FACILITIES MANAGEMENT

OPEN CALL FOR BIDS

FOR

EN-164-21: Engineering Building Renovations to EN-2078

Request for Open Call Number: **TFM-052-25**

Issued: **December 9, 2025**

Submission Deadline: **Thursday, January 22, 2026 @ 3:00PM NST**

REQUEST FOR OPEN CALL FOR BIDS INFORMATION SHEET

Request for Open Call			
Title:	**EN-164-21: Engineering Building, Renovations to EN-2078**		
Open Call #:	**TFM-052-25**	Issue Date:	**December 9, 2025**
Site Visit:	**Location:** **Engineering Building, EN-2078**		**December 16, 2025 @ 10:00am**
Questions Deadline:	**Eight (8) days prior to closing time, at 3:00pm (NST).**	Closing Date & Time: Bid Submission Format: Opening Date, Time & Location:	**Thursday January 22, 2026 @ 3:00 pm NST** **opencalls@mun.ca** **Thursday, January 22, 2026 @ 3:30 pm NST** **Via Conference line:** **1-416-915-6530 (toll free)** **Access Code: *2771 260 3627*** **Attendee ID: Please press Pound(#)**
Bids Irrevocable Period after Submission Deadline:			**45 days (See section 1.6)**
Bid Submission: Responses to this solicitation must be submitted by email to opencalls@mun.ca Email subject line must read: BID SUBMISSION: TFM-052-25 EN-164-21: Engineering Building, Renovations to EN-2078			
Inquiries and Communication			

Inquiries and communication: Strategic Procurement Office, Memorial University of Newfoundland, opencalls@mun.ca. Inquiries accepted only via email. No phone calls will be accepted. **Please reference open call Title and Open Call # from above, ie: TFM-052-25 EN-164-21: Engineering Building, Renovations to EN-2078 in subject line. Emails not containing this requirement information in the subject line will NOT receive a response.**

Bids submitted by fax, mail, courier, drop off or by any other means of delivery other than by email stated above shall not be accepted.

ABOUT MEMORIAL UNIVERSITY

As Newfoundland and Labrador's only university, Memorial has a special obligation to the people of this province. Established as a memorial to the Newfoundlanders who lost their lives on active service during the First and Second World Wars, Memorial University draws inspiration from these shattering sacrifices of the past as we help to build a better future for our province, our country and our world.

We are a multi-campus, multi-disciplinary, public university committed to excellence in teaching and learning, research and scholarship, and to public engagement and service. We strive to have national and global impact, while fulfilling our social mandate to provide access to university education for the people of the province and to contribute to the social, cultural, scientific and economic development of Newfoundland and Labrador and beyond.

The Memorial experience goes beyond academics; it invites a discovery of self, community and place. At Memorial, we celebrate our unique identity through the stories of our people – the work of scholars and educators, the ingenuity of students, the achievements of alumni – and the impact we collectively make in the province, the country and the world. Memorial is the natural place where people and ideas become.

Memorial University has more than 18,500 students and 3,600 faculty and staff spread across four campuses and nearly 100,000 alumni active throughout the world. From local endeavors to research projects of national importance, Memorial's impact is felt far and wide.

Mission, Vision and Values

Vision

Memorial University will be one of the most distinguished public universities in Canada and beyond, and will fulfill its special obligation to the people of Newfoundland and Labrador.

Mission

Memorial University is an inclusive community dedicated to innovation and excellence in teaching and learning, research, scholarship, creative activity, service and public engagement.
Memorial welcomes and supports students and scholars from all over the world and contributes knowledge and expertise locally, nationally and internationally.

Values

Excellence: Encouraging and promoting excellence through innovation and creativity, rigor and pragmatism.

Integrity: Being honest and ethical in all interactions, maintaining the highest ethical standards in teaching, research, public engagement and service.

Collegiality: Engaging others with respect, openness and trust in pursuit of a common purpose, having regard for individuals, ideals and the institution as a whole.

Inclusiveness and diversity: Embracing and acting on responsibility to guarantee diversity and equity.

Responsiveness: Being receptive to individuals and communities.

Accountability: Accepting responsibility for achievement of common goals and objectives.

Freedom and Discovery: Supporting the freedom to pursue knowledge that is based on individual and collective intelligence, curiosity, ingenuity and creativity.

Recognition: Acknowledging, tangibly, all aspects of university enterprise including teaching and learning, research, scholarship, creative activity and public engagement.

Responsibility to place: Valuing and fulfilling the special obligation to the people of Newfoundland and Labrador by supporting and building capacity for excellence that:

- addresses needs and opportunities for Newfoundland and Labrador;
- engages the university community on matters of national and international significance;
- produces and delivers academic programs of national and international calibre; and,
- Recognizes the dynamic opportunities presented by a multi-campus institution.

Responsibility to learners: Recognizing students as a first priority and providing the environment and support to ensure their academic and personal success.

Interdisciplinary collaboration: Supporting overarching themes in all pursuits that cut across academic units and address significant opportunities and challenges for which Memorial is particularly well positioned to build nationally and internationally recognized capacity.

Sustainability: Acting in a manner that is environmentally, economically and socially sustainable in administration, academic and research programs.

Memorial's exceptional staff and students contribute to the vitality and positive environment of the university through active community engagement. Memorial University has always been a publicly engaged institution. Since the founding of the University in 1949, the work of many of Memorial's students, faculty and staff has emphasized the importance of strong, sustained partnerships with members of the public of Newfoundland and Labrador and beyond.

Faculty and Staff

Memorial is one of the largest employers in the province, with approximately 3,600 faculty and staff. Memorial has been recognized as an Employer of Distinction by the Newfoundland and Labrador Employers' Council, which is reflective of its investment in comprehensive benefits, services such as childcare and recreation facilities, emphasis on work-life balance, and its vibrant work environment.

Governance and Administration

The management, administration and control of the property, revenue, business and affairs of the University are vested in a Board of Regents. The Board is appointed under the *Memorial University Act* and is responsible for the management, administration, and control of the property, revenue, business and affairs of the university. Matters of an academic character are in general charge of the Senate of the University.

For more information on Memorial University of Newfoundland, please visit:
Memorial's home page: http://www.mun.ca/

Territory Acknowledgements at Memorial:

We acknowledge that the lands on which Memorial University's Campus are situated are in the traditional territories of diverse Indigenous groups and we acknowledge with respect the diverse histories and cultures of the Beothuk, *Mi'kmaq, Innu, and Inuit of this province.*

PROCUREMENT AND CONTRACTING DOCUMENTS GROUP

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

Open Call for Bids – Cover Sheet 1
Request for Open Call for Bids (OCB) Information Sheet 1
About Memorial University 1
00 01 10 ..... Table of Contents Stipulated Price Contract (Architectural) 3
00 01 15 ..... List of Drawings (Architectural) 1
00 01 15 ..... Drawing List (Mechanical, Electrical, Structural) 1

Open Call for Bids Strategic Procurement Sections

Part 1 – Submission Instructions 3
Part 2 – Evaluation and Award 2
Part 3 – Terms and Conditions of the OCB Process 7
Part 4 – Environmental Health and Safety Requirements 6
Part 5 – General Conditions 1
Part 6 – Supplementary Terms and Conditions 2

Appendix A – Specifications & Drawings 1
Appendix B – Submission Form 3
Appendix C1 – Pricing Form 1
Appendix C2 – Unit Rates (Left Blank Intentionally) 1
Appendix C3 – Furniture Bidding Table (Left Blank Intentionally) 1
Appendix D – List of Subcontractors 1
Appendix E – Project Reference (Roofing) 3

General Conditions and Agreement between Owner and Contractor for the Stipulated Price Contract

Index 2
General Conditions 36
Supplementary General Conditions… 2
Special Conditions 9
Campus Safety and Health Regulations 4
Contractor Performance Evaluation 3

SPECIFICATIONS GROUP

General Requirements Subgroup

DIVISION 01 - GENERAL REQUIREMENTS

01 10 00 ..... Summary 5
01 21 00 ..... Allowances 4
01 35 29.06 .... Health and Safety Requirements 10
01 36.00 ..... EMCS: System Integrator 9
01 91 13 ..... General Commissioning Requirements 3

Facility Construction Subgroup

DIVISION 02 - EXISTING CONDITIONS

02 26 00 ..... Hazardous Materials Report 124

02 41 19 ..... Selective Structure Demolition 6
02 82 00.02 .... Asbestos Abatement - Intermediate Precautions 6

DIVISION 04 - MASONRY
04 20 00 ..... Unit Masonry (CMU and CSUM ONLY) 16

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES
06 10 00 ..... Rough Carpentry 8
06 16 00 ..... Sheathing 6

DIVISION 07 - THERMAL AND MOISTURE PROTECTION
07 01 50.19 .... Preparation for Re-roofing 4
07 21 00 ..... Blanket Insulation 3
07 52 00 ..... Modified Bituminous Membrane Roofing 12
07 62 00 ..... Sheet Metal Flashing and Trim 6
07 92 00 ..... Joint Sealants 10

DIVISION 08 - OPENINGS
08 11 13 ..... Hollow Metal Doors and Frames 11
08 14 16 ..... Flush Wood Doors 5
08 31 13 ..... Access Doors and Frames 5
08 71 00 ..... Door Hardware 18
08 71 13 ..... Automatic Door Operators 6
08 80 00 ..... Glazing 8

DIVISION 09 - FINISHES
09 01 90.63 .... Interior Re-painting 5
09 22 16 ..... Non-load-bearing Steel Framing 5
09 29 00 ..... Gypsum Board 7
09 51 13 ..... Acoustical Panel Ceilings 7
09 65 13 ..... Resilient Base and Accessories 5
09 65 16 ..... Resilient Sheet Flooring 5
09 91 23 ..... Interior Painting 12
09 93 00 ..... Wood Stains and Transparent Finishes 4

Facility Services Subgroup

DIVISION 10 - SPECIALTIES
10 44 16.19 .... Fire Extinguishers and Safety Blankets 2

DIVISION 22 – PLUMBING
22 05 00 ..... Common Work Results for Plumbing 6
22 05 15 ..... Plumbing Specialties and Accessories 8
22 07 19 ..... Plumbing Piping Insulation 8
22 11 18.01 .... Domestic Water Piping Plastic 12
22 13 19 ..... Drainage Waste and Vent Piping – Corrosion Resistant 4
22 42 16 ..... Commercial Lavatories and Sinks 3

DIVISION 23 – HEATING, VENTILATION AND AIR CONDITIONING (HVAC)

23 05 00 ..... Common Work Results for HVAC 7
23 05 01 ..... Use of HVAC Systems During Construction 1
23 05 13 ..... Common Motor Requirements for HVAC Equipment 4
23 05 15 ..... Common Installation Requirements for HVAC Pipework 6
23 05 23.01 .... Valves - Bronze 6
23 05 29 ..... Hangers and Supports for HVAC Piping and Equipment 7
23 05 53.01 .... Mechanical Identification 6
23 05 93 ..... Testing, Adjusting and Balancing for HVAC 6
23 05 94 ..... Pressure Testing of Ducted Air Systems 4
23 07 13 ..... Duct Insulation 6
23 07 19 ..... HVAC Piping Insulation 8
23 08 00 ..... Commissioning of Laboratory Ventilation Systems 9
23 08 01 ..... Performance Verification Mechanical Piping Systems 3
23 21 13.02 .... Hydronic Systems: Steel 7
23 31 13.01 .... Metal Ducts – Low Pressure to 500 Pa 6
23 33 00 ..... Air Duct Accessories 6
23 33 14 ..... Dampers - Balancing 3
23 34 00 ..... HVAC Fans 6
23 37 13 ..... Diffuser, Registers and Grilles 3
23 74 00 ..... Packaged Outdoors HVAC Equipment 9
23 85 01 ..... Room Pressure Control System 12

DIVISION 25 – INTEGRATED AUTOMATION

25 01 11 ..... EMCS: Start-up, Verification and Commissioning 6
25 01 12 ..... EMCS: Training 3
25 05 01 ..... EMCS: General Requirements 9
25 05 02 ..... EMCS: Submittals and Review Process 6
25 05 03 ..... EMCS: Project Record Documents 3
25 05 54 ..... EMCS: Identification 3
25 05 60 ..... EMCS: Field Installation 11
25 08 20 ..... EMCS: Warranty and Maintenance 4
25 10 01 ..... EMCS: Local Area Network (LAN) 3
25 30 01 ..... EMCS: Building Controllers 10
25 30 02 ..... EMCS: Field Control Devices 11
25 30 03 ..... EMCS: Variable Frequency Drives (to 600 Volts) 5
25 90 01 ..... EMCS: Site Requirements, Applications and Systems Sequences of Operations 11

END OF SECTION

PART 1 - GENERAL

ARCHITECTURAL

1. A-0 GENERAL NOTES, SYMBOL LEGEND & SITE ACCESS PLANS
2. A-0.1 SITE ACCESS & CORE LOCATION PLANS
3. A-0.2 SITE ACCESS, PARTIAL DEMOLITION & ROOF PLANS
4. A-1.0 DEMOLITION FLOOR PLANS
5. A-1.1 LAB BENCH PLANS & ELEVATIONS CP-5006, 5006A & SN-3108
6. A-1.2 LAB BENCH & FIXTURE PLANS & ELEVATIONS SN-1008, 3123
7. A-2.0 REFLECTED CEILING PLANS
8. A-3.0 NEW FLOOR & FINISH PLANS
9. A-3.1 NEW FURNITURE & FINISH PLANS
10. A-4.0 DOOR & ROOF SCHEDULE, ELEVATIONS & DETAILS

END OF SECTION

MR-1.0 Partial Roof Plan – Mechanical Layout
MP-1.0 Patrial Level 2 Floor Plan – Sanitary Layout
MP-2.0 Partial Level 2 Floor Plan – Domestic Layout
MP-3.0 Patrial Level 2 Floor Plan – Heating Layout
MV-1.0 Patrial Level 2 Floor Plan – Ventilation Layout
ME-1.0 Patrial Level 2 Floor Plan – New RCP & Control Layout
MP-4.0 Plumbing Details
MV-2.0 Ventilation Details and Elevations
ME-2.0 Control Schematics & Schedule

E-0 Electrical Legend, Key Plan, Part Plan, Part Single Line and Details
E-1.0 Power and Misc Systems Demolition Floor Plan
E-2.0 Lighting and Fire Alarm Systems Demolition Floor Plan
E-3.0 Revised Power and Misc Systems Floor Plan
E-4.0 Revised Lighting and Fire Alarm Systems Floor Plan
E-5.0 Controls Schematics and Electrical Schedules
E-6.0 Electrical Specification

S-1 General Notes & Key Plan
S-2 Part Roof Framing Plan
S-3 Sections & Details
S-4 Sections & Details

END OF SECTION

PART 1 – SUBMISSION INSTRUCTIONS

1.1 Bids to be Submitted on Time

Bids must be submitted as set out above on or before the Submission Deadline. Bids submitted after the Submission Deadline will be rejected. Onus and responsibility rest solely with the bidder to submit its bid to the email indicated in the Open Call for Bids on or before the Submission Deadline. The Owner does not accept any responsibility for any bids submitted by means other than the email listed above. Bidders making submissions near the deadline do so at their own risk due server availability. The time for the closing will be determined according to the inbox, time stamp on opencalls@mun.ca.

Bids received after the closing time based on this time stamp, will NOT be considered.

1.2 Bids to be Submitted in Prescribed Format

- Bidders should submit **one (1)** email submission in PDF format.
- Please note: File size cannot exceed 15 MB. Otherwise server may reject bid submission due to size.
- **Bids submitted by fax, mail, courier, drop off or by any other means of delivery other than by email stated above shall not be accepted.**

1.3 Amendment/Revision of Bids

Bidders shall amend their bids after they have been submitted if, and only if, the amendment is emailed prior to the Submission Deadline marked **BID SUBMISSION AMENDMENT** followed by open call number and name. Previous submissions shall be cancelled and the bid submission with the most recent date and time shall be considered the final bid.

Bidders shall revise **APPENDIX C- Pricing form *only*** by submitting an updated **Pricing Form** prior to submission deadline. The revised **Pricing Form** shall replace the **Pricing Form** received with the original bid submission.

PLEASE NOTE: **APPENDIX C – Pricing Form** is the only section of the bid that can be revised independently. All other amendments/revisions shall require completing a new bid submission.

Bidders may revise their bid by email: opencalls@mun.ca

The Owner does not accept any responsibility for amendments submitted by means other than the email listed above. Bidders making submission near the deadline do so at their own rick due to service availability. The time for the closing will be determined according to the inbox, time stamp on opencalls@mun.ca. Amendments to bids received after the closing time base on this times stamp, will NOT be considered.

Email inquiries and requests for clarification shall be accepted up to eight (**8) days (3:00pm NST)** prior to the closing time. Inquiries and requests for clarification received after this date shall not be addressed. The Strategic Procurement Office will be the only official source of

information regarding this Open Call for Bids and information from any other source shall be considered unofficial and may not be correct.

1.4 Amendment of Open Call for Bid Documents

To ensure consistency and quality in the information provided to bidders the Owner shall provide, by way of amendment to this Open Call for Bids, in the form of an addendum, any relevant information with respect to the Open Call inquiries received in writing without revealing the source of those inquiries. Bidders are cautioned that it is their responsibility to ensure that they receive all information relevant to this Open Call. The Owner shall not be responsible for bidders who fail to inform themselves regarding the scope and nature of the work. The Owner shall publish all amendments on Memorial University's current service providers: MERX: www.merx.com, BIDS: www.bids.ca and PODS: www.pods.net. In addition, all amendments will be published on https://www.mun.ca/finance/strategic_procurement/. Bidders should check on a regular basis for Open Call updates. Bidders are solely responsible for ensuring they are aware of and have complied with all amendments by tender closing time. In the event there is a discrepancy between MERX, BIDS, and PODS and the official website https://www.mun.ca/finance/strategic_procurement/ website, the https://www.mun.ca/finance/strategic_procurement/ is the official website. Bidders are welcome to register their email address through opencalls@mun.ca to receive addendum notifications from Open Calls as a matter of courtesy. This does not relieve any Bidder of their responsibility to ensure all addenda has been received.

1.5 Withdrawal of Bids

Bidders may withdraw their bids prior to the Submission Deadline. To withdraw a bid, a notice of withdrawal must be sent to the opencalls@mun.ca email address prior to the Submission Deadline. The Owner is under no obligation to return withdrawn bids.

1.6 Bids Irrevocable after Submission Deadline

Bids shall be irrevocable for a period of **45** days running from the moment that the Submission Deadline passes.

1.7 Delivery

Time is of the essence and delivery schedule(s) are legally binding. Memorial University reserves the right to assess penalties or cancel awards to Bidders who fail to meet the stated delivery or completion dates. Delivery of all materials and services must be DAP (delivered at place) or DDP (delivered duty paid (all locations) and local environs.

1.8 Signature

Memorial University, in consideration of section 11 of the Electronic Commerce Act, confirms its acceptance of electronic signatures, or other acceptable form of electronic consent, in satisfaction of the signature requirement for bid submissions. The electronic form of signature or consent must be directly related to the relevant bid submission at issue and must be reliable, in a manner as determined by Memorial University, for the purpose of identifying the person submitting the bid response. By submitting a bid under this process, the bidder confirms that the signatory has the appropriate and proper authority to bind the bidder to its submission, a confirmation upon which Memorial University relies in the

processing of the bid submission.

Bidders must complete Appendix B –Submission Form. Any bids received without Appendix B completed will be deemed non-complaint.

1.9 Closure

In the event that the University is closed earlier than normally expected prior to a scheduled open calls closing for that day, or for the full day, the closing date for those open calls will be extended to the next business day for the University at the same time as listed originally.

1.10 Corporations Act

The Corporations Act of Newfoundland and Labrador requires that an extra-provincial company be registered before it begins or carries on business in the Province. If your company is not registered, please apply for the appropriate forms and procedures to:

Commercial Registrations Division
Dept of Government Services, PO Box 8700 St John's, NL Canada A1B 4J6
Phone: 709-729-3317, Fax: 709-729-0232
Website: http://www.gs.gov.nl.ca/registries/companies/corp_art_inc.html

[End of Part 1]

PART 2 – EVALUATION AND AWARD

2.0 Stages of Evaluation

The Owner will conduct the evaluation of bids in the following stages:

2.1.0 Stage I – Mandatory Submission Requirements

Stage I will consist of a review to determine which bids comply with all of the mandatory submission requirements. Bids that do not comply with all of the mandatory submission requirements as of the Submission Deadline will, subject to the express and implied rights of the Owner, be disqualified and not evaluated further.

2.1.1 Stage II – Mandatory Technical Requirements

Stage II will consist of a review to determine which bids comply with all of the mandatory technical requirements. Bids that do not comply with all of the mandatory technical requirements as of the Submission Deadline will, subject to the express and implied rights of the Owner, be disqualified and not evaluated further. The mandatory technical requirements are listed in Appendix A - Specifications.

2.1.2 Stage III – Pricing

Stage III will consist of a scoring of the submitted pricing of each compliant bid in accordance with the evaluation method set out in the Pricing Form (Appendix C). The evaluation of price will be undertaken after the evaluation of mandatory requirements has been completed.

2.2 No Amendment to Forms

Other than inserting the information requested on the mandatory submission forms set out in the Open Call, a bidder may not make any changes to any of the forms. Any bid containing any such changes, whether on the face of the form or elsewhere in the bid, shall be disqualified.

2.3 Selection of Lowest Compliant Bidder as Preferred Supplier

Subject to the Owner's reserved rights, the compliant bidder with the lowest pricing will be the preferred supplier, and will be selected to enter into the Agreement in accordance with the following section. In the event of a tie, the preferred supplier will be determined by way of a coin toss, in accordance with the Public Procurement Policy. Provincial suppliers, suppliers with a place of business in Newfoundland and Labrador, will be given provincial supplier preference provision. This mandates an allowance of ten percent for provincial suppliers for all procurement below trade agreement thresholds.

Please note, the supplier preference does not apply when the estimated value of the commodity is above the trade agreement threshold shown in the following table.

Public Body	Thresholds			
	Goods	Services	Public Works	Lease of Space
Memorial University	$133,800	$133,800	$334,400	$100,000

2.4 Notice to Bidder and Execution of Agreement

Notice of selection by the Owner to the preferred supplier shall be in writing. The preferred supplier shall execute the Agreement, the form and content of which will be mutually agreed upon between the parties and satisfy any other applicable conditions of this open call within fifteen (15) days of notice of selection. This provision is solely for the benefit of the Owner and may be waived by the Owner.

2.5 Failure to Enter into Agreement

If a selected bidder fails to execute the Agreement or satisfy the pre-conditions of award listed in the Open Call Particulars within fifteen (15) days of notice of selection the Owner may, without incurring any liability, proceed with the selection of another bidder and pursue all remedies available to the Owner.

2.6 Payment Terms

The University's standard payment terms are net 30 days after delivery of goods, or net 15 days after successful completion of installation as applicable. In the case of services, payment terms are also net 30 days after successful completion of the service. These terms shall also apply in the case of sub-contracted items. Prepayments will not be considered unless the supplier provides an irrevocable standby letter of credit, or the supplier provides a credit reference from its banker (in conjunction with a 50% materials and labour bond and a 50% performance bond) satisfactory to the Director of Financial and Administrative Services.

[End of Part 2]

PART 3 – TERMS AND CONDITIONS OF THE OCB PROCESS

3.1 Open Call Incorporated into Bid

All of the provisions of this Open call are deemed to be accepted by each bidder and incorporated into each bidder's bid. A bidder who submits conditions, options, variations or contingent statements to the terms as set out in this Open call, either as part of its bid or after receiving notice of selection, unless otherwise indicated, shall be disqualified.

3.2 Bidders to Follow Instructions

Bidders should structure their bids in accordance with the instructions in this Open call. Where information is requested in this Open Call, any response made in a bid should reference the applicable section numbers of this Open Call.

3.3 Bids in English

All bids are to be in English only.

3.4 No Incorporation by Reference

The entire content of the bidder's bid should be submitted in a fixed form, and links to the content of websites or other external documents referred to in the bidder's bid but not attached will not be considered to form part of its bid.

3.5 References and Past Performance

In the evaluation process, the Owner may consider information provided by the bidder's references and may also consider the bidder's past performance or conduct on previous contracts with the Owner or other institutions.

3.6 Information in Open Call Only an Estimate

The Owner and its advisors make no representation, warranty or guarantee as to the accuracy of the information contained in this Open Call or issued by way of addenda. Any quantities shown or data contained in this Open Call or provided by way of addenda are estimates only, and are for the sole purpose of indicating to bidders the general scale and scope of the Deliverables. It is the bidder's responsibility to obtain all the information necessary to prepare a bid in response to this Open Call.

3.7 Bidders to Bear Their Own Costs

The bidder will bear all costs associated with or incurred in the preparation and presentation of its bid, including, if applicable, costs incurred for interviews or demonstrations.

3.8 Bid to be Retained by the Owner

The Owner will not return the bid or any accompanying documentation or samples submitted by a bidder.

3.9 Trade Agreements

Bidders should note that procurements falling within the scope of the Canadian Free Trade Agreement, and/or the Canada-European Union Comprehensive Economic Trade Agreement are subject to those trade agreements but that the rights and obligations of the parties will be governed by the specific terms of this Open Call.

3.10 No Guarantee of Volume of Work or Exclusivity of Contract

The Owner makes no guarantee of the value or volume of work to be assigned to the preferred supplier. The Agreement will not be an exclusive contract for the provision of the described Deliverables. The Owner may contract with others for goods and services the same as or similar to the Deliverables or may obtain such goods and services internally.

3.11 Communication After Issuance of Open Call

Bidders shall promptly examine all of the documents comprising this Open Call, and

(a) shall report any errors, omissions or ambiguities; and
(b) may direct questions or seek additional information in writing by email to opencalls@mun.ca on or before the Deadline for Questions. All questions or comments submitted by bidders by email to the Open Call Contact shall be deemed to be received once the email has entered into the Open Call Contact's email inbox. No such communications are to be directed to anyone other than the Open Call Contact, and the Owner shall not be responsible for any information provided by or obtained from any source other than the Strategic Procurement Office. The Owner is under no obligation to provide additional information. It is the responsibility of the bidder to seek clarification from the Open Call Contact on any matter it considers to be unclear. The Owner shall not be responsible for any misunderstanding on the part of the bidder concerning this Open Call or its process.

3.12 All New Information to Bidders by Way of Addenda

This Open Call may be amended only by addendum in accordance with this section. If the Owner, for any reason, determines that it is necessary to provide additional information relating to this Open Call, such information will be communicated to all bidders by addenda. Each addendum forms an integral part of this Open Call and may contain important information, including significant changes to this Open Call. Bidders are responsible for obtaining all addenda issued by the Owner. In the Submission Form (Appendix B), bidders MUST confirm their receipt of all addenda by setting out the number of each addendum in the space provided.

3.13 Addenda and Extension of Submission Deadline

Any addendum issued within four (4) calendar days of the Open Call for Bids closing (Including on closing day) will extend closing by a reasonable period to be determined by Memorial University.

When evaluating bids, the Owner may request further information from the bidder or third parties in order to verify, clarify or supplement the information provided in the bidder's bid. The response received by the Owner shall, if accepted by the Owner, form an integral part of the bidder's bid.

3.14 Notification to Other Bidders

In accordance with section 30 of the *Public Procurement Regulations*, once the Agreement is awarded by the Owner, the outcome of the Open Call will be publicly posted at https://www.mun.ca/finance/strategic_procurement/. There will be no issuing of regret letters.

3.15 Debriefing

In accordance with the Public Procurement Act and Regulations, unsuccessful bidders may request a debriefing within ten (10) business days after the award has been posted. The request must be sent in writing to the Open call contact. The intent of the debriefing information session is to provide the bidder an overview of their bid and why it was unsuccessful and to help the bidder in presenting a better bid in subsequent procurement opportunities. The debriefing process is not for the purpose of providing an opportunity to challenge the procurement process or its outcome. A debriefing shall not disclose information regarding another bidder's bid.

3.16 Supplier Complaint Process

If a bidder wishes to register a complaint with respect to the Open Call process, the complaint should be provided in writing and within the parameters established by section 25 of the Public Procurement Regulations, as amended. The notice must provide a detailed explanation of the bidder's concerns with the procurement process or its outcome, in addition to such other information as may be required by the *Regulations*. Bidders should note that these complaint procedures are separate and distinct from any dispute resolution processes that may be provided for under applicable trade agreements. If a bidder wishes to dispute a matter under an applicable trade agreement, the bidder must follow the process set out in the trade agreement.

3.17 Conflict of Interest and Prohibited Conduct

The Owner may disqualify a bidder for any conduct, situation or circumstances, determined by the Owner, in its sole and absolute discretion, that constitutes a conflict of interest.

The Owner reserves the right to disqualify any bidder that in the Owner's sole opinion has an actual or potential conflict of interest or an unfair advantage.

For the purposes of this Open Call, the term "Conflict of Interest" includes, but is not limited to, any situation or circumstance where in relation to the Open Call process, the bidder has an unfair advantage or engages in conduct, directly or indirectly, that may give it an unfair advantage, including but not limited to: (i) having, or having access to, confidential information of the Owner in the preparation of its bid that is not available to other bidders, (ii) communicating with any person with a view to influencing preferred treatment in the Open Call process (including but not limited to the lobbying of decision makers involved in the Open Call process), or (iii) engaging in conduct that compromises, or could be seen to compromise, the integrity of the open and competitive Open Call process or render that process non-competitive or unfair.

Bidders are required to disclose, to the Open Call Contact, any potential or perceived conflict of interest issues prior to Open Call closing date and time.

3.18 Disqualification for Prohibited Conduct

The Owner may disqualify a bidder, rescind a notification of selection or terminate a contract subsequently entered into if the Owner determines that the bidder has engaged in any conduct prohibited by this Open Call.

3.19 Bidder Not to Communicate with Media

Bidders must not at any time directly or indirectly communicate with the media in relation to this Open Call or any agreement entered into pursuant to this Open Call without first obtaining the written permission of the Open Call Contact.

3.20 No Lobbying

Bidders must not, in relation to this Open Call or the evaluation and selection process, engage directly or indirectly in any form of political or other lobbying whatsoever to influence the selection of the successful bidder(s).

3.21 Illegal or Unethical Conduct

Bidders must not engage in any illegal business practices, including activities such as bid-rigging, price-fixing, bribery, fraud, coercion or collusion. Bidders must not engage in any unethical conduct, including lobbying, as described above, or other inappropriate communications; offering gifts to any employees, officers, agents, elected or appointed officials or other representatives of the Owner; deceitfulness; submitting bids containing misrepresentations or other misleading or inaccurate information; or any other conduct that compromises or may be seen to compromise the competitive process provided for in this Open Call.

3.22 Past Performance or Past Conduct

The Owner may prohibit a supplier from participating in a procurement process based on past performance or based on inappropriate conduct in a prior procurement process, including but not limited to the following:

(a) illegal or unethical conduct as described above;

(b) the refusal of the supplier to honor submitted pricing or other commitments; or

(c) any conduct, situation or circumstance determined by the Owner, in its sole and absolute discretion, to have constituted a Conflict of Interest.

