PROVIDE ALL REQUIRED CORING AND FIRE STOPPING.
2. PROVIDE NEW SANITARY AND VENT PIPING CONNECT TO EXISTING BASE-BUILDING PIPELINE AS INDICATED C/W HANGER. THE EXACT LOCATION OF THE TIE IN TO THE EXISTING SANITARY TO BE VERFIED ON SITE, PROVIDE VENTING OF ALL NEW FIXTURES IN ACCORDANCE WITH OBC PART 7.
3. PROVIDE NEW COMPRESSED AIR PIPING, CONNECT TO EXISTING AS INDICATED. PROVIDE ALL REQUIRED FITTINGS, TRANSITION AND MODIFY PIPING TO SUIT.
4. PROVIDE ø32 CIRCUIT VENT AND TERMINATE AT ROOF LEVEL AS PER DETAILS. SEE M2.05 FOR CONTINUATION.
5. PROVIDE NEW FLOOR DRAIN FOR COSMETOLOGY ROOM ON SECOND FLOOR LEVEL, C/W P-TRAP, TRAP SEAL PRIMER.

Hamilton-Wentworth
Catholic District School Board

NO	REVISIONS	DATE
2	ISSUED FOR TENDER	2025-03-21
1	ISSUED FOR BUILDING PERMIT	2025-03-13

DRAWINGS ARE NOT TO BE SCALED. CONTRACTOR MUST CHECK AND VERIFY ALL DIMENSIONS AND CONDITIONS ON THE PROJECT, AND MUST REPORT ANY DISCREPANCIES TO THE ARCHITECTS BEFORE PROCEEDING WITH THE WORK. THE USE OF THIS DRAWING OR PART THEREOF IS FORBIDDEN WITHOUT THE WRITTEN APPROVAL OF THE ARCHITECTS.

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CLASSROOM
RENOVATIONS

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FIRST FLOOR
COSMETOLOGY
CLASSROOM 207
PLUMBING
MODIFICATION

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SCALE: 1:50	PROJECT: 2024-25
START DATE: FEB 2025	
DRAWN NC	DRAWING: M2.07
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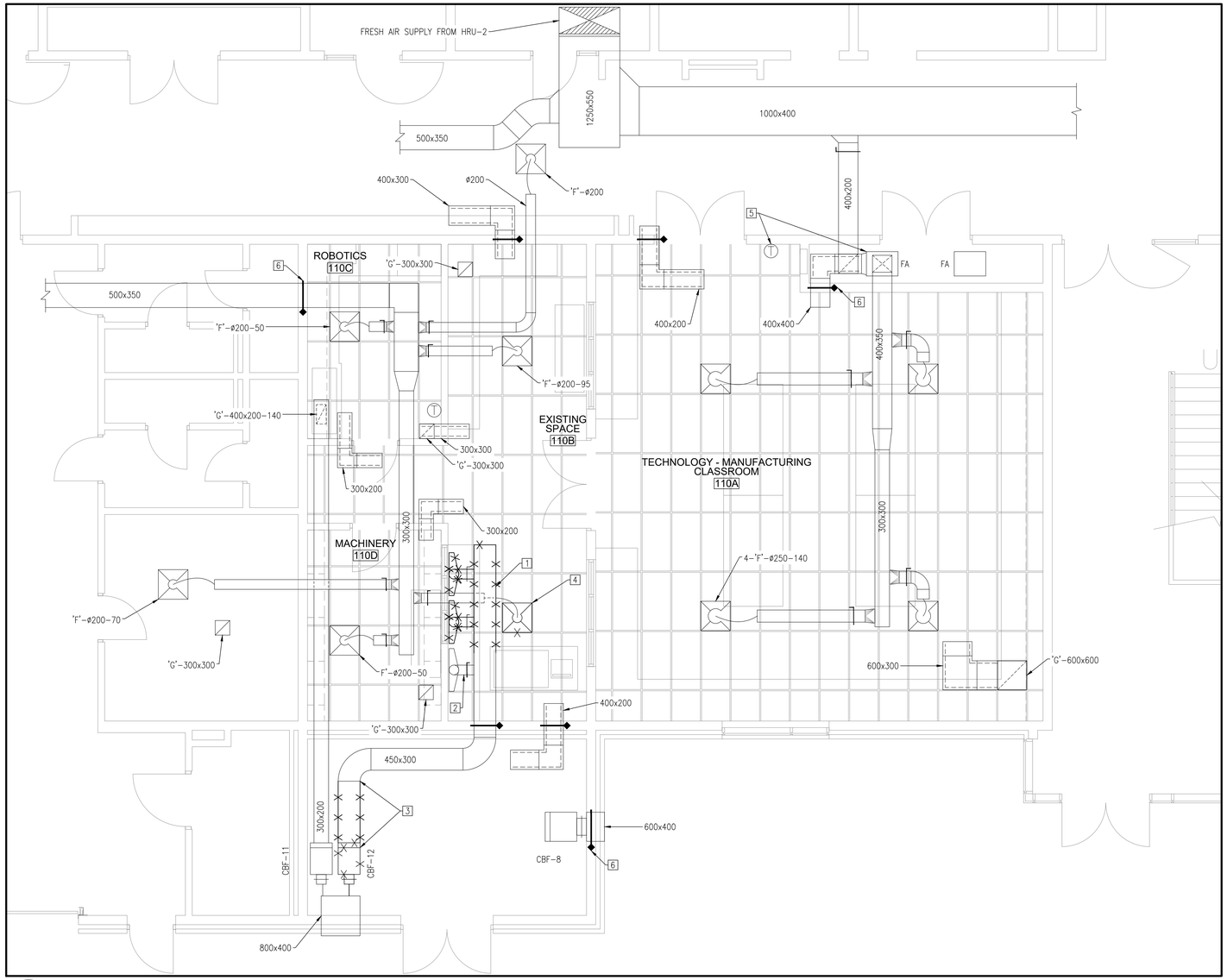
PRINT DATE	



1 M3.01 TECH. MANUF. CLASSROOM 110 - HVAC DEMOLITION
SCALE: 1:50

REFERENCE NOTES

1. DEMOLISH EXISTING GRILLE C/W DUCTWORK AS INDICATED, CAP AND SEAL ALL UNUSED DUCT OPENINGS.
2. EXISTING DUCT DROP TO REMAIN.
3. DEMOLISH EXISTING CBF-12 C/W SECTION OF DUCT UPSTREAM AND DOWNSTREAM AS INDICATED. SEE MODIFICATION PLAN FOR NEW EXHAUST FAN PROVISION.
4. DEMOLISH SUPPLY DIFFUSER FOLLOWING CEILING REMOVAL.
5. EXISTING FAN COIL UNIT TO REMAIN. CONTRACTOR TO VERIFY REPLACEMENT AND REPLACE FILTER FOLLOWING CONSTRUCTION TEST AND ADJUST THERMOSTAT.
6. EXISTING FIRE DAMPER TO REMAIN (TYPICAL).

Hamilton-Wentworth
Catholic District School Board

NO	REVISIONS	DATE
2	ISSUED FOR TENDER	2025-03-21
1	ISSUED FOR BUILDING PERMIT	2025-03-13

LICENSED PROFESSIONAL ENGINEER
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CLASSROOM
RENOVATIONS

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TECH. MANUF.
CLASSROOM 110
HVAC DEMOLITION

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SCALE: 1:50	PROJECT: 2024-25
START DATE: FEB 2025	
DRAWN NC	DRAWING: M3.01
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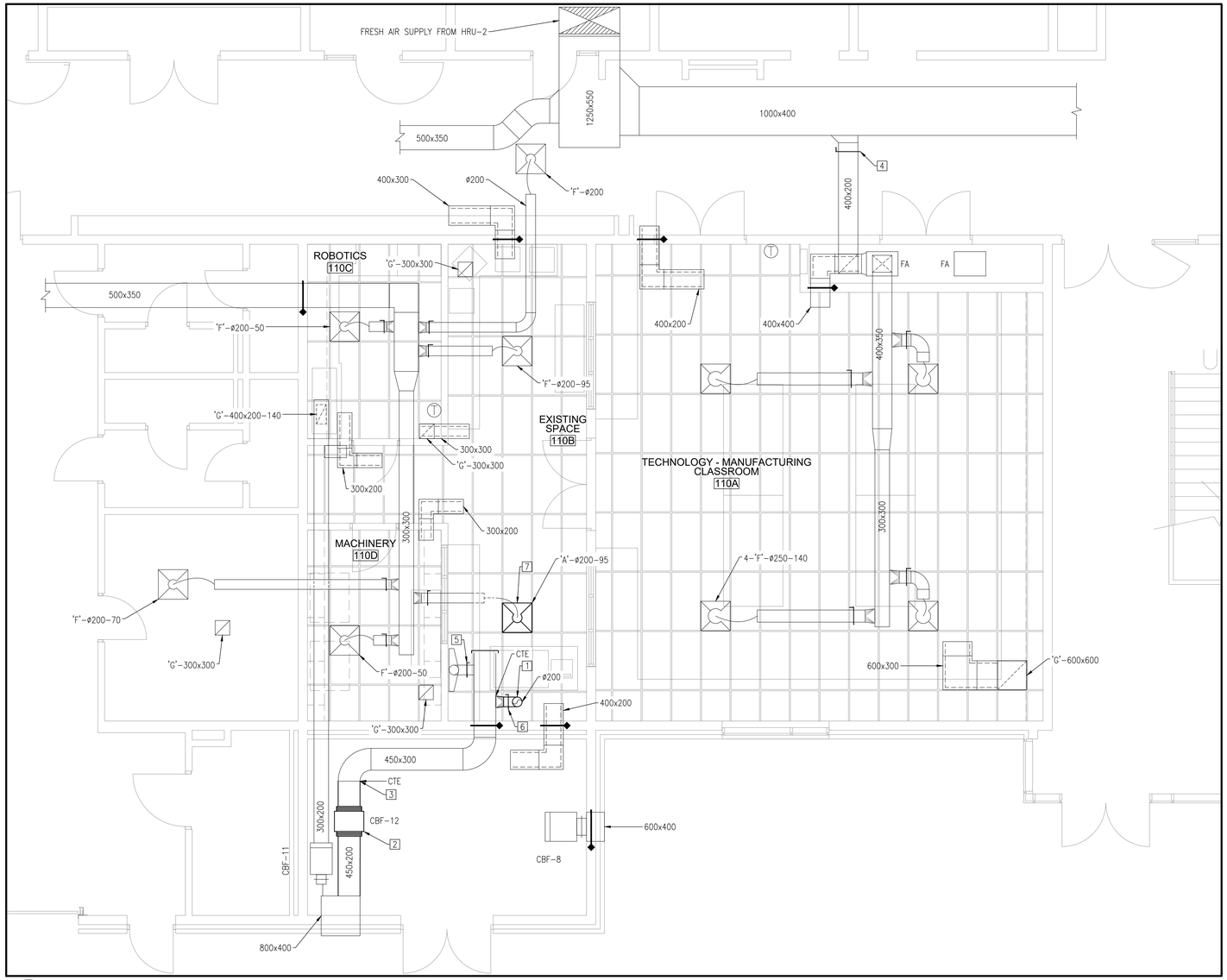

1 M3.02 TECH. MANUF. CLASSROOM 110 - HVAC MODIFICATION
SCALE: 1:50

REFERENCE NOTES

1. PROVIDE NEW EXHAUST DUCT UP TO 1000mm ABOVE FLOOR LEVEL. EXHAUST DUCT TO BE CONNECTED WITH EXISTING 'XL-3000' FUME EXTRACTOR. SITE VERIFY EXACT LOCATION OF DUCT DROP PRIOR TO EQUIPMENT LOCATION. BALANCE EXHAUST RATE TO 140 L/s.
2. INSTALL NEW EXHAUST FAN. SEE SCHEDULE FOR MORE INFORMATION. PROVIDE FLEXIBLE CONNECTION ON INLET AND OUTLET, MODIFY EXISTING DUCT TO SUIT AND CONNECT DISCHARGE TO EXISTING PLENUM/LOUVER.
3. PROVIDE NEW EXHAUST DUCTWORK TO SUIT NEW EXHAUST FAN.
4. BALANCE FRESH AIR SUPPLY TO FAN COIL TO 215 L/s.
5. BALANCE EXHAUST AIR TO 235 L/s.
6. BALANCE EXHAUST AIR TO 140L/s.
7. PROVIDE NEW SUPPLY DIFFUSER, SEE SCHEDULES FOR REQUIREMENTS. DIFFUSER TO COORDINATE EXACT LOCATION WITH ARCHITECTURAL DRAWINGS. PROVIDE BALANCING DAMPER AT EACH BRANCH AND BALANCE SYSTEM TO AIRFLOWS INDICATED ON DRAWINGS.

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2	ISSUED FOR TENDER	2025-03-21
1	ISSUED FOR BUILDING PERMIT	2025-03-13

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TECH. MANUF.
CLASSROOM 110
HVAC MODIFICATION

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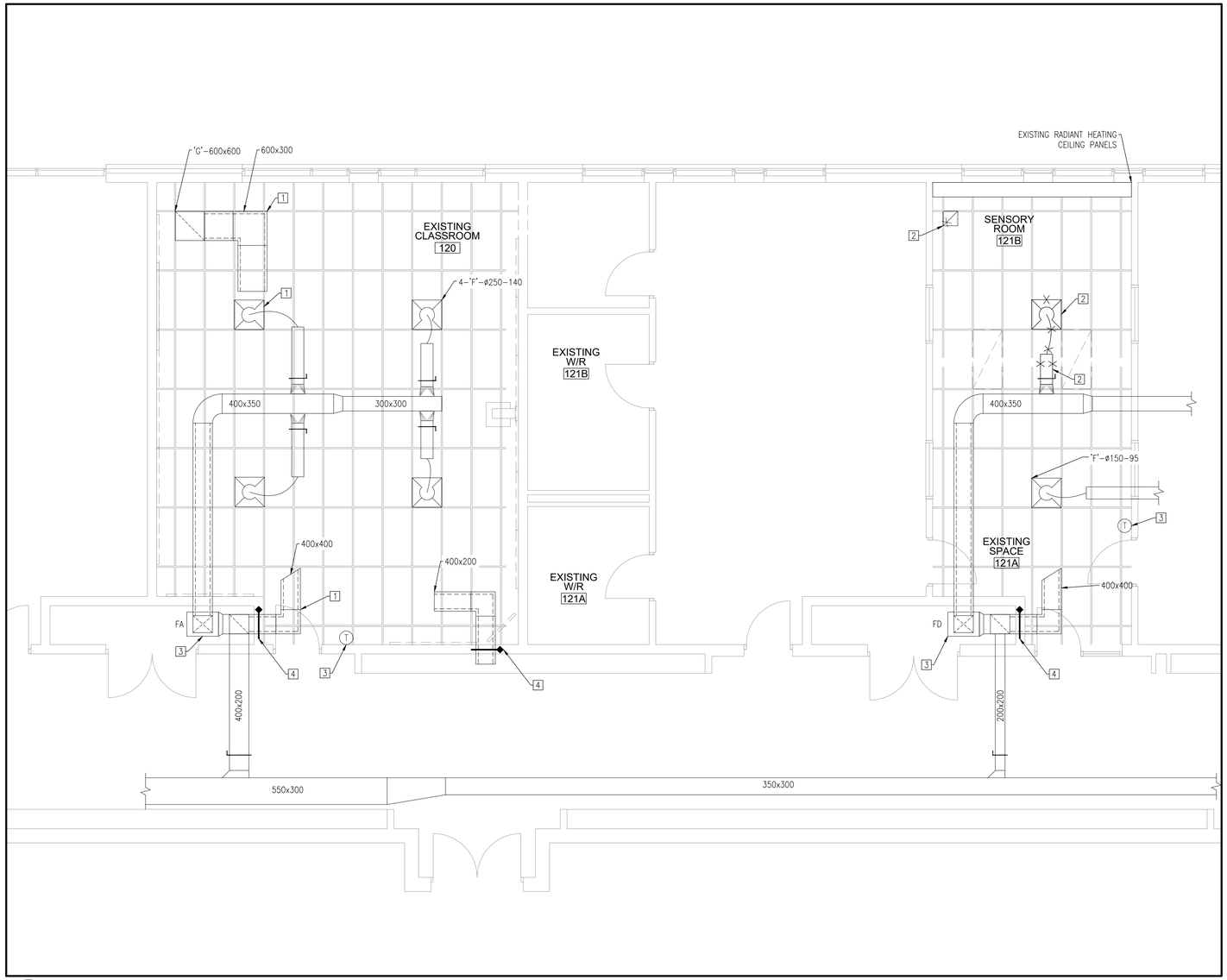

1 M3.03 ALTERNATE LEARNING CLASSROOM 120 - HVAC DEMOLITION
SCALE: 1:50

REFERENCE NOTES

1. EXISTING DUCTWORK, DIFFUSERS, AND GRILLE TO REMAIN. SITE VERIFY AIRFLOW FOR SUPPLY DIFFUSERS, TYPICAL FOR ALL.
2. DEMOLISH DIFFUSER AND GRILLE C/W DUCTWORK AS INDICATED, CAP AND SEAL UNUSED DUCT OPENINGS.
3. EXISTING FAN COIL UNIT TO REMAIN. CONTRACTOR TO VERIFY REPLACEMENT AND REPLACE FILTER FOLLOWING CONSTRUCTION TEST AND ADJUST THERMOSTAT.
4. EXISTING FIRE DAMPER TO REMAIN (TYPICAL).

Hamilton-Wentworth Catholic District School Board

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ALTERNATE LEARNING
CLASSROOM 120
HVAC DEMOLITION

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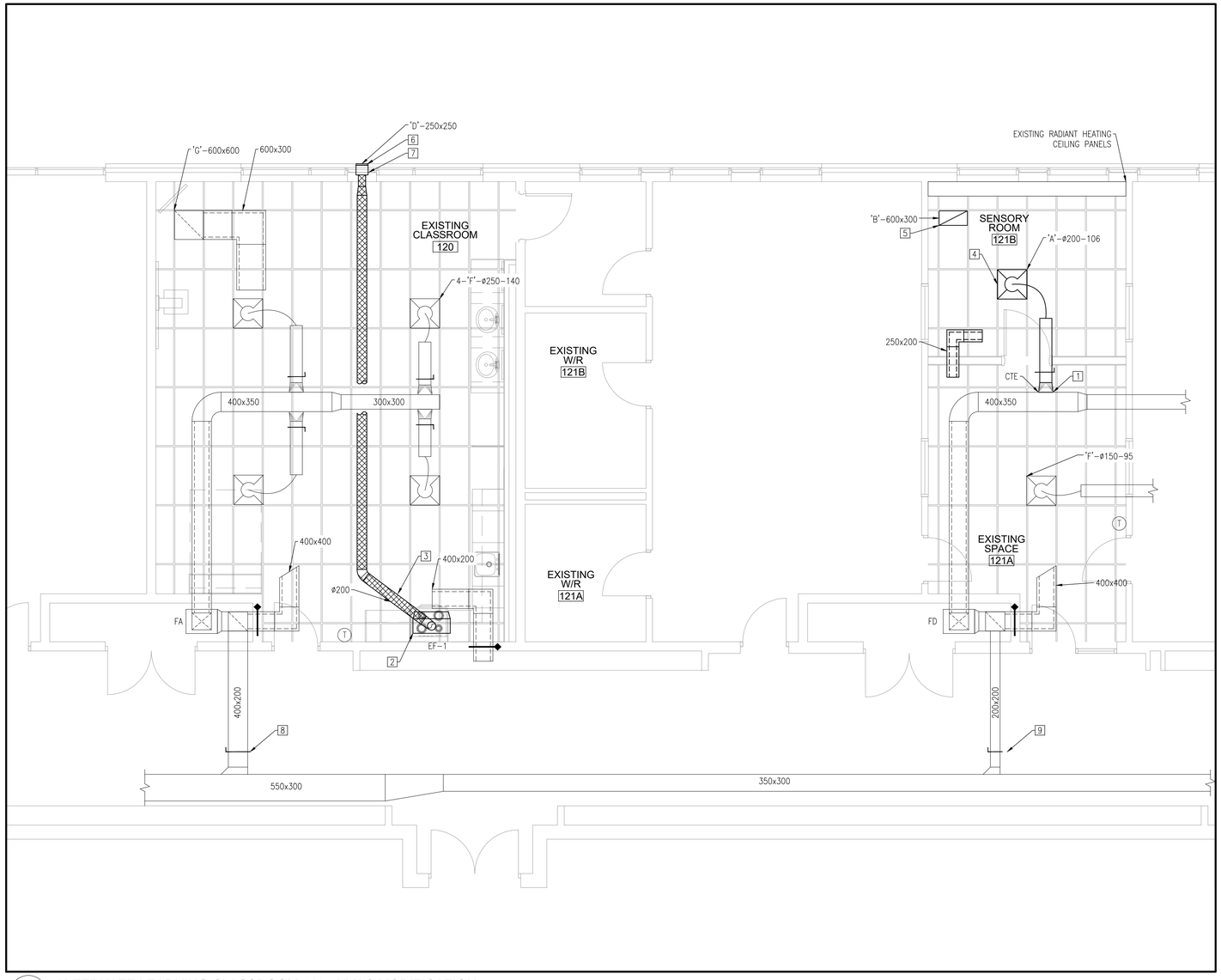

1 M3.04 ALTERNATE LEARNING CLASSROOM 120 - HVAC MODIFICATION

SCALE: 1:50

REFERENCE NOTES

1. PROVIDE NEW DUCTWORK AND CONNECT TO EXISTING DISTRIBUTION AS INDICATED. CAP AND SEAL ANY OPEN DUCTWORK, PROVIDE TRANSITIONS AND ALL REQUIRED OFFSETS TO SUIT.
2. PROVIDE NEW KITCHEN RANGE HOOD AS INDICATED. REFER TO SCHEDULE FOR MORE INFORMATION.
3. ø200 EXHAUST AIR C/W 40mm FIRE RESISTANT WRAP – '3M FIRE BARRIER 615' OR EQUIVALENT, EXTEND DUCT UP THROUGH THE EXTERNAL WALL. PROVIDE EXHAUST LOUVER WITH INSECT SCREEN. TERMINATE AT HIGH LEVEL ALONG THE WALL. CONTRACTOR TO COORDINATE WITH ARCHITECT LOCATION OF LOUVER. SEE SCHEDULE FOR MORE INFORMATION.
4. PROVIDE NEW SUPPLY DIFFUSER, SEE SCHEDULES FOR REQUIREMENTS. DIFFUSER TO COORDINATE EXACT LOCATION WITH ARCHITECTURAL DRAWINGS. PROVIDE BALANCING DAMPER AT EACH BRANCH AND BALANCE SYSTEM TO AIRFLOWS INDICATED ON DRAWINGS.
5. INSTALL NEW RETURN GRILLE, SEE SCHEDULE FOR REQUIREMENTS. GRILLE LOCATION TO BE COORDINATED WITH ARCHITECTURAL DRAWINGS.
6. PROVIDE NEW KITCHEN EXHAUST LOUVER. REFER TO SCHEDULE FOR MORE INFORMATION.
7. PROVIDE INSULATED WALL BOX C/W INTEGRAL BACKDRAFT DAMPER.
8. BALANCE FRESH AIR SUPPLY TO FAN COIL TO 215 L/s.
9. BALANCE FRESH AIR SUPPLY TO FAN COIL TO 95 L/s.

Hamilton-Wentworth Catholic District School Board

NO	REVISIONS	DATE
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1	ISSUED FOR BUILDING PERMIT	2025-03-13

LICENSED PROFESSIONAL ENGINEER
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ALTERNATE LEARNING
CLASSROOM 120
HVAC MODIFICATION

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SCALE: 1:50	PROJECT: 2024-25
START DATE: FEB 2025	
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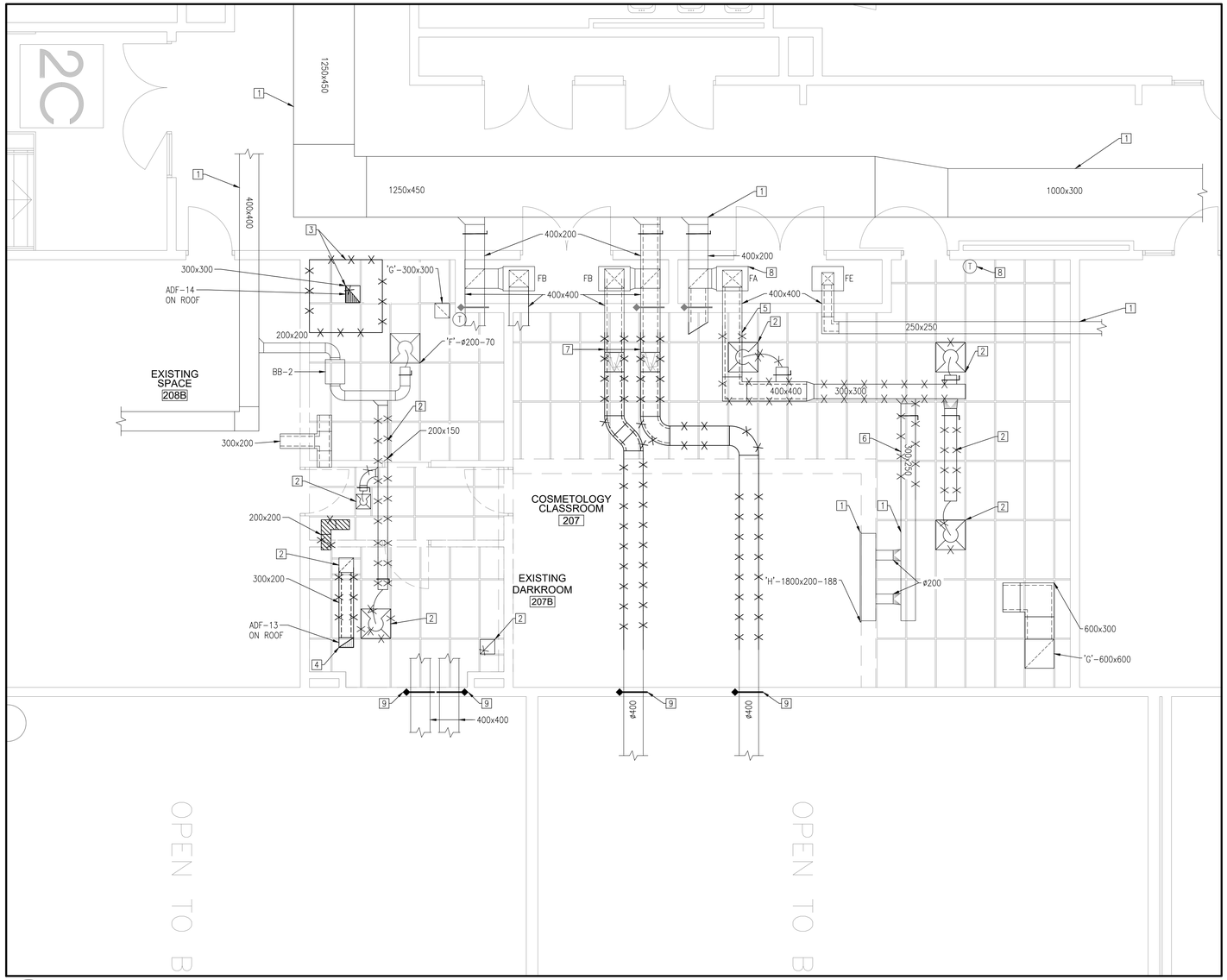
PRINT DATE	



1 M3.05 COSMETOLOGY CLASSROOM 207 - HVAC DEMOLITION
SCALE: 1:50

REFERENCE NOTES

1. EXISTING DUCTWORK, DIFFUSERS, AND GRILLE TO REMAIN. SITE VERIFY AIRFLOW FOR SUPPLY DIFFUSERS, TYPICAL FOR ALL.
2. DEMOLISH DIFFUSER AND GRILLE C/W DUCTWORK AS INDICATED, CAP AND SEAL UNUSED DUCT OPENINGS.
3. DEMOLISH EXISTING ADF-14 EXHAUST FAN AND KILN HOOD. REPAIR SLAB OPENING TO MATCH BASE BUILDING CONSTRUCTION.
4. DEMOLISH EXISTING ADF-13 EXHAUST FAN. REPAIR SLAB OPENING TO MATCH BASE BUILDING CONSTRUCTION.
5. DEMOLISH 400X400 DUCTWORK C/W SUPPORT AND ACCESSORIES. SEE MODIFICATION PLAN FOR INFORMATION.
6. DEMOLISH SECTION OF 300x250 DUCTWORK C/W SUPPORT AND ACCESSORIES. SEE MODIFICATION PLAN FOR INFORMATION.
7. REWORK EXISTING ø400 SUPPLY AND RETURN AIR DUCTWORK AND PROVIDE OFFSETS TO CLEAR NEW ERV DUCT DISTRIBUTION. REFER TO MODIFICATION PLAN FOR MORE INFORMATION.
8. EXISTING FAN COIL UNIT TO REMAIN. CONTRACTOR TO VERIFY REPLACEMENT AND REPLACE FILTER FOLLOWING CONSTRUCTION TEST AND ADJUST THERMOSTAT.

Hamilton-Wentworth
Catholic District School Board

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LICENSED PROFESSIONAL ENGINEER
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CLASSROOM
RENOVATIONS

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COSMETOLOGY
CLASSROOM 207
HVAC DEMOLITION

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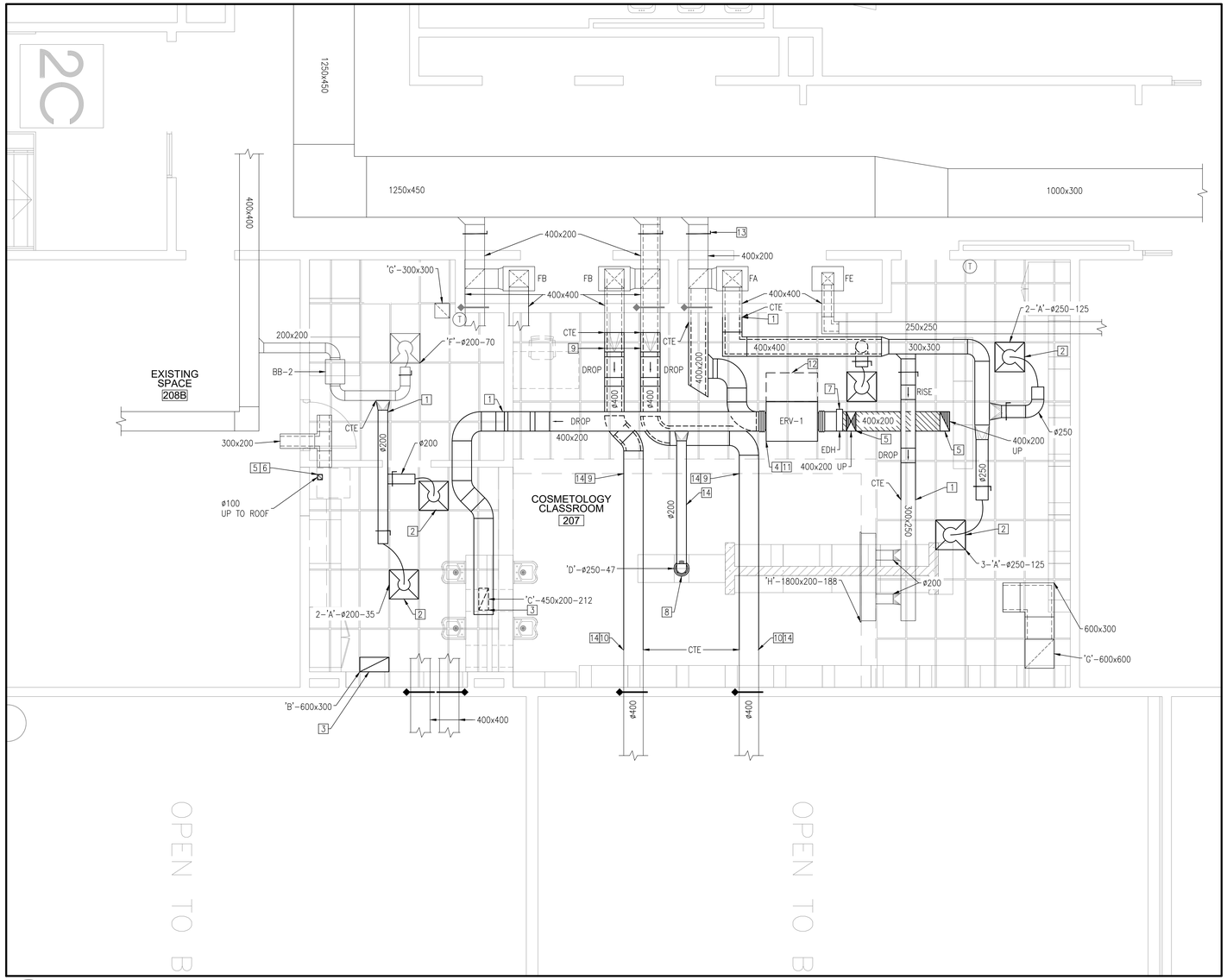

1 M3.06 COSMETOLOGY CLASSROOM 207 - HVAC MODIFICATION
SCALE: 1:50

REFERENCE NOTES

1. PROVIDE NEW DUCTWORK AND CONNECT TO EXISTING DISTRIBUTION AS INDICATED. CAP AND SEAL ANY OPEN DUCTWORK, PROVIDE TRANSITIONS AND ALL REQUIRED OFFSETS TO SUIT.
2. PROVIDE NEW SUPPLY DIFFUSER, SEE SCHEDULES FOR REQUIREMENTS. DIFFUSER TO COORDINATE EXACT LOCATION WITH ARCHITECTURAL DRAWINGS. PROVIDE BALANCING DAMPER AT EACH BRANCH AND BALANCE SYSTEM TO AIRFLOWS INDICATED ON DRAWINGS.
3. INSTALL NEW RETURN GRILLE, SEE SCHEDULE FOR REQUIREMENTS. GRILLE LOCATION TO BE COORDINATED WITH ARCHITECTURAL DRAWINGS.
4. PROVIDE NEW ERV UNIT, REFER TO SCHEDULE FOR MORE INFORMATION. SUPPLY DUCTWORK TO BE CONNECTED WITH EXISTING RETURN DUCT TO FAN COIL UNIT AS INDICATED. LOCATE ERV UNIT BETWEEN CEILING PANELS TO PROVIDE ACCESS FOR MAINTENANCE. SUSPEND FROM STRUCTURE WITH HANGERS C/W SPRING ISOLATORS. INTERLOCK UNIT WITH THE RESPECTIVE FAN COIL UNIT 'FA' SERVING THE CLASSROOM. PROVIDE BAS INTEGRATION OF THE NEW ERV BY BASEBUILDING CONTROLS VENDOR, INCLUDE THE FOLLOWING POINTS:
   - ERV STATUS
   - ERV ALARM
5. EXTEND DUCT UP THROUGH THE ROOF AND TERMINATE WITH GOOSENECK AND BIRDSCREEN. REFER TO DETAILS FOR MORE INFORMATION.
6. INSTALL NEW ø100 DUCTWORK FOR DRYER EXHAUST, FLEXIBLE CONNECTION TO EQUIPMENT AND ACCESSORIES. PROVIDE RIGID DUCTWORK FOR SLAB PENETRATION AND TERMINATION AT ROOF. PROVIDE DRYER DUCT LINT TRAP.
7. INSTALL NEW ELECTRIC DUCT HEATER ON ERV-1 INTAKE. REFER TO SCHEDULE FOR SIZING. COORDINATE INSTALLATION WITH ELECTRICAL.
8. INSTALL NEW RETURN GRILLE. FINISH ELEVATION AT 2200mm ABOVE FLOOR LEVEL. COORDINATE WITH ARCHITECT FINAL LOCATION. REFER TO DETAILS FOR INFORMATION.
9. INSTALL NEW ø400 SUPPLY AND RETURN DUCTWORK AS INDICATED. DROP DUCT TO 75mm. ADJUST EXISTING WALL OPENING TO SUIT CHANGE IN ELEVATION OF THE DUCTS.
10. CONNECT DUCTWORK C/W TRANSITIONS, SUPPORTS AND MODIFY TO SUIT DUCTWORK CONNECTION TO EXISTING SERVICE.
11. REFER TO DETAIL 9 FOR ERV CEILING SPACE DUCTWORK DISTRIBUTION.
12. ERV DOOR CLEARANCE TO BE COORDINATED WITH ARCHITECTURAL, ELECTRICAL AND STRUCTURAL SERVICES.
13. BALANCE FRESH AIR SUPPLY TO FAN COIL TO 215 L/s.
14. PAINT ALL EXPOSED DUCTWORK, HANGERS AND ACCESSORIES IN WHITE FINISH TO MATCH CEILING. COORDINATE EXACT COLOR AND FINISHES WITH ARCHITECT.

Hamilton-Wentworth Catholic District School Board

NO	REVISIONS	DATE
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LICENSED PROFESSIONAL ENGINEER D. BEREZOWSKI 100227871 PROVINCE OF ONTARIO MAR 21,2025

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COSMETOLOGY
CLASSROOM 207
HVAC MODIFICATION

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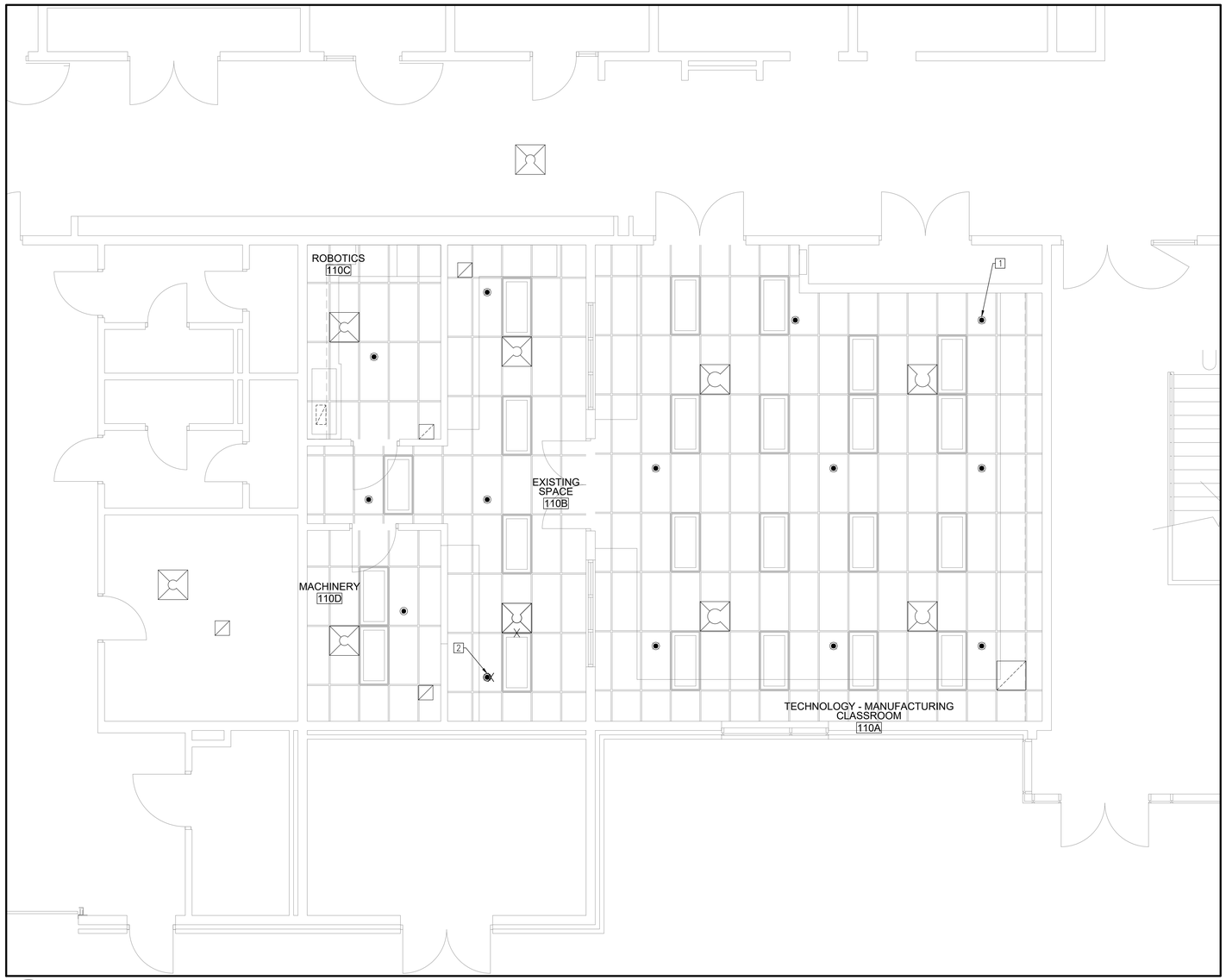

1 / M4.01 TECH. MANUF. CLASSROOM 110 - FIRE PROTECTION DEMOLITION
SCALE: 1:50

REFERENCE NOTES

1. EXISTING SPRINKLER TO REMAIN. TYPICAL FOR ALL.
2. DEMOLISH SPRINKLER AND CAP ALL UNUSED PIPE BRANCHES FROM MAIN.

Hamilton-Wentworth
Catholic District School Board

NO	REVISIONS	DATE
2	ISSUED FOR TENDER	2025-03-21
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LICENSED PROFESSIONAL ENGINEER
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CLASSROOM
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TECH. MANUF.
CLASSROOM 110
FIRE PROTECTION
DEMOLITION

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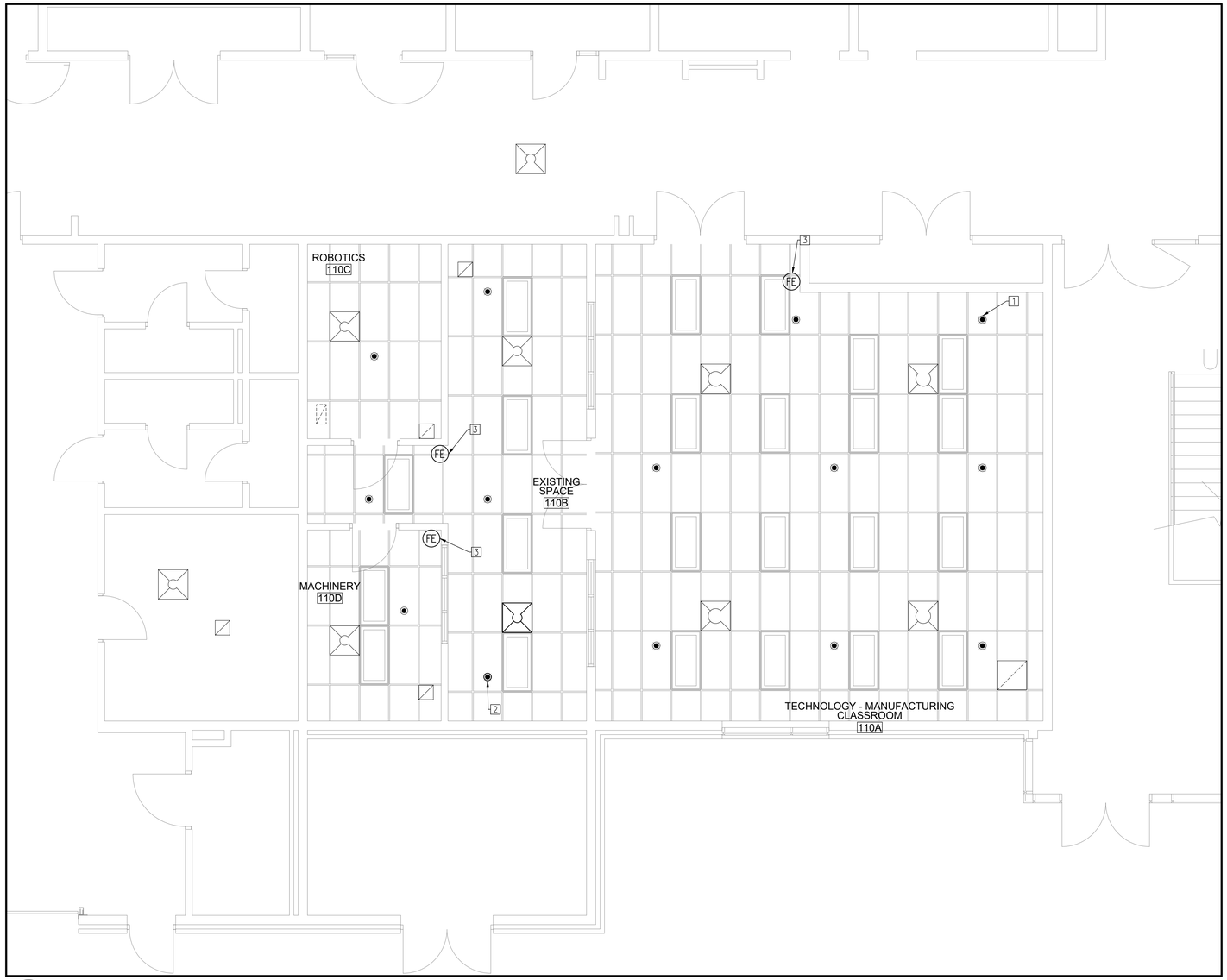

1 / M4.02 TECH. MANUF. CLASSROOM 110 - FIRE PROTECTION MODIFICATION
SCALE: 1:50

REFERENCE NOTES

1. EXISTING SPRINKLER TO REMAIN. TYPICAL FOR ALL.
2. PROVIDE NEW PENDENT SEMI RECESSED SPRINKLER HEAD AS INDICATED.
3. PROVIDE NEW WALL MOUNTED 5LB CLASS 3-A, 10-B, C DRY CHEMICAL FIRE EXTINGUISHER C/W FIRE EXTINGUISHER BRACKET (ULINE MODEL H-5932 OR EQUIVALENT). TOP OF THE EXTINGUISHER IS NOT MORE THAN 1.5m ABOVE FINISHED FLOOR LEVEL.