(d) performance on other contracts, including the efficiency and workmanship as well as the extent to which the Bidders performed the Work in accordance with the contractual clauses and conditions, is sufficiently poor to jeopardize the successful completion of the project being bid on, by way of previous contractor performance evaluations.

In addition, the Owner may suspend the bidding privileges of a supplier with regard to non-compliant or substandard performance in accordance with section 26 of the *Public Procurement Regulations*.

3.23 Confidential Information of the Owner

All information provided by or obtained from the Owner in any form in connection with this Open Call either before or after the issuance of this Open Call:

(a) is the sole property of the Owner and must be treated as confidential;

(b) is not to be used for any purpose other than replying to this Open Call and the performance of the Agreement;

(c) must not be disclosed without prior written authorization from the Owner; and

(d) must be returned by the bidder to the Owner immediately upon the request of the Owner.

3.24 Confidential Information of Proponent

This procurement process is subject to the *Access to Information and Protection of Privacy Act, 2015* (*ATIPPA, 2015*). A Proponent must identify any information in its Proposal or any accompanying documentation supplied in confidence for which confidentiality is requested to be maintained by the Owner. The confidentiality of such information will be maintained by the Owner, except as otherwise required by law or by order of a court or tribunal. Proponents are advised that their Proposal will, as necessary, be disclosed, on a confidential basis, to advisers retained by the Owner to advise or assist with the Request for Proposal process, including the evaluation of Proposals.

The Proponent agrees that any specific information in its submission that may qualify for an exemption from disclosure under subsection 39(1) of the *ATIPPA, 2015* has been identified in its submission. If no specific information has been identified it is assumed that, in the opinion of the Proponent, there is no specific information that qualifies for an exemption under the subsection 39(1) of the *ATIPPA, 2015*.

Contracting with the Owner is a public process. Information provided through this process will be disclosed when requested under the *ATIPPA, 2015*, except where disclosure of that information is harmful to the business' interests, as set out in the three-part test in the *ATIPPA, 2015*.

Information, including the financial value of a contract resulting from this procurement process, will be publicly released as part of the award notification process, in accordance with section 30 of the *Public Procurement Regulations*.

If a Proponent has any questions about the collection and use of personal information pursuant to this Request for Proposal, questions are to be submitted to the Request for Proposal Contact. Further information relating to subsection 39(1) of the ATIPPA, 2015 is provided in guidance documents available through the Office of the Information and Privacy Commissioner at https://oipc.nl.ca/guidance/documents.

3.25 Reserved Rights of the Owner

The Owner reserves the right to:

(a) make public the names of any or all bidders as well as bid price and value of contract;

(b) make changes, including substantial changes, to this Open Call provided that those changes are issued by way of addendum in the manner set out in this Open Call; request written clarification or the submission of supplementary written information in relation to the clarification request from any bidder and incorporate a bidder's response to that request for clarification into the bidder's bid. This shall not be an opportunity for bid repair;

(c) assess a bidder's bid on the basis of: (i) a financial analysis determining the actual cost of the bid when considering factors including quality, service, price and transition costs arising from the replacement of existing goods, services, practices, methodologies and infrastructure (howsoever originally established); and (ii) in addition to any other evaluation criteria or considerations set out in this Open Call consider any other relevant information that arises during this Open call process; and (iii) Unbalanced bids, as determined by the Owner, will be rejected (i.e. prices must fairly represent proper compensation for various items of work to be done).

(d) waive minor irregularities and formalities and accept bids that substantially comply with the requirements of this Open Call ;

(e) verify with any bidder or with a third party any information set out in a bid;

(f) check references other than those provided by any bidder;

(g) disqualify a bidder, rescind a notice of selection or terminate a contract subsequently entered into if the bidder has engaged in any conduct that breaches the process rules or otherwise compromises or may be seen to compromise the competitive process;

(h) cancel this Open Call process at any stage;

(i) cancel this Open Call process at any stage and issue a new Open Call for the same or similar deliverables;

(j) accept any bid in whole or in part; or

(k) reject any or all bids;

(l) not necessarily select the lowest or any bidder;

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

3.26 Limitation of Liability

By submitting a bid, each bidder agrees that:

(a) neither the Owner nor any of it employees, officers, agents, elected or appointed officials,

advisors or representatives will be liable, under any circumstances, for any claim arising out of this Open Call process including but not limited to costs of preparation of the bid, loss of profits, loss of opportunity or for any other claim; and

(b) the bidder waives any right to or claim for any compensation of any kind whatsoever, including claims for costs of preparation of the bid, loss of profit or loss of opportunity by reason of the Owner's decision not to accept the bid submitted by the bidder for any reason, the Owner's decision to enter into an agreement with any other bidder or to cancel this bidding process, and the bidder shall be deemed to have agreed to waive such right or claim.

3.31 Governing Law and Interpretation

These Terms and Conditions of the Open Call Process:

(a) are intended to be interpreted broadly and independently (with no particular provision intended to limit the scope of any other provision);

(b) are non-exhaustive and shall not be construed as intending to limit the pre-existing rights of the Owner; and

(c) are to be governed by and construed in accordance with the laws of the Province of Newfoundland & Labrador and the federal laws of Canada applicable therein.

3.32 Facility Compliance Requirement

(a) Equipment, power tools, instruments and appliances intended for use within Memorial University's facilities must comply with all regulatory requirements related to use and/or installation in University facilities. This includes but is not limited to certification/listing by recognized agencies, Pressure Vessel Act of Newfoundland and Labrador and similar.

(b) Items provided related to this open call that receive power from the University's electrical system must be certified or listed for use within Canada by a recognized agency such as Canadian Standards Association (CSA) or Underwriter Laboratories Canada (ULC). A full list of agencies recognized by Memorial University is available upon request.

(c) Equipment, tools, instruments and appliances that generate pressure may require registration as a pressure system with the Province of Newfoundland and Labrador. Compliance with the Boiler, Pressure Vessel and Compressed Gas Regulations under the Public Safety Act of Newfoundland and Labrador and the Boiler, Pressure Vessel, and Pressure Piping Code CSA B51:19 shall be demonstrated.

(d) The vendor is responsible for all costs associated with ensuring the system is compliant with legislative requirements and for the application and registration processes. Field certifications may be considered but all costs and efforts for such scenarios are the responsibility of the vendor.

[End of Part 3]

PART 4 – ENVIRONMENTAL HEALTH AND SAFETY REQUIREMENTS

4.1 Maintaining a healthy and safe environment for all members of the campus community, as well as visitors, is a priority with the University. This involves a commitment from all sectors of the campus community and extends to outside agencies having occasion to come on campus to conduct business.

The following requirements will apply to all work undertaken by contractors and service personnel on any University property or for any work undertaken on behalf of the Owner.

4.1.0 Regulations, Codes and Standards

Contractors shall be familiar with and abide by provisions of various safety codes and standards applicable to the work performed and should refer to:

The Contractor shall be completely responsible for the safety of the Work as it applies to protection of the public and property and construction of the Work.

The codes that must be followed and enforced for safety are:

(a) The National Building Code, Part 8, Safety Measures at Construction and Demolition Sites (Latest Edition);

(b) Canadian Code for Construction Safety (Latest Edition) as issued by the Associate Committee of the National Building Code;

(c) The Occupational Health and Safety Act of Newfoundland and Labrador (most current version) and Regulations.

In particular, strict adherence to the Provincial Occupational Health and Safety Act and Regulations and with the National Building Code of Canada, Part 8 is required.

4.2.0 General Health and Safety Regulations

(a) Contractors/service agencies shall ensure that members of the campus community are not endangered by any work or process in which they may be engaged. Work areas shall be adequately barricaded, and if dust or fumes are generated, suitable enclosures shall be installed to contain such emissions.

(b) No material shall be stored in such a way as to obstruct walkways or represent a danger to pedestrian or vehicular traffic.

(c) Adequate protection shall be provided to prevent the possibility of goods falling from scaffolding or elevated areas. Areas where goods are being loaded or off loaded shall be barricaded or otherwise protected to prevent unauthorized entry. Appropriate warning signs must be posted.

(d) The work areas must be kept reasonably clean and free from debris which could constitute a fire hazard. Care must be taken to ensure that the work process does not activate fire

alarm detection devices. (Generation of dust and fumes can activate smoke detectors causing a false alarm).

(e) Due consideration shall be given to fire safety in buildings. Flammable goods must be kept away from sources of ignition. No work involving the use of open flame devices must be undertaken around flammable solvents of gases.

(f) Some University buildings contain asbestos and other hazardous materials. Do not alter or disturb any goods believed to contain asbestos goods (unless this is a duly authorized part of the project). Consult with University officials before proceeding with any work.

(g) Safety Data Sheets shall be procured for any hazardous product used on campus. Such sheets shall be made readily available for consultation as required under the Workplace Hazardous Materials Information System (WHMIS).

(h) Contractors are required to complete the online training module for Memorials Zero Energy Isolation Program (ZEIP) before mobilizing on site. Training can be accessed via the link: https://ooc.citl.mun.ca/enrol/index.php?id=21 .

- First time users must create an account. Click **'Create new account'**. Enter required information and click **'Create my new account'**.
- A confirmation email will be sent to the email you entered when creating your account. Open that email and click the link it contains.
- Click **'Zero energy isolation Program for Contractors'**.
- To enroll in the training, enter the enrollment key: 7653. Click **'Enroll me'**.
- Complete the training according to the instructions provided in the course.
- Successful completion certificates shall be available during auditing by Environmental Health & Safety.

NOTE: The above requirements are not to be considered all-inclusive and are considered to be complementary to the safety requirements outlined in the agreement between the University and Supplier. Certain conditions and circumstances may require adherence to additional safety requirements.

As a general requirement, contract/service personnel are expected to conduct all work on campus in a professional and safe manner and to give priority to the safety and welfare of members of the campus community.

4.3.0 Contractor Safety Management

4.3.1 All Contractors and Subcontractors to be used by the Contractor in the execution of the Contract shall be required to submit confirmation of a current third party occupational health and safety program certification (Letter of Assurance). These may include, but not be limited to, Certificate of Recognition (COR), OHSAS 18001, and CSA Z.1000.

4.3.2 All Contractors and Subcontractors shall be required to review and follow all requirements of sections 4.4.5.2. below.

4.3.3 Prior to Contract award, the Contractor will be required to provide the Information requested in 4.4.5.2. below.

4.3.4 The University reserves the right to stop any work or portion of work where no documentation can be produced on site which identifies the hazards presented by a piece of work, safe work procedures for work or certification of employees performing work. The Contractor is liable for any costs incurred by affected parties associated with such a stoppage.

4.4.0 Contractor Safety Management Element

4.4.1 Purpose

This element establishes the requirements for the administration and monitoring of contractor health and safety programs and activities at Memorial University. These measures shall ensure that contractors understand their collective responsibility with respect to the Occupational Health & Safety Act and Regulations, Memorial University policy and this element.

4.4.2 Scope

This procedure shall apply to all work done for Memorial University of Newfoundland with respect to the provision of services as outlined below. Memorial University reserves the right to exempt a Contractor from this element, in whole or in part, based upon an evaluation of the risk of the work being conducted. This evaluation must comply with the hazard identification and risk management element.

4.4.3 Definitions

Act: Newfoundland & Labrador Occupational Health & Safety Act, latest edition.
Contract: A documented agreement between Memorial University and a contractor.
Contractor: The principal contractor, person, partnership, or corporation bound to execute the work under the contract and defined as such in the agreement is responsible for the supervision of the work so as to ensure the work is carried out in accordance with the contract.
Project Management Team: The group assigned by the University to act on behalf of the owner with respect to the execution of Contractor work.
Principal Contractor: The person primarily responsible for the carrying out of a contract.
Regulations: Newfoundland & Labrador Occupational Health & Safety Regulations, latest edition.
Subcontractor: A person, firm or corporation having a direct contract with the Contractor or subcontractor(s) to perform a part or parts of the work included in the contract, or to supply products worked to a special design according to the contract documents, but does not include one who merely supplies products not so worked.

Owner: The Owner, Engineer/Architect are the persons, firms or corporation identified as such in the Contract. The term Owner, Engineer/Architect means, respectively, each of the Owner, Engineer/Architect and their authorized representatives as designated by each such party in writing.
Work: The services and job procedure completion that is described in the contract.

4.4.4 Roles and Responsibilities

4.4.4.1 Project Management Team, including Environmental Health & Safety

Will monitor the Contractor's performance for health and safety compliance. Monitoring activities may include but are not limited to:

- planned and unplanned workplace inspections;
- attendance of meetings;
- communications of safety related issues and topics, as deemed necessary;
- review of contractor records, inspections, work practices and documentation; and
- complete audits to verify that contractors and subcontractors are meeting their legislative, procedural and contractual responsibilities.

4.4.4.2 Contractors

Will comply with applicable Federal and Provincial legislation and applicable MUN safety procedures. Contractor responsibilities include but not limited to:

- report all incidents immediately to the required University project team followed by a written incident report within 24 hours;
- be responsible for the safety of subcontractors including those not under their employ;
- stop work if the conditions are such that work cannot be performed safely;
- perform evaluation, monitoring of the workplace to identify potential hazards and associated risks and ensure corrective actions are implemented;
- ensure daily task specific hazard assessments are completed; and
- maintain the accountability of persons responsible for the reporting and correction of hazards.

4.4.5 Procedure

4.4.5.1 Considerations prior to signing of contract

Prior to signing of contract, the preferred General Contractor shall provide proof of compliance with 4.4.4.2. within seven (7) calendar days. After a pre-signing start up meeting, the General Contractor shall provide proof of compliance of themselves and their subcontractors with 4.4.4.2. as well as the information requested in Section 4.4.4.2.(a)(b).

4.4.5.2 Requirements

All Contractors, and their Subcontractors, shall be required to submit confirmation of a current third party occupational health and safety program certification (Letter of Assurance). These may include, but not be limited to, Certificate of Recognition (COR), OHSAS 18001, and CSA Z.1000.

Contractors shall also provide the following:

(a) health and safety policy statement;

(b) safety program table of contents; and

(c) site hazard assessment;

The hazard assessment shall be updated by the General Contractor and re-submitted whenever the conditions, work practices or work forces change to the extent that new hazards can be identified.

In lieu of a Subcontractors 3rd party program, Contractors shall be required to integrate the Subcontractor(s) into the Contractors program and provide proof of same.

Memorial reserves the right to request and audit the full safety program of Contractors and Subcontractors and their associated documentation. This documentation may include, but not be limited to the following:

(a) safety program and/or manual

(b) applicable documented safe work practices;

(c) inspection reports and schedules;

(d) required employee safety training certifications and qualifications; and

(e) updated list of OHS Committee and/or a worker health and safety representative, or workplace health and safety designate.

Request for submission shall be complied with within 7 calendar days of a written request from Memorial’s Environmental Health and Safety unit.

Memorial reserves the right to:

(a) Reject any Contractor that fails to meet the requirements or schedules outlined herein;

(b) The University reserves the right to stop any work or portion of work where the risk presents an immediate danger.

4.4.5.3 Schedule of Submissions

General Contractors and their sub-contractors who have complied with 5.1.1 will be permitted to commence physical work on the site however no work shall be performed by the General Contractor, their sub-contractors until such a time as they comply with 5.1.1.

4.4.6 Post-Contract Evaluation

Environmental Health & Safety will determine the extent of the evaluation of the Contractor's safety performance at the completion of the contract. This evaluation will be conducted by way of a standard contractor safety evaluation form and will be supported by objective evidence documented during the term of the Contract. The records of the evaluation must be retained with the project owner.

4.5 Access To Site

4.5.1 All Contractors and Subcontractors to be used in the execution of the Contract shall give advance notification of when they will be on site. Any work to be performed outside of Regular Time must have advance approval of the Owner.

Any discontinuation of the Work which causes a Contractor or their Subcontractors to suspend operations onsite will require the following:

- Contractor/Subcontractors shall notify the Owner of the stop work date.
- Contractor/Subcontractors shall ensure the site is left in a safe and secure condition.
- Contractor/Subcontractors shall ensure that locks and tags on mechanical and/or electrical systems are removed and, where necessary, replaced by the University.
- Contractor/Subcontractors shall not return to site without expressed prior permission from the Owner.

[End of Part 4]

PART 5– GENERAL CONDITIONS

5.1 I/We hereby authorize the Owner to release names of Subcontractors, Suppliers and Manufacturers used in my/our Bid including those as listed in Appendix "D", where such information is requested from the Owner.

5.2 I/We understand that Bids that do not list major Subcontractors and Suppliers and Manufacturers where required in Appendix “D” may be rejected.

5.3 I/We reserve the right to substitute other Subcontractors and/or Suppliers and/or Manufacturers for any Subcontractor or Suppliers or Manufacturer withdrawing their Bid or becoming bankrupt after the date hereof. Any such substitutes shall be subject to the approval of the Owner and contingent upon evidence of withdrawal or bankruptcy satisfactory to the Owner.

5.4 I/We agree that upon approval by the Engineer/Architect, the Owner shall have the right to take possession of any part of the work upon its completion, except for minor deficiency items, and that such possession shall not necessarily constitute acceptance of that part of the work.

5.5 I/We understand and agree that the Owner may order changes to the work in the form of additions or deletions in accordance with the General Conditions, Supplementary General Conditions and the intent of the Contract Documents.

5.6 I/We understand and agree that the Unit Price Table in Appendix "C2" must be completed where indicated and the total amount included in my/our stipulated price for the total performance of the work under Part 4 of the Bid and Acceptance form. I/We understand that the Unit Prices include all costs and charges of every kind, including overhead and profit, to perform the items of work listed in Appendix "A". I/We also understand that these same Unit Prices will be used for additions or deletions to the actual measured quantities.

5.7 When Appendix “E” is included in the Open Call, I/we understand that bids which do not list project references, where required in Appendix “E”, will be rejected.

5.8 Corporations Act

The Corporations Act of Newfoundland and Labrador requires that an extra-provincial company be registered before it begins or carries on business in the Province. If your company is not registered, please apply for the appropriate forms and procedures to:

Commercial Registrations Division
Dept. of Government Services, PO Box 8700
St John’s, NL Canada A1B 4J6
Phone: 709-729-3317, Fax: 709-729-0232
Website: http://www.gs.gov.nl.ca/registries/companies/corp_art_inc.html

[End of Part 5]

Part 6 – Supplementary Terms and Conditions

6.1 The open call document consist of the Open Call and Acceptance Form, General Conditions of Contract, Supplementary General Conditions of Contract, Special Conditions, Campus Safety and Health Regulations, Contractors Performance Evaluation, Drawings, Specifications and any Addenda to the Contract Documents issued before the open call closing period.

6.2 Surety

6.2.1 Bid Surety

Bids shall be accompanied by a copy of a bid security by way of a Bid Bond from a surety company acceptable to the Owner and which is licensed to do business in the Province of Newfoundland and Labrador or a copy of a cheque in the amount of 10 percent of the bid price. Originals to be delivered to Memorial University post tender closing. Bid security will not be required for a total contract value of $100,000 or less (HST Excluded), unless specifically called for in the contract documents. The bid security will be returned to the bidder upon receipt of the required Performance Bond and Labour and Materials Payment Bond as per 6.2.2 below.

The terms of the bid security will be invoked and the amount retained by the Owner if: the Tenderer fails to enter into a formal agreement, where one is specified, when notified of the award of the Contract within the tender validity period; or fails to provide the required Performance Bond and Labour and Materials Payment Bond within the time specified

6.2.2 Public Work's Surety

Within seven (7) days of the issuance of the letter of acceptance, the preferred Bidder shall obtain and deliver to the Owner a Performance Bond in the amount of 50 percent of the bid price (HST Excluded) which guarantees the successful and complete performance of the Work. The Performance Bond is required as a condition of bid award. In lieu of a Performance Bond an approved certified cheque in the amount of 10 percent of the bid price may, at their option, be accepted for retention by the Owner until the successful completion of the Contract. The certified cheque will be retained until satisfactory completion of the Work including the warranty period after which it will be returned to the Contractor. Performance Bond or other such security will not be required for a contract value of $100,000 or less. No Work is to be undertaken while the above performance security remains outstanding.

Within seven (7) days of issuance of the letter of acceptance, the preferred Bidder shall obtain and deliver to the Owner a Labour and Materials Payment Bond in the amount of 50 percent of the bid price (HST Excluded). The Labour and Materials Payment Bond is required as a condition of the bid award. In lieu of a Labour and Materials Payment Bond, an approved certified cheque in the amount 10 percent of the bid price may, at their option, be accepted for retention by the Owner until successful completion of the Contract. The certified cheque will be retained until substantial completion of the Work as defined by the Mechanics Lien Act and upon receipt of an acceptable statutory declaration form stating that all labour and material obligations due and payable under the Work have been discharged, after which it will then be returned to the Contractor. Labour and Materials

Payment Bond or other such security will not be required for a contract value of $100,000 or less. No Work is to be undertaken while the above labour and materials security remains outstanding.

No interest will be paid to the preferred Bidder for any certified cheques on deposit during the period of retention.

The cost of all bid, performance and labour and materials security shall be included in the bid price

6.3 Site Visit

A site visit may occur at the time and location identified on the Request for Open Calls for Bids Information Sheet.

Questions will not be answered at the site visit.

Before submitting a bid, Bidders may carefully examine the site of the Proposed Work and fully inform themselves of the existing condition and limitations. It is the responsibility of the Bidder to report any unsatisfactory conditions in writing which may adversely affect the proper completion of the work, to opencalls@mun.ca, at least **eight (8)** days before the open call closing date. Submission of a bid shall imply acceptance of previously completed Work and the conditions of the site, and the Contractor shall, therefore, be fully responsible for executing the Work in accordance with the Contract Documents.

6.4 Substitution of Materials

6.4.1 The open call shall be based upon using the materials or products as specified without substitution, unless there is an "or approved alternate" clause. Where two or more brand names are specified, the choice shall be left to the bidder. Where only one brand name is stated, there shall be no substitution.

6.4.2 Where the Specifications include the "or approved alternate" clause, substitutions may be proposed provided that the request for a substitution is received in writing at least eight (8) days (3:00pm NST) prior to the open call closing date and shall clearly define and describe the product for which the substitution is requested. Submissions shall compare in tabular form, to the characteristics and performance criteria of the specified material.

6.4.3 It is the Bidder's responsibility to ensure that the substituted article is equivalent to the specified article with regard to design, function, appearance, durability, operation and quality.

6.4.4 Request for substitutions made after the award of the contract will be subject to the requirements of Clause 2.37.0 MATERIALS AND SUBSTITUTIONS in the General Conditions of the Contract and will only be considered under special circumstances or where it is clear, at the Engineer's/Architect's discretion, that proposed substitution will provide a substantial benefit to the Owner.

6.4.5 Approval of the substitution shall be in the form of an addendum to the Specifications.

The decision on substitutions will be final.

6.5 Completion date

6.5.1 Bidders shall state the time required to complete the Contract from time of open call award. The bidder shall, within seven (7) days after the Contract is award submit a preliminary construction schedule indicating as closely as possible the starting and completion date for the major sections of the Work.

[End of Part 6]

APPENDIX A – SPECIFICATIONS AND DRAWINGS

SPECIFICATIONS AND DRAWINGS
LOCATED AT THE END OF THIS DOCUMENT

APPENDIX B – SUBMISSION FORM

1. Bidder Information

Please fill out the following form, naming one person to be the bidder's contact for the Open Call process and for any clarifications or communication that might be necessary.	
Full Legal Name of Bidder:	
Any Other Relevant Name under which Bidder Carries on Business:	
Street Address:	
City, Province/State:	
Postal Code:	
Phone Number:	
Fax Number:	
Company Website (if any):	
Bidder Contact Name and Title:	
Bidder Contact Phone:	
Bidder Contact Fax:	
Bidder Contact Email:	

2. Offer

The bidder has carefully examined the Open Call documents and has a clear and comprehensive knowledge of the Deliverables required under the Open Call. By submitting a bid, the bidder agrees and consents to the terms, conditions and provisions of the Open Call, including the Form of Agreement, and offers to provide the Deliverables in accordance therewith at the rates set out in the completed Pricing Form (Appendix C1 and/or C2 and/or C3).

3. Rates

The bidder has submitted its rates in accordance with the instructions in the Open Call and in the Pricing Form (Appendix C1 and/or C2 and/or C3). The bidder confirms that it has factored all of the provisions of Appendix A, including insurance and indemnity requirements, into its pricing assumptions and calculations.

4. Addenda

4.1 The bidder is deemed to have read and accepted all addenda issued by the Owner. The onus is on bidders to make any necessary amendments to their bids based on the addenda. The bidder is required to confirm that it has received all addenda by listing the addenda numbers in table below:(**Listing of individually the numbers of each Addendum received in the blank space)**

NOTE: FAILURE TO COMPLETE "TABLE: ADDENDA RECEIVED" LOCATED BELOW SHALL RESULT IN BID DISQUALIFICATION:

TABLE 1.10: ADDENDA RECEIVED

Bidders who fail to complete the above table will be deemed to have not received all posted addenda and shall be deemed **non- compliant.**

5. No Prohibited Conduct

The bidder declares that it has not engaged in any conduct prohibited by this Open Call.

6. Disclosure of Information

The bidder hereby agrees that any information provided in this bid, even if it is identified as being supplied in confidence, may be disclosed where required by law or by order of a court or tribunal. The bidder hereby consents to the disclosure, on a confidential basis, of this bid by the Owner to the advisers retained by the Owner to advise or assist with the Open Call process, including with respect to the evaluation of this bid.

7. Bid Irrevocable

The bidder agrees that its tender shall be irrevocable for a period of **45** days running from the moment that the Submission Deadline passes.

8. Execution of Agreement

The bidder agrees that in the event its bid is selected by the Owner, in whole or in part, it will finalize and execute the Agreement in the form set out in Appendix A (or in a form mutually acceptable to the parties) to this Open Call in accordance with the terms of this Open Call . Failure to submit this signature section will render the proposal NON-COMPLIANT and the proposal will be disqualified.

BIDDER SIGNATURE FORM:

BIDDERS MUST COMPLETE THE BIDDER SIGNATURE FORM. ANY BIDS RECEIVED WITHOUT THE BIDDER CONTACT FORM COMPLETED WILL BE DEEMED NON- COMPLIANT

(See Part 1 section 1.8 for Electronic Signature acceptance)

Signature of Witness	Signature of Bidder Representative
Name of Witness	Name of Bidder Representative
	Title of Bidder Representative
	Date

I have the authority to bind the bidder.

IN SIGNING THIS PAGE AND SUBMITTING YOUR PROPOSAL, THE PROPONENT ACKNOWLEDGES HAVING READ, UNDERSTOOD AND AGREED TO THE TERMS AND CONDITIONS OF THIS DOCUMENT

APPENDIX C1 – PRICING FORM

1. INSTRUCTIONS ON HOW TO COMPLETE THE PRICING FORM

- Rates must be provided in Canadian Dollars
- Rates quoted by the bidder must be all-inclusive and must include all labor and material costs, all travel and carriage costs, all insurance costs, all costs of delivery to the Owner, all costs of installation and set-up, including any pre-delivery inspection charges, and all other overhead, including any fees or other charges required by law
- Owner: Having carefully examined the site and all conditions affecting the proposed work as well as the Bid Documents including the Drawings and Specifications, all Addenda and the Instructions to bidders, I/We, the undersigned, hereby offer to furnish all necessary labour, materials, superintendence, plant, tools, equipment, etc., required to complete all work requisite and necessary for the proper execution of this Contract, expeditiously and in the satisfactory manner and accept in full payment therefore a stipulated sum of:

	Contract Bid (HST Excluded)	
Price A: Subtotal		HST EXCLUDED
Price B: Sum of Allowances (Section 01 21 00)	$26,086.97	HST EXCLUDED
Price C: Total: [$(A+B)]		HST EXCLUDED

I/We agree to commence work within two (2) weeks after the acceptance of my/our Bid and complete the work in _____weeks from the acceptance of the Bid and to coordinate the scheduling of our work with that of all Subcontractors working on the Project. The time of completion indicated herein is required and will be a significant factor in assessing bids.

2. THE DELIVERABLES:

EN-164-21: Engineering Building, Renovations to EN-2078
as per specifications listed in Appendix A

3. MANDATORY SUBMISSION REQUIREMENTS

(a) Submission Form (Appendix B)
Each bid must include a Submission Form (Appendix B) completed and signed by an authorized representative of the bidder.

(b) Each bid must include Pricing Form (Appendix C1) as per instructions on form.

(c) Where Appendix C2 and C3 are required, they must be included in bid submission.

APPENDIX C2 – UNIT RATES

<PAGE INTENTIONALLY LEFT BLANK, APPENDIX NOT USED>

APPENDIX C3 - FURNITURE BIDDING TABLE

< PAGE INTENTIONALLY LEFT BLANK, APPENDIX NOT USED >

APPENDIX D - LIST OF SUBCONTRACTORS

Herewith is the list of Subcontractors, Suppliers and/or Manufacturers referred to in Section no. **5.1 of Part 5 of the Open Call and Acceptance Form**. The Subcontractors and Suppliers whose bids have been used in the preparation of this Bid must be listed in full including work to be done by own forces (B.O.F.). By Own Forces will be considered valid and satisfactory only if, prior to award, the supplier provides three (3) current (< 3 years) references of satisfactory completion of trade work of similar ***scale, scope and complexity*** as that described within the Bid documents. Trade certifications may be requested in addition to the references above. The determination of suitability is entirely at the discretion of the owner and shall be based on submitted documentation. The owner may use their knowledge and understanding of experience and performance of the Contractor on past work in lieu of this submission. The list will be subject to the approval of the Owner.

NOTE: FAILURE TO COMPLETE THIS PORTION OF THE BID SUBMISSION SHALL RESULT IN DISQUALIFICATION.

The trades below, if listed, have been identified by the owner, however it is the Bidder's responsibility to identify all applicable subtrades.

TRADE/DIVISION	SUBCONTRACTOR - SUPPLIER - MANUFACTURER
Hazardous Materials Abatement	
Demolition	
Masonry	
Metal Stud & Gypsum Board	
Millwork	
Roofing	
Doors & Frames	
Flooring	
Plaster & Paint	
Plumbing	
HVAC	
Controls	
Electrical	
Fire Alarm	
Lift Services	
ADD TRADES AS REQUIRED	

APPENDIX E – PROJECT REFERENCE (ROOFING PROJECTS ONLY)

Hereunder is a list of project references, as required in the specifications. The list will be subject to the approval of the Owner.

NOTE: FAILURE TO COMPLETE THIS PORTION OF THE BID SUBMISSION SHALL RESULT IN BID DISQUALIFICATION.

Project Reference #1	
Project Name:	
Building Location:	
Owner & Contact Information:	
Roof Area (Sq Ft):	
Construction Cost:	
Date of Completion:	
Was work completed as Prime or Sub-Contractor?	
Existing Deck Construction:	
Roof System Construction: **Example Only:** **Metal Deck** **Densdeck Deck Cover** **Sopravap'r** **Sopra-iso (2 layers)** **Sopraboard** **Base Sheet Membrane** **Cap Sheet Membrane**	
Mechanically Fastened or Fully Adhered System?	

Project Reference #2	
Project Name:	
Building Location:	
Owner & Contact Information:	
Roof Area (Sq Ft):	
Construction Cost:	
Date of Completion:	
Was work completed as Prime or Sub-Contractor?	
Existing Deck Construction:	
Roof System Construction: **<u>Example Only:</u>** **Metal Deck** **Densdeck Deck Cover** **Sopravap'r** **Sopra-iso (2 layers)** **Sopraboard** **Base Sheet Membrane** **Cap Sheet Membrane**	
Mechanically Fastened or Fully Adhered System?	

Project Reference #3	
Project Name:	
Building Location:	
Owner & Contact Information:	
Roof Area (Sq Ft):	
Construction Cost:	
Date of Completion:	
Was work completed as Prime or Sub-Contractor?	
Existing Deck Construction:	
Roof System Construction: **<u>Example Only:</u>** **Metal Deck** **Densdeck Deck Cover** **Sopravap'r** **Sopra-iso (2 layers)** **Sopraboard** **Base Sheet Membrane** **Cap Sheet Membrane**	
Mechanically Fastened or Fully Adhered System?	

DEPARTMENT OF FACILITIES MANAGEMENT

GENERAL CONDITIONS

AND

AGREEMENT BETWEEN OWNER AND CONTRACTOR

FOR

THE STIPULATED PRICE CONTRACT

May 2023

GENERAL CONDITIONS AND AGREEMENT
BETWEEN OWNER AND CONTRACTOR FOR THE STIPULATED PRICE CONTRACT

INDEX

1.0 GENERAL CONDITIONS....6
1.1.0 DEFINITIONS....12
2.2.0 DOCUMENTS....14
2.3.0 ADDITIONAL INSTRUCTIONS AND SCHEDULE OF WORK....15
2.4.0 ENGINEER/ARCHITECT'S DECISIONS....16
2.5.0 DELAYS....16
2.6.0 OWNER'S RIGHT TO PERFORM WORK, STOP WORK AND/OR TERMINATE CONTRACT....17
2.10.0 SUBCONTRACTORS....20
2.11.0 DISPUTES....21
2.12.0 INDEMNIFICATION....22
2.13.0 CHANGES IN THE WORK AND EXTRA WORK....22
2.14.0 VALUATION AND CERTIFICATION OF CHANGES IN THE WORK....23
2.15.0 APPLICATION FOR PAYMENT....24
2.16.0 CERTIFICATES AND PAYMENTS....26
2.17.0 TAXES AND DUTIES....29
2.18.0 LAWS, NOTICES, PERMITS AND FEES....29
2.19.0 PATENT FEES....30
2.20.0 WORKERS' COMPENSATION....31
2.21.0 LIABILITY INSURANCE....31
2.22.0 PROPERTY INSURANCE....33
2.23.0 PROTECTION OF WORK AND PROPERTY....34
2.24.0 DAMAGES AND MUTUAL RESPONSIBILITY....35
2.25.0 BONDS....36
2.26.0 WARRANTY....36
2.27.0 CONTRACTOR'S RESPONSIBILITIES AND CONTROL OF THE WORK....37
2.28.0 SUPERINTENDENCE....37
2.29.0 LABOUR AND PRODUCTS....38
2.30.0 SUBSURFACE CONDITIONS....40
2.31.0 USE OF THE WORK....40
2.32.0 CUTTING AND REMEDIAL WORK....41
2.33.0 INSPECTION OF WORK....41
2.34.0 REJECTED WORK....42
2.35.0 SHOP DRAWINGS AND SAMPLES....42
2.36.0 TESTS AND MIX DESIGNS....43
2.37.0 MATERIALS AND SUBSTITUTIONS....43
2.38.0 TIME OF ESSENCE....44
2.39.0 CASH ALLOWANCE....44
2.40.0 CLEANUP AND FINAL CLEANING OF THE WORK....45

3.0 SUPPLEMENTARY GENERAL CONDITION 47
4.0 SPECIAL CONDITIONS 51
4.1.0 LAYOUT OF WORK 48
4.2.0 JOB SIGN 48
4.3.0 TEMPORARY OFFICES AND SHEDS 48
4.4.0 TEMPORARY SERVICES 49
4.8.0 PROGRESS PHOTOGRAPHS 51
4.9.0 OPERATIONS AND MAINTENANCE DATA 51
4.10.0 COORDINATION OF WORK 52
4.11.0 TRAFFIC MAINTENANCE 52
4.12.0 FIRE PROTECTION 52
4.13.0 JOB MEETINGS 53
4.14.0 AS-BUILT DRAWINGS 53
4.15.0 COMPLETION TIME 53
4.16.0 CLOSE DOWN OF WORK 54
4.17.0 BROKEN GLASS 54
4.18.0 HOARDING 54
4.19.0 COMMISSIONING 54
4.20.0 FINAL CLEAN-UP 54
5.0 CAMPUS SAFETY AND HEALTH REGULATIONS 56
5.1.0 REGULATIONS, CODES AND STANDARDS 56
5.2.0 GENERAL SAFETY REGULATIONS 56
6.0 CONTRACTOR PERFORMANCE EVALUATION 58

1.0 GENERAL CONDITIONS

1.1.0 DEFINITIONS

1.1.1 Contract Documents

The Contract Documents consist of the Instructions to bidders, Executed Agreement between the Owner and the Contractor, General Conditions of Contract, Supplementary General Conditions of Contract, Special Conditions, Campus Safety and Health Regulation, Contractor Performance Evaluations, Specifications, Drawings and such other documents forming part of the open call, including all amendments thereto incorporated before their execution and subsequent amendments thereto made pursuant to the provisions of the Contract or agreed upon between the parties. The successful bid and any Addenda to the Specifications issued during the bidding period shall also form part of the Contract Documents.

1.1.2 Owner, Engineer/Architect, Contractor

The Owner, Engineer/Architect and Contractor are the persons, firms or corporation identified as such in the Agreement. The term Owner, Engineer/Architect and Contractor means the Owner, Engineer/Architect and Contractor or their authorized representatives as designated by each party in writing.

1.1.3 Subcontractors

A Subcontractor is a person, firm or corporation having a direct contract with the Contractor to perform a part or parts of the Work included in the Contract, or to supply products worked to a special design according to the Contract Documents, but does not include one who merely supplies products not so worked.

1.1.4 The Project

The Project is the total construction contemplated of which the Work performed under the Contract Documents may be the whole or a part.

1.1.5 The Work

The Work means the total construction and related services required by the Contract Documents.

1.1.6 Place of Work

The Place of Work is the designated site or location of the project of which the Work may be the whole or a part.

1.1.7 Products/Materials/Equipment

The term Products/Materials/Equipment means all materials, machinery, equipment and fixtures forming the Work as required by the Contract Documents but does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work and normally referred to as construction machinery and equipment.

1.1.8 Other Contractor

The term Other Contractor means any persons, firm or corporation employed by or having a separate contract directly or indirectly with the Owner for Work other than that required by the Contract Documents.

1.1.9 Time

a) The Contract Time is the time stated in the Open Call for Bid and Acceptance Form for substantial performance of the Work.

b) The date of substantial performance of the Work is the date certified by the Engineer/Architect.

c) The term day, as used in the Contract Documents, shall mean the calendar day.

d) The term working day means any day observed by the construction industry in the area of the place of the Work.

1.1.10 Substantial Performance of the Work

A Contract shall be deemed to be substantially performed:

a) When the Work or a substantial part thereof is ready for use or is being used for the purpose intended; and

b) When the Work to be done under the Contract is capable of completion or correction at a cost of not more than:

(i) 3% (Three per centum) of the first two hundred and fifty thousand dollars ($250,000) of the Contract Price;

(ii) 2% (Two per centum) of the next two hundred and fifty thousand dollars ($250,000) of the Contract Price; and

(iii) 1% (One per centum) of the balance of the Contract Price.

c) When the Work or a substantial part thereof is ready for use or is being used for the purpose intended and where the Work cannot be completed expeditiously for

reasons beyond the control of the Contractor, the value of the remaining Work to be completed shall be deducted from the Contract Price in determining substantial performance.

1.1.11 Total Performance of the Work

Total Performance of the Work shall mean when the entire Work except those items arising from the provision **2.26.0 WARRANTY** has been performed to the requirements of the Contract Documents and is so certified by the Engineer/Architect.

1.1.12 Changes in the Work

Changes in the Work means additions, deletions or other revisions to the Work within the general scope of Work as contemplated by the Contract Documents.

1.1.13 Extra Work

Extra Work means any additional work or service, the performance of which is beyond the scope of Work as contemplated by the Contract Documents.

2.2.0 DOCUMENTS

2.2.1 The Contract Documents shall be signed in triplicate by the Owner and the Contractor.

2.2.2 Words and abbreviations which have well-known technical or trade meanings are used in the Contract Documents in accordance with such recognized meanings.

2.2.3 In the event of conflicts between Contract Documents, the following shall apply:

a) Documents of later date shall govern;

b) Figured dimensions shown on the drawings shall govern even though they may differ from scaled dimensions on the same drawing;

c) Drawings of larger scale shall govern over those of smaller scale of the same date;

d) Specifications shall govern over drawings;

e) Special Conditions shall govern over Specifications;

f) The General Conditions of Contract shall govern over Specifications;

g) Supplementary General Conditions shall govern over the General Conditions of the Contract;

h) The Executed Agreement between the Owner and the Contractor shall govern over all documents.

2.2.4 The Contractor will be provided, without charge, up to twelve (12) sets of Contract Documents or parts thereof as are reasonably necessary for the performance of the Work.

2.2.5 The Contractor shall keep a copy of all current Contract Documents and shop drawings on the site, in good order and available to the Engineer/Architect and or their representatives. This requirement shall not be deemed to include the executed Contract Documents.

2.2.6 Drawings, specifications, models and copies thereof furnished to the Contractor are to be used only with respect to the Work. Such documents and models are not to be otherwise used or revised in any manner without the written authorization of the Owner.

2.2.7 Models furnished by the Contractor at the Owner's expense are the property of the Owner.

2.3.0 ADDITIONAL INSTRUCTIONS AND SCHEDULE OF WORK

2.3.1 During the progress of the Work, the Engineer/Architect shall furnish to the Contractor such additional instructions as may be necessary to supplement the Contract Documents. All such instructions shall be consistent with the intent of the Contract Documents.

2.3.2 Additional instructions may include minor changes to the Work which affect neither the Contract Price nor the Contract Time.

2.3.3 Additional instructions may be in the form of drawings, samples, models or written instructions.

2.3.4 Additional instructions will be issued by the Engineer/Architect with reasonable promptness and in accordance with any schedule agreed upon for such instructions.

2.3.5 The Contractor shall prepare and update, as required, a construction schedule indicating the timing of major activities of the Work. The schedule shall be designed to conform with the Contract Time. The schedule shall be submitted to the Engineer/Architect within seven (7) days of the date of the Owner's letter of award. The contractor shall monitor the progress of the Work relative to the schedule and advise the Engineer/Architect of any revisions required as a result of delays, as provided for in **2.5.0 DELAYS**, and indicating what action will be taken to complete the Work within the Contract Time.

2.4.0 ENGINEER/ARCHITECT'S DECISIONS

2.4.1 The Engineer/Architect, in the first instance, shall decide on questions arising under the contract Documents and interpret the requirements therein. Such decisions shall be given in writing.

2.4.2 The Contractor shall notify the Engineer/Architect in writing within fourteen (14) days of receipt of a decision of the Engineer/Architect referred to in 2.4.1, should they hold that a decision by the Engineer/Architect is in error and/or at variance with the Contract Documents. Unless the Contractor fulfils this requirement, subsequent claims by them for extra compensation arising out of the decision will not be accepted.

2.4.3 If the question of error and/or variance is not resolved immediately, and the Engineer/Architect decides that the disputed work shall be carried out, the Contractor shall act according to the Engineer/Architect's written decision.

Any questions of change in Contract Price and/or extension of Contract Time due to such error and/or variance shall be decided as provided in **2.11.0 DISPUTES**.

2.5.0 DELAYS

2.5.1 If it can be clearly shown that the Contractor is delayed in the performance of the Work by any act or fault of the Owner, Engineer/Architect, then the Contract Time shall be extended for such reasonable time as the Engineer/Architect may decide in consultation with the Owner and the Contractor. The Contractor shall be entitled to be reimbursed for any costs incurred by them as a result of such a delay occasioned by the act or fault, provided that it can be clearly shown that the Contractor's forces cannot work efficiently elsewhere on the project and that the incurred cost is limited to that which could not reasonably have been avoided.

2.5.2 If the Contractor is delayed in the performance of the Work by a Stop Work Order issued by any court or other public authority and providing that such order was not issued as the result of any act or fault of the Contractor or of anyone employed by them directly or indirectly then the Contract Time shall be extended for such reasonable time as the Engineer/Architect may decide in consultation with the Contractor.

2.5.3 If the Contractor is delayed in the performance of the Work by civil disorders, labour disputes, strikes, lockouts, (including lockouts decreed or recommended for its members by a recognized Contractor's Association, of which the Contractor is a member) fire, unusual delay by common carriers or unavoidable casualties, or without limit to any of the foregoing, by any cause of any kind whatsoever beyond the Contractor's control, then the Contract Time shall be extended for such reasonable time as may be decided by the Engineer/Architect in consultation with the Owner and the Contractor, but in no case shall the extension of time be less than the time lost as the result of the event causing the delay, unless such shorter extension of time be agreed to by the Contractor.

2.5.4 No extension shall be made for delays unless written notice of claims is given to the Engineer/Architect within fourteen (14) days of its commencement, providing that in the case of the continuing cause of delay one notice shall be necessary.

2.5.5 If no schedule is provided under **2.3.0 ADDITIONAL INSTRUCTIONS AND SCHEDULE OF WORK**, no claim for delay will be considered because of failure to furnish instructions until fourteen (14) days after a demand for such instructions had been made and not then unless such claim is reasonable.

2.6.0 OWNER'S RIGHT TO PERFORM WORK, STOP WORK AND/OR TERMINATE CONTRACT

2.6.1 If the Contractor should be adjudged bankrupt or makes a general assignment for the benefit of creditors because of their insolvency or if a Receiver is appointed on account of their insolvency, the Owner may, without prejudice to any other right or remedy they may have, by giving the Contractor or Receiver or Trustee in Bankruptcy written notice, terminate the Contract. If a Performance Bond has been provided by the Contractor guaranteeing faithful performance of the Work, the Owner shall give written notice to the Surety invoking the terms of the bond.

2.6.2 The Owner may notify the Contractor in writing that they are in default of their contractual obligations, if the Contractor:

a) Fails to proceed regularly and diligently with the Work; or

b) Without reasonable cause wholly suspends the carrying out of the Work before the completion thereof; or

c) Refuses or fails to supply sufficient, properly skilled workmen for proper workmanship, products or construction machinery and equipment for the scheduled performance of the Work within five (5) working days of receiving written notice from the Engineer/Architect except in those cases provided in **2.5.0 DELAYS**; or

d) Fails to make payments due to their Subcontractors, their Suppliers for their workmen; or

e) Persistently disregards laws or ordinances, or the Engineer/Architect's instructions; or

f) Otherwise violates the provisions of their Contract to a substantial degree.

Such written notice by the Owner shall instruct the Contractor to correct the default within five (5) working days from the receipt of the written notice. If a Performance Bond has been provided by the Contractor, a copy of such written notice will be provided to the Surety.

2.6.3 If the correction of the default cannot be completed within the five (5) working days specified, the Contractor shall be considered to be in compliance with the Owner's instruction if they:

a) Commence the correction of the default within the specified time; and

b) Provide the Owner with an acceptable schedule for such correction; and

c) Complete the correction in accordance with such schedule.

2.6.4 If the Contractor fails to correct the default within the time specified or subsequently agreed upon, the Owner may, without prejudice to any other right or remedy they may have:

a) Correct such default and deduct the cost thereof as certified by the Engineer/Architect from any payment due under the Contract; or

b) Terminate the Contract by written notice to the Contractor. If a Performance Bond has been provided by the Contractor, the Owner will provide the Surety with a copy of such notice.

2.6.5 If the Owner terminates the Contract under the conditions set out above, they are entitled to:

a) Take possession of the premises and products and utilize the temporary buildings, plants, tools, construction machinery and equipment, goods and materials, intended for, delivered to and placed on or adjacent to the Work and may complete the Work by whatever method they may deem expedient but without undue delay or expense;

b) Withhold any further payments to the Contractor until the Work is finished;

c) Upon total performance of the Work, charge the Contractor the amount by which the full cost of finishing the Work as certified by the Engineer/Architect including compensation to the Engineer/Architect for their additional services and a reasonable allowance to cover the cost of any corrections required by **2.26.0 WARRANTY** exceeds the unpaid balance of the Contract Price; or if such cost of finishing the Work is less than the unpaid balance of the Contract Price, pay the Contractor the difference;

d) On expiry of the warranty period, charge the Contractor the amount by which the cost of corrections under **2.26.0 WARRANTY** exceeds the allowance provided for such corrections, or if the cost of such corrections is less than the allowance, pay the Contractor the difference;

e) Invoke the terms of the Performance Bond if such Bond has been provided under the Contract.

2.6.6 The Contractor's obligation under the Contract as to the performance of the Work up to the time of termination will remain in force after such termination.

2.7.0 CONTRACTOR'S RIGHT TO STOP WORK AND/OR TERMINATE CONTRACT

2.7.1 If the Owner should be adjudged bankrupt or makes a general assignment for the benefit of creditors or if a Receiver is appointed on account of their insolvency, the Contractor may, without prejudice to any other right or remedy they may have, by giving the Owner written notice, terminate the Contract.

2.7.2 If the Work should be stopped or otherwise delayed for a period of thirty (30) days or more under an order of any court or other public authority and providing that such order was not issued as the result of any act or fault of the Contractor or of anyone directly or indirectly employed by him, the Contractor may, without prejudice to any other right or remedy they may have, by giving the Owner fifteen (15) days' written notice, terminate the Contract.

2.7.3 The Contractor may notify the Owner in writing that the Owner is in default of their contractual obligations if:

a) The Engineer/Architect fails to issue a certificate in accordance with **2.16.0 CERTIFICATES AND PAYMENTS;**

b) The Owner fails to pay the Contractor when due any amount certified by the Engineer/Architect and verified by the audit of the Owner;

c) The Owner violates the provisions of the Contract to a substantial degree.

Such written notice shall advise the Owner that if such default is not corrected within fifteen (15) days from the receipt of the written notice, the Contractor may, without prejudice to any other right or remedy they may have, stop the Work and/or terminate the Contract.

2.7.4 If the Contractor terminates the Contract under the conditions set out above, they shall be entitled to be paid for all work performed including reasonable overhead and profit and for any loss sustained upon products, construction machinery and equipment and other damages as the Contractor may have sustained as a result of the termination of the Contract.

2.8.0 OTHER CONTRACTORS

2.8.1 The Owner reserves the right to let separate contracts in connection with the project of which the Work is part or do certain work by their own forces.

2.8.2 The Owner shall, in such cases, coordinate the Work and insurance coverage of other Contractors as it affects the Work of this Contract.

2.8.3 The Contractor shall coordinate their work with that of other Contractors and connect as specified or shown in the Contract Documents. Any change in the costs incurred by the Contractor in the planning and performance of such work which was not shown or included in the Contract Documents as of the date of signing the Contract, shall be evaluated as provided under **2.14.0 VALUATION AND CERTIFICATION OF CHANGES IN THE WORK** and authorized as provided in **2.13.0 CHANGES IN THE WORK AND EXTRA WORK**.

2.8.4 The Contractor shall report to the Engineer/Architect any apparent deficiencies in other Contractor's work which would affect this Contract immediately as they come to their attention and shall confirm such report in writing. Failure by the Contractor to so report shall invalidate any claims against the Owner by reason of the deficiencies of other Contractor's work except as to those of which they were not reasonably aware.

2.9.0 ASSIGNMENT

2.9.1 The Contractor shall not assign the Contract or any part thereof or any benefit or interest therein or thereunder without the written consent of the Owner.

2.10.0 SUBCONTRACTORS

2.10.1 The Contractor agrees to preserve and protect the rights of the Owner under the Contract with respect to any work to be performed under subcontract. The Contractor shall:

a) Require their Subcontractors to perform their work in accordance with and subject to the terms and conditions of the Contract Documents; and

b) Be fully responsible to the Owner for acts and omissions of their Subcontractors and of persons directly or indirectly employed by them as for acts and omissions of persons directly employed by them.

The Contractor, therefore, agrees that they will incorporate all the terms and conditions of the Contract Documents into all Subcontractor Agreements they enter into with their Subcontractors.

2.10.2 The Contractor shall employ those Subcontractors proposed by them in writing and accepted by the Owner prior to the signing of the Contract for such portions of the Work as may be designated in the bidding requirements.

2.10.3 The Owner may, for reasonable cause, object to the use of a proposed Subcontractor and require the Contractor to employ one of the other Subcontractors.

2.10.4 In the event that the Owner requires a change from any proposed Subcontractor, the Contract price shall be adjusted by the difference in cost occasioned by such required change.

2.10.5 The Contractor shall not be required to employ as a Subcontractor any person or firm to whom they may reasonably object.

2.10.6 The Engineer/Architect may, upon reasonable request and at their discretion, provide to a Subcontractor information as to the percentage of the Subcontractor's work which has been certified for payment.

2.10.7 Nothing contained in the Contract Documents shall create any contractual relationship between any Subcontractor and the Owner.

2.11.0 DISPUTES

2.11.1 Differences between the parties to the Contract as to the interpretation, application or administration of this Contract or any failure to agree where agreement between the parties is called for, herein collectively called disputes, which are not resolved in the first instances by decision of the Engineer/Architect pursuant to the provisions of **2.4.0 ENGINEER/ARCHITECT'S DECISIONS** shall be settled in accordance with the requirement of the General Conditions.

2.11.2 The Claimant shall give written notice of such dispute to the other party no later than fourteen (14) days after the receipt of the Engineer/Architect's decisions given under **2.4.0 ENGINEER/ARCHITECT'S DECISIONS**. Such notice shall set forth particulars of the matters in dispute, the probable scope, extent and value of the dispute and relevant provisions of the Contract Documents. The other party shall reply to such notice no later than fourteen (14) days after they receive or are considered to have received it, setting out in such reply their grounds and other relevant provisions of the Contract Documents.

2.11.3 Pending settlement of the dispute, the Engineer/Architect will give such instructions as, in their opinion, are necessary for the proper performance of the Work or to prevent delays pending settlement of the dispute. The parties shall act immediately according to such instructions, it being understood that by so doing neither party will jeopardize any claim they may have. If it is subsequently determined that such instructions were in error or at variance with the Contract Documents, the Owner shall pay the Contractor cost incurred by the Contractor in carrying out such instructions which they were

required to do beyond what the Contract Documents correctly understood and interpreted would have required them to do, including costs resulting from interruption of the Work.

2.11.4 It is agreed that no act by either party shall be construed as a renunciation or waiver of any of their rights or recourse, provided they have given the notices in accordance with Paragraph 2.11.2 and have carried out the instructions as provided in Paragraph 2.11.3.

2.11.5 If the dispute or claim cannot be resolved to the satisfaction of both parties, either party may refer the matter to such judicial tribunal as the circumstances require.

2.11.6 In recognition of the obligation of the Contractor to perform the disputed work as provided in Paragraph 2.11.3, it is agreed that settlement of dispute proceedings may be commenced immediately following the dispute in accordance with the aforegoing settlement of dispute procedures.

2.12.0 INDEMNIFICATION

2.12.1 Except as provided in Paragraph 2.10.2, the Contractor shall be liable for and shall indemnify and hold harmless the Owner and the Engineer/Architect, their agents and employees from and against all claims, demands, losses, costs, damages, actions, suits or proceedings whatsoever arising under any statute or Common law.

a) In respect of personal injury to or the death of any person whomsoever arising out of or in the course of or caused by the carrying out of the Work; and

b) In respect of any injury or damage whatsoever to any property, real or personal or any chattel real, insofar as such injury or damage arises out of or in the course of or by reason of the carrying out of the Work.

2.12.2 The Contractor shall not be liable under Paragraph 2.12.1 if the injury, death, loss or damage is due to any act or neglect of the Owner or Engineer/Architect, their agents or employees.

2.13.0 CHANGES IN THE WORK AND EXTRA WORK

2.13.1 The Owner may, without invalidating the Contract, make changes by altering, adding to or deducting from the Work, with the Contract Price and the Contract Time being adjusted accordingly; and

2.13.2 No change in the Work shall be made without prior written order from the Owner, and no claim for an addition or deduction to the Contract Price or change in the Contract Time shall be valid unless so ordered and at the same time valued or agreed to be valued as provided in **2.14.0 VALUATION AND CERTIFICATION OF CHANGES IN THE WORK.** Signed faxed copies are acceptable at the discretion of the Owner.

2.14.0 VALUATION AND CERTIFICATION OF CHANGES IN THE WORK

2.14.1 The value of any change shall be determined in one or more of the following methods:

a) By estimate and acceptance in a lump sum;

b) By unit prices subsequently agreed upon;

c) By cost and a fixed or percentage fee.

In the case of changes in the Work valued as outlined in Paragraph 2.14.1(a) (as will be the usual case), the Contractor will submit an itemized estimate of all materials and labour (including Subcontractor's work) to complete the change.

In the case of changes in the Work as valued in Paragraph 2.14.1 (c), the Contractor shall submit detailed invoices, vouchers and time sheets for all materials and labour to complete the change.

The submissions in both cases shall be in the manner acceptable to the Engineer/Architect and will show separately the following percentages for overhead and profit:

(i) Subcontractors shall include, in the breakdown, their 15 percent mark-up (10 percent of the estimated cost for the overhead and 5 percent for profit).

(ii) The Contractor shall include, in the breakdown, the percentages as outlined in (i) for the overhead and profit on their portion of the Work.

(iii) The Contractor shall add 10 percent to the Subcontractor's pricing for their own profit and overhead combined.

2.14.2 Notwithstanding the provisions of Paragraph 2.14.1, in case of changes in the Work, the amount charged for equipment rentals shall be that provided in the rental Contract, and no additional amount shall be paid as markup for overhead or profit for the Contractor or Subcontractor.

2.14.3 When a change in the Work is proposed or required, the Contractor shall present to the Engineer/Architect for approval their claim for the change in the Contract Price and/or change in the Contract Time in a form acceptable to the Engineer/Architect and including the appropriate documentation. The Engineer/Architect shall satisfy themselves as to the correctness of such claim, and when approved by the Owner, a change order will be issued to the Contractor to proceed with the change. The value of Work performed in the change shall be included for payment with the regular certificates for payment.

2.14.4 In the case of changes in the Work to be paid for under methods (b) and (c) of Paragraph 2.14.1, the form of presentation of costs and methods of measurement shall be agreed to by the Engineer/Architect and Contractor before proceeding with the change. The Contractor shall keep accurate records, as agreed upon, of quantities or costs and present an account of the cost of the change in the Work, together with vouchers where applicable.

2.14.5 If the method of valuation, measurement and the change in Contract Price and/or change in Contract Time cannot be promptly agreed upon, and the change is required to be proceeded with, then the valuation, measurement and the change in Contract Price and/or Contract Time will be subject to final determination in the manner set out in **2.11.0 DISPUTES**. In this case, the Engineer/Architect shall, with the consent of the Owner, issue a written authorization for the change setting out the method of valuation and, if by lump sum, their valuation of the change in Contract Price and/or Contract Time.

2.14.6 In the case of a dispute in the valuation of a change authorized in the Work and pending final determination of such value, the Engineer/Architect shall certify the value of the Work performed in accordance with their own evaluation of the change and include the amount with the regular certificates for payment. The Contractor shall keep accurate records of quantities and cost of such work.

2.14.7 It is intended in all matters referred to above that both the Engineer/Architect and Contractor shall act promptly.

2.14.8 Should the Owner direct the Contractor not to correct work that has been damaged or that was not performed in accordance with the Contract Document, an equitable deduction from the Contract amount by the Architect/Engineer shall be made to compensate the Owner for the uncorrected or uncompleted work.

2.14.9 Credits will be based on the net cost of material and labour or the net difference in the unit price quantities.

2.15.0 APPLICATION FOR PAYMENT

2.15.1 Applications for payment on account may be made monthly as the Work progresses.

2.15.2 Applications for payment shall be made monthly on a date to be agreed upon between the Owner and the Contractor, and the amount claimed shall be for the value proportionate to the amount of the Contract, of the Work performed and products delivered to the site at that date.

2.15.3 The Contractor shall submit to the Engineer/Architect, before the first application for payment, a schedule of values of the various parts of the Work aggregating the total amount of the Contract Price and divided so as to facilitate evaluation of applications for payment.

2.15.4 This schedule shall be made out in such form and supported by such evidence as to its correctness as the Engineer/Architect may reasonably direct and, when approved by the Engineer/Architect, shall be used as the basis for application for payment.

2.15.5 When making application for payment, the Contractor shall submit a statement based upon this schedule. Claims for products delivered to the site but not yet incorporated into the Work shall be supported by such evidence as the Engineer/Architect may reasonably require to establish the value and delivery of the products.

2.15.6 With each monthly claim for payment, except the first, the Contractor shall submit a Statutory Declaration attesting that they have made all payments to Subcontractors, Suppliers, and workmen on behalf of whom amounts were included in the previous claim for payment.

2.15.7 Applications for release of holdback monies following the substantial performance of the Work and the application for final payment shall be made at the time in the manner set forth in **2.16.0 CERTIFICATES AND PAYMENTS**.

2.15.8 For **all** projects, it should be clearly understood that the University's policy is as follows:

a) Each Progress Claim must be accompanied by a breakdown indicating amounts included for each Subcontractor;

b) When the University makes a Progress Payment, it is made in prorated amounts on behalf of those Subcontractors for whom amounts have been included in the corresponding Progress Claim;

c) The Contractor submitting the Progress Claim **must** make payment of the amounts included for the various Subcontractors to the various Subcontractors within ten (10) working days of issuance of the Progress Payment by the University.

d) Monthly payment amounts are not final or conclusive as to their value or quality of work performed and are subject to reopening and readjustment

2.15.9 Contractors not following the above procedures will be considered to be in default of their Contract, and the University may proceed in accordance with **Article 2.6.0 OWNER'S RIGHT TO PERFORM WORK, STOP WORK AND/OR TERMINATE CONTRACT** Subsection **2.6.2 (d)** of the General Conditions.

2.16.0 CERTIFICATES AND PAYMENTS

2.16.1 The Engineer/Architect shall, within ten (10) days of receipt of an application for payment from the Contractor submitted in accordance with **2.15.0 APPLICATION FOR PAYMENT**, issue a certificate for payment in the amount applied for or such amount as they shall determine to be properly due. If the Engineer/Architect amends the application, they shall promptly notify the Contractor in writing, giving their reason(s) for the amendment.

2.16.2 The Owner shall, within thirty (30) days of receipt and approval by the Owner of a certificate for payment from the Engineer/Architect, make payment to the Contractor on account.