Hamilton-Wentworth
Catholic District School Board

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TECH. MANUF.
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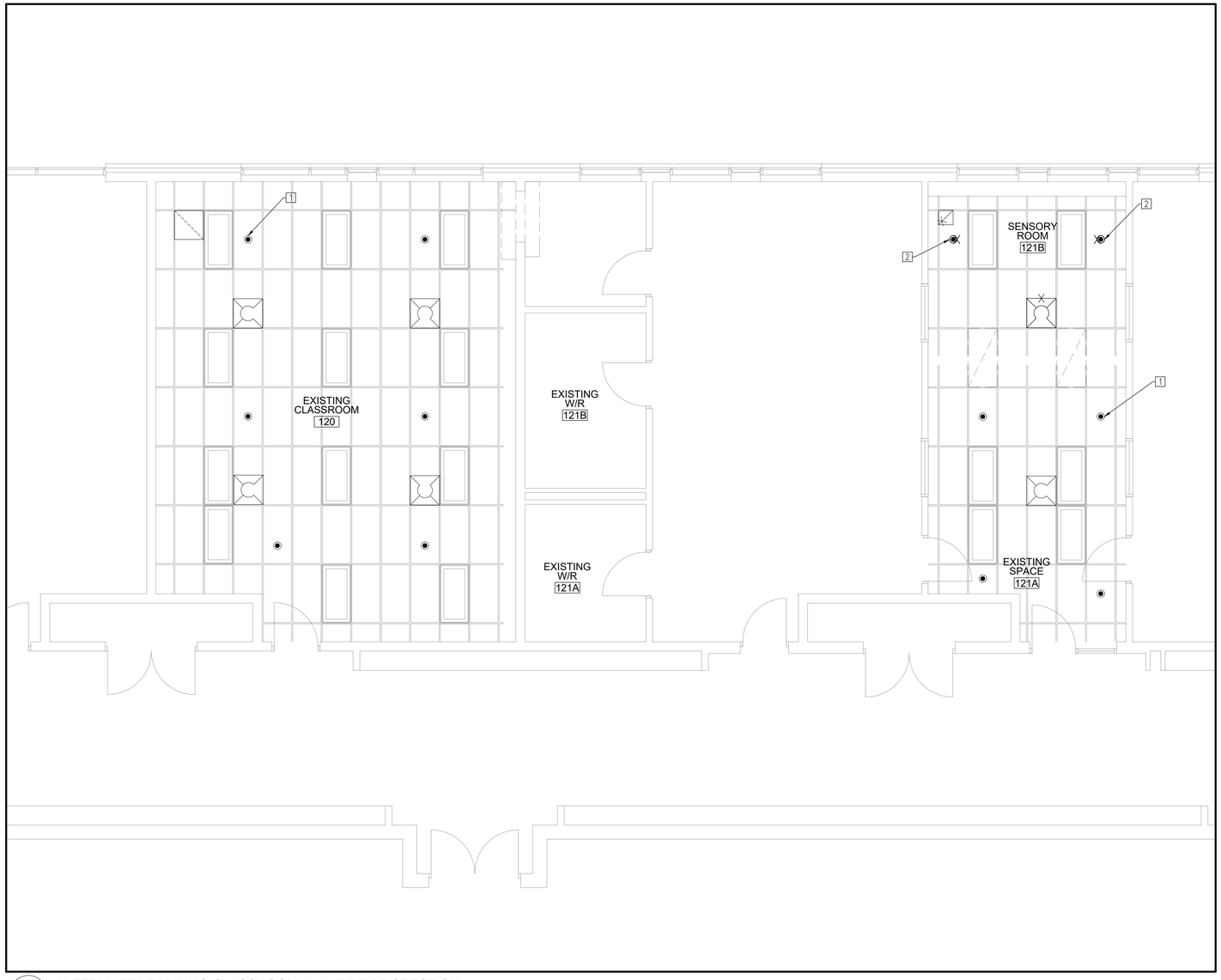

1 M4.03 ALTERNATE LEARNING CLASSROOM 120 - FIRE PROTECTION DEMOLITION

SCALE: 1:50

REFERENCE NOTES

1 EXISTING SPRINKLER TO REMAIN. TYPICAL FOR ALL.

2 DEMOLISH SPRINKLER AND CAP ALL UNUSED PIPE BRANCHES FROM MAIN.

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ALTERNATE LEARNING
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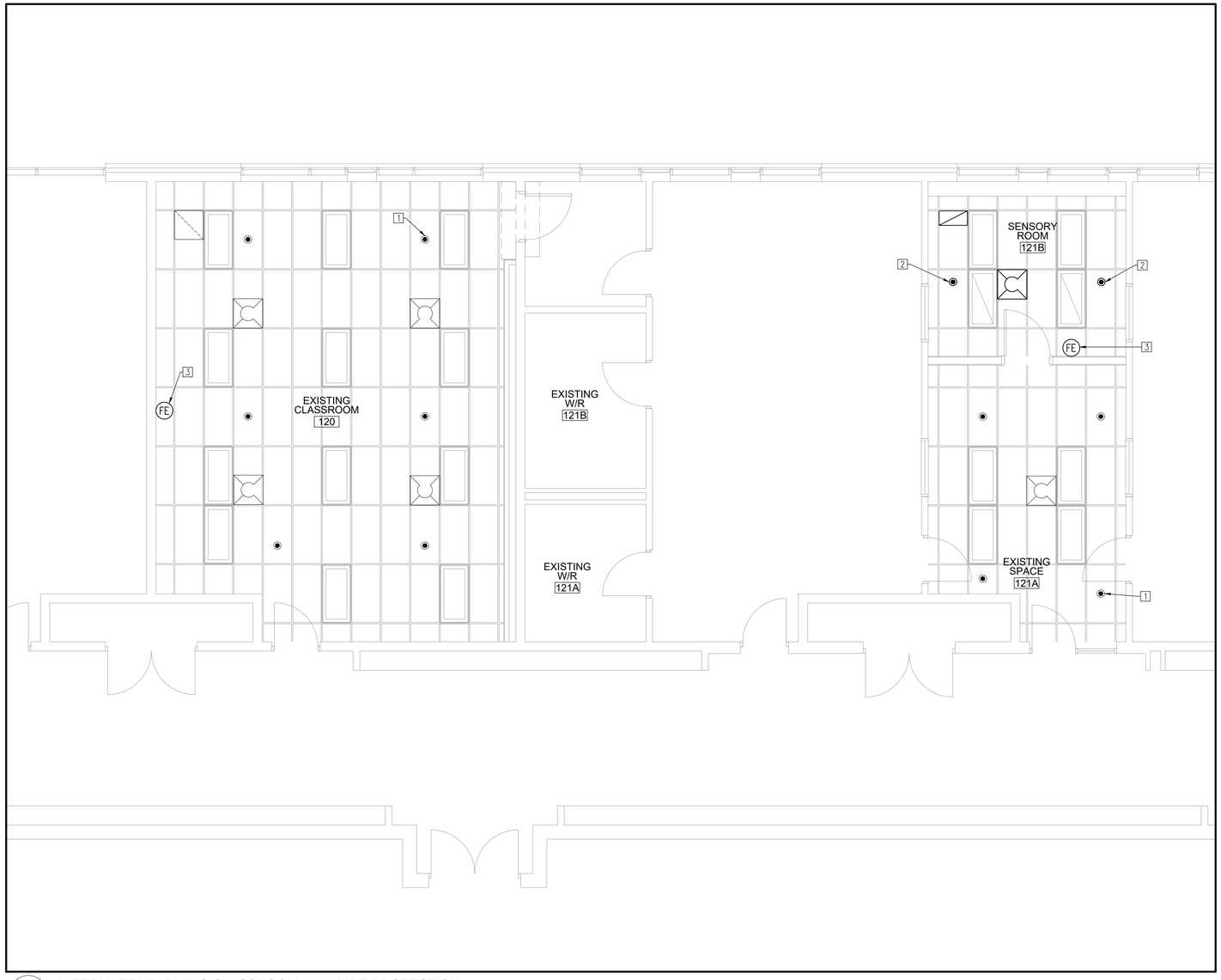
Tel. 905-664-8735 Fax. 905-664-8737
Web: www.2gai.com

SCALE:	PROJECT: 2024-25
START DATE: FEB 2025	
DRAWN NC	DRAWING: M4.03
CHECKED DB	
PRINT DATE	



1 M4.04 ALTERNATE LEARNING CLASSROOM 120 - FIRE PROTECTION MODIFICATION

SCALE: 1:50

REFERENCE NOTES

1. EXISTING SPRINKLER TO REMAIN. TYPICAL FOR ALL.
2. PROVIDE NEW PENDENT SEMI RECESSED SPRINKLER HEAD AS INDICATED.
3. PROVIDE NEW WALL MOUNTED 5LB CLASS 3-A, 10-B, C DRY CHEMICAL FIRE EXTINGUISHER C/W FIRE EXTINGUISHER BRACKET (ULINE MODEL H-5932 OR EQUIVALENT). TOP OF THE EXTINGUISHER IS NOT MORE THAN 1.5m ABOVE FINISHED FLOOR LEVEL.

Hamilton-Wentworth
Catholic District School Board

NO	REVISIONS	DATE
2	ISSUED FOR TENDER	2025-03-21
1	ISSUED FOR BUILDING PERMIT	2025-03-13

LICENSED PROFESSIONAL ENGINEER
MAR 21,2025
D. BEREZOWSKI
100227287
PROVINCE OF ONTARIO

DYNAMIS ENGINEERING INC
222 ISLINGTON AVENUE, SUITE 260
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T: 416-936-5443
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BISHOP TONNOS CSS
CLASSROOM
RENOVATIONS

100 Panabaker Dr, Ancaster, ON L9G 5E3

ALTERNATE LEARNING
CLASSROOM 120
FIRE PROTECTION
MODIFICATION

GRGURIC
ARCHITECTS
INCORPORATED
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STONEY CREEK, ONTARIO, L8G 1J8
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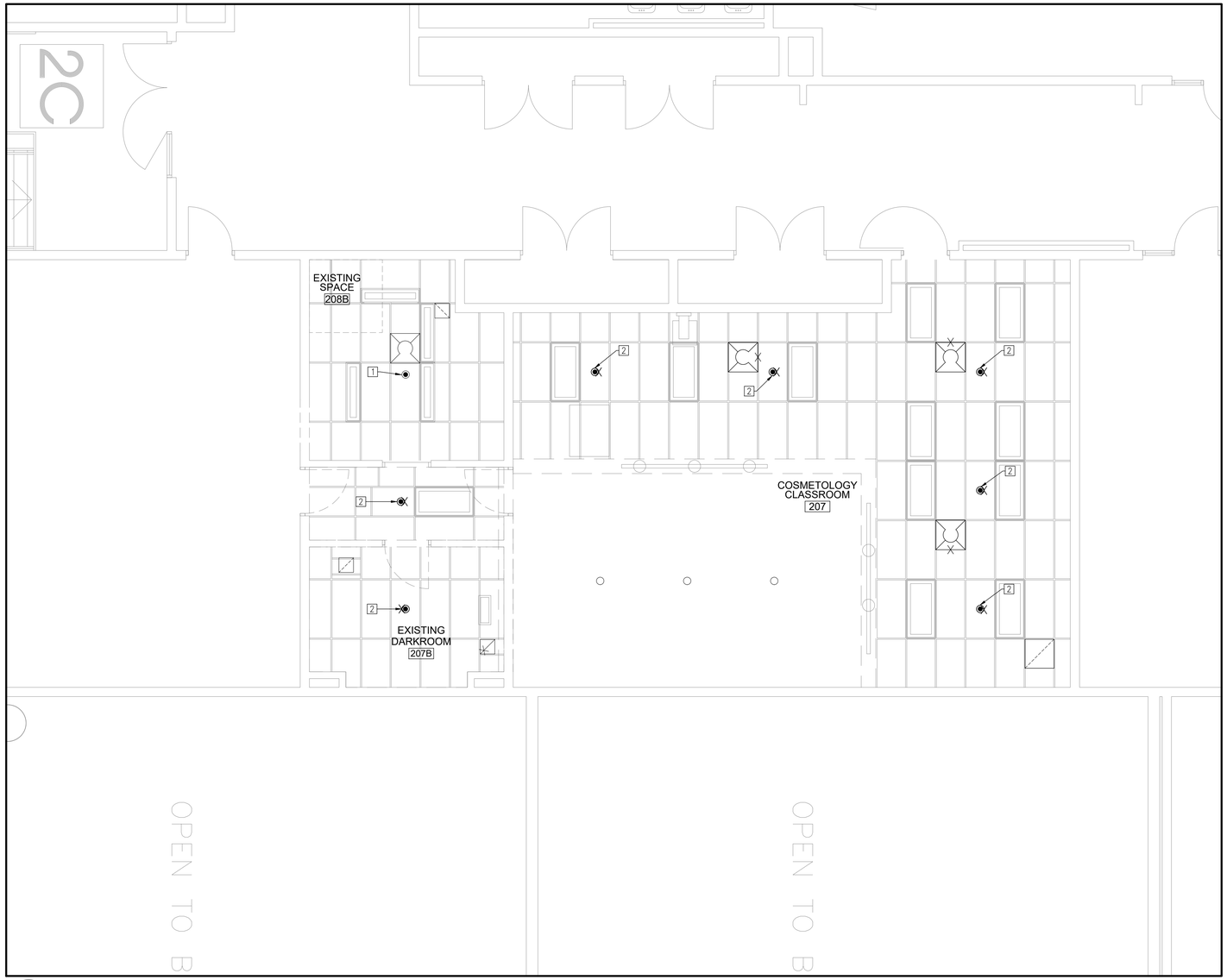
SCALE: 1:50	PROJECT: 2024-25
START DATE: FEB 2025	
DRAWN NC	DRAWING: M4.04
CHECKED DB	
PRINT DATE	



1 M4.05 COSMETOLOGY CLASSROOM 207 - FIRE PROTECTION DEMOLITION
SCALE: 1:50

REFERENCE NOTES

1 EXISTING SPRINKLER TO REMAIN. TYPICAL FOR ALL.

2 DEMOLISH SPRINKLER AND CAP ALL UNUSED PIPE BRANCHES FROM MAIN.

Hamilton-Wentworth Catholic District School Board

NO	REVISIONS	DATE
2	ISSUED FOR TENDER	2025-03-21
1	ISSUED FOR BUILDING PERMIT	2025-03-13

LICENSED PROFESSIONAL ENGINEER D. BEREZOWSKI 100122871 PROVINCE OF ONTARIO MAR 21,2025

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COSMETOLOGY CLASSROOM 207 FIRE PROTECTION DEMOLITION

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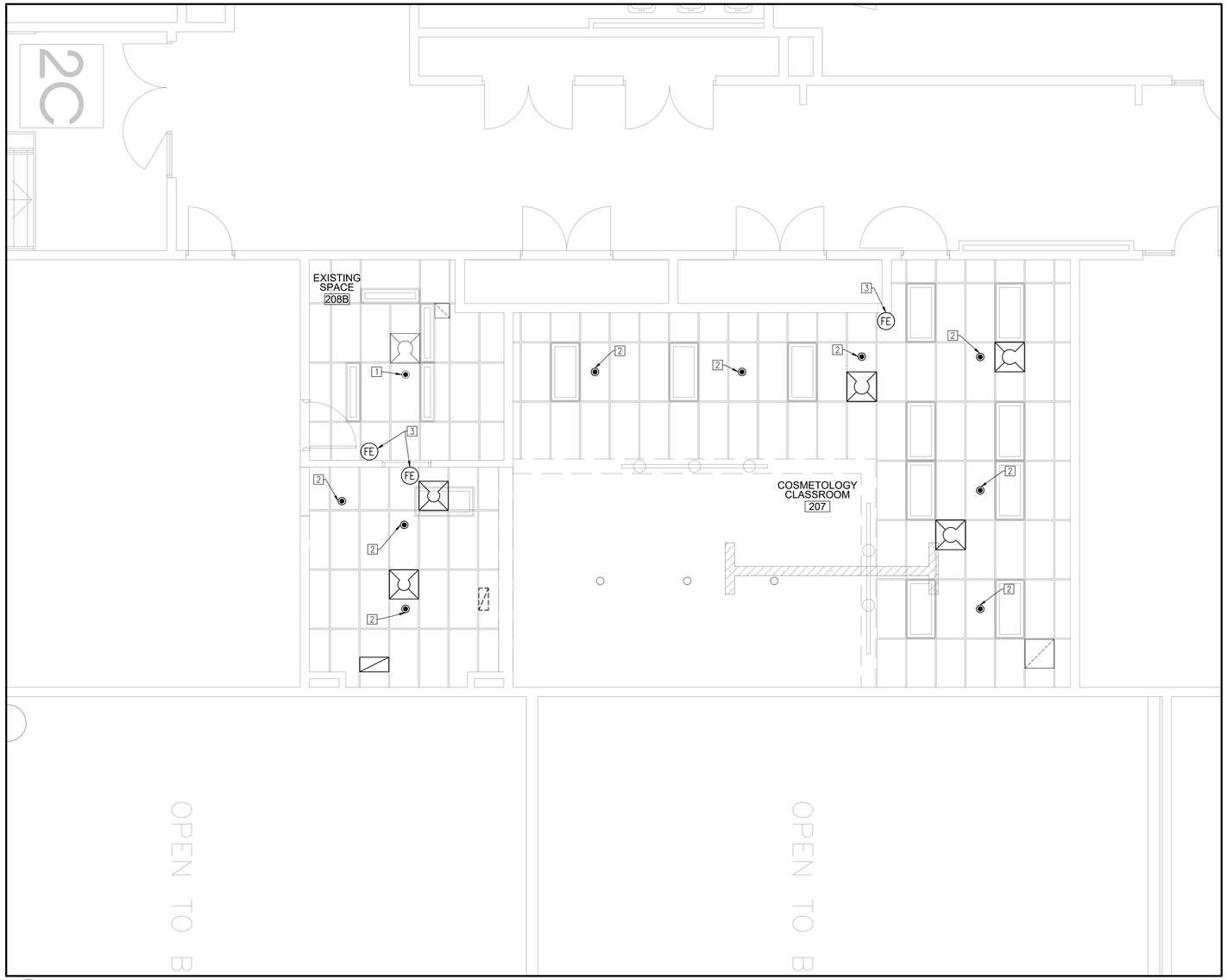
SCALE: 1:50	PROJECT: 2024-25
START DATE: FEB 2025	
DRAWN NC	DRAWING: M4.05
CHECKED DB	
PRINT DATE	



1 M4.06 COSMETOLOGY CLASSROOM 207 - FIRE PROTECTION MODIFICATION
SCALE: 1:50

REFERENCE NOTES

1. EXISTING SPRINKLER TO REMAIN. TYPICAL FOR ALL.
2. PROVIDE NEW PENDENT SEMI RECESSED SPRINKLER HEAD AS INDICATED.
3. PROVIDE NEW WALL MOUNTED 5LB CLASS 3-A, 10-B, C DRY CHEMICAL FIRE EXTINGUISHER C/W FIRE EXTINGUISHER BRACKET (ULINE MODEL H-5932 OR EQUIVALENT). TOP OF THE EXTINGUISHER IS NOT MORE THAN 1.5m ABOVE FINISHED FLOOR LEVEL.

Hamilton-Wentworth Catholic District School Board

NO	REVISIONS	DATE
2	ISSUED FOR TENDER	2025-03-21
1	ISSUED FOR BUILDING PERMIT	2025-03-13

LICENSED PROFESSIONAL ENGINEER
MAR 21,2025
D. BEREZOWSKI
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COSMETOLOGY
CLASSROOM 207
FIRE PROTECTION
MODIFICATION

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SCALE: 1:50	PROJECT: 2024-25
START DATE: FEB 2025	
DRAWN NC	DRAWING: M4.06
CHECKED DB	
PRINT DATE	

ELECTRICAL SPECIFICATIONS

ELECTRICAL GENERAL REQUIREMENTS

1 General Conditions

1.1 The clauses in the General Conditions, Labour Conditions, Supplementary Conditions and Instructions to Bidders shall be considered an integral part of these specifications and shall govern the electrical work to be done.

2 Codes and Regulations

2.1 All work shall be done in accordance with the latest editions of the Ontario Building Code, Ontario Electrical Safety Code, C.S.A. Standards, U.L.C., N.F.P.A., O.S.H.A. and local regulations and with the requirements of all applicable inspection Authorities Having Jurisdiction. Additionally, all work shall comply with Owner's requirements and conform to base building standards.

3 Permits and Approvals

3.1 Obtain and pay for all required approvals, permits and notices and pay all inspection fees, taxes and all other applicable costs whatsoever connected with the electrical work. Provide Certificate of Acceptance from the local ESA Inspection Department.

4 Intent

4.1 It is the intent of these drawings and specifications that the Contractor provide complete and fully operational systems. All miscellaneous items and ancillary components required to achieve this shall be provided and all costs shall be included in the tender price.

5 Definitions

5.1 The terms 'provide' or 'supply and install' shall be understood to mean that the Contractor shall supply and install, inclusive of all labour, materials and testing, for the equipment or system which is being referenced.

6 Site Visit

6.1 Study the electrical drawings and the documents of all other trades and visit the site during tender in order to establish the full extent of the work and to determine existing job conditions. Include in the tender price for the total scope of work including but not limited to removing, rerouting of all existing electrical equipment and wiring to successfully execute all work described. Include in bid for discrepancies, if any, shown on these drawings relating to existing conditions.

7 Insurance

7.1 Provide insurance for the duration of the project to protect the building Owner, Tenant and Trades from all claims. Submit at the time of the bid proof of an amount in accordance with the bid form requirements or acceptable to the Owner.

8 Workers Compensation

8.1 The Contractor shall provide the Owner with current certificates of clearance from the Workplace Safety and Insurance Board (WSIB) valid throughout the course of the contract.

9 Contract Documents

9.1 The drawings for the work of this division are diagrammatic in nature intended to convey the scope of work, general arrangement and sizes of equipment and approximate location of wiring devices and other devices.

9.2 Any discrepancies between the Architectural/Interior Design, Mechanical, Security, Audio-Visual, Communications, Food Service or other drawings and the Electrical drawings shall be reported to the Consultant prior to roughing in the electrical services.

9.3 Whenever differences occur between floor plans and details/diagrams or between drawings and specifications the maximum condition shall govern and be included in the tender price.

10 Site Measurements

10.1 All dimensions and measurements shall be determined on the site. Drawings are diagrammatic intended to show general arrangement and some technical details only and shall not be scaled for dimensions or measurements.

11 Demolition

11.1 Complete extent of demolition is not shown. Make allowances for any new or existing services, devices or equipment relocations necessary to complete the work. The Contractor is responsible for all device and fixture counts and shall supply sufficient quantities of new devices or fixtures to complete the work as intended by the drawings. Allow for all costs in the tender price.

12 Interruption to Building Services

12.1 All work shall be performed without power shutdown of any operating systems without the express written approval of the the work. The work shall be so arranged to keep the required number of shutdowns to a minimum. All required power shutdowns shall be performed during premium time, during overnight hours, and shall be pre-arranged at least five business days in advance with the Owner's representative. All allowances for same shall be included in tender price.

13 Temporary Power

13.1 The electrical trade shall be responsible for providing temporary power and lighting, as required by all other trades, to do the work. Coordinate requirements with phasing of work and make all necessary allowances.

14 Removal of Existing Equipment

14.1 Remove any abandoned wiring from the areas defined on the drawings. Wiring in walls and ceilings which are to be demolished shall also be removed as required. Wiring of circuits that are to be removed shall be removed all the way back to the corresponding circuit breaker panel or other overcurrent protective device. Any wiring which may become disconnected because of demolition, which is not intended to be removed, shall be reconnected.

14.2 Wiring, conduit and equipment which is required to maintain services to other parts of the building shall be temporarily supported or relocated as required.

14.3 Unless indicated otherwise, equipment, devices and materials that are stated or shown as "to be removed" shall become the property of the Contractor and shall be removed from the site. Unless indicated otherwise, light fixtures, exit lights, emergency remote heads, fire alarm system devices and wall dimmers that are to be removed shall be cartoned and turned over to Owner at a designated storage space in the building. Any other equipment that is shown to be retained by the Owner shall also be moved to a designated storage space in the building.

15 Relocation of Devices

15.1 Devices and outlets are shown on the drawings in the required locations. Notwithstanding the foregoing, it shall be understood that any electrical outlet, device or lighting fixture may be relocated by the Owner's Representative or the Consultant 15 feet from the location shown without additional charge providing such relocation is made before the affected conduits and boxes are roughed in. Additionally, verify that all existing devices that are to remain fall within the room shown on the new plans. Allow for relocation of existing devices where required.

15.2 Allow for removal and re-installation of existing wall devices to permit new architectural finishes, and for temporary removal of ceiling fixtures and devices where T-bar ceilings to be temporarily removed.

16 Scheduling and Delivery

16.1 All work during construction shall be properly scheduled and coordinated with the other Trades, the Owner and the Tenant. Include in the tender price for all necessary premium time to suit the Owner's or General Contractor's construction schedule.

16.2 A delivery schedule of all major equipment including lighting fixtures to be provided under this contract shall be submitted to the General Contractor at the beginning of the project. Failure to identify delivery problems or unnecessary delay in ordering equipment may result in delay claims against the Contractor.

17 Shop Drawings

17.1 Submit electronically in PDF format shop drawings for power distribution equipment, lighting fixtures, lighting controls, panelboards, disconnect switches, wiring devices, etc., prior to installation for approval.

17.2 Each shop drawing shall be reviewed and stamped as being correct by the General Contractor and the appropriate trade before submission to the Consultant for review. Shop drawings which are not stamped in this manner shall be returned 'not reviewed'.

18 As-built Drawings

18.1 Keep a record set of drawings on site at all times which shall clearly indicate the exact location of all outlets, devices, lighting fixtures, feeder runs, distribution equipment, junction boxes, pull boxes, EOL's, etc. The record drawings shall also include any deviations from the design drawings and all changes issued via change notice or site instruction or other changes made during the course of construction. The information on these drawings shall be incorporated onto the as-built drawings at the completion of the project.

18.2 Submit as-built drawings at the completion of the project in the form of AutoCAD release 2010 or later. Obtain and pay for a cad disk of drawing files. The Contractor may obtain the Consultant's AutoCAD drawing files at a cost of $125.00 per drawing. The as-built drawings shall incorporate all the information from the record drawings recorded during construction. Submit the completed record drawings and the cad files, in AutoCAD release 2010 or later, to the Consultant for review. Following the Consultant's review submit the record drawings, three (3) sets of prints of the as-builts and a USB or CD disk of the as-built drawings in CAD and PDF to the Landlord or Owner as part of the close-out documents.