2.16.3 Notwithstanding any other provisions of the Contract:

a) Where legislation permits and where, upon application by the Contractor, the Engineer/Architect has certified that a Subcontract has been totally performed to their satisfaction prior to the Substantial Performance of this Contract, the Owner may, at their discretion, pay the Contractor the holdback retained for such Subcontractor on the day following the expiration of the Statutory Limitations Period stipulated in the Mechanic's Lien Act applicable to the place of the Work and subject to the following conditions:

(i) A copy of the Contract between the Subcontractor and the General Contractor must be submitted.

(ii) The Subcontract is completed without deficiencies.

(iii) The warranty for the Subcontract will not start until Substantial Performance of the General Contract.

(iv) The General Contractor provides an approved Statutory Declaration that all monies have been paid to the said Subcontractor.

(v) The General Contractor provides an approved Waiver of Lien from this Subcontractor.

(vi) The Contractor and the Subcontractor provide an approved Waiver of Claim for all work associated with this Subcontractor.

(vii) A certificate is issued by the Engineer/Architect indicating that the Subcontract has been totally completed to their satisfaction.

(viii) The Owner will, at that time, release the total amount specified on the Subcontractor's Contract.

2.16.4 Notwithstanding the provisions of Paragraph 16.3 (a) and notwithstanding the wording of such certificate, the Contractor shall ensure that such work is protected pending the Total Performance of the Contract and be responsible for the correction of any defects in it regardless of whether or not they were apparent when such certificates were issued.

2.16.5 The Engineer/Architect shall within ten (10) days of receipt of an application from the Contractor for a Certificate of Substantial Performance make an inspection and assessment of the Work to verify the validity of the application. The Engineer/Architect shall within seven (7) days of their inspection notify the Contractor of their approval or the reasons for their disapproval of the application. When the Engineer/Architect finds the Work to be substantially performed, they shall issue such a certificate. The date of this certificate shall be the date of Substantial Performance of the Contract. Immediately following the issuance of the Certificate of Substantial Performance, the Engineer/Architect, in consultation with the Contractor, shall establish a reasonable date for the Total Performance of the Contract.

2.16.6 Following the issuance of the Certificate of Substantial Performance and upon receipt from the Contractor of all documentation called for in the Contract Documents, the Engineer/Architect shall issue a Certificate for Payment of holdback monies, providing that no lien or privilege claims against the Work exists, that the Contractor has submitted to the Owner a sworn statement that all accounts for labour, Subcontracts, products, construction machinery and equipment and any other indebtedness which may have been incurred by the Contractor in the Substantial Performance of the Work and for which the Owner might in any way be held responsible, have been paid in full and that the Contractor has submitted to the Owner a waiver of all claims associated with this project except holdback monies properly retained. The holdback monies will become due and payable on the day following the expiration of the Statutory Limitation Period stipulated in the Mechanic's Lien Act applicable to the place of buildings. The Owner may retain out of such holdback monies any sum required by law to satisfy any liens against the Work or other monetary claims against the Contractor which may be enforceable against the Owner.

2.16.7 The Engineer/Architect shall, within ten (10) days of receipt of an application from the Contractor for payment upon Total Performance of the Contract, make an inspection and assessment of the Work to verify the validity of the application. The Engineer/Architect shall, within seven (7) days of their inspection, notify the Contractor of their approval or the reasons for their disapproval of the application. When the Engineer/Architect finds the Work to be totally performed to their satisfaction, they shall issue a Certificate of Total Performance and certify for payment the remaining monies due to the Contractor under the Contract, less any holdback monies which are required to be retained. The date of this certificate shall be the date of Total Performance of the Contract. The Owner shall, within thirty (30) days of issuance of such certificate, make payment to the Contractor in accordance with the provisions of the Contract.

2.16.8 The release of any remaining holdback monies shall become due and payable on the day following the expiration of the Statutory Limitation period stipulated in the

Mechanics' Lien Act of the place of building provided that no claims against the Work exists and that the Contractor has submitted to the Owner a sworn statement that all accounts for labour, Subcontractors, products, construction machinery and equipment and any other indebtedness which may have been incurred by the Contractor in the Total Performance of the Work and for which the Owner might in any way be held responsible have been paid in full, except holdback monies properly retained.

2.16.9 No certificate for payment, any payment made thereunder or any partial or entire use of occupancy of the Work by the Owner shall constitute an acceptance of any work or products not in accordance with the Contract Documents.

2.16.10 As of the date of Total Performance of the Work as set out in the Certificate of Total Performance of the Work, the Owner expressly waives and releases the Contractor from all claims against the Contractor including, without limitation, those that might arise from the negligence or breach of Contract by the Contractor except one or more of the following:

a) Those made in writing prior to the date of the Total Performance of the Work and still unsettled;

b) Those arising from the provisions of **2.12.0 INDEMNIFICATION** or **2.26.0 WARRANTY**;

c) Those made in writing within a period of six (6) years from the date of Substantial Performance of the Work, as set out in the Certificate of Substantial Performance of the Work or within such shorter period as may be prescribed by any Limitation Statute of the Province of Newfoundland and Labrador and arising from any liability of the Contractor for damages resulting from their performance of the Contract with respect to substantial defects or deficiencies in the Work for which the Contractor is proven responsible.

As used herein, "substantial defects or deficiencies" means those defects or deficiencies in the Work which affect the Work to such an extent or in such manner that a significant part or the whole of the Work is unfit for the purpose intended by the Contract Documents.

2.16.11 As of the date of Total Performance of the Work, as set out in the Certificate of Total Performance of Work, the Contractor expressly waives and releases the Owner from all claims against the Owner including, without limitation, those that might arise from the negligence or breach of Contract by the Owner except those made in writing prior to the Contractor's application for payment upon Total Performance of the Work and still unsettled.

2.16.12 In the event of conflict between the provisions of the General Conditions and **2.24.0 DAMAGES AND MUTUAL RESPONSIBILITY**, the provisions of this General Condition shall govern.

2.16.13 The holdback to be used by the Engineer/Architect when issuing certificates of payment will be ten (10) percent of the value of the Work completed at the date of Contractor's claim.

2.16.14 Notwithstanding any other provision of this Contract, the Owner may:

a) In the event of a claim by the Owner against the Contractor for damages arising out of the performance or non-performance of the Contract, withhold payment of any amount equal to the alleged damages until the liability for damages is established, and no amount of interest will be paid on amounts held under this Clause;

b) Set-off amounts owing by the Contractor to the Owner;

c) Following the issuance of the Certificate of Substantial Performance, withhold payment of an amount equal to twice the cost as estimated by the Engineer/Architect of remedying deficiencies until the issuance of a Certificate of Total Performance, and no amount of interest will be paid on amounts held under this Clause.

2.17.0 TAXES AND DUTIES

2.17.1 Unless otherwise stated in the Supplementary General Conditions, the Contractor shall pay all applicable government sales taxes, goods and services taxes, customs duties and excise taxes with respect to the Contract.

2.17.2 Any increase or decrease in costs to the Contractor due to changes in such taxes and duties after the date of the Agreement and up to the agreed date of completion shall increase or decrease the Contract Price accordingly. If the Owner so desires, the Contractor is to cooperate with the Engineer/Architect and Owner and permit access to books and records in order to establish the amount of such taxes involved.

2.17.3 The Contractor shall maintain full records of their estimates and of actual costs to them of the Work, together with all proper open calls, quotations, contracts, correspondence, invoices, receipts, payments to Subcontractors and Suppliers and vouchers relating thereto and shall make them available to audit and inspection by the Owner, the Auditor General for Newfoundland and Labrador or by persons acting on their behalf and shall furnish them with any information which they may require from time to time in connection with such records.

2.18.0 LAWS, NOTICES, PERMITS AND FEES

2.18.1 The laws of the Province of Newfoundland and Labrador shall govern the Work.

2.18.2 The Contractor shall obtain all permits, licenses and certificates and pay all fees required for the performance of the Work which are in force at the date of open call closing with the following exceptions:

a) The Contractor shall obtain building permits for the Work but are not required to pay for said permits.
b) The Contractor shall not include the obtaining of permanent easements or rights of servitude.

2.18.3 The Contractor shall give all required notices and comply with all laws, ordinances, rules, regulations, codes and order of all authorities having jurisdiction relating to the Work, to the preservation of the public health and construction safety which are or become in force during the performance of the Work.

2.18.4 The Contractor shall not be responsible for verifying that the Contract Documents are in compliance with the applicable laws, ordinances, rules, regulations and codes relating to the Work. If the Contract Documents are a variance therewith or changes which necessitate modifications to the Contract Documents are required by the authorities having jurisdiction subsequent to the Open call closing date, the Contractor shall notify the Engineer/Architect in writing requesting direction immediately when any such variance or change is observed by them. The Engineer/Architect will make the changes required to the Contract Documents, and the Contract Price and/or Contract Time shall be adjusted in accordance with **2.13.0 CHANGES IN THE WORK AND EXTRA WORK** and evaluated in accordance with **2.14.0 VALUATION AND CERTIFICATION OF CHANGES IN THE WORK**.

2.18.5 If the Contractor fails to notify the Engineer/Architect in writing and obtain their direction as required in 2.18.4 and performs any work knowing it to be contrary to any laws, ordinances, rules, regulation, codes and orders of any authority having jurisdiction, they shall be responsible for and shall correct any violations thereof and shall bear all costs, expense and damages, attributable to their failure to comply with the provisions of such laws, ordinances, rules, regulations, codes and orders.

2.19.0 PATENT FEES

2.19.1 The Contractor shall pay all royalties and patent license fees required for the performance of the Contract and such royalties or fees shall be deemed to have been included in the Contract Price. They shall hold the Owner harmless from and against all claims, demands, losses, costs, damages, actions, suits or proceedings arising out of the Contractor's performance of the Contract which are attributable to an infringement or an alleged infringement of any patent or invention by the Contractor or anyone for whose acts they may be liable.

2.19.2 The Owner shall hold the Contractor harmless against all claims, demands, losses, costs, damages, actions, suits or proceedings arising out of the Contractor's performance of the Contract which are attributable to an infringement or an alleged

infringement of any patent or invention in executing anything for the purpose of the Contract, the model, plan or design of which was supplied to the Contractor by the Owner.

2.20.0 WORKERS' COMPENSATION

2.20.1 The Contractor shall be registered with and shall remain in good standing with the Workplace Health and Safety Compensation Commission during the term of their Contract.

2.20.2 At any time during the term of the Contract when requested by the Owner, the Contractor shall provide evidence of compliance by themselves and any or all of their Subcontractors.

2.21.0 LIABILITY INSURANCE

2.21.1 Comprehensive General Liability Insurance

a) Without restricting the generality of **2.12.0 INDEMNIFICATION**, the Contractor shall provide and maintain, either by way of a separate policy or by an endorsement to their existing policy, Comprehensive General Liability Insurance acceptable to the Owner and subject to limits set out in detail below, inclusive per occurrence for bodily injury, death and damage to property including loss of use thereof.

b) The insurance shall be in the joint names of the Contractor and the Owner. It shall also cover as named Insureds all Subcontractors and anyone employed directly or indirectly by the Contractor or their Subcontractors to perform a part or parts of the Work but excluding Suppliers whose only function is to supply and/or transport products to the project site.

c) The insurance shall also include as Named Insureds the architectural and engineering consultants of the Owner and Engineer/Architect.

d) The insurance shall preclude subrogation claims by the Insurer against anyone insured thereunder.

e) The Comprehensive General Liability Insurance will not be limited to, but shall include coverage for:

(i) Premises and Operations Liability

(ii) Products or Completed Operations Liability

(iii) Blanket Contractual Liability

(iv) Cross Liability

(v) Elevator and Hoist Liability

(vi) Contingent Employer's Liability

(vii) Personal Injury Liability arising out of false arrest, detention or imprisonment or malicious prosecution, libel, slander or defamation of character, invasion of privacy or wrongful entry

(viii) Shoring, blasting, excavating, underpinning, demolition, pile driving and caisson work, work below ground surface, tunnelling and grading, as applicable

(ix) Liability with respect to non-owned, licensed vehicles.

2.21.2 The Contractor shall provide and maintain liability insurance in respect of owned licensed vehicles subject to limits set out in detail in Article **2.21.0 LIABILITY INSURANCE** subsection **2.21.6.**

2.21.3 All liability insurance shall be maintained continuously until twelve (12) months after the date the Engineer/Architect issues a Certificate of Substantial Performance.

2.21.4 The Contractor shall provide the Owner with evidence of all liability insurance prior to the commencement of the Work and shall promptly provide the Owner with a certified true copy of each insurance policy.

2.21.5 All liability insurance policies shall contain an endorsement to provide all Named Insureds with prior notice of changes and cancellations. Such endorsements shall be in the following form:

"It is understood and agreed that the coverage provided by this policy will not be changed or amended in any way nor cancelled until thirty (30) days after written notice of such change or cancellation shall have been given to all Named Insureds."

2.21.6 The Contractor shall protect themselves and indemnify and save the Owner harmless from any and all claims which may arise from the Contractor's performance or failure of performance of the Contract and for this purpose shall, without restricting the generality of the foregoing, maintain insurance acceptable to the Owner to the following limits:

a) Where the contract value exceed $100,000 (inclusive of HST)
   - Comprehensive General Liability = $3,000,000.00;
   - Standard Automobile Policy Liability = $3,000,000.00.

b) Where the contract value is less than $100,000 (inclusive of HST)
   - Comprehensive General Liability = $2,000,000.00;
   - Standard Automobile Policy Liability = $2,000,000.00.

Prior to the commencement of any work hereunder, the Contractor shall file with the Owner a copy of each insurance policy and certificate required.

2.22.0 PROPERTY INSURANCE

2.22.1 The Contractor shall provide and maintain property insurance acceptable to the Owner insuring the full value of the Work in the amount of the replacement cost or the Contract value, whichever is greater, and the full value as stated of products for incorporation into the Work. The insurance shall be in the joint names of the Contractor, the Owner, the Subcontractors as Unnamed Insured or, if they specifically request, as Named Insured. The policies shall preclude subrogation claims by the Insurer against anyone insured thereunder.

2.22.2 Such coverage shall be provided by EITHER an ALL RISKS Builders' Risk Policy OR by a combination of a Coverage and Malicious Damage Endorsements and a Builder's Risk Difference in Conditions Policy providing equivalent coverage of Piers, Wharves and Docks, Government Structures Policy.

2.22.3 The policies shall insure against all risks of direct loss or damage. Such coverage shall apply to:

a) All products, labour and supplies of any nature whatsoever, the property of the Insureds or of others for which the Insureds may have assumed responsibility, to be used in or pertaining to the site preparations, demolition of existing structures, erections and/or fabrication and/or reconstruction and/or repair of the insured project, while on the site or in transit, subject to the exclusion of the property specified.

b) The installation, testing and any subsequent use of machinery and equipment including boilers, pressure vessels or vessels under vacuum.

c) Damage to the Work caused by an accident to and/or the explosion of any boiler(s) or pressure vessel(s) forming part of the Work.

Such coverage shall exclude construction machinery, equipment, temporary structural and other temporary facilities, tools and supplies used in the construction of the Work and which are not expendable under the Contract.

2.22.4 The Contractor shall provide the Owner with evidence of all insurance prior to the commencement of the Work and shall promptly provide the Owner with a certified true copy of each insurance policy.

Policies provided shall contain an endorsement to provide all Named Insureds with prior notice of changes and cancellations. Such endorsements shall be in the following form:

> **"It is understood and agreed that the coverage provided by this policy will not be changed or amended in any way or cancelled until thirty (30) days after written notice of such change or cancellation shall have been given to all Named Insureds."**

2.22.5 All such insurance shall be maintained continuously until ten (10) days after the date the Engineer/Architect issues a certificate of Total Performance. All such insurance shall provide for the Owner to take occupancy of the Work or any part thereof during the terms of this insurance. Any increase in the cost of this insurance arising out of such occupancy shall be at the Owner's expense.

2.22.6 The policies shall provide that, in the event of a loss, payment for damage to the Work shall be made to the Owner and the Contractor as their respective interests may appear. Damage shall not affect the rights and obligations of either party under the Contract except that the Contractor shall be entitled to such reasonable extension of time for Substantial and Total Performance of the Work as the Engineer/Architect may decide.

2.22.7 The Contractor and/or their Subcontractors, as may be applicable, shall be responsible for any deductible amounts under the policies and for providing such additional insurance as may be required to protect the Insureds against loss on items excluded from the policies.

2.22.8 When this Contract pertains to a new building or structure with a total bid amount greater than $25,000.00, the Contractor shall maintain All Risk Builder's Risk Insurance acceptable to the Owner in the joint names of the Owner and Contractor in the amount of 100 percent of the total value of the Work done and material delivered to the site and payable to the Owner and Contractor as their respective interest may appear.

2.23.0 PROTECTION OF WORK AND PROPERTY

2.23.1 The Contractor shall protect the property adjacent to the project site from damage as the result of their operations under the Contract.

2.23.2 The Contractor shall protect the Work and the Owner's property from damage and shall be responsible for any damage which may arise as the result of their operations under the Contract except damage which occurs as the result of:

a) Errors in the Contract documents; and/or

b) Acts or omissions by the Owner, their agents, employees or other Contractors.

2.23.3 Should the Contractor, in the performance of this Contract, damage the Work and/or Owner's property and/or property adjacent to the place of the Work, the Contractor shall be responsible for making good such damage at their own expense or pay all costs incurred by others in making good such damage.

2.23.4 Should any damage occur to the Work and/or Owner's property for which the Contractor is not responsible as provided in of **2.12.0 INDEMNIFICATION**, they shall make good such damage to the Work and, if the Owner so directs, to the Owner's property, and the contract Price and Contract Time shall be adjusted in accordance with in **2.13.0 CHANGES IN THE WORK AND EXTRA WORK** and evaluated in accordance with in **2.14.0 VALUATION AND CERTIFICATION OF CHANGES IN THE WORK**.

2.23.5 The Contractor shall be completely responsible for the safety of the Work as it applies to protection of the public and property and construction of the Work.

The codes that must be followed and enforced for safety are:

a) The National Building Code, Part 8, Safety Measures at Construction and Demolition Sites (Latest Edition);

b) Canadian Code for Construction Safety (Latest Edition) as issued by the Associate Committee of the National Building Code;

c) The Occupational Health and Safety Act (1979) and Regulations.

2.23.6 Any person not following stipulated safety regulations shall be dismissed.

2.24.0 DAMAGES AND MUTUAL RESPONSIBILITY

2.24.1 If either party to this Contract should suffer damage in any manner because of any wrongful act or neglect of the other party or anyone employed by them then they shall be reimbursed by the other party for such damages. The party reimbursing the other party shall be subrogated to the rights of the other party in respect of such wrongful act or neglect if it be that of a third party.

2.24.2 Claims under this Contract shall be made in writing to the party liable within two (2) weeks after the first observance of such damage and may be adjusted by agreement or in the manner set out in **2.11.0 DISPUTES**.

2.24.3 If the Contractor has caused damage to any other Contractor on the Work, the Contractor agrees upon due notice to settle with such other Contractor by agreement or arbitration, if they will so settle. If such other Contractor sues the Owner on account of any damage alleged to have been sustained, the Owner shall notify the Contractor and may require the Contractor to defend the action at the Contractor's expense. If

any final order or judgment against the Owner arises therefrom, the Contractor shall pay or satisfy it and pay all costs incurred by the Owner.

2.24.4 If the Contractor becomes liable to pay or satisfy any final order, judgment or award against the Owner then the Contractor, upon undertaking to indemnify the Owner against any and all liability for costs, shall have the right to appeal in the name of the Owner such final order or judgment to any and all courts of competent jurisdiction.

2.24.5 Should the Contractor fail to meet the date to substantially perform the Work, as indicated in the Agreement between the Owner and the Contractor, and is unable to provide justification acceptable to the Owner for the delay then the Contractor will be held liable for any liquidated damage amount indicated in **3.0 SUPPLEMENTARY GENERAL CONDITIONS** and may be held liable for payment to the Owner for other damages and losses suffered by the Owner as a result of the Contractor's delay including additional costs for Engineering/Architectural supervision.

2.25.0 BONDS

2.25.1 The Contractor shall promptly provide the Owner the surety bonds called for in the Open call Documents.

2.25.2 All such bonds shall be issued by a duly incorporated surety company approved by the Owner and authorized to transact a business or surety-ship in the Province of Newfoundland and Labrador.

2.25.3 If bonds are called for in the and Acceptance form, Instructions to Bidders or Supplementary General Conditions, the costs attributable to providing such bonds shall be included in the bid price.

2.25.4 Should the Owner require the provision of a bond or bonds by the Contractor other than those provided for under 2.25.3, the Contract Price shall be increased by all costs attributable to providing such bonds.

2.26.0 WARRANTY

2.26.1 The Contractor shall be responsible for the proper performance of the Work to the extend that the design and specifications permit such performance.

2.26.2 Subject to Paragraph 2.26.1, the Contractor agrees to correct promptly, at their own expense, defects or deficiencies in the Work which appear prior to and during the period of one (1) year from the date of Substantial Performance of the Work or such longer periods as may be specified for certain products or work.

2.26.3 The Contractor shall correct and/or pay for any damage to other work resulting from any corrections required under the conditions of Paragraph 2.26.2.

2.26.4 Neither the Engineer/Architect's final certificate nor payment thereunder shall relieve the Contractor from their responsibility hereunder.

2.26.5 The Owner and/or Engineer/Architect shall give the Contractor written notice of observed defects promptly.

2.27.0 CONTRACTOR'S RESPONSIBILITIES AND CONTROL OF THE WORK

2.27.1 The Contractor shall have complete control of the Work and shall effectively direct and supervise the Work so as to ensure conformance with the requirements of the Contract Documents. They shall be solely responsible for all construction means, methods, techniques, sequences and procedures and for coordinating all parts of the Work under the Contract.

2.27.2 The Contractor shall have the sole responsibility for the design, erection, operation, maintenance and removal of temporary structural and other temporary facilities and the design and execution of construction methods required in their use. The Contractor shall engage and pay for registered professional engineering personnel skilled in the appropriate disciplines to perform these functions where required by law or by the Contract Documents and, in all cases, where such temporary facilities and their method of construction are of such a nature that professional engineering skill is required to produce safe and satisfactory results.

2.27.3 Notwithstanding the provision of Paragraphs 2.27.1 and 2.27.2 above or any provisions to the contrary elsewhere in the Contract Documents where such Contract Documents include designs for temporary structural and other temporary facilities or specify a method of construction in whole or in part, such facilities and methods shall be deemed to comprise part of the overall design of the Work, and the Contractor shall not be held responsible for that part of the design or the specified method of construction. The Contractor shall, however, be responsible for the execution of such design or specified method of construction in the same manner that they are responsible for the execution of the Work.

2.27.4 The Contractor shall carefully examine the Contract Documents and shall promptly report to the Engineer/Architect any error, inconsistency or omission they may discover. The Contractor shall not be held liable for any damage resulting from any such errors, inconsistencies or omissions in the Contract Documents which they may discover, and they shall not proceed with the Work affected until they have received corrected or missing information from the Engineer/Architect.

2.28.0 PROJECT MANAGER ANDSUPERINTENDENCE

2.28.1 The Contractor shall employ a competent Project Manager and necessary assistants who shall be in attendance at the Work site at all times while the Work is being performed.

2.28.2 The Project Manager shall be satisfactory to the Engineer/Architect and shall not be changed except for good reason and only then after consultation with an agreement by the Engineer/Architect.

The Project Manager shall have a minimum of ten (10) years' experience on construction projects of similar scale, complexity, type and value.

The project manager shall submit a resume and cover letter.

2.28.3 The Superintendent shall represent the Contractor at the place of work and instructions given to them by the Engineer/Architect shall be held to have been given to the Contractor. Important instructions shall be confirmed to the Contractor in writing, other instructions will be so confirmed if requested.

The superintendent shall have a minimum of ten (10) years' experience on construction projects of similar scale, complexity, type and value.

2.29.0 LABOUR AND PRODUCTS

2.29.1 Unless otherwise stipulated elsewhere in the Contract Documents, the Contractor shall provide and pay for all labour, products, tools, construction equipment and machinery, water, heat, light, power, transportation and other facilities and services necessary for the requirements of the Contract Documents.

2.29.2 All products provided shall be new unless otherwise specified in the Contract Documents. Any products which are not specified shall be of a quality best suited to the purpose required, and their use shall be subject to the approval of the Engineer/Architect.

2.29.3 In carrying out their duties under this Contract, the Contractor shall comply with all Provincial and Federal legislation respecting labour and the employment of labour, where applicable, including the Labour Standards Code and shall not operate in conflict with the Human Rights legislation. In the employment of labour, preference should be given to persons normally residing in Newfoundland and Labrador.

2.29.4 The Contractor and Subcontractors shall maintain and keep available for inspection by the Owner, a record of the names and addresses of all persons employed on the project.

2.29.5 The Contractor shall maintain good order and discipline among their employees engaged on the Work and shall employ on the Work only employees skilled in their various trades.

2.29.6 There shall be no discrimination in the selection of workers for employment on the project in respect to race, religion, views or political affiliation, and the office of the Canada Manpower will be used in the recruitment of workers wherever possible.

2.29.7 The Contractor shall pay fair wages and shall pay rates of wages and allowances to the various classes of labour not less favourable than those prevailing in the area where the Work is being performed.

2.29.8 The Contractor shall be aware that the majority of hourly-paid and maintenance workers employed within the University are unionized. It is of utmost importance that

any labour force used by the Contractor neither disrupts or be disrupted by any labour conditions existing on the University campus. Failure by the Contractor to familiarize themselves with labour conditions on Campus or disruptions to the Contractor's own labour force because of labour conditions on Campus will not relieve them of their obligations to furnish all labour and materials necessary to carry out the requirements of the Contract.

2.30.0 SUBSURFACE CONDITIONS

2.30.1 The Contractor shall promptly notify the Engineer/Architect in writing if, in their opinion, the subsurface conditions at the project site differ materially from that indicated or reasonably inferred from the Contract Documents.

2.30.2 After prompt investigation, should the Engineer/Architect determine that conditions do differ materially, they shall issue appropriate instructions for changes in the Work as provided for in **2.13.0 CHANGES IN THE WORK AND EXTRA WORK**.

2.31.0 USE OF THE WORK

2.31.1 The Contractor shall confine their apparatus, the storage of products and the operations of their employees to limits indicated by laws, ordinances, permits or by instructions of the Engineer/Architect and shall not unreasonably encumber the premises with their products.

2.31.2 The Contractor shall not load or permit to be loaded any part of the Work with a weight or force that will endanger its safety.

2.31.3 Unless otherwise provided, the Contractor shall, at their own expense and without expense to the Owner, make suitable provision to accommodate all traffic, either pedestrian or vehicular, over or around the project upon which work is being performed in a manner satisfactory to the Engineer/Architect.

2.31.4 The Contractor shall provide and maintain at their own expense such fences, barriers, signs, lights and watchmen as may be necessary to prevent avoidable accidents to University Users or to the public generally.

2.31.5 All work shall be executed with the least possible interference with or disturbance to personnel and the Public. The Contractor shall cooperate with the person in charge of the premises. The Contractor shall ascertain from the Owner's representative the hours during which the work shall be performed, conform to the directions of the representative and to the directions of the said representative in determining the order in which the work shall be done.

2.31.6 The Contractor shall carry out all work required to maintain the building services and to provide necessary access for personnel and vehicles whenever new work affects occupied portions of the building.

2.31.7 Before final completion of the work, the Owner shall be entitled to make use of any portion of the work which is completed and fit for use for the installation of equipment, storage and furniture, supplies, etc., and for occupancy, if such can be arranged without interfering with the progress of the work.

2.32.0 CUTTING AND REMEDIAL WORK

2.32.1 The Contractor shall do all cutting and remedial work that may be required to make the several parts of the Work come together properly and shall coordinate the Work to ensure that this requirement is kept to a minimum.

2.32.2 Should the Owner, the Engineer/Architect, other contractors or anyone employed by them, be responsible for ill-timed work necessitating additional cutting and/or remedial work to be performed, it shall be valued as provided in **2.14.0 VALUATION AND CERTIFICATION OF CHANGES IN THE WORK** and added to the Contract Price.

2.32.3 Cutting and remedial work shall be performed by specialists familiar with the materials affected and shall be performed in a manner to neither damage nor endanger any work.

2.33.0 INSPECTION OF WORK

2.33.1 The Owner, the Engineer/Architect and their authorized representatives shall have access to the Work for inspection wherever it is in preparation or progress. The Contractor shall cooperate to provide reasonable facilities for such access.

2.33.2 If parts of the Work are designated for special tests, inspections or approvals in the Contract Documents or by the Engineer/Architect's instructions or the laws or ordinances of the place of the Work, the Contractor shall give the Engineer/Architect timely notice requesting inspection. Inspection by the Engineer/Architect shall be made promptly. The Contractor shall arrange for inspections by other authorities and shall notify the Engineer/Architect with timely notice of the date and time.

2.33.3 If the Contractor covers or permits to be covered any of the Work that is designated for special tests, inspections or approvals, before such special tests, the Contractor shall, if so instructed by the Engineer/Architect, uncover the Work, have the inspection satisfactorily completed and make good the Work at their own expense.

2.33.4 The Engineer/Architect may order any part of the Work to be specifically examined, should they believe such work not to be in accordance with the requirements of the Contract Documents. If upon examination such work is found not to be in accordance with the requirements of the Contract Documents, the Contractor shall correct such work and pay the cost of examination and correction. If such work is found to be in accordance with the requirements of the Contract Documents, the Owner will pay the cost of examination and replacement.

2.33.5 The Contractors shall furnish promptly to the Engineer/Architect two (2) copies of all certificates and inspection reports relating to the Work.

2.34.0 *REJECTED WORK*

2.34.1 Defective work, whether the result of poor workmanship, use of defective products or damage through carelessness or other act or omission of the Contractor and whether incorporated in the Work or not which has been rejected by the Engineer/Architect as failing to conform to the Contract Documents, shall be removed promptly from the premises by the Contractor and replaced and/or re-executed promptly in accordance with the Contract Documents at the Contractor's expense.

2.34.2 Other contractors' work destroyed or damaged by such removals or replacements shall be made good promptly at the Contractor's expense.

2.34.3 If, in the opinion of the Engineer/Architect, it is not expedient to correct defective work not done in accordance with the Contract Documents, the Owner may deduct from the Contract Price the difference in value between the Work as done and that called for by the Contract, the amount of which shall be determined in the first instance by the Engineer/Architect.

2.35.0 *SHOP DRAWINGS AND SAMPLES*

2.35.1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by the Contractor to illustrate details of a portion of the Work.

2.35.2 The Contractor shall arrange for the preparation of clearly identified shop drawings as called for by the Contract Documents or as the Engineer/Architect may reasonably request.

2.35.3 Prior to submission to the Engineer/Architect, the Contractor shall review all shop drawings. By this review, the Contractor represents that they have determined and verified all field measurements, field construction criteria, materials, catalogue numbers and similar data, or will do so, and that they have checked and coordinated each shop drawing with the requirements of the Work and of the Contract Documents. The Contractor's review of each shop drawing shall be indicated by stamp, date and signature of a responsible person.