18.3 The Consultant's stamp and logo shall be removed from the as-built drawings. The drawings shall be clearly marked as AS-BUILT and shall include the Contractor's name.

19 Close-out Documents

19.1 After completion of the project submit the following documents for Consultant's review.
- Electrical Safety Authority Inspection Report.
- Fire Alarm Installation Letter.
- Fire Alarm Verification Report and Certificate.
- Light Fixture Independent Support Letter.
- Emergency lighting conformance letter.
- Arc Flash and Short Circuit Coordination Studies
- Warranty letter.
- Maintenance Manuals including all Reviewed and Stamped shop drawings.

19.2 Following Consultant's review submit Close-out Documents including three (3) sets of the Maintenance Manuals to the Owner.

20 Warranty

20.1 The Contractor shall provide a one-year "parts and labour" warranty on all facilities, equipment and devices, effective on the date of acceptance of the work, even if the devices are installed and connected before this date. The warranty shall cover the complete installation.

20.2 The Contractor shall repair and/or replace at no extra cost any defects in materials or workmanship that occur during the warranty period. Work to be done at a time that is suitable to the Landlord or Tenant.

21 Final Inspection

21.1 At the completion of the work the Contractor shall contact the Owner's representative and Summit Engineering to perform a final inspection.

21.2 In areas where ceiling tiles have been installed it will necessary to remove portions of the ceiling tiles for inspection and then re-install them. Include for all costs in the tender price.

21.3 All equipment must be cleaned and tested before final acceptance by the Consultant.

22 Changes to the Contract

22.1 Where extra work of any kind is required obtain written instructions from the Owner or Architect/Design Consultant before proceeding. The Contractor will receive payment for authorized changes only.

22.2 For each change submit a quotation c/w breakdown of material, labour, overhead and profit. Labour units shall be based on the latest National Electrical Contractors Association (NECA) manual column one (1) for the duration of the project. Material pricing shall be based on the latest National Price Guide system with appropriate trade discounts.

22.3 Hourly labour rates shall be inclusive of all ancillary charges for supervision, electrical inspection, hand tools, as-builts, parking, clean-up, elevator downtime and additional bonding. No other ancillary charges will be permitted.

23 Underground Work

23.1 For all underground work it is the Contractor's responsibility to verify with the Owner and the local Utilities for locations of all existing underground services prior to digging. Include for all costs in tender price.

24 Noise and Vibration

24.1 All electrical equipment shall operate without objectionable noise or vibration and to the Owner's satisfaction.

25 Restrictions

25.1 Communications rooms and closets are designed for communications equipment and security DGP's. Do not locate any type of power distribution equipment or power risers within these rooms.

MATERIALS AND INSTALLATION

26 General Conditions

26.1 Unless otherwise specifically provided, all materials and equipment installed shall be new, unused, and bear approval or certification labels indicating conformity with CSA standards. All new materials and equipment shall match base building standards unless shown otherwise.

26.2 Provide all materials, equipment and labour necessary to perform the complete work as indicated.

26.3 All work shall be performed in a professional and expert manner to the satisfaction of the Architect/Design Consultant. Any work that is deemed to unsatisfactory shall be replaced without extra cost to the Owner.

26.4 Damage to any system occurring during execution of the work shall be rectified at the Contractor's expense.

26.5 The construction site shall be kept clean and any debris shall be removed from the site throughout the construction period and at completion of the work.

27 Routing of Equipment

27.1 All wiring shall be run concealed wherever possible. Where wiring is run exposed, it shall be installed parallel to the building structure and present a neat appearance.

27.2 In general, wiring shall be run concealed in finished areas and exposed in unfinished areas and mechanical and electrical room service spaces.

27.3 New conduits and shall be carefully routed to avoid interference with existing services. Routing of conduits within existing riser rooms shall be reviewed and approved by the building Owner prior to installation. Any existing services that interfere with the new installation shall be relocated under this contract. Become familiar with any such conditions during the contractor walk-through and allow for all costs in the tender price.

27.4 The routing of new conduits shall be approved by the Owner's representative or the Consultant before they are installed. They shall not be attached to mechanical or other equipment.

28 Cutting and Patching

28.1 All cutting, patching and painting required to perform the electrical work shall be included in this contract unless otherwise advised by the General Contractor.

29 Directories

29.1 Clearly amend all existing panelboard directories which may be affected by work done under this contract. Amended directories shall be typewritten. New panelboards shall be equipped with a typed directory of circuits showing room number, type of load and wattage.

30 Location of Luminaires

30.1 All luminaires shall be new and as specified on the drawings and specifications except where noted otherwise for existing luminaires to be re-used. Re-used luminaires shall be thoroughly cleaned and re-lamped prior to putting into use again.

30.2 All luminaires shall be supplied complete with all required accessory items such as yokes, trim rings, frame adjusters and other ancillary components as required for a complete and proper installation.

30.3 For exact location of all lighting fixtures and light switches refer to architectural reflected ceiling plans and details where applicable.

30.4 Ensure that all lighting fixtures within rooms are controlled by switches, where switches are shown. Where two or more switches are shown in one room and the room contains emergency fixtures, the switch closest to the door shall be on the emergency power circuit.

31 Lamps and Fuses

31.1 All luminaires shall be complete with suitable lamps in accordance with the luminaire schedule. Include a shop drawing of proposed lamp along with every luminaire shop drawing submitted.

31.2 Fluorescent, HID and LED lamps shall be guaranteed for a period of one year from the date of acceptance. Low voltage, halogen and incandescent lamps shall be guaranteed for a period of six months from the date of final acceptance.

31.3 At completion the job shall be left completely lamped and fused, including all existing and new fixtures and exit signs within the project boundary. Clean and repair all existing fixtures affected by this work. Provide new lenses in existing fixtures where lenses are missing or damaged.

32 Ballasts

32.1 Ballasts shall be manufactured to the latest applicable CSA standards and shall meet or exceed the requirements of the OEM manufacturers.

32.2 Ballast voltage shall be as noted in the luminaire schedule or as required to suit the circuiting shown on the drawings.

32.3 Submit ballast manufacturer's technical data with each luminaire shop drawing.

33 Exit Signs

33.1 Unless otherwise noted, all exit signs shall be new, pictogram style, LED type with voltage rating to suit the circuiting shown on the drawings, or to match existing exit lighting voltage.

33.2 Exit signs shall be single or double face with directional arrows as noted on the drawings.

33.3 (not used).

33.4 All exit signs shall have no light leakage from joints or fittings, have canopy and/or stem hanger to match the housing and shall meet the requirements of standard CSA C860.

33.5 Ensure that exit sign circuit breakers are locked in the 'ON' position.

33.6 Ensure that new or relocated exit signs are positioned to be clearly visible along the intended path of egress and that no ceiling or wall mounted obstructions interfere with or block the visibility of the exit sign. In the event that the building inspector or the consultant finds the sign is obstructed from view or interferes with other systems the contractor shall relocate the sign at no extra cost.

34 Occupancy Sensors

34.1 Provide a complete and fully operational occupancy sensing lighting control system as shown on the drawings and specified herein.

34.2 Locate all equipment in accordance with the manufacturer's recommendations and as indicated on the drawings.

34.3 All sensors to arrive on site factory preset to the maximum time delay setting.

34.4 Final sensitivity adjustment and time delay setting of all sensors shall be carried out 72 hours prior to substantial completion by the Contractor and as directed by the Consultant.

34.5 Adjust all occupancy sensors individually to operate as intended for the size and shape of the space where installed.

35 Core Drilling and Sealing

35.1 Before core drilling floor slab or structural walls, scan slab or walls and have the locations accepted by the building Owner and Structural Engineer in writing. Any existing building services damaged by core drilling must be repaired immediately at no cost to the Owner. Obtain all necessary approvals prior to scanning and core drilling. Include for all costs in tender price. X-raying and core drilling of floors to be carried out after normal working hours and at a time acceptable to the Owner. Schedule core drilling with Owner at least 10 days in advance of performing the work.

35.2 Where conduits pass through fire rated walls or floors, and/or where core drilling is performed, provide fire stopping material listed with, and bearing label of CSA and ULC, and maintain existing fire rating of building component penetrations.

36 Fastenings and Supports

36.1 Fasten exposed conduit or cables to building structure using steel straps or channels. Use beam clamps to secure conduit to exposed steel work. Suspended support systems: U shape, single channel (hot dip galvanized) to suit load to be carried, surface-mounted or suspended with threaded rod as indicated or required. Support equipment, conduit or cables using clips, spring-loaded bolts, cable clamps designed as accessories to basic channel members. Do not use wire lashing or perforated strap to support or secure raceways or cables.

36.2 Independently support from structure all new and relocated suspended, surface or T-bar mounted luminaires using two (2) or more lengths of Weldless 'Single Jack' bright zinc plated steel chain, Canadian Standard #10 gauge, 13 links per foot. Do not support lighting fixtures or other devices from the ceiling support system. Fixtures with linear lamps shall be supported with minimum two chains per 4' length of fixture. Downlight fixtures shall be supported with minimum one chain.

37 Access Doors

37.1 Provide all access doors where required to service all new and existing equipment. Access panels shall be equal to Lehage and shall be compatible with ceiling/wall type and finish. Access doors shall be recessed type with a drywall infill. Electrical services are to be coordinated to minimize the number of access panel locations required. Coordinate location and sizes with the Consultant. Submit installation drawing(s) to the Architect/Interior Designer for review indicating size and location of all proposed access locations prior to proceeding with the installation.

38 Lamacoids and Identification

38.1 All new equipment shall be identified with lamacoid nameplates. Colour shall be black background with white lettering for power distribution equipment and red background with white lettering for fire alarm DGP's and panels. Wording on all lamacoid plates shall be approved by the Consultant and the building Owner prior to engraving.

38.2 All conductors including neutrals and grounds shall be tagged in all junction boxes, device outlet boxes and panelboards for easy identification for testing and maintenance purposes.

39 Wire and Cable

39.1 Unless shown otherwise, all wires shall be copper with RW-90 insulation, 600V rating for 120/208V system and 1000V rating for 240/416V and 347/600V systems, and minimum #12 gauge or as specified. #12 and #10 shall be solid, #8 and larger shall be stranded. In damp locations, outside the building and underground, they shall be RWU-90 XLINK type. All conductors shall be sized for a maximum 2% voltage drop. Provide copper ground wire sized per Code in all branch and power feeder conduits whether or not same is shown on drawings.

39.2 Wiring between VFDs and motors shall be VFD rated cable, size as noted. Symmetrical design with (3) stranded tinned copper circuit conductors + (3) symmetrical bare copper grounds, 2 spiral copper tape shields (100% coverage), XLPE insulation, black PVC jacket; 1000V UL, equal to Belden type 2952. Install cable in EMT. Final connection to motor in flexible conduit.

39.3 Provide a separate neutral conductor for each circuit. Do not share neutrals.

39.4 Lugs for power feeders shall be solderless set screw type or long barrel double crimp type as required.

40 Conduits

40.1 All conduits indoors shall be steel EMT except as otherwise noted. EMT couplings and connectors shall be steel set-screw type or compression concrete tight, die cast set-screw type is not acceptable. Connectors shall be with nylon insulation.

40.2 Flexible armoured cable (BX) shall be permitted only for down-drops from junction boxes to luminaires and for vertical drops in partitions unless prohibited by Code or building standards. BX cable shall not be used in any exposed areas unless otherwise noted. BX cable runs in ceiling spaces shall not exceed 3m (10') in length. Do not terminate BX cable directly into panelboards.

40.3 Final connections to motors and transformers shall be made with flexible metal conduit (minimum 1m length).

40.4 Provide armoured cable "TECK" where shown. All wiring under access floors shall be in TECK or flexible sealtite conduit.

40.5 Outdoor conduits shall be rigid galvanized steel or rigid PVC.

40.6 Underground and concrete encased conduits shall be rigid PVC.

40.7 All conduits for communications wiring shall be installed with bushings at each end. Provide pull strings in all empty conduits.

40.8 Provide approved expansion joints where required by Code and/or as shown.

40.9 Painting of exposed conduits to match existing wall or ceiling finish shall be included in this contract unless otherwise advised by the General Contractor

41 Pull Boxes

41.1 Only certain pull boxes may be indicated on the drawings. Provide a minimum of one pull box for every 30m (100') of conduit run with each 90 degree bend equating to a 9m (30') run of conduit.

41.2 Do not install more than two (2) 90 degree bends between two pull boxes.

41.3 Provide identification nameplates on all pull boxes.

42 Pull Strings

42.1 Provide nylon pull strings in all empty conduits.

43 Grounding and Bonding

43.1 Provide all grounding as per the latest edition of the Ontario Electrical Safety Code and local regulations. Megger all power circuit feeders and isolated ground feeders. If resistance to ground on any feeder is below that required by CSA or other governing authorities, these feeders shall be considered defective and shall be replaced.

43.2 Perform ground continuity and resistance tests on the grounding system using method appropriate to site conditions and to approval of Engineer and local Authorities Having Jurisdiction over the installation. Perform all required tests before energizing the electrical system.

43.3 Provide separate green insulated ground conductor in every feeder and branch wiring power conduit.

43.4 Provide bonding conductor for non-current-carrying conductive parts of electrical equipment, metal raceway, armoured cable per O.E.S.C. and table 16.

43.5 Provide equipotential bonding for non-electrical equipment per O.E.S.C.

44 Mechanical Wiring

44.1 Coordinate all equipment supplied by other trades to ensure voltage and amperage compatibility with design documents prior to equipment being ordered and prior to rough-in of circuits to same.

44.2 Unless shown otherwise, Division 15 Contractor shall provide all starters and control wiring for HVAC equipment and all other equipment and systems provided under Division 15. Division 16 Contractor shall receive and install all starters and shall provide line side and load side line voltage wiring and required disconnect switches. Confirm all requirements and equipment locations with Division 15 Contractor prior to rough-in.

44.3 Control wiring including conduit for all mechanical equipment shall be supplied and installed by Division 15.

44.4 Fan switches shall be supplied by Division 15 for installation and wiring by Division 16.

45 Wiring Devices and Outlet Boxes

45.1 All wiring devices and coverplates shall be specification grade.

45.2 Duplex receptacles shall be decora style, specification grade, 15A, 120V unless otherwise noted. Refer to Architect/Interior Designer's power and communications plans for exact location and mounting height of receptacles and all other wiring devices and outlet boxes. In millwork areas refer to the Architect/Interior Designer's millwork details for this information. Where Architect/Interior Designer's power and communications plans are not available have the Architect/Interior Designer or Owner mark the locations on site prior to rough-in. Verify colour with Architect/Design Consultant prior to installation.

45.3 Local switches shall be decora style, specification grade, 20A with voltage rating as required to suit the voltage of the load being controlled. Verify exact location, mounting height and colour with the Architect/Design Consultant prior to installation.

45.4 Flush mounted devices shall have stainless steel coverplates unless otherwise noted.

45.5 Junction boxes on walls with acoustic panels shall be extended flush with finish of the acoustic panels.

45.6 Outlets shall not be installed back-to-back in partitions. Stagger to prevent sound transfer.

46 Wall Dimmers

46.1 Dimmers shall be fluorescent, LED or low voltage type as required to suit the load being controlled.

46.2 Individual dimmers shall be sized for the total load being controlled plus 25% spare capacity.

46.3 All dimmers and coverplates shall be specification grade.

47 Systems Furniture

47.1 Coordinate exact requirements for power and communication feeds to workstations with workstation supplier prior to rough-in. Provide all final power and voice/datacconnections and disconnections to workstations as required to suit the new layout. Allow for all costs in the tender price.

48 Fire Alarm System

48.1 All new devices shall match the existing system in manufacturer and types. Verify with the existing system manufacturer during the tender period all requirements, wiring and specifications for new devices shown on the drawings. Include for any new circuits, modules, amplifiers, programming and set-up that may be required in the existing fire alarm control panels. Obtain a verification certificate from the fire alarm system manufacturer or maintenance agent for all modifications to the fire alarm system and/or devices.

48.2 Unless otherwise shown, reconnect existing fire alarm system devices and retain in working order throughout construction.

48.3 Provide for all 120V power connections to suit the requirements of the fire alarm system.

48.4 Contractor and/or Owner to verify with the City prior to the fire alarm verification and coordinate if City Inspector wants to be present at the time of verification.

48.5 All fire alarm work shall conform to Standards CAN/ULC-S524, CAN/ULC-S536 and O.B.C. Fire alarm verification shall conform to Standards CAN/ULC-S537 and CAN/ULC-S1001 (Integrated Systems Testing of Fire Protection and Life Safety Systems).

49 Security System

49.1 Provide new or modify existing conduits, device back boxes, pull strings and conductors required for the modifications to the security system as shown on the drawings or required by the security system contractor. The Electrical Contractor shall coordinate all requirements with the Owner's Security Contractor during the tender period and shall include for all costs.

49.2 Provide for all 120V power connections to suit the requirements of the security system.

50 Circuiting

50.1 Circuiting shown is for grouping purposes only. Verify exact circuits available on site and provide new circuits and breakers as required. Indicate exact circuits used on the as-built drawings. Balance loads within 10% across all phases and submit test report for review by the Consultant.

50.2 Contractor shall re-use existing spare circuits within the space that may be found during demolition prior to running new circuits from panels.

50.3 Existing emergency and normal circuits for general lighting may not be as shown. Ensure final circuiting of all lighting, including normal circuits, emergency power circuits and night light fixtures to be as shown on the drawings.

50.4 The work shall be complete and shall include all junction and pull boxes, sockets, connections, raceways, fittings, supports, etc., and all the necessary and appropriate hardware, whether or not it is shown on the drawings for complete and fully operational systems. Identify each junction/pull box according to the panel and circuit number of the wires it contains.

51 Power Distribution Equipment – General

51.1 The products shall be of same manufacturer as base building unless approved otherwise by the Owner. Where approved otherwise products shall be as manufactured by Cutler-Hammer, Schneider or Siemens.

51.2 All transformers, distribution panels, and branch circuit panelboards shall be complete with copper bus (or windings), and shall be of same type and manufacture as existing in base building unless otherwise noted.

51.3 Provide sprinkler proof enclosures for all power distribution equipment in sprinklered buildings.

51.4 Ensure that all neutrals of all transformers are grounded to the building ground system in accordance with O.E.S.C. and table 16. Verify location of appropriate building grounding point on site during tender period.

51.5 All fuses shall be HRC type "J" with time delay unless shown otherwise.

51.6 Provide 4" high concrete housekeeping pad under all power distribution equipment that is to be floor mounted, whether or not same is shown on the drawings.

52. Not Used

53 Plywood Backboards

53.1 Plywood backboards shall be of the highest quality fire retardant fir, 19mm thick, primed and painted with fire retardant paint.

53.2 All electrical equipment shall be mounted on plywood backboards.

53.3 Provide plywood backboards in communications rooms, sized as noted on the drawings.

54. Cable Tray

54.1 The cable tray system shown on the drawings shall be CER '81' series Cable Tray System, or Wiremold Cablofil approved equal, comprised of 0.187" diam. zinc plated steel wire that has been welded into a 2" x 4" steel grid that can be custom cut to size on site.

54.2 Width shall be as noted on the drawings. Depth of tray system shall be 4". Refer to floor plan for routing.

54.3 Cable Tray shall be comprised of 10' sections, custom cut sections, 'L' connections and 'T' connections as required to suit layout shown on the floor plan. Inner bends of all turns shall be rounded to suit ease of cable pulling.

54.4 Finish shall be standard black finish.

54.5 All custom cuts shall be made in accordance with manufacturer's instructions.

54.6 The complete cable tray system shall be installed at the same elevation and be horizontally level. Confirm exact mounting height on site with Architect prior to commencing installation. Where changes in elevation are required due to obstructions on site, these shall be made in accordance with the manufacturer's instructions while maintaining the continuity of the cable tray system.

54.7 Provide all mounting hardware as required to suit installation.

54.8 Provide #2 AWG bare copper ground wire throughout cable tray system and connect to each section of tray using split bolt connector. Connect to building grounding system.

55 Testing

55.1 Provide all testing and start-up for each system to suit the manufacturer's requirements and to satisfactorily demonstrate to the Owner and Consultant that the system and/or equipment are operating in accordance with its intended purpose.

55.2 Provide all required testing to suit the local Authorities Having Jurisdiction.

55.3 All costs involved with all testing shall be fully borne by this Contractor. All testing and commissioning where same will cause electrical service interruptions to the building shall be performed during overnight hours.

55.4 Upon completion of installation turn off all non-emergency lighting in presence of the Consultant and demonstrate all luminaires that are intended to be on emergency power circuits are correctly connected to these circuits. Take emergency lighting readings with only the emergency lighting in operation and submit to the Consultant for review. Contractor and/or Owner to verify with the City prior to the emergency lighting testing and coordinate if City Inspector wants to be present at the time of testing.

56 Circuit Breaker:

Bolt-on moulded case circuit breaker, quick make, quick break type, for manual and automatic operation. Single handle for multi pole applications. Magnetic instantaneous trip elements to operate only when value of current reaches setting. Trip setting on breaker with adjustable trips to range from 3 to 8 times current rating. Interrupting capacity to match existing or as noted. Moulded case circuit breaker to operate by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection. For breaker over 150A, shall be complete with interchangeable trip. For breaker more than 200A shall be solid state type with LSI adjustable overload long time delay, short circuit short time delay and short circuit instantaneous trip.

58 Integrated Systems Testing (IST)

58.1 Provide Integrated Systems Testing as indicated in CAN/ULC-S1001 "Integrated Systems Testing of Fire Protection And Life Safety Systems.

58.2 Contractor shall engage with a 3rd party contractor to arrange for this work. The 3rd party contractor should either be ULC certified IST provider or a licensed Engineer with Professional Engineers Ontario with IST experience: Recommendation below.

Brosz Technical Services Inc.
1300 Rodick Road, Unit C
Markham ON L3R 8C3
905-472-6660
bids@brosz.net

58.3 In general, systems to be tested for proper integration with the fire alarm system are noted in CAN/ULC-S1001 and include but are not limited to elevators, cooking equipment fire suppression systems, hold-open devices, electromagnetic locks, smoke control systems, emergency generators, audio/visual and/or lighting controls, notification systems, sprinkler systems, standpipe systems, fire pumps, water supplies, water supply control valves, freeze protection systems, fixed fire suppression systems. For this project the integrated systems to be tested are: [consultant engineer to specify]

58.4 The test plan and proposed reports shall be submitted to the Consultant for approval prior to scheduling the IST.

58.5 Provide completed IST reports upon completion of fire alarm verification and submission of verification reports and other documentation that is required by the consultant engineer [and governmental Authority Having Jurisdiction (AHJ)] for the integrated systems testing of the project.

DRAWING LIST

Hamilton-Wentworth Catholic District School Board

NO	REVISIONS	DATE
3	ISSUED FOR TENDER	2025-03-21
2	ISSUED FOR PERMIT	2025-03-13
1	ISSUED FOR COORDINATION	2025-03-03

LICENSED PROFESSIONAL ENGINEER P.A. COUILARD 25703781 PROVINCE OF ONTARIO 25 012

BISHOP TONNOS CSS CLASSROOM RENOVATIONS

100 Panabaker Dr, Ancaster, ON L9G 5E3

ELECTRICAL SPECIFICATIONS

GRGURIC ARCHITECTS INCORPORATED

28 KING STREET EAST, UNIT B
STONEY CREEK, ONTARIO, L8G 1J8
Tel. 905-664-8735 Fax. 905-664-8737
Web: www.2gai.com

SCALE: AS NOTED	PROJECT: 25-012
START DATE: FEB 2025	
DRAWN DK	DRAWING: E1.0
CHECKED PC	
PRINT DATE	

DRAWING GENERAL NOTES

1. REFER TO ARCHITECTURAL/INTERIOR DESIGN DRAWINGS FOR ALL FIRE RATED AND SMOKE RATED WALLS. SEAL ALL CONDUIT PENETRATIONS THROUGH SUCH WALLS IN ACCORDANCE WITH SPECIFICATIONS.
2. COORDINATE WORK WITH THE GENERAL CONTRACTOR TO LEAST INTERFERE WITH THE OWNER'S USE OF THE FACILITY. GENERAL CONTRACTOR MAY REQUIRE WORK INTERRUPTIONS DURING THE DAY AND MAY REQUIRE CERTAIN WORK TO BE PERFORMED ON PREMIUM TIME AT NIGHT OR ON WEEKENDS.
3. COMPLETE EXTENT OF DEMOLITION IS NOT SHOWN. TENDERERS SHALL REVIEW THE SITE TOGETHER WITH THE DOCUMENTS OF ALL OTHER TRADES TO DETERMINE THE FULL EXTENT OF DEMOLITION. MAKE ALL ALLOWANCES FOR ANY NEW OR EXISTING SERVICES, DEVICES, OR EQUIPMENT RELOCATIONS NECESSARY TO COMPLETE THE WORK AS INTENDED BY THE DRAWINGS. ALLOW FOR ALL COSTS.
4. VISIT AND EXAMINE CAREFULLY THE BUILDING SO AS TO BECOME FAMILIAR WITH EXISTING CONDITIONS AND DIFFICULTIES THAT WILL AFFECT THE EXECUTION OF THE WORK, BEFORE SUBMITTING PROPOSALS. SUBMISSION OF A PROPOSAL WILL BE EVIDENCE THAT SUCH EXAMINATION HAS BEEN MADE AND LATER CLAIMS FOR LABOUR, EQUIPMENT OR MATERIALS BECAUSE OF DIFFICULTIES ENCOUNTERED, WILL NOT BE RECOGNIZED.
5. WHERE RELOCATION OF EXISTING LUMINAIRES AND DEVICES IS INVOLVED, ADDITIONAL LUMINAIRES AND DEVICES MAY BE REQUIRED. CONTRACTOR TO CONFIRM QUANTITIES REQUIRED. ADDITIONAL LUMINAIRES AND DEVICES REQUIRED SHALL BE SUPPLIED AND INSTALLED BY DIVISION 16 CONTRACTOR. LUMINAIRES AND DEVICES TO MATCH EXISTING BASE BUILDING STANDARD AND/OR AS SPECIFIED.
6. ALLOW FOR REMOVAL AND RE-INSTALLATION OF EXISTING DEVICES TO PERMIT NEW ARCHITECTURAL/INTERIOR DESIGN FINISHES. REMOVE AND RE-INSTALL ALL CEILING MOUNTED LUMINAIRES AND DEVICES WHERE T-BAR CEILING TILES ARE TO BE TEMPORARILY REMOVED OR REPLACED. REVIEW ARCHITECTURAL/INTERIOR DESIGN PLANS DURING TENDER PERIOD TO DETERMINE FULL EXTENT OF THE WORK.
7. CONTRACTOR SHALL NOT RE-USE RECEPTACLES AND SWITCHES FROM DEMOLITION. ALL RECEPTACLES AND SWITCHES INSTALLED SHALL BE NEW UNLESS OTHERWISE NOTED.
8. NOT ALL REQUIRED FEEDERS AND BRANCH CIRCUIT CONDUITS ARE SHOWN ON THE FLOOR PLANS. REFER TO SINGLE LINE DIAGRAM AND PANEL SCHEDULES FOR ADDITIONAL INFORMATION.
9. FOR X-RAY WORK GUIDELINES AND REQUIREMENTS REFER TO THE ELECTRICAL GENERAL REQUIREMENTS THAT FORM PART OF THE ELECTRICAL SPECIFICATIONS.
10. CIRCUITING IS SHOWN FOR GROUPING PURPOSES ONLY. EXISTING CIRCUITS THAT ARE TO REMAIN ARE NOT SHOWN ON PANEL SCHEDULES OR ON FLOOR PLANS. CONTRACTOR SHALL MAINTAIN/REWORK EXISTING CIRCUITS AS REQUIRED AND INSTALL NEW CIRCUITS IN REMAINING BREAKER POSITIONS IN PANELS. SHOW FINAL CIRCUIT NUMBERS USED ON FLOOR PLANS AND PROVIDE FINAL PANEL SCHEDULES ON THE AS-BUILT DRAWINGS AND PANEL DIRECTORIES IN THE PANELS. TYPICAL FOR ALL PANELS.
11. ALL REDUNDANT OR UNUSED BRANCH WIRING THAT IS REMOVED DURING DEMOLITION SHALL BE CUT BACK TO SOURCE PANEL AND DISCONNECTED FROM PANEL. THESE CIRCUITS SHALL BE IDENTIFIED AS SPARE AND BE MADE AVAILABLE FOR RE-USE.
12. REFER TO MECHANICAL DRAWINGS FOR EXACT SIZE, LOCATION, AND ELECTRICAL REQUIREMENTS FOR ALL MOTORS AND MECHANICAL EQUIPMENT. COORDINATE WITH MECHANICAL CONTRACTOR AND PROVIDE ELECTRICAL CONNECTIONS AS REQUIRED FOR A COMPLETE AND FULLY OPERABLE SYSTEM.
13. CONTRACTOR SHALL COORDINATE WITH ALL "VENDOR" TRADES FURNISHING EQUIPMENT REQUIRING ELECTRICAL CONNECTIONS. CHECK CAREFULLY ALL CONSTRUCTION DRAWINGS AND SPECIFICATIONS THAT ARE PART OF THIS PROJECT TO ENSURE COMPLIANCE WITH VENDOR REQUIREMENTS. NO EXTRA CHARGES SHALL BE ACCEPTED BY OWNER, AFTER BIDDING FOR SUCH EQUIPMENT AND LABOR.
14. COORDINATE WORK WITH FIELD CONDITIONS AND OTHER TRADES AND INSTALL CONDUIT AND BOXES TO CLEAR EMBEDDED DUCTS, OPENINGS AND OTHER STRUCTURAL FEATURES.
15. NOT ALL OF THE REQUIRED BOXES, CONDUITS, WIRING AND SLEEVING ARE SHOWN ON THE DRAWINGS. ONLY MAJOR ITEMS ARE SHOWN. COORDINATE AND PROVIDE ALL WORK AS REQUIRED FOR PROPER DEMOLITION AND INSTALLATION.
16. NO WIRING SHALL BE DONE PRIOR TO THE CONTRACTOR'S REVIEW OF THE PROJECT EQUIPMENT SHOP DRAWINGS. COORDINATE FIELD CONDITIONS WITH THE DESIGN DOCUMENTS. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ARCHITECT/INTERIOR DESIGNER/ENGINEER'S ATTENTION FOR FINAL RESOLUTION. WIRING THAT HAVE TO BE REPLACED DUE TO LACK OF PROPER SHOP DRAWING COORDINATION SHALL BE DONE AT CONTRACTOR'S EXPENSE.
17. ALL OUTLETS BOXES SHALL BE PROVIDED WITH PROPER COVER PLATES.
18. CIRCUITS ARE SIZED ASSUMING NO MORE THAN THREE CURRENT CARRYING CONDUCTORS IN A SINGLE CONDUIT. FOR CONDUITS CONTAINING MORE THAN THREE, PROVIDE APPROPRIATE DE-RATING OF CONDUCTORS PER APPLICABLE CODES.
19. CONTRACTOR SHALL ENSURE THAT ALL EXISTING DEVICES THAT ARE TO REMAIN IN THE ROOM SHOWN ON THE NEW PLANS AND DO NOT INTERFERE WITH NEW PARTITION WALLS. ALLOW FOR RELOCATION OF DEVICES WHERE REQUIRED.
20. CLEARLY MARK ALL EXPOSED CONDUITS, PULL BOXES, JUNCTION BOXES, ETC. TO INDICATE THE NATURE OF THE SERVICES AS PER BASE BUILDING STANDARDS.
21. ALL WORK ASSOCIATED WITH THE CORE DRILLING, POWER SHUTDOWNS, MODIFICATIONS TO BASE BUILDING LIFE SAFETY, EMERGENCY LIGHTING, LOW VOLTAGE LIGHTING CONTROL AND SECURITY SYSTEM SHALL BE PERFORMED AFTER REGULAR BUSINESS HOURS AND AT THE TIMES APPROVED BY THE LANDLORD.
22. ALL LIGHTING FIXTURES (EXISTING, RELOCATED, AND NEW) TO BE PROPERLY SUPPORTED FROM THE BUILDING STRUCTURE. PROVIDE CONFORMANCE LETTER AS PART OF CLOSE-OUT DOCUMENT.
23. ENSURE THAT ALL ELECTRICAL, LIFE SAFETY SERVICES AND SERVICES FOR EXISTING LUMINAIRES AND DEVICES THAT ARE REQUIRED TO REMAIN IN SERVICE SHALL DO SO.
24. BE RESPONSIBLE AND PAY FOR ANY DAMAGE TO THE BUILDING INCURRED BY WORK OF THIS CONTRACTOR OR REPAIR TO THE SATISFACTION OF THE OWNER AND CONSULTANT.
25. CARRY OUT THE WORK WITH A MINIMUM OF NOISE, DUST AND DISTURBANCE.
26. ENSURE TO RUN ALL CONDUITS IN OPEN CEILING AREAS TO BE AS CONCEALED AS POSSIBLE, RUN CLOSE TO THE DUCTS WHERE PRACTICAL AND TO PRESENT A NEAT APPEARANCE. WHERE THE CONDUIT RUNS ON EXISTING BLOCK/CONCRETE WALLS/COLUMNS, SURFACE MOUNT RACEWAY (LEGRAND WIREMOLD 500 OR 700) IS ALLOWED.

SPECIAL NOTES – FIRE ALARM SYSTEM

1. EXISTING FIRE ALARM SYSTEM IS MANUFACTURED BY EDWARDS(EST)-"QUICKSTART" SERIES. ELECTRICAL CONTRACTOR SHALL PROVIDE ALL FIRE ALARM SYSTEM WORK INDICATED ON THE DRAWINGS.
2. ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL, RELOCATION, SUPPLY AND INSTALLATION OF ALL FIRE ALARM SYSTEM DEVICES AND ANCILLARY EQUIPMENT. ALL NEW FIRE ALARM SYSTEM DEVICES AND EQUIPMENT SHALL MATCH EXISTING.
3. ALL FIRE ALARM FINAL TIE-IN, TESTING AND VERIFICATIONS SHALL BE PERFORMED BY THE BASE BUILDING FIRE ALARM MAINTENANCE CONTRACTOR. ELECTRICAL CONTRACTOR SHALL RETAIN THE SERVICES OF THE BASE BUILDING FIRE ALARM MAINTENANCE CONTRACTOR TO PERFORM THIS WORK AND SHALL INCLUDE AL THE COSTS IN THE TENDER.
4. ALL FIRE ALARM SYSTEM RE-PROGRAMMING SHALL BE PERFORMED BY THE BASE BUILDING FIRE ALARM MANUFACTURER. THE ELECTRICAL CONTRACTOR SHALL RETAIN THE SERVICES OF THE BASE BUILDING FIRE ALARM MANUFACTURER TO PERFORM THIS WORK AND SHALL INCLUDE ALL THE COSTS IN THE TENDER PRICE.
5. THE ELECTRICAL CONTRACTOR SHALL COORDINATE WITH FIRE ALARM MAINTENANCE CONTRACTOR AND MANUFACTURER DURING THE TENDER PERIOD TO CONFIRM ALL WIRING REQUIREMENTS NECESSARY TO PERFORM THE FIRE ALARM WORK. NO EXTRA COSTS WILL BE PERMITTED AS A RESULT OF FAILURE BY THE CONTRACTOR TO OBTAIN THE NECESSARY INFORMATION. ELECTRICAL CONTRACTOR SHALL PURCHASE ALL REQUIRED FIRE ALARM EQUIPMENT, DEVICES, AMPLIFIERS AND ANCILLARY COMPONENTS FROM BASE BUILDING FIRE ALARM MANUFACTURER.
6. ELECTRICAL CONTRACTOR SHALL MAKE ARRANGEMENTS WITH THE LANDLORD PRIOR TO ANY WORK ON THE FIRE ALARM SYSTEM.
7. REFER ALSO TO ELECTRICAL SPECIFICATIONS SECTION 48.
8. ALL LIFE SAFETY SYSTEMS INTEGRATED WITH THE FIRE ALARM SYSTEM MUST BE VERIFIED AND DOCUMENTED IN ACCORDANCE WITH O.B.C. 3.2.10.1 AND THE LATEST EDITION OF CAN/ULC-S1001-11, "STANDARD FOR INTEGRATED SYSTEMS TESTING OF FIRE PROTECTION AND LIFE SAFETY SYSTEMS". THE FOLLOWING IS TO BE PREPARED AND SUBMITTED BY THE ELECTRICAL CONTRACTOR AND SIGNED BY A P.ENG. TO THE CONSULTANT FOR REVIEW AT THE START OF THE PROJECT:

A. INTEGRATED TESTING PLAN – A WRITTEN SPECIFIC DOCUMENT PREPARED BY THE INTEGRATED TESTING COORDINATOR, OUTLINING THE REQUIRED TESTS AND NECESSARY FUNCTIONAL RESULTS TO CONDUCT INTEGRATED FIRE PROTECTION AND LIFE SAFETY SYSTEMS TESTING.

B. INTEGRATED TESTING REPORT – A WRITTEN PROJECT SPECIFIC DOCUMENT, PREPARED BY THE INTEGRATED TESTING COORDINATOR, DOCUMENTING THE IMPLEMENTATION OF THE INTEGRATED TESTING PLAN.

THE FOLLOWING SYSTEMS (WHERE APPLICABLE) ARE TO BE INTEGRATED INTO THE TESTING PLAN AND TESTING REPORT:

.1	FIRE ALARM SYSTEM (INCLUDING SEQUENCE OF OPERATION)
.2	MASS NOTIFICATION SYSTEM
.3	ELEVATORS
.4	EMERGENCY GENERATORS
.5	AUDIO/VISUAL SYSTEM
.6	LIGHTING CONTROL SYSTEM
.7	NOTIFICATION SYSTEMS
.8	FIRE PROTECTION SYSTEM INCLUDING SPRINKLER SYSTEM, STANDPIPE, ETC.
.9	FREEZE PROTECTION SYSTEMS
.10	FIRE SUPPRESSION SYSTEMS
.11	SMOKE CONTROL PRESSURIZATION SYSTEMS
.12	SMOKE CONTROL SMOKE EXHAUST SYSTEMS
.13	HAZARDOUS PROTECTION MONITORING
.14	SMOKE ALARMS
.15	NURSE CALL SYSTEM
.16	OTHER SYSTEM (WHERE APPLICABLE)

9. ELECTRICAL CONTRACTOR TO OBTAIN THE CONTACT PERSON OF THE BASE BUILDING FIRE ALARM MAINTENANCE CONTRACTOR FROM THE LANDLORD.
   Hamilton Fire Control:
   Telephone Number: 905-527-7042
   matt@hamiltonfirecontrol.ca
   Attn: Matt Scarabacha

LIGHTING NOTES

1. WITHIN 10 WORKING DAYS OF CONTRACT AWARD, THE CONTRACTOR SHALL PROVIDE SUBMITTALS FOR ALL SPECIFIED LUMINAIRES FOR THE REVIEW BY THE DESIGN TEAM. THE SUBMITTALS SHALL INCLUDE LUMINAIRE CATALOG CUTS INDICATING THE FOLLOWING:
   - MANUFACTURER'S NAME AND COMPLETE CATALOG NUMBER
   - FIXTURE TYPE DESIGNATION
   - COMPLETE DIMENSIONS AND FINISHES
   - FIXTURE PHOTOMETRIC TEST DATA FROM AN INDEPENDENT TESTING LABORATORY.
   - ALL FIXTURE OPTIONS AND ACCESSORIES WHEN SPECIFIED
   - LAMP TYPE, QUANTITY PER LUMINAIRE, WATTAGE, LUMEN OUTPUT, RATED LIFE, COLOUR TEMPERATURE, COLOUR RENDERING INDEX AND BEAM SPREAD.
   - LED CHIPS DRIVER TYPE, VOLTAGE AND MANUFACTURER AS APPLICABLE
2. CONTRACTOR SHALL CONFIRM THAT LUMINAIRE VOLTAGES ARE COMPATIBLE WITH THEIR APPLICATION AND SYSTEM CIRCUITING PRIOR TO ORDERING FIXTURES.
3. LUMINAIRES, LAMPS AND RELATED DEVICES PROVIDED UNDER THIS CONTRACT SHALL CARRY THE APPROVAL LABEL OF CSA FOR THE SPECIFIC APPLICATION IN WHICH THEY ARE USED.
4. CONTRACTOR SHALL PROVIDE THE CORRECT SIZE OF THE CONDUCTORS TO KEEP VOLTAGE DROP IN THE SECONDARY WIRING BELOW 3% OF THE RATED VOLTAGE.
5. SUBMISSIONS SHALL COMPLY WITH ALL PERFORMANCE SPECIFICATIONS.
6. EQUALS OF THE SPECIFIED LUMINAIRES WILL BE CONSIDERED. ALTERNATES WILL NOT BE CONSIDERED.

ALL LUMINAIRES SHALL BEAR EITHER CSA OR cETL OR cUL MARK TO MEET CODE IN CANADA. LUMINAIRES WITH ETL OR UL MARK WILL NOT BE CONSIDERED TO SATISFY STANDARDS IN CANADA.

CONTRACTOR SHALL CONFIRM WITH LUMINAIRE SUPPLIER OR SHOP DRAWINGS TO SELECT PROPER DIMMER TO ENSURE THE DIMMING PROTOCOL (ELV OR 0-10V) BETWEEN DIMMER AND THE LUMINAIRE TO BE THE SAME PRIOR TO SUBMITTING SHOP DRAWINGS OF DIMMERS.

CONTRACTOR SHALL HAVE THE LIGHTING CONTROLS MANUFACTURER/SUPPLIER PROVIDE A FULL SET OF FLOOR PLANS DOCUMENTING ALL CONTROLS HARDWARE, COMPONENTS, WIRING, ETC FOR A COMPLETE AND OPERATIONAL SYSTEM AND INCLUDE ALL COSTS.

CONTRACTOR TO ADJUST THE SENSITIVITY AND AIMING DIRECTION OF OCCUPANCY SENSORS ON SITE TO ENSURE THE SENSORS ENGAGE THE LIGHTING FIXTURES AT APPROPRIATE DISTANCE AND ANGLE.

LUTRON-LIGHTING CONTROLS

#$OS	#MAESTRO SERIES OCC/VAC
#$OF	#MAESTRO SERIES OCC/VAC + FAN (DUAL CCT)
#$OD	#MAESTRO SERIES OCC/VAC/DIMMER (TO MATCH FIXTURE DIMMING PROTOCOL)
XXXX	#LOS-CDT-WH (500, 1000, 2000 SF)
#$D	#DIVA DIMMER 0-10V

WHERE NOTED;
(#) INDICATES QTY OF DEVICES INSTALLED AT LOCATION
d(#) INDICATES DIMMER 'LEG' CONTROLLING FIXTURES.

CEILING SENSORS SHALL BE AISLEWAY STYLE FOR CORRIDOR APPLICATIONS

CONTRACTOR TO SUBMIT PLANS TO VENDOR TO COORDINATE LAYOUTS, COVERAGE, DEVICE SPECIFICATIONS, LUMINAIRE COMPATIBILITY, INTERCONNECTION DETAILS AND WIRING ETC... TO ENSURE A FULLY COORDINATED INSTALLATION.

VENDOR TO PROVIDE WIRING DIAGRAM SHOP DRAWINGS SUBMITTALS

CONTRACTOR TO FULLY COORDINATE PROGRAMMING OF ALL DEVICES AND SETUP TO ENSURE INTENDED/DESIRED OPERATION IS PROVIDED. INCLUDE DEMONSTRATION AND TRAINING TO OWNERS REPRESENTATIVE.

PROVIDE CORRESPONDING DIMMING PROTOCOL FOR LINE VOLTAGE AND 0-10V LUMINAIRES, REFER TO FIXTURE SCHEDULE.

ALL DEVICES SHALL BE MATCHING STYLE/FACE AND COVERPLATE.

SECURITY/CCTV NOTES:

OWNERS SECURITY CONTRACTOR SCOPE: (OWNERS FORCES-NOT BY ELECTRICAL)

1. THE SECURITY ACCESS AND CCTV CONTRACTOR SHALL PROVIDE ALL DEVICES, HARDWARE, PROGRAMMING CABLING WORK AS SHOWN. INCLUDE ALL COSTS IN TENDER PRICE FOR A COMPLETE AND OPERATIONAL SYSTEM.
2. THE SCOPE OF WORK OF THE SECURITY CONTRACTOR SHALL BE ALL THE WORK NORMAL TO THE CABLING AND DEVICES INSTALLATION INCLUDING BUT NOT LIMITED TO ALL CABLING, JACKS/INSERTS, COVERPLATES, CABLE MANAGERS, ETC, ALL BY THE SECURITY CONTRACTOR AS DETERMINED BY THE OWNER
3. CCTV UNITS WILL BE POE WITH 1-DATA DROP PER POINT AS SHOWN. SHOWN FOR REFERENCE PURPOSES THIS PLAN ONLY.

ELECTRICAL CONTRACTOR SCOPE:

1. EXCEPT WHERE NOTED OTHERWISE ALL EMPTY CONDUITS AND BACKBOXES FOR THE SYSTEMS SHALL BE PROVIDED BY THE ELECTRICAL CONTRACTOR. ALL LINE VOLTAGE WORK SHALL BE PROVIDED BY THE ELECTRICAL CONTRACTOR.
2. ALL CABLING INSTALLED IN T-BAR CEILINGS SHALL BE SUPPORTED BY J-HOOKS. MAXIMUM SPACING BETWEEN J-HOOKS 5'. INSTALL CABLING IN NEAT AND ORGANIZED BUNDLES AND DO NOT LAY CABLES ON THE T-BAR CEILING. ALL CABLING IN T-BAR CEILINGS SHALL BE RUN IN CONDUIT TO NEAREST ACCESSIBLE CEILING OR TO DESIGNATED SECURITY ROOM.
3. BACKBOX LOCATIONS ARE APPROXIMATE ONLY AND SHALL BE ADJUSTED TO SUIT THE SECURITY/ACCESS/CCTV CONSULTANTS LAYOUTS
4. MOUNTING HEIGHTS OF ALL DEVICES IS ESTABLISHED BY THE SAME CONSULTANT, ELECTRICAL CONTRACTOR TO INSTALL AS REQUIRED.

NOTE:

SYSTEMS GENERALLY CONSISTS OF, CAMERAS, CONTROLLERS, READERS, REQUEST TO EXIT, DOOR LOCK/LATCH, PUSHBUTTONS ALL CABLING ETC..

ELECTRICAL PLANS SHOW LOCATIONS FOR ARRANGEMENT AND COORDINATION

STRUCTURED CABLING NOTES:

OWNERS COMMUNICATIONS CONTRACTOR SCOPE:(OWNERS FORCES-NOT BY ELECTRICAL)

1. THE COMMUNICATIONS CONTRACTOR SHALL PROVIDE ALL STRUCTURED CABLING WORK AS SHOWN. COMMUNICATIONS CONTRACTOR SHALL INSTALL AN END-TO-END SOLUTION FOR DATA BETWEEN PATCH PANELS AND OUTLETS. INCLUDE ALL COSTS IN TENDER PRICE FOR A COMPLETE AND OPERATIONAL SYSTEM.
2. THE SCOPE OF WORK OF THE COMMUNICATIONS CONTRACTOR SHALL BE ALL THE WORK NORMAL TO THE HORIZONTAL CABLING INSTALLATION INCLUDING BUT NOT LIMITED TO ALL CABLING, JACKS/INSERTS, COVERPLATES, PATCH PANELS, CABLE MANAGERS, COILED SLEEVES AT WORKSTATIONS, ETC, ALL BY THE COMMUNICATIONS CONTRACTOR DETERMINED BY THE OWNER.
3. WIRELESS ACCESS POINTS (WAP) WILL BE POE WITH 1-DATA DROP PER POINT AS SHOWN. SHOWN FOR REFERENCE PURPOSES THIS PLAN ONLY.