2.35.4 The Contractor shall submit shop drawings to the Engineer/Architect for their review with reasonable promptness and in orderly sequence so as to cause no delay in the Work or in the Work of other contractors. If either the Contractor or the Engineer/Architect so requests, they shall jointly prepare a schedule fixing the dates for submission and return of shop drawings. Shop drawings shall be submitted in the form

of reproducible transparencies or prints as the Engineer/Architect may direct. At the time of the submission, the Contractor shall notify the Engineer/Architect in writing of any deviations in the shop drawings from the requirements of the Contract Documents.

2.35.5 The Engineer/Architect will review and return shop drawings in accordance with any schedule agreed upon or otherwise with reasonable promptness so as to cause no delay. The Engineer/Architect's review will be for conformity to the design concept and for general arrangements only, and such review shall not relieve the Contractor of responsibility for errors or omissions in the shop drawings or of responsibility for meeting all requirements of the Contract Documents unless a deviation on the shop drawings has been approved in writing by the Engineers/Architects.

2.35.6 The Contractor shall make any changes in shop drawings which the Engineer/ Architect may require consistent with the Contract Documents and resubmit, unless otherwise directed by the Engineer/Architect. When resubmitting, the Contractor shall notify the Engineer/Architect in writing of any deviations other than those requested by the Engineer/Architect.

2.35.7 The Contractor shall submit for the Engineer/Architect's approval such standard manufacturer's samples as the Engineer/Architect may reasonably require. Samples shall be labeled as to origin and intended use in the Work and shall conform to the requirements of the Contract Documents.

2.35.8 The Contractor shall provide samples of special products, assemblies or components when so specified. The cost of such samples not specified shall be authorized as an addition to the Contract Price as provided in **2.13.0 CHANGES IN THE WORK AND EXTRA WORK**.

2.36.0 TESTS AND MIX DESIGNS

2.36.1 The Contractor shall furnish to the Engineer/Architect test results and mix designs as may be requested. The testing company must first be approved by the Engineer/Architect.

2.36.2 The cost of tests and mix designs beyond those called for in the Contract Documents or beyond those required by law, ordinances, rules and regulations relating to the Work and the preservation of public health, shall be authorized as an addition to the Contract Price as provided in **2.13.0 CHANGES IN THE WORK AND EXTRA WORK.**

2.37.0 MATERIALS AND SUBSTITUTIONS

2.37.1 Materials described and named in the specifications with "or approved equal" clause after the Manufacturer's name are so described as to the establish quality only, and substitutions of a similar materials may be made before the award of the Contract provided the Engineer/Architect's approval is obtained. Substitutions after the award

may be considered under special circumstances as indicated in Subsection 1.7.4 in the **INSTRUCTIONS TO Bidders**

2.37.2 Requests for substitutions must be accompanied by sufficient information in the form of shop drawings, manufacturer's literature, samples and other data to permit proper investigation of the substitutes proposed, together with any increase or decrease in price.

2.37.3 Whenever a substitute is proposed for approval, the Contractor shall guarantee that such proposed substitute will not adversely affect the space requirements allocated on the drawings for the material specified, and they shall agree to bear any additional expense incurred due to their use of the proposed substitute.

2.37.4 The Engineer/Architect may accept or reject any or all of the proposed substitutions as they see fit, and their decision on a question of equality shall be final.

2.38.0 TIME OF ESSENCE AND SCHEDULE

2.38.1 Time is of the essence of the Contract.

2.39.0 CASH ALLOWANCE

2.39.1 The Contract Price includes cash allowances, if any, stated in the Contract Documents.

2.39.2 Cash allowances, unless otherwise specified, cover the entire cost to the Contractor of services, products, construction machinery and equipment, freight, unloading, handling, storage, installation and other authorized expenses incurred in performing the Work stipulated under the cash allowances. This also includes the Contractors overhead and profit in connection with such cash allowance.

2.39.3 The cash allowance shall not include HST.

2.39.4 Where costs under a cash allowance exceed the amount of the allowance, the Contractor shall be compensated for any excess incurred and substantiated plus an allowance for overhead and profit as set out in **2.14.0 VALUATION AND CERTIFICATION OF CHANGES IN THE WORK.**

2.39.5 The Contract Price shall be adjusted by written order to provide for any excess or deficit to each cash allowance.

2.39.6 Progress payments on account of Work authorized under cash allowance shall be included in the Engineer/Architect's monthly certificates for payment.

2.39.7 A schedule shall be prepared jointly by the Engineer/Architect and Contractor to show the items called for under Cash Allowances. They must be authorized by the Owner for ordering purposes so that the progress of the Work will not be delayed.

2.40.0 CLEANUP AND FINAL CLEANING OF THE WORK

2.40.1 The Contractor shall maintain the Work in a tidy condition and free from the accumulation of waste products and debris, other than that caused by the Owner, other contractors or their employees.

2.40.2 When the Work is substantially performed, the Contractor shall remove their surplus products, tools, construction machinery and equipment not required for the performance of the remaining Work. They shall also remove waste products and debris, other than that caused by the Owner, other contractors or their employees, and leave the Work clean and suitable for occupancy by the Owner, unless otherwise specified.

2.40.3 When the Work is totally performed, the Contractor shall remove their surplus products, tools, construction machinery and equipment. They shall also remove waste products and debris other than that caused by the Owner, other contractors or their employees.

3.0 SUPPLEMENTARY GENERAL CONDITIONS

SUPPLEMENTARY GENERAL CONDITIONS

This page is intentionally left blank.

4.0 SPECIAL CONDITIONS

4.1.0 LAYOUT OF WORK

4.1.1 Other than the original lot lines and a bench mark, both shown on the drawings, establish and maintain all grades, lines, levels and well-built batter boards at all corners of the building. As work progresses, lay out on the forms or rough flooring the exact location of all partitions as a guide to all trades.

4.1.2 Verify all grades, lines, levels and dimensions as shown on the drawings and report any errors or inconsistencies in the above to the Engineer/Architect before commencing Work.

4.2.0 JOB SIGN

4.2.1 At the start of the job, erect two painted signs as detailed and where located by the Engineer/Architect. This will be the only sign or advertisement permitted on the site unless instructed otherwise by the Engineer/Architect.

4.2.2 The signs shall be 8'0" x 8'0" plywood, properly supported. It shall be painted and shall show the names of the building, Owner, Prime Consultant, Major Subconsultants, Contractor and Major Subcontractors. A drawing of the signs to be erected will be supplied by the Engineer/Architect.

4.3.0 TEMPORARY OFFICES AND SHEDS

4.3.1 Construct and maintain, until completion of the Contract temporary offices and storage sheds in approved locations on site for the use of staff.

4.3.2 Buildings shall be of weatherproof wood stud and plywood construction completely equipped with adequate lighting, heating and ventilation, and in addition, the Contractor's office shall be fully furnished with desks, plan tables, storage cabinets, file drawers, chairs, stools and plan racks.

4.3.3 Provide storage sheds for small tools, equipment, perishable materials, etc., as necessary. All buildings shall be equipped with windows for natural light and doors properly fitted and equipped with locks.

4.3.4 Maintain offices and storage sheds in good condition to the approval of the Engineer/Architect from start of Work until final completion of Work or, when directed by the Engineer/Architect, remove offices and sheds from the site and leave areas free of debris and waste materials and in a clean and tidy condition.

4.3.5 Offices and storage sheds required by Trade Contractors, such as mechanical and electrical, shall be provided by the trade requiring them.

4.3.6 Provide an office approximately 120 square feet for the absolute use of the Owner or their representative(s). It shall be properly fitted and furnished with light, heat, telephone, lock and key, shelving, table and chairs and plan rack. The building shall be removed from the site at the completion of the Work.

4.4.0 *TEMPORARY SERVICES*

4.4.1 Light and Power

Furnish all temporary light and power required to provide such intensity of light and sufficient power as necessary for the Work to be carried out under the best conditions. Obtain and pay for all permits and inspection tests required by Provincial and/or Municipal authorities. Pay all charges and maintain fixtures and equipment in good working order. This shall include electric heat.

4.4.2 Telephone

Install and pay for the operation of one job telephone and one telephone for the use of the Engineer/Architect for the duration of the Contract. Subcontractors requiring individual telephones shall have them installed at their expense. Long distance calls will be at the expense of the party making the calls.

4.4.3 Toilets

At the start of operations, provide and maintain in sanitary condition sufficient temporary toilets and washing facilities for the use of personnel on the job. Conform to requirements of the Department of Health and other authorities having jurisdiction. Supply adequate quantities of disinfectant and toilet paper. When building toilets and washing facilities are operable, they may be used under the same conditions as the temporary toilets with the latter being removed, leaving all surfaces and areas hygienically clean and in immaculate condition.

4.4.4 Heat

Provide and maintain in good condition a temporary heating system for use when the building is closed in until the project has been handed over to the Owner. Pay for fuel and maintenance of the system. Maintain temperatures at a minimum of 50° F, (higher if required for special trades). Heating equipment not adequately protected or operated in conditions other than those intended by the manufacturer shall be regarded as temporary. Remove all such equipment and replace with new permanent equipment.

When ready for operation, the permanent heating equipment may be used for temporary heating purposes, subject to the conditions of the Mechanical Division of the specifications. Protect all permanent heating equipment used for temporary heating purposes. Provide satisfactory site conditions for the proper operation of this equipment.

4.4.5 Water Supply

Provide in two convenient locations outside the building line a fresh water supply for the use of all trades.

Where connection cannot be made to an existing water supply, provide adequate size tanks and keep them filled for use of all trades.

4.5.0 PLANT AND MACHINERY

4.5.1 Provide all framework, scaffolding, ladders, cranes, derricks, planks, screens, gantries, tarpaulins, tools, equipment and machinery for the proper execution of the Work. Scaffolding shall be erected without damage of the structure or the finishes, be removed to suit the installation of work of other trades and be promptly removed at completion.

4.5.2 Where it is the normal practice for the trade to provide its own scaffolding, it shall be included in the Subcontract.

4.6.0 PROTECTION OF PUBLIC AND WORKMEN

4.6.1 Part 8 of the National Building Code of Canada, latest edition, shall apply to this project in its entirety. This covers fencing, barricades, Fire protection, excavation, use of streets or public property, control of vehicular traffic and mechanical methods of demolition.

4.6.2 The latest edition of Canadian Construction Safety Code shall also apply to all phases of this project.

4.6.3 The Workers' Compensation Board Regulations shall also apply to all phases of this project.

4.7.0 CONSTRUCTION SCHEDULE

4.7.1 The Contractor shall, within seven (7) days after the Contract is awarded, prepare for the use of the Engineer/Architect and Owner, a construction schedule. It shall indicate as closely as possible the starting and completion dates for the major sections of the Work, together with the Subcontractors' names.

4.7.2 With each monthly progress claim, submit one (1) copy of the original construction schedule marked in red to show the actual construction progress on the date of the submission of the claim.

Weekly schedule updates shall be provided.

Provide updated construction schedule demoting the original.

4.8.0 *PROGRESS PHOTOGRAPHS*

4.8.1 Submit with monthly progress claim digital progress photographs taken from points designated by the Engineer/Architect. In the lower right-hand corner of the prints show the date and name of the project.

4.9.0 OPERATIONS AND MAINTENANCE DATA

4.9.1 On completion of the project, submit to the Engineer/Architect two (2) copies of Operations and Maintenance Data and one (1) electronic copy as original editable format.

a) Bind data in vinyl hard covered, 3-ring, loose-leaf binder for 215 x 280 mm size paper.

b) Enclose title sheet, labelled "Operation and Maintenance Data", project number, project name, date and list of contents.

c) Organize contents into applicable sections of work to parallel project specifications breakdown. Mark each section by labelled tabs protected with celluloid covers fastened to hard paper dividing sheets.

d) Provide electronic document in CD or DVD as original editable file format or, at the direction of the Owner, pdf format.

4.9.2 Include the following information plus data specified in Division 15 and 16:

a) Maintenance instruction for finished surface and materials.

b) Copy of hardware schedules.

c) 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 and serial number.

d) Names, addresses, phone and fax numbers of Subcontractors and Suppliers.

e) Guarantees, warranties and bonds showing:

(i) Name and address of project;

(ii) Guarantee commencement date (date of Final Certification of Completion).

(iii) Duration of guarantee.

(iv) Clear indication of what is being guaranteed and what remedial action will be taken under guarantee.

(v) Signature and Seal of Contractor.

f) Additional materials used in project listed under various sections showing name of manufacturer and source of supply.

4.9.3 Neatly type lists and notes. Use clear drawings, diagrams or manufacturer's literature.

4.9.4 The final certificate will not be issued until the data books have been received and approved by the Engineer/Architect.

4.10.0 COORDINATION OF WORK

4.10.1 The Contractor will coordinate the Work of their Subcontractors and provide necessary instructions and scheduling so as to permit continuous progress in the Work by all trades. They will coordinate work between the Subcontractors on the site to ensure that anchor bolts, plates, attachments, etc., are provided and set in place in a timely manner. They will lay out partitions and assist Subcontractors in establishing the actual location of the fixtures, pipes, outlets, duct conduit, etc., so as to limit the interference of one trade with another. Locations shown on the drawings are approximate. If interference problems are encountered which cannot be resolved on the site, advise the Engineer/Architect before proceeding with the Work. Conceal all mechanical and electrical work unless otherwise indicated.

4.11.0 TRAFFIC MAINTENANCE

4.11.1 Do not close or obstruct streets, sidewalks, driveways, etc., without permission from authorities having jurisdiction. Do not place or store materials in street, sidewalks, parking areas, etc., unless so authorized.

4.12.0 FIRE PROTECTION

4.12.1 Fire protection measures shall include:

a) An adequate fire alarm signal, the use of fire resistant tarpaulins, the daily inspection of temporary heating system by competent staff and regular fire patrol;

b) All temporary wiring shall be done by electricians qualified under the applicable local regulations;

c) Supply and maintenance of fifteen (15) pounds dry chemicals and/or five (5) gallons soda-acid fire extinguishers in such locations that no working crew has to

travel more than fifty (50) feet to an extinguisher station. In any case, there shall be not less than one (1) fully charged extinguisher(s) at the job at any time.

4.13.0 JOB MEETINGS

4.13.1 Where the value of the contract exceeds $100,000 (HST included) job meetings shall occur at definitely prescribed times (minimum once a month), which will be determined after commencement of work, the Contractor shall organize job meetings and send out notices stating time and place to the Owner's representative, the Engineer/Architect, Subconsultants, to all Subcontractors and to other persons whose presences are required at the meetings. They shall take note of all persons attending these meetings and shall, within one (1) week after each job meeting, submit to the Owner, the Engineer/Architect, the Subconsultants and others present, minutes of the meeting which must show any major decisions made and any instructions or information required.

4.13.2 Where the value of the contract is less than $100,000 (HST included) job meetings shall occur at the discretion of the University Project Coordinator but shall not occur fewer than once per month.

4.14.0 AS-BUILT DRAWINGS

4.14.1 The Engineer/Architect will issue to the Contractor three (3) sets of prints of architectural, mechanical and electrical drawings for the sole purpose of providing "as-built" drawings. The Contractor shall pass these to the relevant Subcontractor who shall keep two (2) sets in their office and one (1) set on the job. As changes occur, the Subcontractor shall make them on the field set. Upon completion of the project, the Subcontractor shall accurately transfer all changes to the two (2) office sets in red ink and pass them to the Engineer/Architect, through the Contractor, for approval. If they are not approved, the Subcontractor shall prepare new sets for resubmission (purchasing additional white prints for this purpose).

4.14.2 As-built drawings shall be white prints and shall indicate all changes in Architectural, Mechanical and Electrical work, including any changes in location of piping, ducts, panels, etc.

4.14.3 Provide electronic as-builts in CD or DVD as original editable file format or, at the direction of the Owner, pdf format.

4.14.4 The Certificate of Total Performance will not be issued until such drawings have been received and approved.

4.15.0 COMPLETION TIME

4.15.1 The project shall be ready for the use and occupancy by the Owner within the time stated in the Open Call and Acceptance Form.

4.15.2 Prior to the acceptance by the Owner of the Substantial Performance, the Contractor and the Owner shall sign a list of deficiencies as prepared by the Engineer/Architect for prompt correction and/or completion.

4.16.0 CLOSE DOWN OF WORK

4.16.1 Should the Work be closed down for any cause, the Contractor shall assume all responsibility for its proper protection during such period. They must protect all foundation work and other work liable to be damaged.

4.17.0 BROKEN GLASS

4.17.1 The Contractor shall be held responsible for any damaged, broken or scratched glass and at completion shall replace all such glass at no additional cost to the Owner.

4.18.0 HOARDING

4.18.1 Before starting excavating, construct and thereafter maintain all necessary hoarding required by Municipal or Provincial regulations or by other authorities having jurisdiction.

4.19.0 COMMISSIONING

4.19.1 The Contractor is responsible for commissioning the Work to ensure that the various parts are operating in a manner as intended by the Contract Documents. Even through individual components and/or parts of the Work may have been tested and approved prior to the substantial completion, the Contractor must coordinate a final commissioning of the complete Work, including at the place of the Work all their major Subcontractors and Suppliers. The final commissioning will be carried out by the appropriate trades working together in a complementary manner such that the successful operation of the whole Work is completed properly to the satisfaction of the Engineer/Architect. The Substantial Performance Certificate will not be issued until the final commissioning of the Work has been successfully completed.

4.20.0 FINAL CLEAN-UP

4.20.1 At the end of the job, thoroughly clean the building of all rubbish and surplus materials.

4.20.2 Make good all damaged areas in the building caused as a result of the Work of this Contract.

4.20.3 Do final cleaning, waxing and polishing of resilient flooring.

5.0 CAMPUS SAFETY AND HEALTH REGULATIONS

Maintaining a healthy and safe environment for all members of the campus community, as well as visitors, is a priority with the University. This involves a commitment from all sectors of the campus community and extends to outside agencies having occasion to come on campus to conduct business.

The following regulations will apply to all work undertaken by contractors and service personnel on any University property.

5.1.0 REGULATIONS, CODES AND STANDARDS

Contractors shall be familiar with and abide by provisions of various safety codes and standards applicable to the work performed and should refer to Article **23. PROTECTION OF WORK AND PROPERTY** in the **General Conditions**.

In particular, strict adherence shall be required to the Provincial Occupational Health and Safety Act and Regulations and the National Building Code of Canada, Part 8.

5.2.0 GENERAL SAFETY REGULATIONS

a) Contractors/service agencies shall ensure that members of the campus community are not endangered by any work or process in which they may be engaged. Work areas shall be adequately barricaded, and if dust or fumes are generated, suitable enclosures shall be installed to contain such emissions.

b) No material shall be stored in such a way as to obstruct walkways or represent a danger to pedestrian traffic.

c) Adequate protection shall be provided to prevent the possibility of materials falling from scaffolding or elevated areas. Areas where materials are being loaded or offloaded shall be barricaded or otherwise protected to prevent unauthorized entry. Where necessary, appropriate warning signs shall be posted.

d) The work areas must be kept reasonably clean and free from debris which could constitute a fire hazard. Care must be taken to ensure that the work process does not activate fire alarm detection devices. (Generation of dust and fumes can activate smoke detectors causing a false alarm).

e) Due consideration shall be given to fire safety in buildings. Flammable materials must be kept away from sources of ignition. No work involving the use of open flame devices must be undertaken around flammable solvents or gases.

f) Do not alter or disturb any materials believed to contain asbestos materials (unless this is a duly authorized part of the project). Should suspect materials be encountered, consult with University officials before proceeding.

g) Material Safety Data Sheets shall be procured for any hazardous product used on campus. Such sheets shall be made readily available for consultation as required under the Workplace Hazardous Materials Information System.

NOTE: The above regulations are not to be considered all inclusive and are considered to be complementary to the safety requirements outlined in the agreement between the Owner and the Contractor/Service Agency. Certain conditions and circumstances may require adherence to additional safety regulations.

As a general requirement, contract/service personnel are expected to conduct all work on campus in a professional and safe manner and to give priority to the welfare of members of the campus community.

6.0 CONTRACTOR PERFORMANCE EVALUATION

6.1.0 The purpose of this process is to maintain an acceptable level of performance with external contractors carrying out work for the Department of Facilities Management.

6.2.0 A record of the performance of external contractors will be maintained to identify the following:

a) Those contractors who by virtue of satisfactory performance will continue to be eligible to submit bids for work at the University;

b) Those contractors whose performance is considered unsatisfactory and will be advised of the need to improve performance to remain eligible to submit bids for work at the University;

c) Those contractors whose record of unsatisfactory performance will render them ineligible to submit bids for work at the University.

6.3.0 Contractors' performance will be evaluated on a points rating system relative to quality of work performed, timeliness in completing work and management/administration of contracts/work and safety parameters.

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Types of items described in this Section:

B. Types of items described in this Section:
1. Work Covered By the Contract Documents.
2. Type of Contract.
3. Work Phases.
4. Work Under Other Contracts.
5. Products Ordered In Advance.
6. Owner-Furnished Products.
7. Use of Premises.
8. Owner's Occupancy Requirements.
9. Work Restrictions.
10. Interpretation Of Documents
11. Specification Formats and Conventions.
12. Project Management and Coordination.
13. Construction Progress Documentation.
14. Photographic Documentation.
15. Substitution Procedures.
16. Submittal Procedures.
17. Environmental Procedures.
18. Wildlife Protection.
19. Quality Requirements.
20. Regulatory Requirements.
21. Temporary Facilities and Control.
22. Temporary Barriers and Enclosures.
23. Product Requirements.
24. Execution.
25. Construction Waste Management And Disposal.
26. Closeout Procedures.
27. List of Incomplete Items (Punch List)
28. Operation and Maintenance Data.
29. Project Record Documents.
30. Demonstration and Training.

C. Types of items you will not find described in this Section:
1. Health and Safety Requirements

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: EN-164-21: Engineering Building, Renovations to EN-2078
1. Project Location: Main Campus, Memorial University, St. John’s, NL

B. Owner: Memorial University of Newfoundland & Labrador
   1. Owner's Representative: Department of Facilities Management

C. The Work consists of the following:
   1. The Work includes renovations to existing classroom involving selective demolition and new construction including architectural, furniture, and associated electrical work.

1.4 TYPE OF CONTRACT

A. Project will be constructed under a single lump sum contract.

1.5 WORK PHASES

A. The Work shall be conducted in one (1) phase.

B. Before commencing Work of each phase, submit a schedule showing the sequence, commencement and completion dates, and move-out and -in dates of Owner's personnel for all phases of the Work.

1.6 WORK UNDER OTHER CONTRACTS

A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate the Work of this Contract with work performed under separate contracts.

B. Preceding Work: Owner has awarded / will award separate contract(s) for the following construction operations at Project site. Those operations are scheduled to be substantially complete before work under this Contract begins.
   1. No proceeding work planned.

C. Concurrent Work: Owner has awarded / will award separate contract(s) for the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.
   1. Work associated with Facilities Management trade shop support and Information Technology Services.

D. Future Work: Owner has awarded / will award separate contract(s) for the following additional work to be performed at site after Substantial Completion. Completion of that work will depend on successful completion of preparatory work under this Contract.
   1. No future work planned.

1.7 PRODUCTS ORDERED IN ADVANCE

A. General: Owner has negotiated Purchase Orders with suppliers of material and equipment to be incorporated into the Work. Owner will assign these Purchase Orders to Contractor. Costs for receiving, handling, storage if required, and installation of material and equipment are included in the Contract Sum.
   1. Contractor's responsibilities are same as if Contractor had negotiated Purchase Orders, including responsibility to renegotiate purchase and to execute final Purchase-Order agreements.

B. List of Products Ordered in Advance:
   1. None.

1.8 OWNER-FURNISHED PRODUCTS

A. Owner will furnish products indicated. The Work includes providing support systems to receive Owner's equipment and making plumbing, mechanical, and electrical connections.
   1. Owner will arrange for and deliver Shop Drawings, Product Data, and Samples to Contractor.
   2. Owner will arrange and pay for delivery of Owner-furnished items according to Contractor's Construction Schedule.
   3. After delivery, Owner will inspect delivered items for damage. Contractor shall be present for and assist in Owner's inspection.
   4. If Owner-furnished items are damaged, defective, or missing, Owner will arrange for replacement.
   5. Owner will arrange for manufacturer's field services and for delivery of manufacturer's warranties to Contractor.
   6. Owner will furnish Contractor the earliest possible delivery date for Owner-furnished products. Using Owner-furnished earliest possible delivery dates, Contractor shall designate delivery dates of Owner-furnished items in Contractor's Construction Schedule.
   7. Contractor shall review Shop Drawings, Product Data, and Samples and return them to Owner's Representative noting discrepancies or anticipated problems in use of product.
   8. Contractor is responsible for receiving, unloading, and handling Owner-furnished items at Project site.
   9. Contractor is responsible for protecting Owner-furnished items from damage during storage and handling, including damage from exposure to the elements.
   10. If Owner-furnished items are damaged as a result of Contractor's operations, Contractor shall repair or replace them.
   11. Contractor shall install and otherwise incorporate Owner-furnished items into the Work.

B. Owner-Furnished Products:
   1. Owner supplied furnishings, fume hoods, shower and eyewash station, and av equipment included in contract as noted on drawings. Contractor to store, protect, and install owner supplied furnishing and equipment on site for the duration of the project.

1.9 USE OF PREMISES

A. General: Contractor shall have full use of premises for construction operations, including use of Project site, during construction period. Contractor's use of premises is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

B. General: Contractor shall have limited use of premises for construction operations as indicated on Drawings by the Contract limits.

C. Use of Site: Limit use of premises to areas under construction. Do not disturb portions of Project site beyond areas in which the Work is indicated.
   1. Owner Occupancy: Allow for Owner occupancy of Project site and use by the public.
   2. Driveways and Entrances: Keep driveways parking garage, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
      a. Schedule deliveries to minimize use of driveways and entrances.
      b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

D. Use of Existing Building: If the work involves construction in an existing building, maintain the existing building in a weather tight condition throughout construction period. Repair damage caused by construction operations. Protect building and its occupants during construction period.

1.10 OWNER'S OCCUPANCY REQUIREMENTS

A. Full Owner Occupancy: Owner will occupy site and existing building during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits, unless otherwise indicated.
   1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
   2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

B. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits, unless otherwise indicated.
   1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
   2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

C. Owner Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed areas of building, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.
   1. Obtain a Certificate of Occupancy from authorities having jurisdiction before Owner occupancy.
   2. Before partial Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of building.
   3. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of building.

1.11 WORK RESTRICTIONS

A. On-Site Work Hours: Work shall be generally performed inside the existing building during normal business working hours, Monday through Friday, except otherwise indicated.
   1. Weekend Hours: **Contractor to notify Owner's representative 48hrs prior to scheduling.**
   2. Early Morning Hours: **Contractor to notify Owner's representative 48hrs prior to scheduling.**
   3. Hours for Utility Shutdowns: **Dependant on Scope of shutdown. Contractor to notify Owner's representative 2 weeks prior to scheduling.**
   4. Hours for Core Drilling and other noise generating activities: **To be scheduled after regular work hours. Contractor to notify Owner's representative 48hrs prior to scheduling.**

B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
   1. Notify Owner's Representative not less than two days in advance of proposed utility interruptions.
   2. Do not proceed with utility interruptions without Owner's Representative's written permission.

C. No smoking is permitted on MUN Campus.

1.12 INTERPRETATION OF DOCUMENTS

A. In the event of discrepancies or conflicts in interpreting the Plans (drawings) and Specifications,
   1. Supplementary General Conditions take precedence over all other documents.

2. General Conditions take precedence over drawings and specifications.
3. Division 1 Sections take precedence over technical specification sections in other Divisions;
4. Legends and schedules take precedence over drawings and Specifications, whether they are bound with the specifications or integral with the drawings;
5. Specifications take precedence over all other drawings;

B. Plans (drawings) and Specifications are complementary. When work is shown or mentioned on the drawings but is not indicated in the Specifications, or when work is indicated in the Specifications but is not shown or mentioned on the Drawings, it shall nevertheless be included in the Contract.

1.13 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 50-division format and CSI/CSC's *MasterFormat* numbering system.
1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
2. Division 01: Sections in Division 01 govern the execution of the Work of all Sections in the Specifications.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

C. The words *shall*, *shall be*, or *shall comply with*, depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.14 PROJECT MANAGEMENT AND COORDINATION

A. Coordination
1. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

B. Administrative and supervisory personnel
1. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.
2. Maintain same superintendent on Project for duration of Project. Immediately notify Owner`s Representative if superintendent should become unavailable to work and immediately replace with an alternate person acceptable to the Owner`s Representative.

C. Project meetings
1. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
2. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Owner`s Representative, within three days of the meeting.

3. Progress Meetings: Conduct progress meetings at monthly intervals. Coordinate dates of meetings with preparation of payment requests.

1.15 Requests For Interpretation (RFIs)

1. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.
   a. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
2. Allow seven working days for Owner`s Representative's response for each RFI.
3. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Owner`s Representative in writing within 10 days of receipt of the RFI response.

1.16 CONSTRUCTION PROGRESS DOCUMENTATION

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's Construction Schedule within 30 days of date established for the Notice of Award.

1. Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
2. At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

B. Reports

1. Daily Construction Reports: Prepare a daily construction report and submit to Owner`s Representative each week recording the following information concerning events at Project site:
   a. List of subcontractors at Project site.
   b. List of separate contractors at Project site.
   c. Approximate count of personnel at Project site.
   d. Equipment at Project site.
   e. Material deliveries.
   f. High and low temperatures and general weather conditions.
   g. Accidents.
   h. Meetings and significant decisions.
   i. Unusual events.
   j. Stoppages, delays, shortages, and losses.
   k. Meter readings and similar recordings.
   l. Emergency procedures.
   m. Orders and requests of authorities having jurisdiction.
   n. Change Orders received and implemented.
   o. Construction Change Directives received and implemented.
   p. Services connected and disconnected.
   q. Equipment or system tests and start-ups.
   r. Partial Completions and occupancies.
   s. Substantial Completions authorized.
2. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for interpretation. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

1.17 PHOTOGRAPHIC DOCUMENTATION

A. Preconstruction Photographs: Before starting construction take, digital photographs of Project site and surrounding areas, including existing items to remain during construction, from different vantage points.

B. Periodic Construction Photographs: Take digital photographs weekly, with timing each month adjusted to coincide with the cut-off date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

C. E-mail or otherwise submit photos to Owner`s representative on monthly basis to coincide with the each Application for Payment.

1.18 SUBSTITUTION PROCEDURES

A. Substitution Requests: Submit PDF copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
      a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
      b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
      c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable specification section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
      d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
      e. Samples, where applicable or requested.
      f. Certificates and qualification data, where applicable or requested.
      g. List of similar installations for completed projects with project names and addresses and names and addresses of Owner's Representatives and owners.
      h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
      i. Research reports evidencing compliance with building code in effect for Project.
      j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
      k. Cost information, including a proposal of change, if any, in the Contract Sum.
      l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
      m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
   2. Owner's Representative's Action: If necessary, Owner's Representative will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Owner's Representative will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
      a. Forms of Acceptance: Change Order, Construction Change Directive, or Owner's Representative's Supplemental Instructions for minor changes in the Work.
      b. Use product specified if Owner's Representative does not issue a decision on use of a proposed substitution within time allocated.