ELECTRICAL CONTRACTOR SCOPE:

1. EXCEPT WHERE NOTED OTHERWISE ALL EMPTY CONDUITS AND BACKBOXES FOR THE COMMUNICATIONS HORIZONTAL CABLING SYSTEM SHALL BE PROVIDED BY THE ELECTRICAL CONTRACTOR. ALL LINE VOLTAGE WORK SHALL BE PROVIDED BY THE ELECTRICAL CONTRACTOR.
2. ALL CABLING INSTALLED IN T-BAR CEILINGS SHALL BE SUPPORTED BY J-HOOKS OR MESH TRAY. MAXIMUM SPACING BETWEEN J-HOOKS 5'. INSTALL CABLING IN NEAT AND ORGANIZED BUNDLES AND DO NOT LAY CABLES ON THE T-BAR CEILING. RUN ALL CABLING TO SYSTEMS FURNITURE VIA PACK POLES SUPPLIED WITH SYSTEMS FURNITURE, OR VIA BASE FEEDS FROM WALL OR THROUGH FLOOR AS SHOWN. RUN ALL CABLING TO WALL OUTLETS AS PER DETAILS ON DETAILS DRAWNGS. ALL CABLING IN T-BAR CEILINGS SHALL BE RUN IN CONDUIT TO NEAREST ACCESSIBLE CEILING OR TO IT/SERVER ROOM.
3. PROVIDE ALL BONDING ON CABLE MESH TRAY SYSTEM AND BOND TO MAIN IT ROOM SYSTEM

NOTE:

SYSTEMS GENERALLY CONSISTS OF, RACKS, OUTLETS, ALL CABLING ETC..

ELECTRICAL PLANS SHOW LOCATIONS OF DEVICES FOR ARRANGEMENT AND COORDINATION

AV SYSTEMS NOTES:

OWNERS AV CONTRACTOR SCOPE: (OWNERS FORCES-NOT BY ELECTRICAL)

1. THE AV CONTRACTOR SHALL PROVIDE ALL DEVICES, HARDWARE, PROGRAMMING CABLING WORK AS PART OF SEPARATE WORK SCOPE AS DIRECTED BY THE OWNERS FORCES. NO WORK TO BE CARRIED BY THE ELECTRICAL CONTRACTOR
2. THE SCOPE OF WORK OF THE AV CONTRACTOR SHALL BE ALL THE WORK NORMAL TO THE CABLING AND DEVICES INSTALLATION INCLUDING BUT NOT LIMITED TO ALL CABLING (HDMI,AUDIO,VIDEO), JACKS/INSERTS, COVERPLATES, CABLE MANAGERS, ETC, ALL BY THE AV CONTRACTOR AS DETERMINED BY THE OWNER

ELECTRICAL CONTRACTOR SCOPE:

1. EXCEPT WHERE NOTED OTHERWISE ALL EMPTY CONDUITS, 'J' HOOKS AND BACKBOXES FOR THE SYSTEMS SHALL BE PROVIDED BY THE ELECTRICAL CONTRACTOR. ALL LINE VOLTAGE WORK SHALL BE PROVIDED BY THE ELECTRICAL CONTRACTOR.
2. ALL CABLING INSTALLED IN T-BAR CEILINGS SHALL BE SUPPORTED BY J-HOOKS. MAXIMUM SPACING BETWEEN J-HOOKS 5'. INSTALL CABLING IN NEAT AND ORGANIZED BUNDLES AND DO NOT LAY CABLES ON THE T-BAR CEILING. ALL CABLING IN T-BAR CEILINGS SHALL BE RUN IN CONDUIT TO NEAREST ACCESSIBLE CEILING OR TO DESIGNATED ROOM. UTILIZE BASKET TRAY WERE AVAILABLE.

NOTE:

SYSTEMS GENERALLY CONSISTS OF, MUSIC, PAGING, P/A, AUDIO, VIDEO AND ALL CABLING ETC..

ELECTRICAL PLANS SHOW LOCATIONS FOR ARRANGEMENT AND COORDINATION

Hamilton-Wentworth Catholic District School Board

NO	REVISIONS	DATE
3	ISSUED FOR TENDER	2025-03-21
2	ISSUED FOR PERMIT	2025-03-13
1	ISSUED FOR COORDINATION	2025-03-03

P.A. COUILLARD
25/07/31
PROVINCE OF ONTARIO
25 012

BISHOP TONNOS CSS CLASSROOM RENOVATIONS

100 Panabaker Dr, Ancaster, ON L9G 5E3

ELECTRICAL NOTES

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SCALE: AS NOTED	PROJECT: 25-012
START DATE: FEB 2025	
DRAWN DK	DRAWING: E1.1
CHECKED PC	
PRINT DATE	

ELECTRICAL LEGEND

SYMBOL	DESCRIPTION
	EXISTING LUMINAIRE TO REMAIN.
	EXISTING LUMINAIRE TO BE REMOVED OR RELOCATED.
	NEW LUMINAIRE OR EXISTING LUMINAIRE IN RELOCATED POSITION
	CROSS HATCHING DENOTES LUMINAIRE CONNECTED TO NIGHT LIGHT CIRCUIT OR EMERGENCY POWER SOURCE
	TRACK LIGHTING. LENGTH OF TRACK TO SCALE, QUANTITY OF FIXTURE HEADS AS INDICATED.
	COVE LIGHT.
	LINEAR OR STRIP LIGHT LUMINAIRE, CEILING MOUNTED.
	LINEAR OR STRIP LIGHT LUMINAIRE, WALL MOUNTED.
	WALL WASHER LUMINAIRE. CEILING MOUNTED (RECESSED OR SURFACE).
	DOWNLIGHT LUMINAIRE. CEILING MOUNTED (RECESSED OR SURFACE).
	WALL MOUNTED LUMINAIRE.
	PENDANT MOUNTED LUMINAIRE.
'A'	LUMINAIRE DESIGNATOR. LETTER DENOTES TYPE. REFER TO LUMINAIRE SCHEDULE.
	CEILING MOUNTED EXIT LIGHT C/W FACES AND ARROWS AS INDICATED. ARROWS INDICATE ILLUMINATED FACES AND DIRECTION. BARS INDICATE ILLUMINATED FACES ONLY.
	WALL MOUNTED EXIT LIGHT C/W FACES AND ARROWS AS INDICATED. ARROWS INDICATE ILLUMINATED FACES AND DIRECTION. BARS INDICATE ILLUMINATED FACES ONLY.
B.E.	EMERGENCY D.C. BATTERY UNIT C/W UNIT MOUNTED HEADS (QUANTITY OF HEADS AS INDICATED). MOUNTED AT 8'-0" A.F.F.
C C	REMOTE EMERGENCY D.C. LAMP UNIT (NUMBER OF HEADS AS INDICATED). MOUNTED AT 8'-0" A.F.F. 'C' DENOTES CEILING MOUNT.
$TAG	SINGLE POLE LINE VOLTAGE LIGHT SWITCH. VOLTAGE TO SUIT LOAD CONTROLLED.(TAG IDENTIFIES OTHER FUNCTION-SEE BELOW)
	3/4 - 3 or 4 WAY LINE VOLTAGE LIGHT SWITCH. VOLTAGE TO SUIT LOAD CONTROLLED.
	M - LIGHTING MASTER SWITCH FOR FLOOR AS INDICATED.
	F - EXHAUST FAN SWITCH, DECORA STYLE, COLOUR WHITE C/W WHITE COVERPLATE, SUPPLIED BY DIV. 15, INSTALLED BY DIV. 16.
	K - KEY OPERATED SWITCH.
	OS - WALL MOUNTED OCCUPANCY SENSOR , DUAL TECHNOLOGY OCCUPANCY SENSOR C/W 120V OR 347V POWER PACK AS REQUIRED AND ALL OTHER REQUIRED ACCESSORIES. VOLTAGE TO SUIT LOAD CONTROLLED.
	OD - WALL MOUNTED OCCUPANCY SENSOR DIMMER. DUAL TECHNOLOGY OCCUPANCY SENSOR C/W 120V OR 347V POWER PACK AS REQUIRED AND ALL OTHER REQUIRED ACCESSORIES. VOLTAGE TO SUIT LOAD CONTROLLED.
	D - DIMMER SWITCH (1 UNLESS NOTED OTHERWISE. RATING AND TYPE TO SUIT LOAD.(#) INDICATES QTY AT LOCATION d(#) INDICATES DIMMER/CIRCUIT CONTROLLING FIXTURES.
	PS - PROJECTION SCREEN SWITCH. SUPPLIED BY OTHERS AND INSTALLED C/W WIRING BY DIV. 16.
	LV - LOW VOLTAGE LIGHTING CONTROL STATION TIED TO LOW VOLTAGE LIGHTING CONTROL SYSTEM.
	B - MOTORIZED BLIND CONTROL SWITCH. SUPPLIED BY OTHERS AND INSTALLED C/W WIRING BY DIV. 16.
	GANGED SWITCHES.
LZ-#	CEILING MOUNTED OCCUPANCY SENSOR C/W 120V OR 347V POWER PACK AS REQUIRED AND ALL OTHER REQUIRED ACCESSORIES. TAG INDICATES 'ZONE' TO BE CONTROLLED (WHERE NOTED). OTHERWISE ALL SENSORS ACT IN UNISON FOR ALL AREA FIXTURES.
TS	LIGHTING CONTROL TOUCH SCREEN.
	INDICATES LEGS OR FIXTURE GROUPS CONTROLLED FROM WALL STATION.
	AUDIO VISUAL ROUGH-IN
TV	WALL MOUNTED CABLE TV OUTLET BOX. REFER TO DETAIL.
PJ	PROJECTOR, PROVIDE DUPLEX RECEPTACLE IN CEILING.
PS	PROJECTOR REGRESSED SCREEN, PROVIDE DUPLEX RECEPTACLE IN CEILING. WIRE CONTROL TO WALL SWITCH 'PS'
A B C	WALL MOUNTED OUTLETS GROUPING. REFER TO DETAILS FOR TYPES.
HD	HDMI DESIGNATED OUTLET, PROVIDE 1 GANG BOX AND 1" C TO CEILING VOID. WIRING BY AV CONTRACTOR. HD# INDICATES QTY. OF HDMI CABLES BY AV CONTRACTOR.
HD#	INDICATES QTY. OF HDMI CABLES BY AV CONTRACTOR.
V	VIDEO DESIGNATED OUTLET, PROVIDE 1 GANG BOX AND 1" C TO CEILING VOID. WIRING BY AV CONTRACTOR. # INDICATES QTY. OF AV CABLES BY AV CONTRACTOR.
CM	ZOOM MEETING CAMERA
SS	SOUND SYSTEM/ AV / PA SPEAKER

SYMBOL	DESCRIPTION
	POWER AND COMMUNICATIONS
	WALL MOUNTED DUPLEX RECEPTACLE, 15A, 120V UNLESS OTHERWISE NOTED.(20=20A, 120V T-SLOT (CSA 5-20R)
	WALL MOUNTED DUPLEX RECEPTACLE, ABOVE COUNTER OR SPECIAL HEIGHT AS NOTED.
	WALL MOUNTED DUPLEX SPLIT RECEPTACLE.
GFI	WALL MOUNTED DUPLEX RECEPTACLE WITH GROUND FAULT INTERRUPTER.
C	WALL OR POWER POLE MOUNTED SINGLE RECEPTACLE. 15A, 120V U-GROUND OR AS OTHERWISE INDICATED BY CSA CONFIGURATION OR VOLTAGE AND AMPERAGE AS INDICATED. 'C' DENOTES MOUNTED ABOVE T-BAR CEILING.
	WALL MOUNTED QUAD RECEPTACLE.
CL	SINGLE U-GROUND 15A, 120V RECESSED CLOCK RECEPTACLE, MOUNT AT HEIGHT INDICATED ON ARCHITECT'S DRAWINGS.
	FLUSH MOUNTED 'POKE THRU' FLOOR FITTING C/W 15A, 120V DUPLEX RECEPTACLES AND PROVISIONS FOR COMMUNICATIONS AND AV WHERE INDICATED. REFER TO DETAILS FOR TYPE. FLUSH MOUNTED IN CONCRETE.
	FLOOR MOUNTED DUPLEX RECEPTACLE, 15A, 120V.
	FLOOR MOUNTED QUADPLEX RECEPTACLE.
	FLOOR MOUNTED COMBINATION C/W 2- 120V DUPLEX RECEPTACLE(S) AND PROVISIONS FOR COMMUNICATIONS AND AV WHERE INDICATED. REFER TO DETAILS FOR TYPE.(LP=LOW PROFILE, FF=FLUSH FINISH)
F RC12,14 W P WF	DIRECT CONNECTION TO SYSTEMS FURNITURE. 'F' DENOTES FLOOR MOUNTED, 'W' DENOTES WALL BASE FEED, 'WF' DENOTES FLOOR MOUNTED FED FROM WIREMOLD, 'P' DENOTES PACK POLE SUPPLIED WITH SYSTEMS FURNITURE. REFER TO DETAILS AND SYSTEMS FURNITURE SCHEDULE WHERE APPLICABLE.
	WALL MOUNTED TELEPHONE OUTLET BOX. REFER TO DETAIL.
C	DATA OUTLET, WALL MOUNTED OR AS OTHERWISE SHOWN. REFER TO DETAILS. 'C' DENOTES MOUNTED ABOVE T-BAR CEILING.
WAP	WIRELESS ACCESS POINT
	WALL MOUNTED COMBINATION TELEPHONE/DATA OUTLET BOX. REFER TO DETAILS.
	VOICE/DATA OUTLETS MOUNTED IN TABLETOP MONUMENT. MONUMENT SUPPLIED BY OTHERS. PROVIDE JACKS AND TERMINATE COMMUNICATIONS CABLING AT MONUMENT. COORDINATE ALL WORK WITH AV CONTRACTOR AND CONFIGURATION OF TABLE.
P	POWER POLE WITH DEVICES AS SHOWN.
W	FLOOR OR WALL MOUNTED RACEWAY C/W QUANTITY OF DEVICES INDICATED AND BARRIER FOR 2-COMPARTMENTS. WIREMOLD 4000 SERIES WITH SCUFFCOAT FINISH COLOUR AS DIRECTED BY ARCHITECT, UNLESS OTHERWISE NOTED. FEED FROM RECESSED EMT OR FLEXIBLE CONDUITS INSIDE WALL/COLUMN FROM ACCESSIBLE CEILING SPACE, FOR POWER AND DATA.
	CONDUITS/WIRING IN FLOOR BELOW OR CONNECTRAC, AS INDICATED.
BF	BARRIER FREE OPERATOR PUSHBUTTON. SUPPLIED BY OTHERS, INSTALLED AND WIRED BY DIV. 16.
	DIRECT CONNECTION TO EQUIPMENT AS INDICATED.
	SINGLE PHASE MOTOR CONNECTION (OR AS INDICATED ON PLANS).
	DISCONNECT SWITCH. PROVIDE SAFETY DISCONNECT AT ALL MOTORS WHERE REQUIRED BY CODE, WHETHER SHOWN OR NOT ON FLOOR PLANS.
30A/20AF	CONTACTOR.
	COMBINATION MAGNETIC STARTER BY DIV. 15..
VSD	VARIABLE SPEED DRIVE BY DIV. 15.
	PANEL (RECESSED OR SURFACE).
K13 HT	DISTRIBUTION TRANSFORMER. K13 OR HARMONIC MITIGATING AS INDICATED.
	JUNCTION BOX
###	MECHANICAL EQUIPMENT NOMENCLATURE
BBH	ELECTRIC BASEBOARD HEATER
FFH	ELECTRIC FORCE FLOW HEATER
EF	EXHAUST FAN
RTU	RTU/HVAC UNIT
WC	HANDS FREE WATER CLOSET (PROVIDE 120V POWER 24V BY MECHANICAL)
LV	HANDS FREE LAVATORY (PROVIDE 120V POWER 24V BY MECHANICAL)
UR	HANDS FREE URINAL (PROVIDE 120V POWER 24V BY MECHANICAL)
FA	HANDS FREE FAUCET (PROVIDE 120V POWER 24V BY MECHANICAL)
VAV	VAV BOX
LS	LEAK SENSOR
HWT	HOT WATER TANK
CH	WATER CHILLER
	REFER TO MECHANICAL DRAWINGS AND SCHEDULES FOR EXACT LOADS AND VOLTAGES
###	APPLIANCES/FIXTURE NOMENCLATURE
RF	REFRIGERATOR
RG	RANGE/STOVE
CM	COFFEE MAKER
MW	MICROWAVE
DW	DISHWASHER
FR	REFRIGERATOR
H2	WATER FOUNTAIN/HYDRATION STATION
TL	UNIVERSAL WASHROOM TABLE LIFT
VM	VENDING MACHINE
HD	HAND DRYER
WM	WASHING MACHINE
DR	CLOTHES DRYER

SYMBOL	DESCRIPTION
	FIRE ALARM
FACP, FAAP	FIRE ALARM PANEL (RECESSED OR SURFACE). 'FACP' DENOTES FIRE ALARM CONTROL PANEL, 'FAAP' DENOTES FIRE ALARM ANNUNCIATOR PANEL 'FGP' FIRE ZONE GRAPHIC PLACARD
	FIRE ALARM PULL STATION(NC-NORMALLY CLOSED AUX CONTACTS).
	LIFE SAFETY SYSTEM STROBE LIGHT WALL OR CEILING MOUNTED
	LIFE SAFETY HORN CEILING OR WALL MOUNTED
	LIFE SAFETY HORN-STROBE CEILING ('C') OR WALL MOUNTED
	IN BARRIER FREE/UNIVERSAL WASHROOM, SET dB LEVEL DOWN IF TOO HIGH DURING TESTING
FS	FIRE SYSTEM SPEAKER
	SMOKE DETECTOR - CEILING OR WALL MOUNTED
	THERMAL DETECTOR CEILING OR WALL MOUNTED
CO	CARBON MONOXIDE DETECTOR CEILING OR WALL MOUNTED
	DUCT TYPE SMOKE DETECTOR.
SA	120V POWERED SMOKE ALARM C/W A VISUAL SIGNALLING COMPONENT AND BATTERY BACKUP.
CO	120V POWERED CARBON MONOXIDE ALARM C/W A VISUAL SIGNALLING COMPONENT AND BATTERY BACKUP.
SA CO	120V POWERED COMBINATION OF SMOKE AND CARBON MONOXIDE ALARM C/W A VISUAL SIGNALLING COMPONENT AND BATTERY BACKUP.
FS	SPRINKLER SYSTEM FLOW SWITCH BY DIV. 15 CONNECTED TO FA SYSTEM BY DIV, 16.
PS	SPRINKLER SYSTEM LOW WATER PRESSURE SWITCH BY DIV. 15 CONNECTED TO FA SYSTEM BY DIV. 16.
CV	SPRINKLER SYSTEM ALARM CHECK VALVE BY DIV. 15 CONNECTED TO FA SYSTEM BY DIV. 16.
SV	SPRINKLER SYSTEM SUPERVISED VALVE BY DIV. 15 CONNECTED TO FA SYSTEM BY DIV. 16.
CTL	FIRE ALARM CONTROL MODULE
MON	FIRE ALARM MONITOR MODULE
DH	ELECTRO-MAGNETIC DOOR HOLD OPEN DEVICE
	SECURITY ROUGH-IN
CR	SECURITY CARD READER.
DC	SECURITY DOOR CONTACT.
	SECURITY SYSTEM EXIT PUSH BUTTON.
ML	SECURITY MAGLOCK.
ES	SECURITY ELECTRIC STRIKE.
SC	SECURITY CAMERA.
KP	SECURITY KEY PAD.
MS	SECURITY MOTION SENSOR.
	INTERCOM STATION ('M' DENOTES MASTER).
CT	SECURITY CURRENT TRANSFER DEVICE.
DB	DURESS BUTTON
PB	PUSH BUTTON
DO	POWERED DOOR OPERATOR
GB	GLASS BREAK SENSOR
RX	SECURITY REQUEST TO EXIT
	STRUCTURED CABLING/COMMS
D-	DATA/COMMS/POE INSTALLATION 'D-' INDICATES QTY. OF CABLES/JACKS
v	INDICATES TERMINATE AS A VoIP STYLE CONNECTION
	ADDITIONAL NOMENCLATURE
N-1	DENOTES REFER TO NOTE N-1.
E	DENOTES EXISTING EQUIPMENT TO REMAIN UNLESS OTHERWISE NOTED.
R	DENOTES EXISTING EQUIPMENT TO BE REMOVED.
ER	EXISTING IN RELOCATED POSITION
REL	DENOTES TO RELOCATE EXISTING DEVICE.
RE/RE	DENOTES REMOVE AND RE-INSTALL IN SIMILAR LOCATION
AFF	ABOVE FINISHED FLOOR.
F	DENOTES ROUGH-IN FOR FUTURE DEVICE.
TL	DENOTES TWISTLOCK RECEPTACLE.
OC	DENOTES MOUNTED ABOVE COUNTER OR OTHER LEVEL AS NOTED ON DESIGNER'S DRAWINGS.
U/C	DENOTES MOUNTED UNDER COUNTER OR OTHER LEVEL AS NOTED ON DESIGNER'S DRAWINGS.
C	DENOTES CEILING MOUNTED.
NL	DENOTES LUMINAIRE ON NIGHT LIGHT CIRCUIT.
SC	DENOTES SEPARATE CIRCUIT.
EM	DENOTES EMERGENCY POWER.
USB	DENOTES RECEPTACLE WITH USB POWER. LEVITON #T5633
EC.	DENOTES EMPTY CONDUIT COMPLETE WITH PULL STRING.
C/W	DENOTES COMPLETE WITH.
TV	WALL MOUNT DEVICES MOUNTED BEHIND TELEVISION/MONITOR , HEIGHT 65" OR AS NOTED. PROVIDE REGRESSED BOX/COVER. PASS & SEYMOUR 3 GANG, # TV3LVKITWCC2

LUMINAIRE SCHEDULE

SYMBOL	DESCRIPTION
'F1'	RECESSED ARCHITECTURAL 2x4 LED DIMMABLE, 37W, 4000K 347V, INCLUDE ALL NECESSARY HANGER SUPPORTS AND MOUNTING ACCESSORIES TO SUIT CEILING TYPE AS SHOWN IN ARCHITECTURAL/INTERIOR DESIGN DRAWINGS.TBAR/DRYWALL/ACOUSTIC PANEL etc.) VISIONEERING #LRTA-2X4-LED-840K-040L-UNV-P98
'L1'	SUSPENDED ARCHITECTURAL LINEAR LED DIMMABLE, 37W, 4000K UNV, INCLUDE ALL NECESSARY HANGER SUPPORTS AND MOUNTING ACCESSORIES TO SUIT CEILING TYPE AS SHOWN IN ARCHITECTURAL/INTERIOR DESIGN DRAWINGS.TBAR/DRYWALL/ACOUSTIC PANEL etc.) CORONET #LSI-UPDN-10'-40-HIGH/HIGH-UNV-DB-W-AC-FL-NA-NA-STD

LUMINAIRE INSTALLATION NOTES

CONTRACTOR TO CONFIRM CEILING TRIM FINISHES WITH ARCHITECTURAL CEILING TYPES AND ADJUST ACCORDINGLY

WHERE SINGLE LINEAR FIXTURES SHOWN, TYPE IS INDICATED WITH FIXTURE LENGTH FOR PRICING PURPOSES, LENGTH SHOWN IS NOMINAL AND EXACT FINAL LENGTHS TO BE COORDINATED WITH MANUFACTURER.

i.e 'L5-6' INDICATES 6' LONG FIXTURE.

WHERE CONTINUOUS LINEAR FIXTURES SHOWN AS A CONTIGUOUS SHAPE (RECTANGLE, SQUARE ETC.) LENGTH FOR PRICING PURPOSES, LENGTH SHOWN IS NOMINAL AND EXACT FINAL LENGTHS TO BE COORDINATED WITH MANUFACTURER. PROVIDE FINISHED CORNERS AS REQUIRED BY MANUFACTURER.

ALL DIMMER AND DRIVER TYPES TO BE VERIFIED FOR COMPATIBILITY BY CONTRACTOR AND VENDORS, ADJUST ACCORDINGLY.