B. Substitutions for Cause: Submit requests for substitution immediately upon discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
   1. Conditions: Owner's Representative will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Owner's Representative will return requests without action, except to record noncompliance with these requirements:
      a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
      b. Substitution request is fully documented and properly submitted.
      c. Requested substitution will not adversely affect Contractor's construction schedule.
      d. Requested substitution has received necessary approvals of authorities having jurisdiction.
      e. Requested substitution is compatible with other portions of the Work.
      f. Requested substitution has been coordinated with other portions of the Work.
      g. Requested substitution provides specified warranty.
      h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

C. Substitutions for Convenience: Owner's Representative will consider requests for substitution if received within 60 days after the Notice of Award. Requests received after that time may be considered or rejected at discretion of Owner's Representative.
   1. Conditions: Owner's Representative will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Owner's Representative will return requests without action, except to record noncompliance with these requirements:
      a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume.
      b. Requested substitution does not require extensive revisions to the Contract Documents.
      c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
      d. Substitution request is fully documented and properly submitted.
      e. Requested substitution will not adversely affect Contractor's construction schedule.
      f. Requested substitution has received necessary approvals of authorities having jurisdiction.
      g. Requested substitution is compatible with other portions of the Work.
      h. Requested substitution has been coordinated with other portions of the Work.
      i. Requested substitution provides specified warranty.

1.19 SUBMITTAL PROCEDURES

A. Contractor's Review
   1. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Owner`s Representative.

B. Preferred Size for Paper Submittals
   1. Provide paper submittals on sheets no less than 8 ½ x 11” Whenever practical, provide paper submittals on sheet size not greater than 11 x 17”. In all cases ease of readability of submittal content by Engineer shall take precedent over providing information on preferred sheet size.

C. Submittal Procedures
   1. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
      a. Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and

statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

2. Submit three paper copies of each submittal, unless otherwise indicated. The Owner`s Representative will return no copies on any submittals but instead will e-mail a web link to a web site which will host PDFs of the reviewed documents.
3. Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Owner`s Representative's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
    a. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Owner`s Representative will advise Contractor when a submittal being processed must be delayed for coordination.
    b. Resubmittal Review: Allow 15 days for review of each resubmittal.
    c. Sequential Review: Where sequential review of submittals by Owner`s Representative's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.
4. Owner`s Representative will review each submittal, make marks to indicate corrections or modifications required, and return it. Owner`s Representative will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:
    a. REVIEWED – NO COMMENTS
    b. REVIEWED WITH COMMENTS. REVISE & RESUBMIT PRIOR TO START OF WROK.
    c. REVIEVED WITH COMMENTS. PROCEED WITH WORK SUBJECT TO IMPLEMENTATION OF NOTED COMMENTS, REVISE AND RESUBMIT.
    d. NOT ACCEPTED.

1.20 ENVIRONMENTAL PROCEDURES

A. Definitions
1. Hazardous Material: Product, substance, or organism that is used for its original purpose; and that is either dangerous goods or a material that may cause adverse impact to the environment or adversely affect health of persons, animals, or plant life when released into the environment.

B. Fires and burning of rubbish on site not permitted.

C. Store, handle, and dispose of hazardous materials in accordance with applicable federal and provincial laws, regulations, codes and guidelines. Store in location that will prevent spillage into the environment

D. Provide temporary drainage and pumping as necessary to keep excavations and site free from water.
1. Do not pump water containing suspended materials into waterways, sewer or drainage systems.

E. Protect any trees and plants on site and adjacent properties that are in immediate area of construction.
1. Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.
2. Restrict tree removal to areas indicated or designated by Owner`s Representative.

F. Minimize stripping of topsoil and vegetation.

1.21 WILDLIFE PROTECTION

A. Should nests of migratory birds (Seagulls) be encountered during work, immediately notify Owner’s Representative for directives to be followed.
1. Do not disturb nest site and neighbouring vegetation until nesting is completed.
2. Minimize work immediately adjacent to such areas until nesting is completed.

3. Protect these areas by following recommendations of Canadian Wildlife Service.

1.22 QUALITY REQUIREMENTS

A. Conflicting Requirements
1. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Owner`s Representative for a decision before proceeding.
2. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Owner`s Representative for a decision before proceeding.

B. Quality Control
1. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
a. Payment for these services will be made by the Owner.
b. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
2. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
a. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
b. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
c. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

1.23 REGULATORY REQUIREMENTS

A. Perform Work in accordance with National Building Code of Canada (NBC) including all amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.

B. Meet or exceed requirements of:
1. Contract documents.
2. Specified standards, codes, and referenced documents.

1.24 TEMPORARY FACILITIES AND CONTROLS

A. Temporary Utility Installation
1. General: Install temporary service or connect to existing service.
a. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
2. Sanitary Facilities: If the Owner has existing toilet facilities these may be used as long as these facilities are kept cleaned and maintained in a condition acceptable to the Owner. Otherwise provide temporary toilets,

wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

3. Water Service: If the Owner has existing water service it may be used as long as it does not impact on the Owner`s need. Otherwise install water service and distribution piping in sizes and pressures adequate for construction.
4. Sewers and Drainage: Provide temporary utilities as required to remove effluent lawfully.
5. Heating: Provide temporary heating as required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
6. Ventilation and Humidity Control: Provide temporary ventilation as required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
7. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
    a. Install electric power service overhead, unless otherwise indicated.
    b. If the Owner has an existing power source, the contractor may access it for temporary power provided it does not impact the Owner`s needs.
8. Lighting: Provide temporary lighting with local switching as required to provide adequate illumination for construction operations, observations, inspections, and traffic conditions.
9. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
10. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weather tight enclosure for building exterior.
11. Tree and Plant Protection: Install temporary fencing as required to protect trees and plants intended to remain. Install protection outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
12. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner as required to prevent people and animals from easily entering site except by entrance gates.

B. Operation, Termination, and Removal
    1. Maintain facilities in good operating condition until removal.
    2. Remove each temporary facility when need for its service has ended.

1.25 TEMPORARY BARRIERS AND ENCLOSURES

A. Hoarding
    1. For work involving the excavation for new foundations or the erection of new structures outside of an enclosure, provide hoarding.

B. Weather Enclosures
    1. Provide weather tight closures to unfinished door and window openings, tops of shafts and other openings in floors and roofs.

C. Dust Tight Screens
    1. Provide dust tight screens or insulated partitions to localize dust generating activities, and for protection of workers, finished areas of Work and public.

D. Protection Of Building Finishes

1. Provide protection for finished and partially finished building finishes and equipment during performance of work.
2. Provide necessary screens, covers, and hoardings.
3. Be responsible for damage incurred due to lack of or improper protection.

1.26 PRODUCT REQUIREMENTS

A. Manufacturer's Instructions
1. Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
2. Notify Owner`s Representative in writing, of conflicts between specifications and manufacturer's instructions, so that Owner`s Representative may establish course of action.

B. Quality
1. Products, materials, equipment and articles (referred to as products throughout specifications) incorporated in Work shall be new, not damaged or defective, and of best quality (compatible with specifications) for purpose intended. If requested, furnish evidence as to type, source, and quality of products provided.
2. Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
3. Should any dispute arise as to quality or fitness of products, decision rests strictly with Owner`s Representative based upon requirements of Contract Documents.
4. Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.

C. Product Warranties
1. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

D. Product Selection Procedures
1. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.

1.27 EXECUTION

A. Materials
1. Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
2. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to the Owner`s Representative for the visual and functional performance of in-place materials.

B. Construction Layout
1. Where work involves construction outside of an existing footprint, engage a land surveyor to lay out the Work using accepted surveying practices.
2. On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified location certificate showing dimensions, locations, angles, and elevations of construction and site work.

C. Installation
1. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
a. Make vertical work plumb and make horizontal work level.
b. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
c. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
d. Maintain minimum headroom clearance of 2440 mm in occupied spaces and in unoccupied spaces.
2. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
3. Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
a. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Owner`s Representative.

D. Cutting And Patching
1. Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
a. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
2. Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

E. Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

F. Progress Cleaning
1. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
2. Site: Maintain Project site free of waste materials and debris.

G. Correction Of The Work
1. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
2. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
3. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

H. Protection Of Installed Construction
1. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
2. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1.28 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

A. Waste Reduction
1. Reduce construction waste during installation work. Undertake practices which will minimize waste and optimize full use of new materials on site, such as:

a. Use of a central cutting area to allow for easy access to off-cuts;
b. Use of off-cuts for blocking and bridging elsewhere.
c. Use of effective and strategically placed facilities on site for storage and staging of left-over or partially cut materials (such as gypsum board, plywood, ceiling tiles, insulation etc...) to allow for easy incorporation into

B. Material Source Separation Process
1. Perform demolition and removal of existing building components and equipment following a systematic deconstruction process.
2. Separate materials and equipment at source, carefully dismantling, labelling and stockpiling alike items for the following purposes:
a. Reinstallation into the work where indicated.
b. Salvaging reusable items not needed in project which Contractor may sell to other parties. Sale of such items not permitted on site.
c. Sending as many items as possible to locally available recycling facility.
d. Segregating remaining waste and debris into various individual waste categories for disposal in a *non-mixed state* as recommended by waste processing/landfill sites.

C. Disposal Requirements
1. Dispose of waste only at approved waste processing facility or landfill sites approved by authority having jurisdiction.

1.29 CLOSEOUT PROCEDURES

A. Substantial Completion
1. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
a. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
b. Advise Owner of pending insurance changeover requirements.
c. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
d. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
e. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
f. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
g. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
h. Complete start-up testing of systems.
i. Submit test/adjust/balance records.
j. Terminate and remove temporary facilities from Project site, along with mock-ups, construction tools, and similar elements.
k. Advise Owner of changeover in heat and other utilities.
l. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
m. Complete final cleaning requirements, including touch-up painting.
n. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
2. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Owner`s Representative will either proceed with inspection or notify Contractor of unfulfilled requirements. Owner`s Representative will prepare the Certificate of Substantial Completion after inspection or will notify

Contractor of items, either on Contractor's list or additional items identified by Owner`s Representative, that must be completed or corrected before certificate will be issued.

3. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

B. Final Completion
   1. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
      a. Submit a final Application for Payment according to the General Conditions.
      b. Submit certified copy of Owner`s Representative's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Owner`s Representative. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
      c. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
      d. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
   2. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Owner`s Representative will either proceed with inspection or notify Contractor of unfulfilled requirements. Owner`s Representative will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
      a. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

C. Final Cleaning
   1. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
   2. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1.30 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
   1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
   2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
   3. Include the following information at the top of each page:
      a. Project name.
      b. Date.
      c. Name of Owner's Representative.
      d. Name of Contractor.
      e. Page number.
   4. Submit list of incomplete items in the following format:
      a. Three paper copies of product schedule or list, unless otherwise indicated.

1.31 WARRANTIES

A. Submittal Time: Submit written warranties on request of Owner's Representative for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
   1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 215-by-280-mm paper.
   2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
   3. Identify each binder on the front and spine with the typed or printed title *WARRANTIES*, Project name, and name of Contractor.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.

1.32 OPERATION AND MAINTENANCE DATA

A. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

B. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

C. Manual Contents: Operations and maintenance manual content is specified in individual specification sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
   1. Where applicable, clarify and update reviewed manual content to correspond to modifications and field conditions.

D. Format: Submit operations and maintenance manuals in the following format:
   1. PDF electronic file. Assemble each manual into a composite electronically-indexed file. Submit on digital media acceptable to Owner's Representative.
      a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically-linked operation and maintenance directory.
      b. Enable inserted reviewer comments on draft submittals.

1.33 PROJECT RECORD DOCUMENTS

A. Record Drawings
   1. Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.
   2. Mark Record Prints to show the actual installation where installation varies from that shown originally.
   3. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
      a. Accurately record information in an understandable drawing technique.
      b. Record data as soon as possible after obtaining it. Record and check the mark-up before enclosing concealed installations.
   4. Content: Types of items requiring marking include, but are not limited to, the following:
      a. Dimensional changes to Drawings.
      b. Revisions to details shown on Drawings.
      c. Depths of foundations below first floor.
      d. Locations and depths of underground utilities.
      e. Revisions to routing of piping and conduits.
      f. Revisions to electrical circuitry.

g. Actual equipment locations.
h. Duct size and routing.
i. Locations of concealed internal utilities.
j. Changes made by Change Order or Change Directive.
k. Changes made following Owner`s Representative's written orders.
l. Details not on the original Contract Drawings.
m. Field records for variable and concealed conditions.
n. Record information on the Work that is shown only schematically.

5. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
6. Mark record sets with erasable, red-coloured pencil. Use other colours to distinguish between changes for different categories of the Work at same location.
7. Mark important additional information that was either shown schematically or omitted from original Drawings.
8. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
9. Submit record drawings to Owner`s Representative prior to requesting Substantial Completion inspection.

1.34 DEMOSTRATION AND TRAINING

A. Demonstrate start-up, operation, control, adjustment, troubleshooting, servicing, and maintenance of each item of maintenance of each item of equipment.

B. Instruct personnel in all phases of operation and maintenance using operation and maintenance manuals as the basis of instruction.

C. Review contents of manual in detail to explain all aspects of operation and maintenance.

D. Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent during instructions.

E. The GC shall be responsible for training coordination and scheduling and ultimately for ensuring that training is completed.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

.1 Types of items described in this Section:
  .1 Administrative and procedural requirements governing allowances.
    .1 Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to the Contractor. If necessary, additional requirements will be issued by Change Order.
  .2 Types of allowances include the following:
    .1 Revise list below to suit Project.
    .2 Lump-sum allowances.
    .3 Unit-cost allowances.
    .4 Quantity allowances.
    .5 Contingency allowances.
    .6 Testing and inspecting allowances.

.2 Types of items you will not find described in this Section:
  .1 Procedures for using unit prices.
  .2 Procedures governing the use of allowances for testing and inspecting.
  .3 Divisions 02 through 49 Sections for items of Work covered by allowances.

1.3 SELECTION AND PURCHASE

.1 At the earliest practical date after award of the Contract, advise Owner's Representative of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

.2 At Owner's Representative's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

.3 Purchase products and systems selected by Owner's Representative from the designated supplier.

1.4 SUBMITTALS

.1 Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

.2 Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

.3 Submit time sheets and other documentation to show labour time and cost for installation of allowance items that include installation as part of the allowance.

.4 Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.5 COORDINATION

.1 Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.6 QUANTITY ALLOWANCES

.1 Allowance shall include cost to Contractor of specific products and materials selected by Owner's Representative under allowance and shall include freight, and delivery to Project site.

.2 Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labour, installation, overhead and profit, and similar costs related to products and materials selected by Owner's Representative under allowance shall be included as part of the Contract Sum and not part of the allowance.

.3 Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

.1 If requested by Owner's Representative, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.7 CONTINGENCY ALLOWANCES

.1 Use the contingency allowance only as directed by Owner's Representative for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.

.2 Contractor's overhead, profit, and related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, insurance, equipment rental, and similar costs.

.3 Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit margins.

.4 At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

.5 The cash allowance shall not include HST.

1.8 TESTING AND INSPECTING ALLOWANCES

.1 Testing and inspecting allowances include the cost of engaging testing agencies, actual tests and inspections, and reporting results.

.2 The allowance does not include incidental labour required to assist the testing agency or costs for retesting if previous tests and inspections result in failure. The cost for incidental labour to assist the testing agency shall be included in the Contract Sum.

.3 At Project closeout, credit unused amounts remaining in the testing and inspecting allowance to Owner by Change Order.

1.9 ADJUSTMENT OF ALLOWANCES

.1 Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If

applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

.1 Include installation costs in purchase amount only where indicated as part of the allowance.

.2 If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.

.3 Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

.2 Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labour, installation, overhead, and profit.

.1 Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.

.2 No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

.1 Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

.1 Control Integration Allowance:

.1 Include a control integration allowance of $ 21,739.14 for use according to Owner's instructions.

.2 Lump-Sum Allowance:

.1 No Lump Sum Allowances apply to this Work.

.3 Unit-Cost Allowance:

.1 No Unit Cost Allowances apply to this Work.

.4 Contingency Allowance:

.1 Include a contingency allowance of $ 4,347.83 for use according to Owner's instructions.

.5 Testing and Inspection Allowance:

.1 No testing and Inspection Allowance apply to this Work.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Types of items described in this Section:

1. Health and safety requirements for projects located in Newfoundland and Labrador.

1.3 REFERENCES

A. Code and standards referenced in this section refer to the latest edition thereof.

B. Canadian Standards Association (CSA)

1. CSA S269.1 Falsework for Construction Purposes.
2. CAN/CSA-Z259.1 Safety Belts and Lanyards.
3. CAN/CSA-Z259.10 Full body Harnesses.
4. CAN/CSA-Z259.11 Shock Absorbers for Personal Fall Arrest Systems.
5. CAN/CSA-Z259.2, Fall Arresting Devices, Personnel Lowering Devices and Lifelines.
6. FCC No. 301 Standard for Construction Operations.
7. CSA Z275.2 Occupational Safety Code for Diving Operations.
8. CSA Z275.4 Competency Standard for Divers Operations.

C. FCC No. 302 Standard for Welding and Cutting.

D. Transportation of Dangerous Goods Act Regulations.

E. Newfoundland Occupational Health and Safety Act, Amended

F. Consolidated Newfoundland and Regulations 1149 WMIS Regulations Under the Occupational Health and Safety Act

G. Consolidated Newfoundland and Regulations 1165 Occupational Health and Safety Regulations under the Occupational Health and Safety Act.

H. Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations.

I. National Building Code of Canada.

1.4 SUBMITTALS

A. At least 10 (ten) working days prior to commencing any site work: submit to Owner's Representative copies of:

1. A complete Site Specific Hazard Assessment and Safety Program Table of Contents.
2. **Including requirments as outlined by the Department of Envrionmental Health & Safety, See APPENDIX A.**

B. Acceptance of the Project Health and Safety Hazard Assessment and Management Plan and other submitted documents by the Owner's Representative shall only be viewed as acknowledgement that the contractor has submitted the required documentation under this specification section.

C. Owner's Representative makes no representation and provides no warranty for the accuracy, completeness and legislative compliance of the Project Health and Safety Hazard Management Plan and other submitted documents by this acceptance.

D. Responsibility for errors and omissions in the Project Health and Safety Hazard Assessment and Management Plan and other submitted documents is not relieved by acceptance by Owner's Representative.

1.5 OCCUPATIONAL HEALTH AND SAFETY (PROJECT HEALTH AND SAFETY HAZARD ASSESSMENT AND MANAGEMENT PLANS)

A. Conduct operations in accordance with latest edition of the Newfoundland Occupational Health and Safety (OH&S) Act and Regulations.

B. Prepare a detailed Project Health and Safety Hazard Assessment and Management Plan for the Owner. Assessment shall identify, evaluate and control job specific hazards and the necessary control measures to be implemented for managing hazards.

C. Provide a copy of the Project Health and Safety Hazard Assessment and Management Plan upon request to Occupational Health and Safety Branch, Department of Labour, Province of Newfoundland and Labrador and the Owner.

D. The written Health and Safety Hazard Assessment and Management Plan shall incorporate the following:

1. A site-specific health and safety plan, refer to clause 1.6 Site-Specific Health and Safety Hazard Assessment and Management Plan of this section for requirements.
2. An organizational structure which shall establish the specific chain of command and specify the overall responsibilities of contractor's employees at the work site.
3. A comprehensive work plan which shall:

    a. define work tasks and objectives of site activities/operations and the logistics and resources required to reach these tasks and objectives
    b. establish personnel requirements for implementing the plan, and
    c. establish site specific training and notification requirements and schedules.

4. A personal protected equipment (PPE) Program which shall detail PPE:

    a. Selection criteria based on site hazards.
    b. Use, maintenance, inspection and storage requirements and procedures.

c. Decontamination and disposal procedures.
d. Inspection procedures prior to during and after use, and other appropriate medical considerations.
e. Limitations during temperature extremes, heat stress and other appropriate medical consideration.

5. An emergency response procedure, refer to Clause 1.7 Supervision and Emergency Response Procedure of this section for requirements.
6. A hazard communication program for informing workers, visitors and individuals outside of the work area as required.
7. A diving program which shall contain standard operating procedures to be followed in the diving operation.
8. A health and safety training program.
9. General safety rules.

E. Periodically review and modify as required each component of the Project Health and Safety Hazard Assessment and Management Plan when a new hazard is identified during completion of work and when an error or omission is identified in any part of the Project Health and Safety Hazard Assessment and Management Plan.

F. Implement all requirements of the Project Health and Safety Hazard Assessment and Management Plan.

1. Ensure that every person entering the project site is informed of requirements under the Project Health and Safety Hazard Assessment and Management Plan.
2. Take all necessary measures to immediately implement any engineering controls, administrative contacts, personal protective equipment required or termination of work procedures to ensure compliance with the Project Health and Safety Hazard Assessment and Management Plan.

1.6 SITE SPECIFIC HEALTH AND SAFETY PLAN

A. Prepare a detailed site Specific Project Health and Safety Plan which shall:

1. Contain certain hazard assessment results.
2. Identify engineering and administrative demonstrative controls (work-practices and procedures) to be implemented for managing identified and potential hazards, and comply with applicable federal and provincial legislation and more stringent requirements that have been specified in these specifications.

B. Review for completeness the hazard assessment results immediately prior to commencing work, when a new hazard is identified during completion of work and when an error or omission is identified.

1. Be solely responsible for investigating, evaluation and managing any report of actual or potential hazards.
2. Retain copies of all completed hazard assessments at the project site and make available to the Owner's Representative immediately upon request.

1.7 SUPERVISION AND EMERGENCY RESCUE PROCEDURE

A. Carry out work under the direct supervision of competent persons responsible for safety by ensuring the work complies with the appropriate section of OH&S Act and Regulations

B. Assign a sufficient number of supervisory personnel to the work site.

C. Provide a suitable means of communications for workers required to work alone.

D. Develop an emergency rescue plan for the job site and ensure that supervisors and workers are trained in the emergency rescue plan.

E. The emergency response plan shall address, as a minimum:

1. Pre-emergency planning.
2. Personnel roles, lines of authority and communication.
3. Emergency recognition and prevention.
4. Safe distances and places of refuge.
5. Site security and control
6. Evacuation routes and procedures
7. Decontamination procedures which are not covered by the site specific safety and health plan.
8. Emergency medical treatment and first aid.
9. Emergency alarm, notification and response procedures including procedures for reporting incidents to local, provincial and federal government departments.
10. PPE and emergency equipment.
11. Procedures for handling emergency incidents.
12. Site specific emergency response training requirements and schedules.
13. For diving operation, include procedures for:

    a. Managing deteriorating environmental conditions.
    b. Managing unexpected weather or sea-state condition.
    c. Evacuation of diver(s) under pressures greater that atmospheric pressure.
    d. In-water emergency transfers.
    e. Managing failing of equipment below the surface that impairs the ability of a diver to complete a dive.
    f. Managing failure of any major component of diving plant or equipment.
    g. Emergency signalling between divers involved in the diving program and between the diver(s) and the attendants using umbilical, tethers or other suitable methods.
    h. Mobilizing stand-by divers.
    i. Mobilizing crafts, stand-by boats and any other devices to be used for rescue.
    j. Contacting evacuation, rescue, treatment facilities and medical services that will be used in the diving program.
    k. Operation of emergency power and lighting facilities.

F. The emergency response procedures shall be rehearsed regularly as part of the overall training program.

G. Provide adequate first aid facilities for the jobsite and ensure that a minimum number of workers are trained in first aid in accordance with the First Aid Regulations.

1.8 CONTRACTORS SAFETY OFFICER

A. The contractor's Safety Officer will be solely responsible for the implementation and monitoring of the Project Health and Safety Hazard Assessment and Management Plan, and will have the authority to implement health and safety changes as directed by the Owner's Representative. The Safety Officer shall have as a minimum:

1. Completed training in hazardous occurrence management and response/protocols.
2. Completed training in the use, maintenance of fall protection systems.
3. Completed training in the design and construction of scaffolding.
4. Completed training in confined space entry protocols and techniques.
5. Completed training in First Aid.

6. Have working knowledge of occupational safety and health regulations.
7. Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
8. Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
9. Be on site during execution of Work and report directly to and be under direction of site supervisor.

1.9 HEALTH AND SAFETY COMMITTEE

A. Establish an Occupational Health and Safety Committee where ten or more workers are employed on the job site as per the OH&S Act and Regulations.Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.

C. Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.10 RESPONSIBILITY

A. Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.

B. Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.11 UNFORESEEN HAZARDS

A. Should any unforeseen or peculiar safety-related factor, hazard, or condition become evident during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction. Advise Owner’s Representative verbally and in writing.

1.12 INSTRUCTION AND TRAINING

A. Workers shall not participate in or supervise any activity on the work site until they have been trained to a level required by this job function and responsibility. Training shall as a minimum thoroughly cover the following:

1. Federal and Provincial Health and Safety Legislation requirements including roles and responsibilities of workers and person(s) responsible for implementing, monitoring and enforcing health and safety requirements.
2. Safety and health hazards associated with working on a contaminated site including recognition of symptoms and signs which might indicate over exposure to hazards.
3. Limitations, use, maintenance and disinfection-decontamination of personal protective equipment associated with completing work.
4. Limitations, use, maintenance and care of engineering controls and equipment.

5. Limitations and use of emergency notifications and response equipment including emergency response protocol.
6. Work practices and procedures to minimize the risk of an accident and hazardous occurrence from exposure to a hazard.

B. Provide and maintain training of workers, as required, by Federal and Provincial legislation.

C. Provide copies of all safety training certificates, upon request, to Owner's Representative for review, and to be maintained on the worker when they enter the work site.

D. Authorized visitors shall not access the work site until they have been:

1. Notified of the names of persons responsible for implementing, monitoring and enforcing the Health and Safety Hazard Assessment and Management Plan.
2. Briefed on safety and health hazards present on the site.
3. Instructed in the proper use and limitations of personal protective equipment.
4. Briefed as the emergency response protocol including notification and evacuation process.
5. Informed of practices and procedures to minimize risks from hazards and applicable to activities performed by visitors.

1.13 CONSTRUCTION SAFETY MEASURES

A. Observe construction safety measures of National Building Code, latest edition, Provincial Government, OH&S Act and Regulations, Workplace Health and Safety and Compensation Commission and Municipal Authority provided that in any case of conflict or discrepancy more stringent requirements shall apply.

B. Administer the project in a manner that will ensure, at all times, full compliance with Federal and Provincial Acts, regulations and applicable safety codes and the site Health and Safety Hazard Assessment and Management Plan.

C. Provide Owner's Representative with copies of all orders, directions and any other documentation, issued by the Provincial Department of Government Services, Occupational Health and Safety branch immediately after receipt.

1.14 POSTING OF DOCUMENTS

A. Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province and authority having jurisdiction, and in consultation with Owner's Representative.

1.15 HEALTH AND SAFETY MONITORING

A. Periodic inspections of the contractor's work may be carried out by the Owner's Representative to maintain compliance with the Health and Safety Program. Inspections will include visual inspections as well as testing and sampling as required.

B. The contractor shall be responsible for any and all costs associated with delays as a result of contractor's failure to comply with the requirements outlined in this section.

1.16 CORRECTION OF NON-COMPLIANCE

A. Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Owner's Representative.

B. Provide Owner's Representative with written report of action taken to correct non-compliance of health and safety issues identified.

C. Owner's Representative may stop work if non-compliance of health and safety regulations is not corrected.

1.17 WHMIS

A. Ensure that all controlled products are in accordance with the Workplace Hazardous Materials Information System (WHMIS) Regulations and Chemical Substances of the OH&S Act and Regulations regarding use, handling, labelling, storage, and disposal of hazardous materials.

B. Deliver copies of relevant (Material) Safety Data Sheets (SDS) to job site and the Owner's Representative. The SDS must be acceptable to Labour Canada and Health and Welfare Canada for all controlled products that will be used in the performance of this work.

C. Train workers required to use or work in close proximity to controlled products as per OH&S Act and Regulations.

D. Label controlled products at jobsite as per OH&S and Regulations.

E. Provide appropriate emergency facilities as specified in the SDS where workers might be exposed to contact with chemicals, e.g. eye-wash facilities, emergency shower.

1. Workers to be trained in use of such emergency equipment.

F. Contractor shall provide appropriate personal protective equipment as specified in the SDS where workers are required to use controlled products.

1. Properly fit workers for personal protective equipment
2. Train workers in care, use and maintenance of personal protective equipment.

G. No controlled products are to be brought on-site without prior approved SDS.

H. The SDS are to remain on site at all times.

1.18 OVERLOADING

A. Ensure no part of work or associated equipment is subjected to loading that will endanger its safety or will cause permanent deformation.

1.19 FALSEWORK

A. Design and construct falsework in accordance with CSA S269.1.

1.20 SCAFFOLDING

A. Design, erect and maintain scaffolding in accordance with CSA S269.2 and Sections 91-97 of the OH&S Act and Regulations.

B. Ensure that fall-restraint or fall-arrest devices are used by all workers working at elevations greater than 3.05 metres above grade or floor level in accordance with CSA Z259.

1.21 PERSONAL PROTECTIVE EQUIPMENT

A. Ensure workers on the jobsite use personal protective equipment appropriate to the hazards identified in the Hazard Assessment and Management Plan and those workers are trained in the proper care, use, and maintenance of such equipment.

B. PPE selections shall be based on an evaluation of the performance characteristics of the PPE relative to the requirements and limitations of the site, task-specific conditions, duration and hazards and potential hazards identified on site.

C. Provide workers and visitors to the site with proper respiratory protection equipment.

1. No work shall be performed in an area where an airborne contaminant exceeds one half (½) the IDLH concentration.
2. Respiratory protection shall be provided in accordance with the requirements of the Occupational Health and Safety Branch, Department of Labour of the Province of Newfoundland and Labrador and these specifications.
3. Establish, implement and maintain a respirator inspection and maintenance program.
4. Copies of all respirator owners' maintenance manuals shall be kept at all times at the contractor's site office.

D. Provide and maintain a supply of dermal protection equipment to allow visitors and all workers proper dermal protection.

1. Dermal protection shall be sufficient to act as a protective barrier between the skin and an airborne contaminant or hazardous material. Dermal protection shall also be provided for all physical hazards.
2. Dermal protection equipment shall not be used after exceeding 75% of the break through time. The break through time shall be based on the contaminant which requires the least amount of time to break through the protective equipment
3. Copies of all dermal protection user specifications, owners and maintenance manuals shall be kept at all times at the contractor's site office.
4. Establish, implement and maintain air inspection program to ensure proper dermal protection in accordance with CSA, NIOSH, U.S. EPA and manufacturer's requirements.

E. Provide all workers and up to two (2) visitors to the site with proper hearing protection. Workers and visitors shall not be exposed to noise levels greater than 85 dB (A) over an eight hour shift without proper hearing protection.

F. Provide all workers and up to two (2) visitors to the site with CSA approved eye protection sufficient to act as a protective barrier between the eye and airborne contaminants, hazardous materials and physical hazard.

G. Provide workers and up to two (2) visitors to the site with CSA approved hard hats.

1.22 EXCAVATION SAFETY

A. Protect excavations more than 1.25 metres deep against cave-ins or wall collapse by side wall sloping to the appropriate angle of repose, an engineered shoring/sheathing system or an approved trench box.

1. Provide a ladder which can extend from the bottom of the excavation to at least 0.91 metres above the top of the excavation.

B. Ensure that all excavations less than 1.25 metres deep are effectively protected when hazardous ground movement may be expected.

C. Design trench boxes, certified by a registered Professional Engineer, and fabricated by a reputable manufacturer. Provide the manufacturer's Depth Certificate Statement permanently affixed. Use trench boxes in strict accordance with manufacturer's instructions and depth certification data.

D. For excavations deeper than six (6) metres, provide a certificate from a registered Professional Engineer stating that the protection methods proposed have been properly designed in accordance with accepted engineering practice. The engineer's certificate shall verify that the trench boxes, if used, are properly designed and constructed to suit the depth and soil conditions.

1. Ensure that the superintendent and every crew chief, foreperson and lead hand engaged in trenching operations or working in trenches have in his/her possession a copy of the Department of Labour's "Trench Excavation Safety Guide".

1.23 CONFINED SPACE WORK

A. Comply with requirements of Canada Occupational Safety and Health Regulations, Part XI and Consolidated Regulations Newfoundland and Labrador (CRNL) OH&S 1165/96.

B. Provide approved air monitoring equipment where workers are working in confined spaces and ensure any test equipment to be used is calibrated, in good working order and used by trained persons.

C. Develop a confined space entry program specific to the nature of work performed and in accordance with OH&S Act and Regulations and ensure supervisors and workers are trained in the confined space entry program.

1. Ensure that personal protective equipment and emergency rescue equipment appropriate to the nature of the work being performed is provided and used.

D. Provide and maintain training of workers, as required by the Federal and Provincial Legislation.

E. Provide Owner's Representative with a copy of an "Entry Permit" for each entry into the confined space to ensure compliance with Federal and Provincial Legislation.

1.24 HAZARDOUS MATERIALS

A. Should material resembling hazardous materials (asbestos/mould) be encountered during the execution of work and notify Owner's Representative. Do not proceed until written instructions have been received from Owner's Representative.

B. Unless otherwise noted, for hazardous materials abatement and repair, employ the services of a recognized Environmental Consultant to provide all air monitoring and testing services for regulatory requirements.

1.25 HEAVY EQUIPMENT

A. Ensure mobile equipment used on jobsite is of the type specified in OH&S Act and Regulations fitted with a Roll Over Protective (ROP) Structure.

B. Provide certificate of training in Power Line Hazards for operators of heavy equipment.

C. Obtain written clearance from the power utility where equipment is used in close proximity to (within 5.5 metres) overhead or underground power lines.

D. Equip cranes with:

1. A mechanism which will effectively prevent the hook assembly from running into the top boom pulley.
2. A legible load chart.
3. A maintenance log book.

1.26 WORK STOPPAGE

A. Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations of Work.

PART 2 - PRODUCTS (NOT APPLICABLE)

EXECUTION (NOT APPLICABLE)

Part 1 General

1.1 SUMMARY

.1 Section includes:

.1 Hardware and software requirements for the Systems Integrator Operator Work Station (OWS) in a Building Energy Monitoring and Control System (EMCS).

.2 Requirements for EMCS Systems Integrator

1.2 RELATED SECTIONS

.1 Section 25 05 01 – EMCS: General Requirements.

.2 Section 25 05 02 – EMCS: Submittals and Review Process.

.3 Section 25 05 03 – EMCS: Project Record Documents.

.4 Section 25 30 01 – EMCS: Building Controllers.

.5 Section 25 90 01 – EMCS: Site Requirements, Applications and Systems Sequences of Operation.

1.3 DEFINITIONS

.1 Acronyms and definitions: refer to Section 25 05 01 - EMCS: General Requirements.

.2 Remote Auxiliary OWS: performs identical user interface functions as primary OWS.

1.4 OWS SYSTEM DESCRIPTION

.1 Consists of commercial personal computer (must be in current production) with sufficient memory and processor capacity to perform all functions specified.

1.5 SUBMITTALS

.1 In accordance with Section 25 05 02 - EMCS: Submittals and Review Process.

1.6 ENVIRONMENTAL CONDITIONS

.1 OWS to operate in conditions of 10 C to 32□C and 20 % to 90 % non-condensing RH.

1.7 MAINTENANCE

.1 In accordance with Section 25 08 20 – EMCS: Warranty and Maintenance and Section 25 05 03 - EMCS: Project Records Documents.

Part 2 Products

2.1 OPERATOR'S CONTROL SOFTWARE

.1 Update existing OWS to include all work included under this project.

.2 OWS is not to form part of real-time control functions either directly or indirectly or as part of communication link. Real-time control functions to reside in MCUs, LCUs, and TCUs with peer to peer communication occurring at MCU to MCU device level.

.3 Time Synchronization Module.

.1 System to provide Time Synchronization of real-time clocks in controllers.

.2 System to perform this feature on regular scheduled basis and on operator request.

.4 User Display Interface Module.

.1 OWS software to support "Point Names" as defined in Section 25 05 01 - EMCS: General Requirements and as defined in the EBI Naming Convention to be provided at the kickoff meeting.

.2 Upon operator's request in either text, graphic or table mode, system to present condition of single point, system, area, or connected points on system to OWS. Display analog values digitally to 1 place of decimal with negative sign as required. Update displayed analog values and status when new values received. Flag points in alarm by blinking, reverse video, different colour, bracketed or other means to differentiate from points not in alarm. For systems supporting COSV, refresh rate of screen data not to exceed 5 seconds from time of field change and system is to execute supervisory background scan every 20 seconds to verify point data value. For other systems, refresh rate not to exceed 5 seconds for points displayed. Initial display of new system graphic display (with up to 30 active points), including presentation of associated dynamic data not to exceed 8 seconds.

.5 General Event Log Module: to record system activities occurring at OWS or elsewhere in the system including:

.1 Operator Log-in from any user interface device.

.2 Communication messages - errors, failures and recovery.

.3 Event notifications and Alarms by category.

.4 Record of Operator initiated commands.

.6 The General Event Log:

.1 Able to be archived as necessary to prevent loss of information. Archiving to occur automatically.

.2 Hold minimum of 4 months' information and be readily accessible to operator.

.7 Operator Control Software Module: To support entry of information into system from keyboard and mouse, disk, or from another network device. Display of information to user: dynamic displays, textual displays, and graphic displays to display logging and trending of system information and following tasks:

.1 Automatic logging of digital alarms and change of status messages.

.2 Automatic logging of analog alarms.

.3 System changes: alarm limits, set-points, alarm lockouts.

.4 Display specific point values, states as selected.

.5 Provide reports as requested and on scheduled basis when required.

.6 Display graphics as requested, and on alarm receptions (user's option).

.7 Display list of points within system.

.8 Display list of systems within building.

.9 Direct output of information to selected peripheral device.

.10 On-line changes:

.1 Alarm limits.

.2 Setpoints.

.3 Deadbands.

.4 Control and change of state changes.

.5 Time, day, month, year.

.6 Control loop configuration changes for controller-based CDLs.

.7 Control loop tuning changes.

.8 Schedule changes.

.9 Changes, additions, or deletions, of points, graphics, for installed and future systems.

.11 According to assigned user privileges (password definition) the following functions to be supported:

.1 Permit operator to terminate automatic (logic based) control and set value of field point to operator selected value. These values or settings to remain in effect until returned to automatic (logic based) control by the operator.

.2 Requests for status, analog, graphic displays, logs, controls to be through user interface screens.

.12 Software and tools utilized to generate, modify and configure building controllers to be installed and operational on the OWS.

.8 Message Handling Module - and Error Messages: Message Handling Module to provide message handling for the following conditions:

.1 Message and alarm buffering to be provided to prevent any loss of information.

.2 Error detection correction and retransmission to be included to guarantee data integrity.

.3 Informative messages to operator for data error occurrences, errors in keyboard entry, failure of equipment to respond to requests or commands, and failure of communications between EMCS devices.

.9 Access Control to Field Equipment

.1 Minimum 5 levels of password access protection to limit control, display, or data base manipulation capabilities. The following is preferred format of progression of password levels:

.1 Guest: No password data access and display only.

.2 Operator Level: Full operational commands including automatic override.

.3 Technician: Data base modifications.

.4 Programmer: Data base generation.

.5 Highest Level : System Administration - Password assignment, addition, modification.

.2 User-definable, automatic log-off timers from 1 to 60 min. to prevent operators leaving devices on-line inadvertently. Default setting = 3 minutes.

.10 Trend Data Module: Includes Historical data collection utility, Trend data utility, Control loop plot utility. Each utility to permit operator to add trend point, delete trend point, set scan rate.

.1 Historical data collection utility: collect concurrently operator selected real or calculated point values at operator selectable rate 30-480 minutes. Samples to include for each time interval (time-stamped), minimum present value, maximum present value, and average present value for point selected. Rate to be individually selectable for each point. Data collection to be continuous operation, stored in temporary storage until removed from historical data list by operator. Temporary storage to have at least 6 month capacity.

.2 Trend data utility: continuously collect point object data variables for variables from building controllers as selected by operator, including at minimum; present value of the following point object types - DI, DO, AI, AO, AO set points value, calculated values. Trend data utility to have capacity to trend concurrently points at operator-selectable rate of 05 seconds to 3600 seconds, individually selectable for selected value, or use of COSV detection. Collected trend data to be stored on minimum 96 h basis in temporary storage until removed from trend data list by operator. Option to archive data before overwriting to be available.

.3 Control Loop Plot Utility: For AO Points provide for the concurrent plotting of the measured value input - present value, present value of the output, and AO setpoint. The operator selectable sampling interval to be selectable between 1 second to 20 seconds. Plotting utility to scroll to left as the plot reaches right side of display window. Systems not supporting control loop plot as separate function must provide predefined groups of values. Each group to include values for one control loop display.

.4 Trend data Module to include display of historical or trend data to OWS screen in X Y plot presentation. Plot utility to display minimum of 6 historical points or up to 6 trend points concurrently or 1 control loop plot. For display output of active trend data, display to automatically index to left when window becomes full. Provide plotting capabilities to display collected data based on range of selected value for (Y) component against time/date stamp of collected data for (X) component.

.5 Provide separate reports for each trend utility. Provide operator feature to specify report type, by point name and for output device. Reports to include time, day, month, year, report title, and operator's initials. Implement reports using report module. Ensure trend data is exportable to third party spreadsheet or database applications for PCs.

.11 Report Module: reports for energy management programs, function totalization, analog/pulse totalization and event totalization features available at MCU level. Refer also to Section 25 30 01 - EMCS: Building Controllers.

.1 Reports to include time, day, month, year, report title, operator's initials.

.2 Software to provide capability to:

.1 Generate and format reports for graphical and numerical display from real time and stored data.

.2 Print and store reports as selected by operator.

.3 Select and assign points used in such reports.

.4 Sort output by area, system, as minimum.

.3 Periodic/automatic report:

.1 Generate specified report(s) automatically including options of start time and date, interval between reports (hourly, daily, weekly, monthly), output device. Software to permit modifying periodic/automatic reporting profile at any time.

.2 Reports to include:

.1 Power demand and duty cycle summary: see application program for same.

.2 Disabled "Locked-out" point summary: include point name, whether disabled by system or by operator.

.3 Run time summary: summary of accumulated running time of selected equipment. Include point name, run time to date, alarm limit setting. Run time to accumulate until reset individually by operator.

.4 Summary of run time alarms: include point name, run time to date, alarm limit.

.5 Summary of start/stop schedules: include start/stop times and days, point name.

.6 Motor status summary.

.4 Report types:

.1 Dynamic reports: system to printout or display of point object data value requested by operator. System to indicate status at time of request, when displayed, updated at operator selected time interval. Provide option for operator selection of report type, by point name, and/or output device. Ensure reports are available for following point value combinations:

.1 Points inaccessible from this OWS (total connected for this location), multiple "areas".

.2 Area (points and systems in Area).

.3 Area, system (points in system).

.4 System (points by system type).

.5 System point (points by system and point object type).

.6 Area point (points by system and point object type).

.7 Point (points by point object type).

.5 Summary report: printout or display of point object data value selected by operator. Report header to indicate status at time of request. Ensure reports are available on same basis as dynamic reports. Provide option as to report type, point name, output device.

.6 Include preformatted reports as listed in Event/Alarm Module.

.12 Graphics Display Module: Graphics software utility to permit user to create, modify, delete, file, and recall graphics required by Section 25 90 01 - EMCS: Site Requirements, Applications and Systems Sequences of Operation.

.1 Provide capacity for 100% expansion of system graphics. Graphic interface to provide user with multiple layered diagrams for site, building in plan view, floor furniture plan view and building systems, overlayed with dynamic data appropriately placed and permitting direct operator interaction. Graphic interface to permit operator to start and stop equipment, change set points, modify alarm limits, override system functions and points from graphic system displays by use of mouse or similar pointing device.

.2 Display specific system graphics: provide for manual and/or automatic activation (on occurrence of an alarm). To include capability to call up and cancel display of any graphic picture.

.3 Library of pre-engineered screens and symbols depicting standard air handling components (fans, coils, filters, dampers, VAV), complete mechanical system components (chillers, boilers, pumps), electrical symbols.

.4 Graphic development, creation, modification package to use mouse and drawing utility to permit user to:

.1 Modify portion of graphic picture/schematic background.

.2 Delete graphic picture.

.3 Call up and cancel display of graphic picture.

.4 Define symbols.

.5 Position and size symbols.

.6 Define background screens.

.7 Define connecting lines, curves.

.8 Locate, orient, size descriptive text.

.9 Define, display colours of all elements.

.10 Establish co-relation between symbols or text and associated system points or other graphic displays.

.5 User to be able to build graphic displays showing on-line point data from multiple MCU panels. Graphic displays to represent any logical grouping of system points or calculated data based upon building function, mechanical system, building layout, other logical grouping of points which aids operator in analysis of facility operation. Data to be refreshed on screen as "changed data" without redrawing of entire screen or row on screen.

.6 Dynamic data (temperature, humidity, flow, status) to be shown in actual schematic locations, to be automatically updated to show current values without operator intervention.

.7 Windowing environment to allow user to view several graphics simultaneously to permit analysis of building operation, system performance, display of graphic associated with alarm to be viewed without interrupting work in progress.

.8 Utilize graphics package to generate system schematic diagrams as required in Section 25 90 01- EMCS: Site Requirements, Applications and Systems Sequences of Operation, and as directed by Owner's Representative. In addition provide graphics for schematic depicted on mechanical plan flow diagrams, point lists and system graphics. Provide graphic for floor depicting room sensors and control devices located in their actual location. For floor graphic include secondary diagram to show TCU-VAV box actuator and, flow sensor. Diagram to be single line schematic of ductwork as well as any

associated heating coil or radiation valve. Owner's Representative to provide CAD. Provide display of TCU -VAV's in table form, include the following values as minimum; Space Temp, Setpoint, mode, actual flow, min flow setpoint, max flow setpoint, cooling signal value, and heating signal value. Table to be organized by rooms and floor groupings.

.9 Provide complete directory of system graphics, including other pertinent information. Utilize mouse or pointing device to "point and click" to activate selected graphic.

.10 Provide unique sequence of operation graphic or pop-up window for each graphic that is depicted on OWS. Provide access to sequence of operation graphic by link button on each system graphic. Provide translation of sequence of operation, a concise explanation of systems operation, from control descriptive logic into plain English language.

.13 Event/Alarm Module : displays in window alarms as received and stored in General Event Log.

.1 Classify alarms as "critical", "cautionary", "maintenance". Alarms and alarm classifications to be designated by personnel requiring password level.

.2 Presentation of alarms to include features identified under applicable report definitions of report module paragraph.

.3 Alarm reports:

.1 Summary of points in critical, cautionary or maintenance alarm. Include at least point name, alarm type, current value, limit exceeded.

.2 Analog alarm limit summary: include point name, alarm limits, deviation limits.

.3 Summary of alarm messages: include associated point name, alarm description.

.4 Software to notify operator of each occurrence of alarm conditions. Each point to have its own secondary alarm message.

.5 EMCS to notify operator of occurrence of alarms originating at any field device within the following time periods of detection:

.1 Critical - 5 seconds.

.2 Cautionary - 10 seconds.

.3 Maintenance - 10 seconds.

.6 Display alarm messages in English.

.7 Primary alarm message to include as minimum: point identifier, alarm classification, time of occurrence, type of alarm. Provide for initial message to be automatically presented to operator whenever associated alarm is reported. Assignment of secondary messages to point to be operator-editable function. Provide secondary messages giving further information (telephone lists, maintenance functions) on per point basis.

.8 System reaction to alarms: provide alarm annunciation by dedicated window (activated to foreground on receipt of new alarm or event) of OWS with visual and audible hardware indication. Acknowledgement of alarm to change visual indicator from flashing to steady state and to silence audible device acknowledgement. Steady state to remain until alarm condition is corrected but must not impede reporting of new alarm conditions. Notification of any type of alarm not to impede notification of subsequent alarms or the function of Controller's/CDL. Random occurrence of alarms must not cause loss of any alarm or over-burden system. Acknowledgement of one alarm not to be considered as acknowledgement of any other alarms.

.9 Controller network alarms: system supervision of controllers and communications lines to provide following alarms as minimum:

.1 Controller not responding - where possible delineate between controller and communication line failure.

.2 Controller responding - return to normal.

.3 Controller communications bad - high error rate.

.4 Controller communications normal - return to normal.

.10 Digital/alarm status to be interrogated every 2 seconds as minimum or be direct interrupting non-polling type (COV). Annunciate each non-expected status with alarm message.

.14 .Archiving and Restoration Module.

.1 Primary OWS to include services to store back-up copies of controller databases. Perform complete backup of OWS software and data files at time of system installation and at time of final acceptance. Provide backup copies before and after Controller's revisions or major modifications.

.2 Provide continuous integrity supervision of controller data bases. When controller encounters database integrity problems with its data base, system to notify operator of need to download copy data base to restore proper operation.

.3 Ensure data base back-up and downloading occurs over LAN without specialized operator technical knowledge. Provide operator with ability to manually download entire controller data base, or parts thereof as required.

.15 CDL Generator and Modifier Module.

.1 CDL Generator module to permit generation and modification of CDLs.

.2 Provide standard reference modules for text based systems module that will permit modification to suit site specific applications. Module to include cut, paste, search and compare utilities to permit easy CDL modification and verification.

.3 Provide full library of symbols used by manufacturer for system product installed accessible to operators for systems using graphical environment for creation of CDLs Module to include graphic tools required to generate and create new object code for downloading to building controllers.

.4 Module to permit testing of code before downloading to building controllers.

Part 3 Execution

3.1 SYSTEMS INTEGRATOR

.1 This EMCS Systems Integrator(SI) contractor shall provide system integration services to integrate all the EMCS field data points (and remove and update those resulting from demolition) from the project into the existing Honeywell Enterprise Building Integrator (EBI) system.

.2 The EMCS contractor shall install the EMCS that conforms to the latest BACnet standards.

.3 The EMCS contractor will install all field devices required to conform to the specifications (including EMCS Naming Convention) and provide all points including point descriptions to this SI contractor for inclusion in the existing Honeywell front end.

.4 The System Integrator (SI) shall assign to the EMCS contractor the series of BACnet instance numbers to be used by the EMCS contractor on this project.

.5 The SI shall assign to the EMCS contractor the Point Naming Convention and Point Names to be used by the EMCS contractor when defining the field hardware and software points.

.6 The SI shall provide a list of alarm points to be programmed by EMCS contractor.

.7 The SI shall connect to the EMCS high speed LAN using industry standard tools for BACnet and view all points made available by the EMCS contractor. Should the SI be aware of points or systems that are missing then the SI shall inform the EMCS contractor and the EMCS contractor shall make these points available.

.8 Creation of floor plan and master system graphics for the SI systems shall be completed by SI contractor. A graphic review package shall be submitted to the Consultant for review and approval.

.9 The SI contractor will assign all the points to graphics as per the specifications with graphics to be fully inclusive of all systems and points. Owner/Engineer to review and this contractor to include any additional graphics points as directed during commissioning.

.10 The SI contractor will assign all alarm points to the appropriate workstations and operator security level.

.11 During commissioning this SI contractor to be fully involved including EMCS points integration and confirmation of EMCS sequences. Full control ‘SI” system capability to be confirmed during commissioning.

.12 The System Integrator shall be Honeywell Limited or approved equal. Only approved technicians factory certified on Honeywell EBI R410.2 and having completed EBI Advanced training course 7252 will be permitted to perform the integration work.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

.2 OPR and BoD documentation are included by reference for information only.

1.2 SUMMARY

.1 Types of items described in this Section:
  .1 General requirements that apply to implementation of commissioning without regard to specific systems, assemblies, or components.

.2 Types of items you will not find described in this Section:
  .1 Commissioning process activities for building exterior enclosure, roof, and foundation systems, assemblies, equipment, and components.
  .2 Commissioning process activities for building interiors construction, stairways, and finish systems and assemblies.
  .3 Commissioning process activities for conveying systems, assemblies, equipment, and components.
  .4 Commissioning process activities for fire-suppression systems, assemblies, equipment, and components.
  .5 Commissioning process activities for plumbing systems, assemblies, equipment, and components.
  .6 Commissioning process activities for HVAC systems, assemblies, equipment, and components.
  .7 Commissioning process activities for integrated automation systems, assemblies, equipment, and components.
  .8 Commissioning process activities for electrical systems, assemblies, equipment, and components.
  .9 Commissioning process activities for communications systems, assemblies, equipment, and components.
  .10 Commissioning process activities for electronic safety and security systems, assemblies, equipment, and components.

1.3 DEFINITIONS

.1 BoD: Basis of Design. A document that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

.2 Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

.3 CxA: Commissioning Authority.

.4 OPR: Owner's Project Requirements. A document that details the functional requirements of a project and the expectations of how it will be used and operated. These include Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

.5 Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean *as-built* systems, subsystems, equipment, and components.

1.4 COMMISSIONING TEAM

.1 Members Appointed by Contractor(s): Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated action. The commissioning team shall consist of, but not be limited to, representatives of Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.

.2 Members Appointed by Owner:
- .1 CxA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.
- .2 Representatives of the facility user and operation and maintenance personnel.
- .3 Owner's Representative and engineering design professionals.

1.5 OWNER'S RESPONSIBILITIES

.1 Provide the OPR documentation to the CxA and Contractor for information and use.

.2 Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.

.3 Provide the BoD documentation, prepared by Owner's Representative and approved by Owner, to the CxA and Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.

1.6 CONTRACTOR'S RESPONSIBILITIES

.1 Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:
- .1 Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
- .2 Cooperate with the CxA for resolution of issues recorded in the Issues Log.
- .3 Attend commissioning team meetings held on a variable basis.
- .4 Integrate and coordinate commissioning process activities with construction schedule.
- .5 Review and accept construction checklists provided by the CxA.
- .6 Complete paper construction checklists as Work is completed and provide to the Commissioning Authority on a weekly basis.
- .7 Review and accept commissioning process test procedures provided by the Commissioning Authority.
- .8 Complete commissioning process test procedures.

1.7 CxA'S RESPONSIBILITIES

.1 Organize and lead the commissioning team.

.2 Provide commissioning plan.

.3 Convene commissioning team meetings.

.4 Provide Project-specific construction checklists and commissioning process test procedures.

.5 Verify the execution of commissioning process activities using random sampling. The sampling rate may vary from 1 to 100 percent. Verification will include, but is not limited to, equipment submittals, construction checklists, training, operating and maintenance data, tests, and test reports to verify compliance with the OPR. When a random sample does not meet the requirement, the CxA will report the failure in the Issues Log.

.6 Prepare and maintain the Issues Log.

.7 Prepare and maintain completed construction checklist log.

.8 Witness systems, assemblies, equipment, and component startup.

.9 Compile test data, inspection reports, and certificates; include them in the systems manual and commissioning process report.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 Section Includes a copy of:

.1 Asbestos and Lead Paint Building Materials Survey for: Engineering Building Memorial University of Newfoundland dated June 19, 2013

.2 This report was prepared primarily for the use of the Owner and the Design Team. The recommendations shall not be construed as a requirement of this Contract, unless also contained elsewhere in the Contract Documents.

.3 The report, by its nature, cannot reveal all conditions that exist or occur on the site. Undertake whatever precautionary measures as required by authorities having jurisdiction and whatever measures as you see prudent and appropriate to protect workers, building occupants, and the environment from hazardous materials.

.4 Should conditions be found to vary substantially from the report, changes in the design and construction of the Work may be made, with resulting credits or expenditures to the Contract Price accruing to the Owner.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION (Not used)

END OF SECTION

ASBESTOS AND LEAD PAINT BUILDING MATERIALS SURVEY FOR:
ENGINEERING BUILDING
MEMORIAL UNIVERSITY OF NEWFOUNDLAND



Prepared for:

Memorial University of Newfoundland

St. John's, NL

Pinchin LeBlanc Environmental Ltd
Project No. 02-02-00900

June 19, 201

27 AUSTIN STREET, ST. JOHN'S NL, A1B 4C3 TEL: (709) 754-4490 FAX: (709) 754-1359
SAINT JOHN, NB • DARTMOUTH, NS • LABRADOR CITY, NL • CORNER BROOK, NL

ISO 9001:2008 Registered Quality System (Dartmouth, NS)

EXECUTIVE SUMMARY

Pinchin LeBlanc Environmental Limited. (Pinchin) was retained by Memorial University of Newfoundland to perform asbestos and lead paint surveys in selected buildings on the Memorial University of Newfoundland's St. John's, NL campus. A total of twenty-seven (27) buildings were surveyed for asbestos containing materials (ACM) and lead based paints (LBP). This report will provide the findings for the following location;

BUILDING DESCRIPTION: ENGINEERING BUILDING

BUILDING ADDRESS: MEMORIAL UNIVERSITY OF NL, ST. JOHN'S CAMPUS, NL

A summary of the findings for the Engineering Building (hereafter referred to as "Site Building") is provided. For specific recommendations regarding any hazardous materials listed the reader will refer to Sections 3 and 4 of this report:

1. Friable asbestos containing building materials were identified in the Site Building, specifically parging cement,
2. Non-friable materials with the potential to become friable during renovation and demolition activities were identified inside the Site Building, specifically drywall joint compound.
3. Non-friable asbestos-containing building materials were identified in the Site Building, specifically vinyl floor tiles, transite, incandescent heat shields, and tar mastic;
4. Paints containing greater than 600 mg/kg of lead were identified in the Site Building, specifically the cream paint as observed in EN1250, the green paint as observed in EN1035, and the green paint in EN 4013.

This Executive Summary is subject to the same standard limitations as contained in the report and must be read in conjunction with the entire report.

TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 SURVEY INFORMATION 2

3.0 ACM SURVEY FINDINGS 2

3.1 SPRAYED OR TROWELLED FIREPROOFING AND THERMAL INSULATION 2
3.2 MECHANICAL INSULATION 2
3.3 ACOUSTIC CEILING TILES 3
3.4 DRYWALL, PLASTER, AND TEXTURE FINISHES 3
3.5 VINYL FLOORING MATERIALS 4
3.5.1.1 Asbestos Containing Vinyl Floor Tiles 5
3.5.1.2 Non Asbestos-Containing Vinyl Floor Tiles 6
3.5.2 Vinyl Sheet Flooring 7
3.5.2.1 Non-Asbestos Containing Vinyl Sheet Flooring 7
3.6 ASBESTOS CEMENT PRODUCTS 8
3.7 VERMICULITE INSULATION 8
3.8 OTHER ASBESTOS CONTAINING BUILDING MATERIALS 8

4.0 LBP SURVEY FINDINGS 9

5.0 RECOMMENDATIONS 9

APPENDIX I ASBESTOS ANALYTICAL REPORT

APPENDIX II LEAD PAINT ANALYTICAL REPORT

APPENDIX III SITE DRAWINGS

APPENDIX IV SAMPLE LOG

1.0 INTRODUCTION

Pinchin LeBlanc Environmental Ltd. (Pinchin) was retained by Memorial University of Newfoundland to perform asbestos and lead paint surveys in selected buildings on the Memorial University of Newfoundland's St. John's, NL campus. A total of twenty-seven (27) buildings were surveyed for asbestos containing materials (ACM) and lead based paints (LBP). This report will provide the findings for the following location;

BUILDING DESCRIPTION: ENGINEERING BUILDING

BUILDING ADDRESS: MEMORIAL UNIVERSITY OF NL, ST. JOHN'S CAMPUS, NL

The report presents a detailed investigation of condition, quantity, location, access, and type of ACM and LBP present in the building. The Overview Report, provided under separate cover, provides detailed information regarding the survey methodology, sampling procedure, evaluation criteria, suspect materials and regulatory information.

Provincial regulations and guidelines distinguish between friable[1] and non-friable[2] materials. The asbestos building materials survey performed by Pinchin included a search for both friable and common non-friable ACM.

For reporting purposes, the survey will be divided into sections. The report is presented in this manner to accommodate ease in reading and to allow access to report information for specific areas or materials within the building. The report also addresses specific systems and products likely present in the building. The sections of the report are as follows:

2.0 Survey Information

3.0 ACM Survey Findings

4.0 LBP Survey Findings

5.0 Recommendations

1 The term friable is applied to a material that can be readily reduced to dust or powder by hand or moderate pressure. Friable ACM has a much greater potential to release airborne asbestos fibres when disturbed. The most common friable ACM used in the past are sprayed or trowelled materials (for fireproofing or thermal insulation), texture plaster (decorative or acoustic), and mechanical insulations.

2 Common non-friable ACM include vinyl floor tiles, ceiling tiles, gasket materials, asbestos cement pipe or board (transite), and asbestos textiles. Although a product may be considered non-friable when new, if the product releases fine dust due to deterioration or during removal, the free dust is considered friable. For example, most lay-in or glued on acoustic ceiling tiles release significant dust during removal of large quantities of these tiles.

2.0 SURVEY INFORMATION

The survey was conducted between July 27th and August 1st, 2012. The survey, collection of representative bulk samples, and recording of information was performed by Mr. Trent Hardy and Mr. Philip Lowery of Pinchin. All accessible areas of the building were inspected for the presence of asbestos containing materials (ACM) and lead based paints (LBP).

A total of eighty-three (83) representative bulk samples were collected for analysis for asbestos content and thirteen (13) bulk samples were collected for analysis of lead content.

3.0 ACM SURVEY FINDINGS

The ACM found during this survey are detailed in the location & data excel document provided to the client. The excel document serves as the clients active asbestos management plan. Quantities of materials identified, locations and friable or non-friable are also present in this excel file. Laboratory certificates for asbestos samples collected are presented in Appendix I and lead samples are presented in Appendix II. Sample location drawings are provided in Appendix III. A photographic record of the samples collected during the survey of the building is presented in Appendix IV. The following is summary of the findings for this building.