EXTRUDED ALUMINUM RUNNING MAN STYLE LED EXIT SIGN C/W HIGH OUTPUT LED LAMPS, 120AC, 6V-24V UNIVERSAL DC, CB60 APPROVED, CSA 22.2 No. 141-10 STANDARD. SINGLE OR DOUBLE-FACE WITH DIRECTIONAL INDICATORS AND MOUNTING AS REQUIRED. UNIVERSAL MOUNTING. WHERE EXIT SIGN IS REQUIRED TO BE SUSPENDED, PROVIDE ALL REQUIRED MOUNTING ACCESSORIES FOR A COMPLETE INSTALLATION. EXACT HOUSING COLOUR SHALL BE DETERMINED BY THE ARCHITECT/INTERIOR DESIGNER DURING THE SHOP DRAWING REVIEW STAGE.
LUMACELL #'LA' SERIES, OR STANPRO OR BEGHELLI APPROVED EQUAL

EMERGENCY LIGHTING SINGLE REMOTE HEAD, 7W MR16 LED LAMP, 24VDC, DIE CAST ALUMINUM HOUSING. EXACT COLOUR/FINISH SHALL BE DETERMINED BY THE ARCHITECT/INTERIOR DESIGNER DURING THE SHOP DRAWING REVIEW STAGE.
LUMACELL #'DR' SERIES, OR STANPRO OR BEGHELLI APPROVED EQUAL

EMERGENCY LIGHTING DOUBLE REMOTE HEADS, 2x7W MR16 LED LAMP, 24VDC, DIE CAST ALUMINUM HOUSING. EXACT COLOUR/FINISH SHALL BE DETERMINED BY THE ARCHITECT/INTERIOR DESIGNER DURING THE SHOP DRAWING REVIEW STAGE.
LUMACELL #'DR' SERIES, OR STANPRO OR BEGHELLI APPROVED EQUAL

B.E. EMERGENCY LIGHTING STEEL BATTERY UNIT, 20 GAUGE STEEL CABINET, WHITE FINISH, SUITABLE FOR WALL MOUNTING C/W STEEL MOUNTING SHELF, 2x7W MR16 LED UNIT MOUNTED LAMPS, 120VAC INPUT VOLTAGE, 24VDC OUTPUT VOLTAGE, TAMPERPROOF SCREWS, CABTIRE CORD SET. UNIT SHALL BE RATED FOR 360 WATT AT 30 MINUTES AND WITH AUTO TEST SELF DIAGNOSTICS OPTION. PROVIDE BREAKER LOCKING DEVICES ON CIRCUIT BREAKER IN PANEL.
LUMACELL #'RGS' SERIES, OR STANPRO OR BEGHELLI APPROVED EQUAL

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DRAWINGS ARE NOT TO BE SCALED. CONTRACTOR MUST CHECK AND VERIFY ALL DIMENSIONS AND CONDITIONS ON THE PROJECT, AND MUST REPORT ANY DISCREPANCIES TO THE ARCHITECTS BEFORE PROCEEDING WITH THE WORK. THE USE OF THIS DRAWING OR PART THEREOF IS FORBIDDEN WITHOUT THE WRITTEN APPROVAL OF THE ARCHITECTS.

P.A. COUILLARD 25/03/21 PROVINCE OF ONTARIO 25 012

BISHOP TONNOS CSS CLASSROOM RENOVATIONS

100 Panabaker Dr, Ancaster, ON L9G 5E3

ELECTRICAL LEGEND & LUMINAIRE SCHEDULE

GRGURIC ARCHITECTS INCORPORATED
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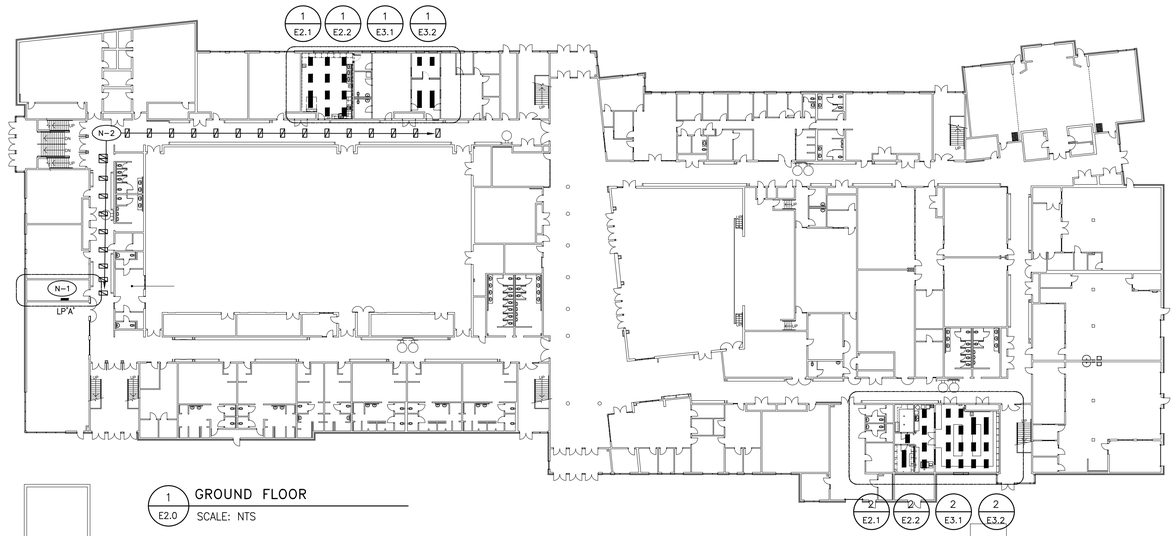
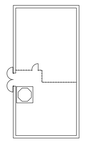


1 E2.0 GROUND FLOOR
SCALE: NTS



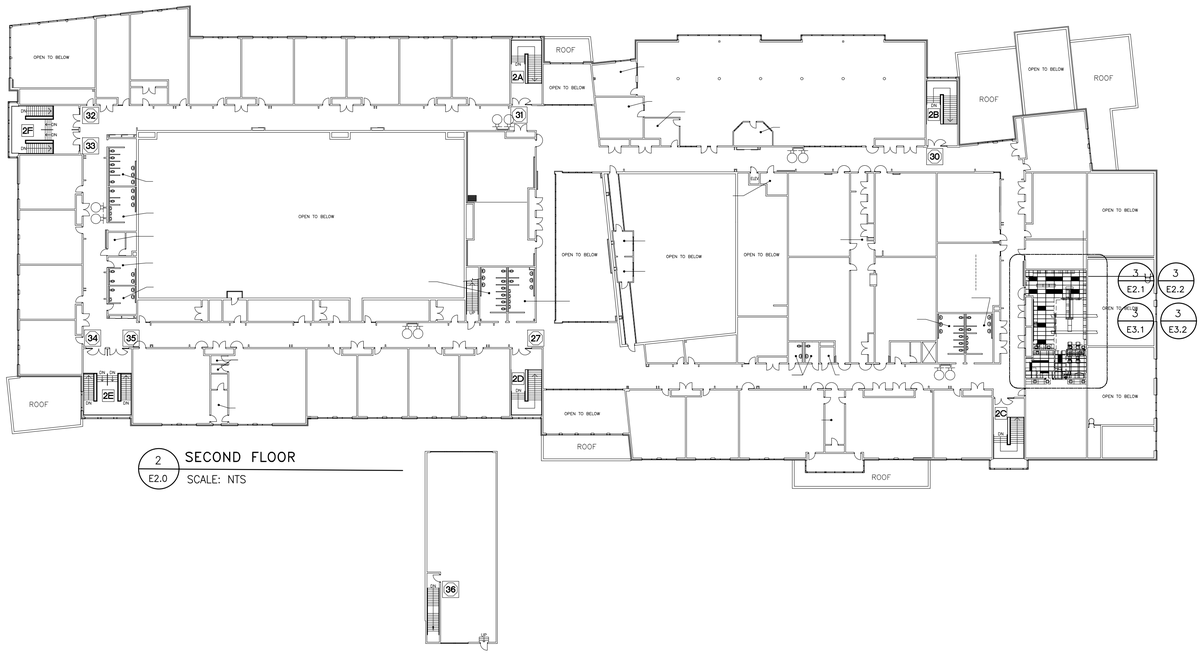
BASEMENT FOOTBALL STORAGE ROOM
(BELOW FITNESS CENTRE)

DRAWING REFERENCE NOTES:

(N-1) APPROXIMATE LOCATION OF EXISTING MAIN ELECTRICAL ROOM. PROVIDE NEW BREAKERS IN EXISTING PANEL AS FOLLOWS;

PANEL 'A'
-50A 2P-NEW STOVE
-7-15A 1P NEW RECEPTACLES

(N-2) EXISTING CEILING TO BE RE/RE AS REQUIRED FOR NEW ELECTRICAL INSTALLATIONS, AVOID REMOVAL OF CEILING DEVICES AND FIXTURES AS MUCH AS IS PRACTICABLE. ITEMS SHOWN ARE APPROXIMATE AND TO BE CONFIRMED ON SITE BY CONTRACTOR.



2 E2.0 SECOND FLOOR
SCALE: NTS

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P.A. COULLARD
100157037
LICENCE OF AUTHORITY
25 012

BISHOP TONNOS CSS
CLASSROOM
RENOVATIONS

100 Panabaker Dr, Ancaster, ON L9G 5E3

OVERALL FLOOR PLAN

GRGURIC ARCHITECTS INCORPORATED
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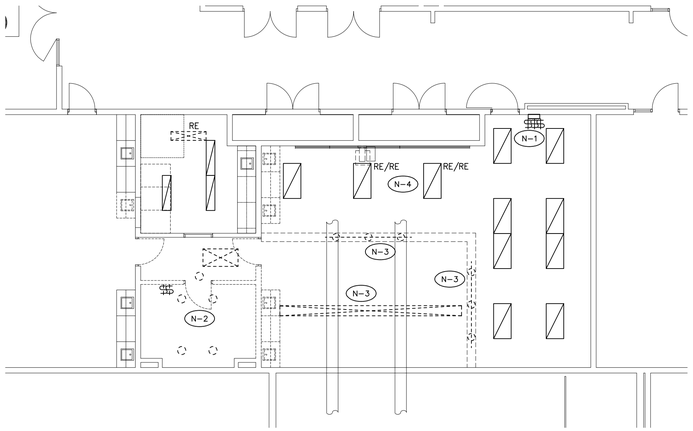


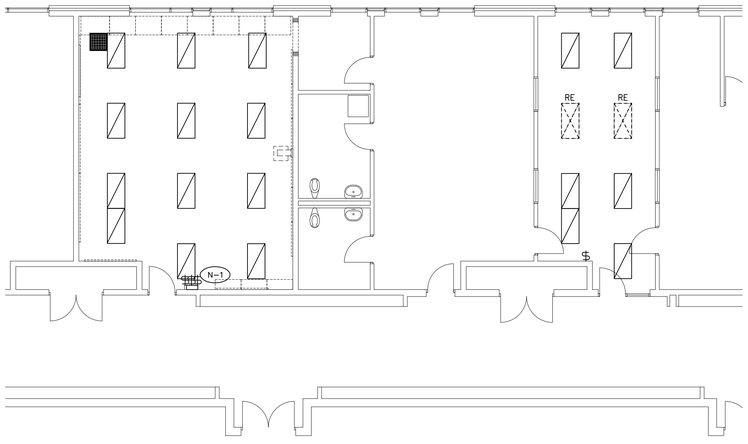
1 / E2.1 COSMETOLOGY CLASSROOM
SCALE: 1/8"=1'-0"

GENERAL DEMOLITION NOTES:

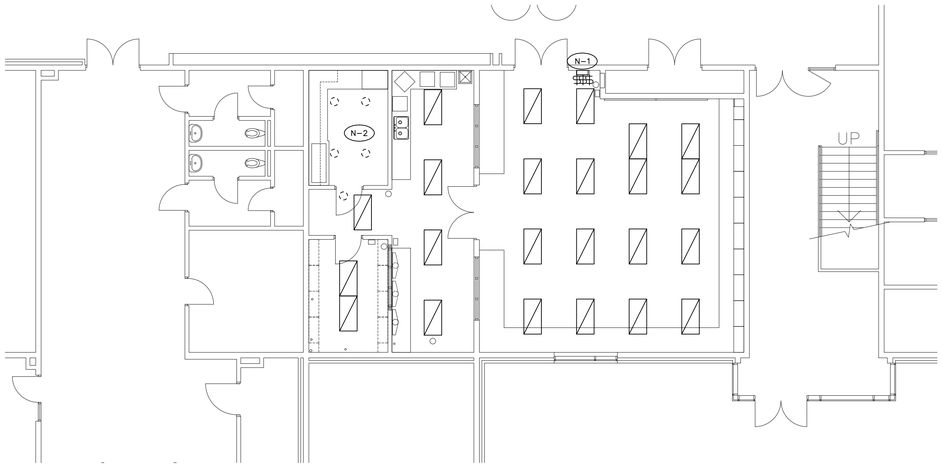
1. EXACT LOCATION OF ALL EXISTING LUMINAIRES, LIGHT SWITCHES, DIMMERS, RECEPTACLES AND OTHER DEVICES/EQUIPMENT SHALL BE CONFIRMED ON SITE.
2. ALL LUMINAIRES, LIGHT SWITCHES, DIMMERS, RECEPTACLES AND OTHER DEVICES/EQUIPMENT SHOWN ON THIS DRAWING ARE EXISTING TO BE DISCONNECTED AND REMOVED UNLESS NOTED OTHERWISE. CUT BACK AND REMOVE CONDUIT AND WIRING BACK TO SOURCE. DEVICES DENOTED WITH AN 'E' ARE EXISTING TO REMAIN IN PLACE AND OPERATIONAL. DEVICES NOTED WITH AN 'RE' ARE TO BE RELOCATED TO NEW POSITION AS NOTED ON NEW PLANS AND CONNECTED AS NOTED. WHERE THE REMOVAL OF DEVICES AFFECTS THE OPERATION OF DEVICES REQUIRED TO REMAIN, REPLACE BRANCH WIRING AS REQUIRED TO MAINTAIN THE CONTINUITY OF ELECTRICAL SERVICES TO THOSE DEVICES.
3. ALL EXISTING LUMINAIRES, LIGHT SWITCHES, DIMMERS, RECEPTACLES AND DEVICES/EQUIPMENT ON WALLS TO BE DEMOLISHED SHALL ALSO BE REMOVED. THESE DEVICES MAY NOT ALL NECESSARILY BE INDICATED ON THIS PLAN. CONTRACTOR SHALL VISIT THE SITE DURING TENDER PERIOD TO ASCERTAIN THE FULL SCOPE OF DEMOLITION. CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING ALL SUCH ITEMS AS REQUIRED TO FACILITATE THE COMPLETE DEMOLITION.
4. WHERE LUMINAIRES, LIGHT SWITCHES, DIMMERS, RECEPTACLES AND DEVICES/EQUIPMENT ARE REMOVED CUT BACK AND REMOVE CONDUIT AND WIRING THAT IS NO LONGER REQUIRED BACK TO SOURCE PANEL.
5. ALL EXISTING ELECTRICAL DEVICES/EQUIPMENT WHICH ARE NO LONGER REQUIRED SHALL BE REMOVED AND DISPOSED OF OFF SITE, UNLESS NOTED OTHERWISE.
6. REMOVE ALL REDUNDANT LINE VOLTAGE AND LOW VOLTAGE CONDUIT AND WIRING IN CEILING SPACE WHICH IS NOT IN USE.
7. INCLUDE FOR THE REMOVAL OF ALL EXISTING HORIZONTAL COMMUNICATIONS CABLING. CABLING NOT SHOWN. VERIFY EXTENT OF THE WORK DURING TENDER PERIOD. COORDINATE WITH GENERAL CONTRACTOR TO HAVE THE COMMUNICATIONS CONTRACTOR VERIFY IF ANY EXISTING CABLING IS LIVE AND SHOULD REMAIN.
8. ENSURE THAT ALL ELECTRICAL, LIFE SAFETY SERVICES AND SERVICES FOR EXISTING EQUIPMENT THAT ARE REQUIRED TO REMAIN IN SERVICE SHALL DO SO.
9. BE RESPONSIBLE AND PAY FOR ANY DAMAGE TO THE BUILDING INCURRED BY WORK OF THIS CONTRACTOR OR REPAIR TO THE SATISFACTION OF THE OWNER AND CONSULTANT.
10. CARRY OUT THE WORK WITH A MINIMUM OF NOISE, DUST AND DISTURBANCE.
11. REFER TO THE MECHANICAL DRAWINGS FOR EXTENT OF MECHANICAL DEMOLITION WORK. DISCONNECT EXISTING MECHANICAL EQUIPMENT WHICH IS BEING REMOVED. CUT BACK CONDUIT AND WIRING TO SOURCE ELECTRICAL PANEL. MAINTAIN ELECTRICAL SERVICES TO EXISTING MECHANICAL EQUIPMENT WHICH IS TO REMAIN IN SERVICE. REPLACE BRANCH WIRING AS NEEDED.
12. REFER TO NEW PLANS FOR NEW LOCATION OF RELOCATED LUMINAIRES, DEVICES AND EQUIPMENT.

DRAWING REFERENCE NOTES:

- (N-1) EXISTING CLASSROOM MODULAR CONTROL PANEL TO REMAIN AS PRESENTLY INSTALLED.
- (N-2) DARKROOM LIGHTING AND SWITCHES TO BE REMOVED AND TURNED OVER TO OWNER.
- (N-3) EXISTING FIXTURES TO BE TURNED OVER TO OWNER
- (N-4) RE/RE FIXTURES THIS AREA TO ACCOMMODATE INSTALLATION OF NEW ERV UNIT.



2 / E2.1 ALTERNATE LEARNING
SCALE: 1/8"=1'-0"



3 / E2.1 TECH MANUFACTURING
SCALE: 1/8"=1'-0"

Hamilton-Wentworth Catholic District School Board

NO	REVISIONS	DATE
3	ISSUED FOR TENDER	2025-03-21
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1	ISSUED FOR COORDINATION	2025-03-03

P.A. COUILLARD
25/03/21
LICENCE OF ONTARIO
25 012

BISHOP TONNOS CSS
CLASSROOM
RENOVATIONS

100 Panabaker Dr, Ancaster, ON L9G 5E3

LIGHTING
DEMOLITION

GRGURIC
ARCHITECTS
INCORPORATED

28 KING STREET EAST, UNIT B
STONEY CREEK, ONTARIO, L8G 1J8
Tel. 905-664-8735 Fax. 905-664-8737
Web: www.2gai.com

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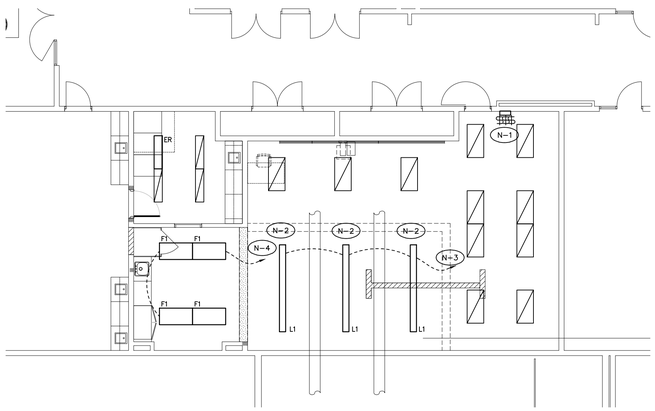


1 / E2.1 COSMETOLOGY CLASSROOM

SCALE: NTS

LIGHTING GENERAL NOTES:

1. EXACT LOCATION OF ALL EXISTING LUMINAIRES AND LIGHT SWITCHES/CONTROLS SHALL BE CONFIRMED ON SITE
2. REFER TO THE ARCHITECT'S DRAWINGS FOR THE EXACT LOCATION AND MOUNTING HEIGHT OF ALL WALL MOUNTED LIGHT AND DIMMER SWITCHES. ALL WALL MOUNTED LIGHT AND DIMMER SWITCHES SHALL BE MOUNTED FOR BARRIER FREE AT 43"AFF (1100mm). COORDINATE WITH ARCHITECT ON SITE FOR EXACT LOCATION PRIOR TO COMMENCEMENT OF WORK.
3. ALL EXIT SIGNS ON THIS PLAN SHALL BE NEW, TYPE AS NOTED, UNLESS OTHERWISE NOTED, WITH AC VOLTAGE INPUTS AS REQUIRED. DO NOT RE-USE ANY OF THE EXISTING EXIT SIGNS, UNLESS OTHERWISE NOTED. PROVIDE NEW 120V AC CIRCUIT FOR EXIT SIGNS. PROVIDE BREAKER LOCK-ON DEVICE ON ALL EXIT SIGN CIRCUITS.
4. ALL CEILING MOUNTED EXIT SIGNS AND REMOTE EMERGENCY HEADS IN OPEN CEILING AREAS SHALL BE STEM MOUNTED TO 9'-0" AFF UNLESS OTHERWISE NOTED. STEMS SHALL BE PAINTED WHITE. EXACT MOUNTING SHALL BE AS REQUIRED TO CLEAR MECHANICAL SERVICES AND BEAMS, ETC. AND TO ENSURE EXIT SIGNS BE COMPLETELY VISIBLE.
5. ALL WALL MOUNTED EXIT SIGNS, EMERGENCY LIGHTING BATTERY UNITS AND REMOTE EMERGENCY HEADS SHALL BE MOUNTED AT 8'-0" AFF UNLESS OTHERWISE NOTED.
6. WHEN RELOCATING BASE BUILDING LIGHTING FIXTURES, EXTEND EXISTING CIRCUITS AS REQUIRED. MATCH EXISTING BRANCH WIRING METHOD.
7. ALL CONDUITS AND WIRING IN FINISHED AREAS AND AREAS WITH SUSPENDED TILE OR WHITE GYPSUM BOARD CEILINGS SHALL BE RUN CONCEALED.
8. ALL CONDUITS AND WIRING IN OPEN CEILING AREAS SHALL BE RUN TIGHT TO THE UNDERSIDE OF THE CEILING DECK. DO NOT SUSPEND CONDUITS MID-SPAN.
9. ALL LIGHT SWITCHES SHALL BE ROCKER STYLE, DECORA TYPE, WHITE WITH MATCHING COVERPLATE. VOLTAGE TO SUIT LOAD CONTROLLED.
10. ALL DIMMER SWITCHES SHALL BE 0-10V DIMMING PROTOCOL OR ELV DIMMING PROTOCOL, WHITE FINISH, RATED FOR CONNECTED LOAD PLUS 25% SPARE CAPACITY WITH MATCHING COVERPLATE, UNLESS NOTED OTHERWISE. PROVIDE CORRECT DIMMER TYPE TO SUIT LOAD CONTROLLED. ALL WIRING REQUIREMENTS PER MANUFACTURER'S RECOMMENDATIONS.
11. ALL OCCUPANCY SENSOR SWITCHES SHALL DECORA TYPE, WHITE WITH MATCHING COVERPLATE. MANUAL/AUTO CONTROL, COLOUR WHITE, FLUSH MOUNTED. DUAL TECHNOLOGY. 120V VOLTAGE RATING TO SUIT LOAD CONTROLLED, UNLESS NOTED OTHERWISE. PROVIDE GANGED COVERPLATE WHERE THERE ARE MORE THAN ONE (1) SWITCH.
12. ALL LIGHT SWITCHES AND DIMMER SWITCHES SHOWN ARE NEW, UNLESS NOTED OTHERWISE. CONTRACTOR MAY BE PERMITTED TO RE-USE EXISTING BACK BOXES IF LOCATIONS ARE SUITABLE OTHERWISE NEW BACK BOXES SHALL BE PROVIDED.

DRAWING REFERENCE NOTES:

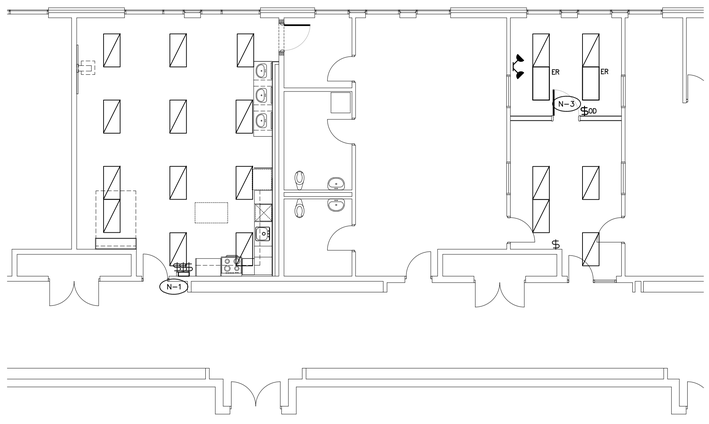
(N-1) EXISTING CLASSROOM MODULAR CONTROL PANEL TO REMAIN AS PRESENTLY INSTALLED.

(N-2) SUSPEND NEW FIXTURES FROM EXISTING CEILING, UTILIZE EXISTING POWER FEED IN POINTS AS NEW CONNECTION TO EXISTING FIXTURES, OFFSET USING MANUFACTURER PROVIDED CABLE CORD AS REQUIRED AND RUN DOWN VERTICAL SUPPORTS.

PROVIDE CUSTOM CABLE AND AIRCRAFT CABLE SUPPORTS, SUSPEND 12" ABOVE UNDERSIDE OF ROUND DUCTWORK. COORDINATE ON SITE. ALLOW TO ADJUST HEIGHT +/-24" PER OWNERS DISCRETION.

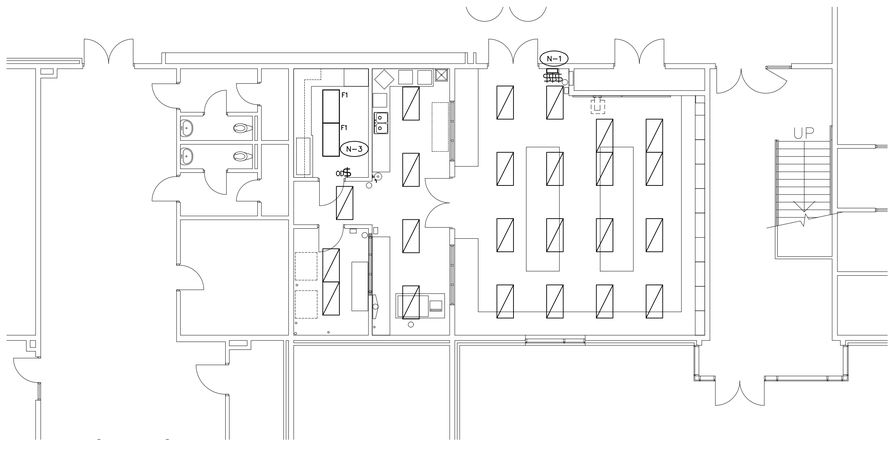
(N-3) WIRE NEW/RELOCATED FIXTURE TO EXISTING LIGHTING CONTROL , COORDINATE ON SITE. PROVIDE NEW AND/OR ADJUST WIRING AS REQUIRED.

(N-4) WIRE NEW/EXISTING FIXTURES TO EXISTING LIGHTING CONTROL FROM REMOVED TRACK LIGHTS, COORDINATE ON SITE. PROVIDE NEW AND/OR ADJUST WIRING AS REQUIRED.



2 / E2.2 ALTERNATE LEARNING

SCALE: NTS



3 / E2.2 TECH MANUFACTURING

SCALE: NTS

Hamilton-Wentworth Catholic District School Board

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BISHOP TONNOS CSS
CLASSROOM
RENOVATIONS

100 Panabaker Dr, Ancaster, ON L9G 5E3

LIGHTING
NEW INSTALLATION

GRGURIC
ARCHITECTS
INCORPORATED

28 KING STREET EAST, UNIT B
STONEY CREEK, ONTARIO, L8G 1J8
Tel. 905-664-8735 Fax. 905-664-8737
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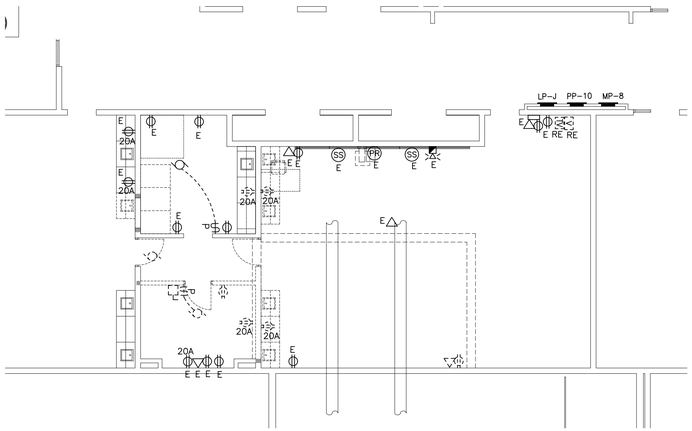


1 / E3.1 COSMETOLOGY CLASSROOM

SCALE: NTS

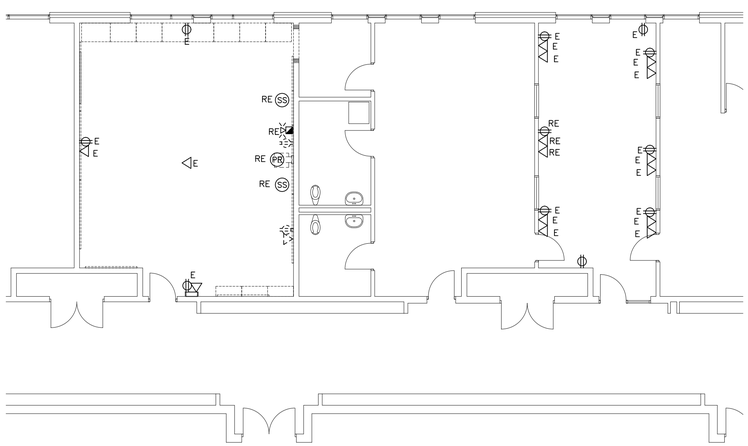
GENERAL DEMOLITION NOTES:

1. EXACT LOCATION OF ALL EXISTING LUMINAIRES, LIGHT SWITCHES, DIMMERS, RECEPTACLES AND OTHER DEVICES/EQUIPMENT SHALL BE CONFIRMED ON SITE.
2. ALL LUMINAIRES, LIGHT SWITCHES, DIMMERS, RECEPTACLES AND OTHER DEVICES/EQUIPMENT SHOWN ON THIS DRAWING ARE EXISTING TO BE DISCONNECTED AND REMOVED UNLESS NOTED OTHERWISE. CUT BACK AND REMOVE CONDUIT AND WIRING BACK TO SOURCE. DEVICES DENOTED WITH AN 'E' ARE EXISTING TO REMAIN IN PLACE AND OPERATIONAL. DEVICES NOTED WITH AN 'RE' ARE TO BE RELOCATED TO NEW POSITION AS NOTED ON NEW PLANS AND CONNECTED AS NOTED. WHERE THE REMOVAL OF DEVICES AFFECTS THE OPERATION OF DEVICES REQUIRED TO REMAIN, REPLACE BRANCH WIRING AS REQUIRED TO MAINTAIN THE CONTINUITY OF ELECTRICAL SERVICES TO THOSE DEVICES.
3. ALL EXISTING LUMINAIRES, LIGHT SWITCHES, DIMMERS, RECEPTACLES AND DEVICES/EQUIPMENT ON WALLS TO BE DEMOLISHED SHALL ALSO BE REMOVED. THESE DEVICES MAY NOT ALL NECESSARILY BE INDICATED ON THIS PLAN. CONTRACTOR SHALL VISIT THE SITE DURING TENDER PERIOD TO ASCERTAIN THE FULL SCOPE OF DEMOLITION. CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING ALL SUCH ITEMS AS REQUIRED TO FACILITATE THE COMPLETE DEMOLITION.
4. WHERE LUMINAIRES, LIGHT SWITCHES, DIMMERS, RECEPTACLES AND DEVICES/EQUIPMENT ARE REMOVED CUT BACK AND REMOVE CONDUIT AND WIRING THAT IS NO LONGER REQUIRED BACK TO SOURCE PANEL.
5. ALL EXISTING ELECTRICAL DEVICES/EQUIPMENT WHICH ARE NO LONGER REQUIRED SHALL BE REMOVED AND DISPOSED OF OFF SITE, UNLESS NOTED OTHERWISE.
6. REMOVE ALL REDUNDANT LINE VOLTAGE AND LOW VOLTAGE CONDUIT AND WIRING IN CEILING SPACE WHICH IS NOT IN USE.
7. INCLUDE FOR THE REMOVAL OF ALL EXISTING HORIZONTAL COMMUNICATIONS CABLING. CABLING NOT SHOWN. VERIFY EXTENT OF THE WORK DURING TENDER PERIOD. COORDINATE WITH GENERAL CONTRACTOR TO HAVE THE COMMUNICATIONS CONTRACTOR VERIFY IF ANY EXISTING CABLING IS LIVE AND SHOULD REMAIN.
8. ENSURE THAT ALL ELECTRICAL, LIFE SAFETY SERVICES AND SERVICES FOR EXISTING EQUIPMENT THAT ARE REQUIRED TO REMAIN IN SERVICE SHALL DO SO.
9. BE RESPONSIBLE AND PAY FOR ANY DAMAGE TO THE BUILDING INCURRED BY WORK OF THIS CONTRACTOR OR REPAIR TO THE SATISFACTION OF THE OWNER AND CONSULTANT.
10. CARRY OUT THE WORK WITH A MINIMUM OF NOISE, DUST AND DISTURBANCE.
11. REFER TO THE MECHANICAL DRAWINGS FOR EXTENT OF MECHANICAL DEMOLITION WORK. DISCONNECT EXISTING MECHANICAL EQUIPMENT WHICH IS BEING REMOVED. CUT BACK CONDUIT AND WIRING TO SOURCE ELECTRICAL PANEL. MAINTAIN ELECTRICAL SERVICES TO EXISTING MECHANICAL EQUIPMENT WHICH IS TO REMAIN IN SERVICE. REPLACE BRANCH WIRING AS NEEDED.
12. REFER TO NEW PLANS FOR NEW LOCATION OF RELOCATED LUMINAIRES, DEVICES AND EQUIPMENT.

DRAWING REFERENCE NOTES:

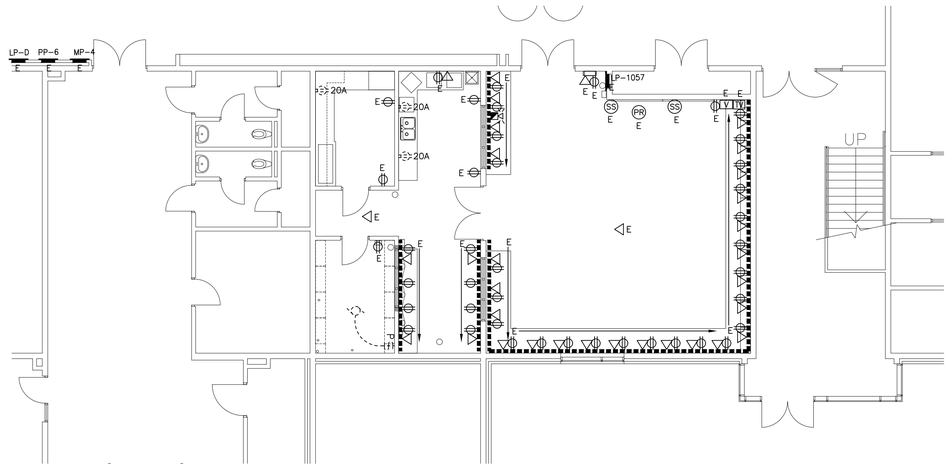
(N-1) EXISTING EXTERIOR BOX AND SERVICES DOWN WALL SERVING PORTABLE (TO BE REMOVED AS REQUIRED BY OWNERS FORCES. ELECTRICAL CONTRACTOR TO DISCONNECTS POWER INSIDE BUILDING AND MAKE SAFE.

(N-2) EXISTING OUTDOOR P/A AND CLASS CHANGE EQUIPMENT TO BE RELOCATED AS NOTED ON NEW PLANS



2 / E3.1 ALTERNATE LEARNING

SCALE: NTS



3 / E3.1 TECH MANUFACTURING

SCALE: NTS

Hamilton-Wentworth Catholic District School Board

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P.A. COUILLARD 25/03/31 LICENCE OF INTENT 25 012

BISHOP TONNOS CSS CLASSROOM RENOVATIONS

100 Panabaker Dr, Ancaster, ON L9G 5E3

POWER & SYSTEMS DEMOLITION

GRGURIC ARCHITECTS INCORPORATED

28 KING STREET EAST, UNIT B
STONEY CREEK, ONTARIO, L8G 1J8
Tel. 905-664-8735 Fax. 905-664-8737
Web: www.2gai.com

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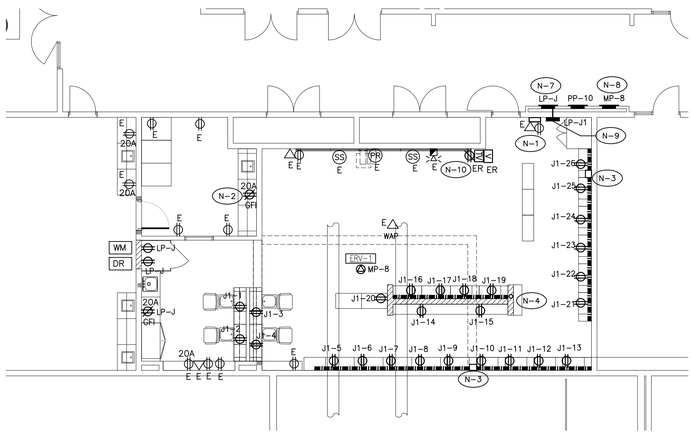


1 / E3.2 COSMETOLOGY CLASSROOM

SCALE: NTS

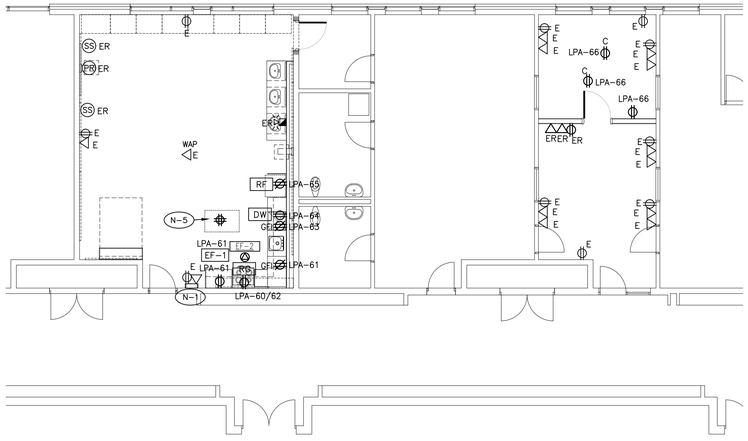
DRAWING GENERAL NOTES:

1. REFER TO THE ARCHITECT'S DRAWINGS FOR THE EXACT LOCATION AND MOUNTING HEIGHT OF ALL RECEPTACLES AND COMMUNICATIONS OUTLET BOXES. WHERE THIS INFORMATION IS NOT INDICATED HAVE THE OWNER OR ARCHITECT VERIFY EXACT LOCATIONS ON SITE PRIOR TO ROUGHING IN. DO NOT SCALE LOCATIONS FROM ELECTRICAL DRAWINGS. OUTLETS INSTALLED WITHOUT APPROVED LOCATIONS SHALL BE RELOCATED AT THE CONTRACTOR'S EXPENSE.
2. ALL RECEPTACLES AND COMMUNICATIONS OUTLET BOXES SHALL BE MOUNTED AT 16" AFF AS MEASURED TO THE CENTRE-LINE OF THE DEVICE UNLESS OTHERWISE NOTED IN ARCHITECTURAL DRAWINGS.
3. REPORT ANY DISCREPANCIES BETWEEN THIS PLAN AND THE ARCHITECT'S POWER AND COMMUNICATIONS PLAN TO THE CONSULTANT PRIOR TO ROUGHING IN ANY SERVICES.
4. ALL DUPLEX RECEPTACLES SHALL BE DECORA TYPE, WHITE FINISH. PROVIDE WITH MATCHING WHITE COLOUR COVERPLATE. REPLACE ALL EXISTING DUPLEX RECEPTACLES THAT ARE TO REMAIN WITH NEW DECORA RECEPTACLES AND COVERPLATES AS SPECIFIED.
5. WHERE POWER AND COMMUNICATIONS OUTLET BOXES ARE SHOWN ADJACENT TO EACH OTHER PROVIDE GANGED COVERPLATE SIZE AS REQUIRED. REFER TO DETAIL.
6. DO NOT INSTALL OUTLETS BACK TO BACK.
7. ALL WALL MOUNTED WIRING DEVICE BACK BOXES SHALL BE FLUSH MOUNTED WITH CONDUIT VERTICALLY CONCEALED AND HORIZONTAL CONDUITS SHALL BE TIGHT TO UNDERSIDE OF DECK/SLAB UNLESS OTHERWISE NOTED. IN OPEN CEILING AREAS, TAKE SPECIAL CARE TO NEATLY RUN THE CONDUITS TO NOT BE VISIBLE AS MUCH AS POSSIBLE. SELECT CONDUIT ROUTINGS ACCORDINGLY.
8. IN AREAS WHERE COUNTERS OR OTHER MILLWORK ARE PROVIDED, COORDINATE EXACT LOCATION OF OUTLETS AND WIRING WITH MILLWORK AND ARCHITECT.
9. FOR PLUG-IN EQUIPMENT, CONFIRM CSA CONFIGURATION OF REQUIRED RECEPTACLE PRIOR TO PURCHASE AND INSTALLATION.
10. SUPPLY AND INSTALL EQUIPMENT DISCONNECT SWITCHES IN STRICT COMPLIANCE WITH CODE REQUIREMENTS (NOT ALL LOCAL DISCONNECT SWITCHES ARE SHOWN).
11. PROVIDE ALL EMPTY CONDUITS C/W PULL STRINGS AND BACK BOXES AS REQUIRED TO SUIT THE COMPLETE INSTALLATION OF THE COMMUNICATIONS SYSTEMS (VOICE, DATA, CATV) AND SECURITY SYSTEMS (ACCESS CONTROL AND CCTV).
12. REFER TO MECHANICAL DRAWINGS FOR EXACT LOCATION AND MOUNTING HEIGHT OF ALL HVAC AND PLUMBING EQUIPMENT. CONFIRM EXACT LOCATION OF ALL MECHANICAL EQUIPMENT WITH MECHANICAL CONTRACTOR PRIOR TO ROUGHING IN ELECTRICAL SERVICES.

DRAWING REFERENCE NOTES:

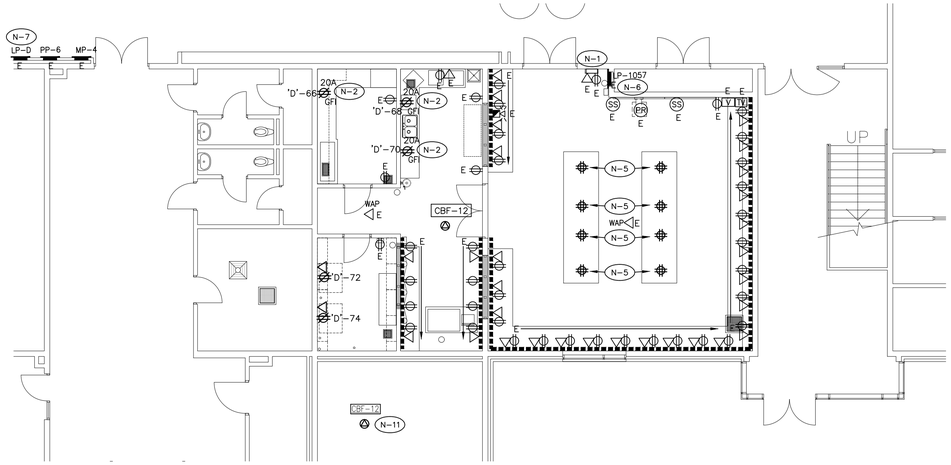
- (N-1) EXISTING CLASSROOM MODULAR CONTROL PANEL TO REMAIN AS PRESENTLY INSTALLED.
- (N-2) EXISTING 20A RECEPTACLE REPLACED WITH NEW 20A TSLOT GFI PROTECTED DEVICE.
- (N-3) NEW SURFACE RACEWAY, RUN VERTICAL SECTION FOR POWER FEED IN UP TO ACCESSIBLE TBAR CEILING OR RUN NEW CONDUITS IN NEW WALL WHERE AVAILABLE. COORDINATE LOCATION SO AS TO BE CLEAR OF MIRRORS ON WALL.
- (N-4) NEW SERVICES FOR THIS AREA TO BE FED FROM FLOOR BELOW, PROVIDE FIRE RATED POKE THRU AND RUN BRANCH CIRCUITS INTO MILLWORK
- (N-5) CEILING MOUNTED OUTLET ON CABLE REEL HUBBELL#HBL145143R215M1. INSTALL IN RECESSED BOX ABOVE CEILING HUBBELL#HBLIPRBOX. PROVIDE ALL MOUNTING HARDWARE AND INSTALL PER MANUFACTURERS INSTRUCTIONS.
- (N-6) PROVIDE 8-15A 1P BREAKERS FOR NEW CABLE REELS.
- (N-7) PROVIDE 5-20A 1P BREAKERS FOR NEW DEVICES
  PROVIDE NEW BREAKERS AS FOLLOWS;
  1-30A 2P (DRYER)
  1-15A 1P WASHING MACHINE
  1-60A 3P FOR NEW SUB PANEL
  1-20A 1P GFI OUTLET
- (N-8) PROVIDE 15A 2P BREAKER FOR ERV-1
- (N-9) PROVIDE NEW SUB PANEL, 60A 208V 3PH 4W, 32 CCT, PROVIDE 26 15A 1P BREAKERS. WIRE FEEDER THROUGH WALL TO NEW PANEL. ALL NEW CIRCUITS TO RISE/DROP IN CHASE AS REQUIRED. FIRE SEAL ALL PENETRATIONS.
- (N-10) WIRE NEW OUTLET TO EXISTING TV OUTLET CIRCUIT
- (N-11) REWIRE EXISTING CIRCUIT TO NEW CBF-12 FAN

ALL RECEPTACLES OF 15A AND 20A IN THIS PROJECT SHALL BE TAMPER RESISTANCE (TR) TYPE PER OESC 26-706. INCLUDE IN TENDER TO REPLACE ALL EXISTING RECEPTACLES OF 15A AND 20A TO BE 'TR' TYPE



2 / E3.2 ALTERNATE LEARNING

SCALE: NTS



3 / E3.2 TECH MANUFACTURING

SCALE: NTS

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LICENCE OF AUTHORITY P.A. COULARD 25/03/28 25 012

BISHOP TONNOS CSS CLASSROOM RENOVATIONS

100 Panabaker Dr, Ancaster, ON L9G 5E3

POWER & SYSTEMS NEW INSTALLATION

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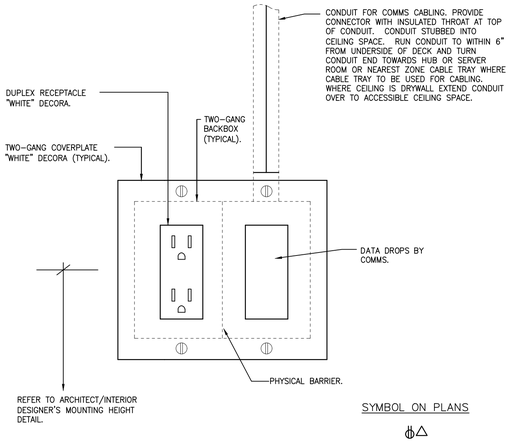
PROVIDE 1-3/4" CONDUIT FOR UP TO FOUR (4) CAT6 CABLES AND 1-1" CONDUIT FOR UP TO SEVEN (7) CAT6 CABLES. PROVIDE SINGLE GANG BACKBOX FOR UP TO THREE (3) CAT6 CABLES, PROVIDE DOUBLE GANG BACKBOX FOR FOUR (4) TO SIX (6) CAT6 CABLES.



1 / E4.1 TYPICAL POWER/COMMUNICATIONS WALL GROUPING DETAIL

SCALE: NTS

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BISHOP TONNOS CSS
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ELECTRICAL DETAILS

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