3.1 Sprayed or Trowelled Fireproofing and Thermal Insulation

Two (2) samples of spray applied fireproofing material were collected from above the ceiling in rooms EN 3034, and EN 1052. Analysis of the samples did not identify the presence of asbestos (reference samples 02-02-900-S080 and 02-02-900-S004).

3.2 Mechanical Insulation

Insulating cement, also referred to as "parging cement", present on pipe elbows for and fittings was sampled in site building. Results from two (2) of the three (3) samples contain 25- 30% Chrysotile asbestos in (reference sample 02-02-900-S082 and 02-02-900-S008). For locations and conditions of this material at the time of the building survey refer to location & data excel document.

The sample of tar mastic and paper sampled above ceiling in room EN 1053 contains 10% chrysotile asbestos (reference sample 02-02-900-S005). For locations and conditions of this material at the time of the building survey refer to location & data excel document.

One (1) sample of the tar paper used on fibreglass insulation was collected from EN 1053. Analysis of the samples did not identify the presence of asbestos (reference sample 02-02-900-S038).

3.3 Acoustic Ceiling Tiles

Seven (7) samples were collected of acoustic ceiling tiles were observed in the site building. Analysis of the samples did not identify the presence of asbestos. A summary of the acoustic ceiling tiles samples collected are as follows:

- The 2"x2" acoustic ceiling tile distinguished with a pinhole and fleck pattern located in EN 2077 (reference sample 02-02-900-S048);
- The 2"x2" acoustic ceiling tile distinguished with a pinhole fleck pattern located in EN-1051A (reference sample 02-02-900-S007);
- The 2"x2" acoustic ceiling tile distinguished with a pinhole pattern located in EN 1056 (reference sample 02-02-900-S012);
- The 2"x2" acoustic ceiling tile distinguished with a plain pattern located in EN 1037 (reference sample 02-02-900-S040);
- The 2"x2" acoustic ceiling tile distinguished with a pinhole pattern located in EN 1052 (reference sample 02-02-900-S003);
- The 2"x2" acoustic ceiling tile distinguished with a pinhole and fleck pattern located in EN 1053 (reference sample 02-02-900-S010);and
- The 2"x2" acoustic ceiling tile distinguished with a pinhole and fissure pattern located in EN 1034B (reference sample 02-02-900-S029);

3.4 Drywall, Plaster, and Texture Finishes

Drywall was used as a wall and ceiling finish throughout the building. Until the early to mid-1980s, drywall joint compound may have contained chrysotile asbestos. Drywall joint compound is considered a non-friable material. Most buildings of this type undergo constant renovation, including the removal and replacement of drywall partitions. Therefore extensive sampling of drywall compound is necessary to come to a reasonable conclusion regarding the extent of asbestos. Furthermore, any attempt to distinguish and delineate all asbestos-containing drywall compounds from new non-asbestos drywall compound is often unachievable. Therefore, drywall joint compound was sampled at walls, which were believed to be original to try to define the presence of asbestos content in the original drywall compound.

Twenty (20) samples, in total, of drywall joint compound were collected in the site building. Results from ten (10) samples collected were determined to contain asbestos (reference samples 02-02-900-S024, 02-02-900-S043 02-02-900-S057 02-02-900-S058 02-02-900-S060 02-02-900-S068 02-02-900-S070 02-02-900-S072 02-02-900-S073 and 02-02-900-S074).

Plaster was used as a wall and ceiling finish in various locations in the Site Building. Until the early to mid-1980s, plaster may have contained chrysotile asbestos. Plaster is considered a potentially friable material. Most buildings of this type undergo constant renovation, including the removal and replacement of plaster. Moreover, the addition of asbestos to plaster compound was done at the site by the individual plasterer on an as needs basis. Therefore extensive sampling of plaster is necessary to come to a reasonable conclusion regarding the extent of asbestos. Furthermore, any attempt to distinguish and delineate all asbestos-containing plaster from new non-asbestos plaster is often unachievable. Therefore, plaster was sampled at walls which were believed to be original to try to define the presence of asbestos content in the original plaster.

Six (6) samples of plaster were collected throughout the site building. Analysis of the samples did not identify the presence of asbestos (reference samples 02-02-900-S079, 02-02-900-S078, 02-02-900-S05, 02-02-900-S075, 02-02-900-S076 and 02-02-900-S077).

Friable textured ceiling stucco was also observed on the ceilings of the stairwells of the site building. Samples of this material were collected from EN 2000 and EN 2001 and analysis of the samples did not identify the presence of asbestos (reference sample 02-02-900-S052 and 02-02-900-S054).

3.5 Vinyl Flooring Materials

3.5.1 *Vinyl Floor Tiles*Thirty (30) types of vinyl floor tiles were observed in the site building. Results from eleven (11) of the thirty (30) samples collected contain asbestos. For locations and conditions of this material at the time of the building survey refer to location & data excel document. A list of the visually different asbestos and non-asbestos vinyl floor tiles is provided below:

3.5.1.1 Asbestos Containing Vinyl Floor Tiles

Asbestos Floor Tile Summary Engineering Building			
Reference Sample	**Description**	**Location**	**Asbestos (%)**
02-02-900-S021	12"x12" vinyl floor tiles brown with abundant grey flecks	EN 1019A	3%
02-02-900-S035	12"x12" vinyl floor tiles brown with white and dark brown streaks	EN 1023F	3%
02-02-900-S033	12"x12" vinyl floor tiles green with brown and white streaks	EN 1026A	3%
02-02-900-S018	12"x12" vinyl floor tiles green with thick green streak	EN 1C01	3%
02-02-900-S050	12"x12" vinyl floor tiles grey with brown streaks	EN 2006	2%
02-02-900-S034	12"x12" vinyl floor tiles grey with dark grey streaks	EN 1023A	3%
02-02-900-S041	12"x12" vinyl floor tiles grey with dark grey streaks	EN 2024	3%
02-02-900-S023	12"x12" vinyl floor tiles light brown with brick red streak	EN 1019A	3%
02-02-900-S011	12"x12" vinyl floor tiles light brown with large white streaks	EN 1056	3%
02-02-900-S055	12"x12" vinyl floor tiles red with abundant white streaks	EN 2C01	3%
02-02-900-S013	12"x12" vinyl floor tiles very light brown with large brown streaks	EN 1061	3%
For additional locations of these materials at the time of the building survey refer to location & data excel document.			

3.5.1.2 Non Asbestos-Containing Vinyl Floor Tiles

Non-Asbestos Floor Tile Summary Engineering Building		
Reference Sample	**Description**	**Location**
02-02-900-S001	12"x12" Vinyl floor tiles greenish blue with large green and white streak	EN 1052
02-02-900-S042	12"x12" vinyl floor tiles grey with abundant white and dark grey flecks	EN 2020
02-02-900-S019	12"x12" vinyl floor tiles green with large white streaks	EN 1C01
02-02-900-S026	12"x12" vinyl floor tiles large brown and cream streaks	EN 1038F
02-02-900-S044	12"x12" vinyl floor tiles light yellow with dark yellow and white specks	EN 2048
02-02-900-S064	12"x12" vinyl floor tiles pale yellow with abundant yellow and white streak	EN 3000A
02-02-900-S036	12"x12" vinyl floor tiles white	EN 1023F
02-02-900-S022	12"x12" vinyl floor tiles white mottled brown	EN 1019A
02-02-900-S020	12"x12" vinyl floor tiles white with abundant grey flecks	EN 1015B
02-02-900-S006	12"x12" vinyl floor tiles white with black streaks	EN 1051A
02-02-900-S059	12"x12" vinyl floor tiles white with brown streak	EN 3057
02-02-900-S028	12"x12" vinyl floor tiles white with large brown flecks	EN 1010
02-02-900-S031	12"x12" vinyl floor tiles white with light blue streaks	EN 1035E
02-02-900-S046	12"x12" vinyl floor tiles, white with abundant grey flecks	EN 205C
02-02-900-S045	12"x12" vinyl floor tiles, white with yellow streak	EN 2050

Non-Asbestos Floor Tile Summary Engineering Building		
Reference Sample	**Description**	**Location**
02-02-900-S009	12"x12" vinyl; floor tiles blue with white streak	EN 1053
02-02-900-S017	12"x12" vinyl floor tiles aqua with white and green fleck	EN 1C01
02-02-900-S081	12"x12" vinyl floor tiles pebble stone pattern	
02-02-900-S083	12"x12" vinyl floor tiles orange with brown	EN2042
For additional locations of these materials at the time of the building survey refer to location & data excel document.		

3.5.2 Vinyl Sheet Flooring

Six (6) types of vinyl sheet flooring were observed in the site building. Analysis of the samples did not identify the presence of asbestos. A summary of the visually different asbestos containing vinyl sheet flooring is provided it the tables below:

3.5.2.1 Non-Asbestos Containing Vinyl Sheet Flooring

Non-Asbestos Containing Vinyl Sheet Flooring Engineering Building		
Sample Number	**Description**	**Location**
02-02-900-S069	Vinyl Sheet Flooring white with grey and brown mottles	EN 4029B
02-02-900-S039	Vinyl sheet flooring blue wave pattern	EN
02-02-900-S071	Vinyl sheet flooring brown stone pattern	EN 4004
02-02-900-S061	Vinyl sheet flooring dark blue	EN 3038
02-02-900-S066	Vinyl sheet flooring pale yellow with brown flecks	EN 2030

Non-Asbestos Containing Vinyl Sheet Flooring Engineering Building		
Sample Number	**Description**	**Location**
02-02-900-S065	Vinyl Sheet Flooring, dark grey flecks	EN 4028
For additional locations of these materials at the time of the building survey refer to location & data excel document.		

3.6 Asbestos Cement Products

One (1) sample of transite sheeting was collected inside the fume hood from EN 1020B and contains 20% chrysotile asbestos (reference sample 02-02-900-S025). For locations and conditions of this material at the time of the building survey refer to location & data excel document.

The black phenolic lab bench also referred as "transite counter" was sampled in room EN 1001 and contains 15% amosite and 5% chrysotile asbestos (reference sample 02-02-900-S016). For locations and conditions of this material at the time of the building survey refer to location & data excel document.

3.7 Vermiculite Insulation

No vermiculite containing products were observed. Visual observations were made above the ceiling and through any hatches.

3.8 Other Asbestos Containing Building Materials

One (1) sample of foil paper in the incandescent light fixture was collected from EN 4027 and contains 40% chrysotile asbestos (reference sample 02-02-900-S053). For locations and conditions of this material at the time of the building survey refer to location & data excel document.

One (1) sample of leveling compound on the ducts was collected from room EN 1049. Analysis of the sample did not identify the presence of asbestos (reference sample 02-02-900-S015).

One (1) sample of mastic compound on the ducts was collected from EN 3000A. Analysis of the samples did not identify the presence of asbestos (reference sample 02-02-900-S063).

4.0 LBP SURVEY FINDINGS

Analytical results indicate that three (3) of the samples collected of painted surfaces would be considered a risk to worker exposure during construction or renovation activities (with lead concentrations exceeding 0.06%). The cream paint as observed in EN 1250 (reference sample 02-02-900-L002) contains 0.26%, the green paint as observed in EN 10350 (reference sample 02-02-900-L013) contains 0.067% and the green paint in EN 4013 (reference sample 02-02-900-L012) contains 0.11% and the same paint colours located elsewhere, should be managed as lead-containing.

Results indicate that were detected, all other paint samples containing less than 0.06% lead.

All paints observed inside the Site Building were observed in GOOD condition.

5.0 RECOMMENDATIONS

Asbestos containing materials and lead based paints have been identified in the Site Building. Listed below are a series of general recommendations for the Site Building. Recommendations provided in the Overview Report may also be reviewed and applied to this building.

Friable ACMs

Friable asbestos containing materials identified inside the Site Building include: parging cement.

1. Type III (high risk) asbestos abatement procedures should be carried out for the scheduled removal of greater than 1ft^2 of friable asbestos containing materials. Alternatively, Type II (moderate risk) glove bag abatement procedures may be applied where practical;
2. Type II (moderate risk) asbestos abatement procedures should be carried out for the scheduled repair or enclosure of friable ACMs or for the removal of less than 1ft^2 of material;

Potentially Friable Materials

Non-friable materials with the potential to become friable during renovation and demolition activities were identified inside the Site Building, specifically drywall joint compound

1. Under the NL guidance documents for moderate and low risk asbestos abatement procedures, quantities of these materials within an enclosure exceeding 100 ft^2 should be removed using Type III (high risk) asbestos abatement procedures. Quantities less than 100 ft^2 but exceeding 10ft^2 should be removed using Type II (moderate risk) asbestos abatement procedures, while

quantities less than 10 ft^2 should be removed using Type I (low risk) asbestos abatement procedures.

Non-Friable Materials

Non-friable asbestos containing materials identified inside the Site Building include: transite, tar mastic, and vinyl floor products.

1. Type I (low risk) asbestos abatement procedures should be carried out for the scheduled disturbance of any non-friable materials provided the materials can be removed intact, and without the use of powered hand tools.

2. Should the use of powered hand tools or excessive breakage of the materials become necessary, Type II (moderate risk) asbestos abatement procedures should be adopted.

Lead Based Paints

Do not grind, sand, torch or cut lead materials without using proper procedures, as material poses a health hazard if disturbed by these methods.

Any painted surfaces visually matching the identified paint colors should be managed as lead containing and necessary precautions (i.e.: worker protection) should be employed prior to the disturbance to these materials. Do not grind, sand, torch or cut lead materials without using proper procedures, as material poses a health hazard if disturbed by these methods.

Should there be any questions pertaining to the contents of this report, please do not hesitate to contact the undersigned at our office.

PINCHIN LEBLANC ENVIRONMENTAL LIMITED

Prepared by;

Paul Staeben
NL Vice President
pstaeben@pinchinleblanc.com

APPENDIX I

ASBESTOS ANALYTICAL REPORT

Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020

NVLAP Lab Code: 200664-0

Customer: Pinchin LeBlanc Environmental
27 Austin St
2nd Flr
St Johns, NL A1B 4C3

Attn: Nicole Power

Project: 02-02-900

Lab Order ID: 1214573
Analysis ID: 1214573PLM
Date Received: 9/4/2012
Date Reported: 9/10/2012

Sample ID / *Lab Sample ID*	Description / *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes / Treatment
02-02-900-S001 - A *1214573PLM_1*	12x12 VFT, greenish blue with large green and white streaks *tile*	None Detected		100% Other	Blue Non Fibrous Heterogeneous Dissolved
02-02-900-S001 - B *1214573PLM_83*	12x12 VFT, greenish blue with large green and white streaks *mastic*	None Detected	3% Cellulose	97% Other	Black Non Fibrous Heterogeneous Dissolved
02-02-900-S002 *1214573PLM_2*	Drywall joint compound	None Detected		100% Other	Tan Non Fibrous Homogeneous Crushed
02-02-900-S003 *1214573PLM_3*	2x4 Acoustic ceiling tile pinhole pattern 2x4 Acoustic ceiling tile	None Detected	50% Cellulose 30% Fiber Glass	10% Perlite 10% Other	Tan, White Fibrous Heterogeneous Crushed
02-02-900-S004 *1214573PLM_4*	Spray insulation above ceiling	None Detected	60% Mineral Wool	40% Other	Gray Fibrous Heterogeneous Crushed
02-02-900-S005 - A *1214573PLM_5*	Tar paper and mastic *tar paper*	None Detected	95% Cellulose	5% Other	Brown Fibrous Heterogeneous Teased
02-02-900-S005 - B *1214573PLM_84*	Tar paper and mastic *mastic*	10% Chrysotile		90% Other	Black Non Fibrous Heterogeneous Dissolved
02-02-900-S006 - A *1214573PLM_6*	12x12 Vinyl floor tiles white with black streaks *tile*	None Detected		100% Other	White Non Fibrous Heterogeneous Dissolved

Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommended that analysis of floor tiles, vermiculite, and/or heterogeneous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by NVLAP or any other agenc

Dorlos Ammerman (116)
Analyst

Nathaniel Durham, MS or Approved Signatory

Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020

NVLAP Lab Code: 200664-0

Customer: Pinchin LeBlanc Environmental
27 Austin St
2nd Flr
St Johns, NL A1B 4C3

Attn: Nicole Power

Project: 02-02-900

Lab Order ID: 1214573
Analysis ID: 1214573PLM
Date Received: 9/4/2012
Date Reported: 9/10/2012

Sample ID *Lab Sample ID*	Description *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes Treatment
02-02-900-S006 - B *1214573PLM_85*	12x12 Vinyl floor tiles white with black streaks *mastic*	None Detected	2% Cellulose	98% Other	Black Non Fibrous Heterogeneous Dissolved
02-02-900-S007 *1214573PLM_7*	2x2 Acoustic ceiling tile pinhole with fleck pattern	None Detected	40% Cellulose 40% Fiber Glass	10% Perlite 10% Other	Tan, White Fibrous Heterogeneous Crushed
02-02-900-S008 *1214573PLM_8*	Pipe elbow parging	30% Chrysotile		70% Other	Gray Fibrous Heterogeneous Teased
02-02-900-S009 - A *1214573PLM_9*	12x12 Vinyl; floor tiles blue with white streaks *tile*	None Detected		100% Other	Blue Non Fibrous Heterogeneous Dissolved
02-02-900-S009 - B *1214573PLM_86*	12x12 Vinyl; floor tiles blue with white streaks *mastic*	None Detected	5% Cellulose	95% Other	Black Non Fibrous Heterogeneous Dissolved
02-02-900-S010 *1214573PLM_10*	2x4 Acoustic ceiling tile pinhole with fleck pattern	None Detected	50% Cellulose 30% Fiber Glass	10% Perlite 10% Other	Tan, White Fibrous Heterogeneous Crushed
02-02-900-S011 - A *1214573PLM_11*	12x12 Vinyl floor tiles light brown with large white streaks *tile*	3% Chrysotile		97% Other	Brown Non Fibrous Heterogeneous Dissolved
02-02-900-S011 - B *1214573PLM_87*	12x12 Vinyl floor tiles light brown with large white streaks *mastic*	None Detected	2% Cellulose	98% Other	Black Non Fibrous Heterogeneous Dissolved

Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommended that analysis of floor tiles, vermiculite, and/or heterogeneous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by NVLAP or any other agenc

Dorlos Ammerman (116)
Analyst

Nathaniel Durham, MS or Approved Signatory

Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020

NVLAP Lab Code: 200664-0

Customer: Pinchin LeBlanc Environmental
27 Austin St
2nd Flr
St Johns, NL A1B 4C3

Attn: Nicole Power

Project: 02-02-900

Lab Order ID: 1214573
Analysis ID: 1214573PLM
Date Received: 9/4/2012
Date Reported: 9/10/2012

Sample ID / *Lab Sample ID*	Description / *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes / Treatment
02-02-900-S012	2x2 Acoustic ceiling tiles pinhole pattern	None Detected	40% Cellulose 40% Fiber Glass	10% Perlite 10% Other	Tan, White Fibrous Heterogeneous
1214573PLM_12					Crushed
02-02-900-S013 - A	12x12 Vinyl floor tiles very light brown with large brown streaks	3% Chrysotile		97% Other	Tan Non Fibrous Heterogeneous
1214573PLM_13	*tile*				Dissolved
02-02-900-S013 - B	12x12 Vinyl floor tiles very light brown with large brown streaks	None Detected	3% Cellulose	97% Other	Black Non Fibrous Heterogeneous
1214573PLM_88	*mastic*				Dissolved
02-02-900-S014	Drywall joint compound	None Detected		100% Other	White Non Fibrous Homogeneous
1214573PLM_14					Crushed
02-02-900-S015	Leveling compound above ceiling ductwork	None Detected	5% Cellulose	95% Other	White Non Fibrous Heterogeneous
1214573PLM_15					Crushed
02-02-900-S016	Counter top	15% Chrysotile 5% Amosite		80% Other	Black Fibrous Heterogeneous
1214573PLM_16					Crushed
02-02-900-S017 - A	12x12 Vinyl floor tiles aqua with white and green fleck	None Detected		100% Other	Blue Non Fibrous Heterogeneous
1214573PLM_17	*tile*				Dissolved
02-02-900-S017 - B	12x12 Vinyl floor tiles aqua with white and green fleck	None Detected	3% Cellulose	97% Other	Black Non Fibrous Heterogeneous
1214573PLM_89	*mastic*				Dissolved

Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommended that analysis of floor tiles, vermiculite, and/or heterogeneous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by NVLAP or any other agenc

Dorlos Ammerman (116)
Analyst

Nathaniel Durham, MS or Approved Signatory

Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020

NVLAP Lab Code: 200664-0

Customer: Pinchin LeBlanc Environmental
27 Austin St
2nd Flr
St Johns, NL A1B 4C3

Attn: Nicole Power

Project: 02-02-900

Lab Order ID: 1214573
Analysis ID: 1214573PLM
Date Received: 9/4/2012
Date Reported: 9/10/2012

Sample ID *Lab Sample ID*	Description *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes Treatment
02-02-900-S018 - A *1214573PLM_18*	12x12 Vinyl floor tiles green with thick green streak *tile*	**3% Chrysotile**		**97% Other**	Red Non Fibrous Heterogeneous Dissolved
02-02-900-S018 - B *1214573PLM_90*	12x12 Vinyl floor tiles green with thick green streak *mastic/leveling compound*	**None Detected**	**4% Cellulose**	**96% Other**	White, Black Non Fibrous Heterogeneous Dissolved
02-02-900-S019 - A *1214573PLM_19*	12x12 Vinyl floor tiles green with large white streaks *tile*	**None Detected**		**100% Other**	Green Non Fibrous Heterogeneous Dissolved
02-02-900-S019 - B *1214573PLM_91*	12x12 Vinyl floor tiles green with large white streaks *mastic*	**None Detected**	**3% Cellulose**	**97% Other**	Black Non Fibrous Heterogeneous Dissolved
02-02-900-S020 - A *1214573PLM_20*	12x12 Vinyl floor tiles white with abundant grey flecks *tile*	**None Detected**		**100% Other**	White Non Fibrous Heterogeneous Dissolved
02-02-900-S020 - B *1214573PLM_92*	12x12 Vinyl floor tiles white with abundant grey flecks *mastic*	**None Detected**	**3% Cellulose**	**97% Other**	Black Non Fibrous Heterogeneous Dissolved
02-02-900-S021 - A *1214573PLM_21*	12x12 Vinyl floor tiles brown with abundant grey flecks *tile*	**3% Chrysotile**		**97% Other**	Brown Non Fibrous Heterogeneous Dissolved
02-02-900-S021 - B *1214573PLM_93*	12x12 Vinyl floor tiles brown with abundant grey flecks *mastic*	**None Detected**	**2% Cellulose**	**98% Other**	Black Non Fibrous Heterogeneous Dissolved

Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommended that analysis of floor tiles, vermiculite, and/or heterogeneous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by NVLAP or any other agenc

Dorlos Ammerman (116)
Analyst

Nathaniel Durham, MS or Approved Signatory

Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020

NVLAP Lab Code: 200664-0

Customer: Pinchin LeBlanc Environmental
27 Austin St
2nd Flr
St Johns, NL A1B 4C3

Attn: Nicole Power

Project: 02-02-900

Lab Order ID: 1214573
Analysis ID: 1214573PLM
Date Received: 9/4/2012
Date Reported: 9/10/2012

Sample ID *Lab Sample ID*	Description *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes Treatment
02-02-900-S022 - A *1214573PLM_22*	12x12 Vinyl floor tiles white mottled brown *tile*	None Detected		100% Other	White Non Fibrous Heterogeneous Dissolved
02-02-900-S022 - B *1214573PLM_94*	12x12 Vinyl floor tiles white mottled brown *mastic*	None Detected	3% Cellulose	97% Other	Black Non Fibrous Heterogeneous Dissolved
02-02-900-S023 - A *1214573PLM_23*	12x12 Vinyl floor tiles light brown with brick red streak *tile*	3% Chrysotile		97% Other	Tan Non Fibrous Heterogeneous Dissolved
02-02-900-S023 - B *1214573PLM_95*	12x12 Vinyl floor tiles light brown with brick red streak *mastic*	None Detected	2% Cellulose	98% Other	Black Non Fibrous Heterogeneous Dissolved
02-02-900-S024 *1214573PLM_24*	Drywall joint compound	3% Chrysotile		97% Other	Tan Non Fibrous Homogeneous Crushed
02-02-900-S025 *1214573PLM_25*	Transite sheeting in fume hood	20% Chrysotile		80% Other	Gray Fibrous Heterogeneous Crushed
02-02-900-S026 - A *1214573PLM_26*	12x12 Vinyl floor tiles large brown and cream streaks *tile*	None Detected	3% Cellulose	97% Other	Cream Non Fibrous Heterogeneous Dissolved
02-02-900-S026 - B *1214573PLM_96*	12x12 Vinyl floor tiles large brown and cream streaks *mastic*	None Detected	3% Cellulose	97% Other	Black Non Fibrous Heterogeneous Dissolved

Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommended that analysis of floor tiles, vermiculite, and/or heterogeneous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by NVLAP or any other agenc

Dorlos Ammerman (116)
Analyst

Nathaniel Durham, MS or Approved Signatory

Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020

NVLAP Lab Code: 200664-0

Customer: Pinchin LeBlanc Environmental
27 Austin St
2nd Flr
St Johns, NL A1B 4C3

Attn: Nicole Power

Project: 02-02-900

Lab Order ID: 1214573
Analysis ID: 1214573PLM
Date Received: 9/4/2012
Date Reported: 9/10/2012

Sample ID / *Lab Sample ID*	Description / *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes / Treatment
02-02-900-S027 / *1214573PLM_27*	Drywall joint compound	None Detected		100% Other	Tan, Non Fibrous, Homogeneous / Crushed
02-02-900-S028 - A / *1214573PLM_28*	12x12 Vinyl floor tiles white with large brown flecks / *tile*	None Detected		100% Other	White, Non Fibrous, Heterogeneous / Dissolved
02-02-900-S028 - B / *1214573PLM_97*	12x12 Vinyl floor tiles white with large brown flecks / *mastic*	None Detected	2% Cellulose	98% Other	Black, Non Fibrous, Heterogeneous / Dissolved
02-02-900-S029 / *1214573PLM_29*	2x4 Acoustic ceiling tiles pinhole and fissure pattern	None Detected	50% Cellulose 30% Fiber Glass	10% Perlite 10% Other	Tan, White, Fibrous, Heterogeneous / Crushed
02-02-900-S030 / *1214573PLM_30*	Pipe elbow parging on furnace exhaust	None Detected	25% Mineral Wool 10% Cellulose	65% Other	Gray, Fibrous, Heterogeneous / Crushed
02-02-900-S031 - A / *1214573PLM_31*	12x12 Vinyl floor tiles white with light blue streaks / *tile*	None Detected		100% Other	White, Non Fibrous, Heterogeneous / Dissolved
02-02-900-S031 - B / *1214573PLM_98*	12x12 Vinyl floor tiles white with light blue streaks / *mastic*	None Detected	3% Cellulose	97% Other	Black, Non Fibrous, Heterogeneous / Dissolved
02-02-900-S032 / *1214573PLM_32*	Drywall joint compound	None Detected		100% Other	White, Non Fibrous, Homogeneous / Crushed

Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommended that analysis of floor tiles, vermiculite, and/or heterogeneous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by NVLAP or any other agenc

Dorlos Ammerman (116)
Analyst

Nathaniel Durham, MS or Approved Signatory

Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020

NVLAP Lab Code: 200664-0

Customer: Pinchin LeBlanc Environmental
27 Austin St
2nd Flr
St Johns, NL A1B 4C3

Attn: Nicole Power

Project: 02-02-900

Lab Order ID: 1214573
Analysis ID: 1214573PLM
Date Received: 9/4/2012
Date Reported: 9/10/2012

Sample ID *Lab Sample ID*	Description *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes Treatment
02-02-900-S033 - A *1214573PLM_33*	12x12 Vinyl floor tiles green with brown and white streaks *tile*	**3% Chrysotile**		**97% Other**	Green Non Fibrous Heterogeneous Dissolved
02-02-900-S033 - B *1214573PLM_99*	12x12 Vinyl floor tiles green with brown and white streaks *mastic*	**None Detected**	**2% Cellulose**	**98% Other**	Black Non Fibrous Heterogeneous Dissolved
02-02-900-S034 - A *1214573PLM_34*	12x12 Vinyl floor tiles grey with dark grey streaks *tile*	**3% Chrysotile**		**97% Other**	Gray Non Fibrous Heterogeneous Dissolved
02-02-900-S034 - B *1214573PLM_100*	12x12 Vinyl floor tiles grey with dark grey streaks *mastic*	**None Detected**	**3% Cellulose**	**97% Other**	Black Non Fibrous Heterogeneous Dissolved
02-02-900-S035 - A *1214573PLM_35*	12x12 Vinyl floor tiles brown with white and dark brown streaks *tile*	**3% Chrysotile**		**97% Other**	Brown Non Fibrous Heterogeneous Dissolved
02-02-900-S035 - B *1214573PLM_101*	12x12 Vinyl floor tiles brown with white and dark brown streaks *mastic*	**None Detected**	**2% Cellulose**	**98% Other**	Black Non Fibrous Heterogeneous Dissolved
02-02-900-S036 - A *1214573PLM_36*	12x12 Vinyl floor tiles white *tile*	**None Detected**		**100% Other**	Tan Non Fibrous Heterogeneous Dissolved
02-02-900-S036 - B *1214573PLM_102*	12x12 Vinyl floor tiles white *mastic*	**None Detected**	**3% Cellulose**	**97% Other**	Black Non Fibrous Heterogeneous Dissolved

Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommended that analysis of floor tiles, vermiculite, and/or heterogeneous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by NVLAP or any other agenc

Dorlos Ammerman (116)
Analyst

Nathaniel Durham, MS or Approved Signatory

Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020

NVLAP Lab Code: 200664-0

Customer: Pinchin LeBlanc Environmental
27 Austin St
2nd Flr
St Johns, NL A1B 4C3

Attn: Nicole Power

Project: 02-02-900

Lab Order ID: 1214573
Analysis ID: 1214573PLM
Date Received: 9/4/2012
Date Reported: 9/10/2012

Sample ID / *Lab Sample ID*	Description / *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes / Treatment
02-02-900-S037 / *1214573PLM_37*	Drywall joint compound	None Detected		100% Other	White, Non Fibrous, Homogeneous / Crushed
02-02-900-S038 / *1214573PLM_38*	Tar paper wrap on straight fiberglass insulation	None Detected	80% Cellulose	20% Other	Brown, Black, Fibrous, Heterogeneous / Dissolved
02-02-900-S039 / *1214573PLM_39*	Vinyl sheet flooring blue wave pattern; *vinyl only*	None Detected	15% Cellulose	85% Other	Blue, Fibrous, Heterogeneous / Dissolved
02-02-900-S040 / *1214573PLM_40*	2x4 Acoustic ceiling tile	None Detected	40% Cellulose 40% Fiber Glass	10% Perlite 10% Other	Tan, White, Fibrous, Heterogeneous / Crushed
02-02-900-S041 - A / *1214573PLM_41*	12x12 Vinyl floor tiles grey with dark grey streaks; *tile*	3% Chrysotile		97% Other	Black, Non Fibrous, Heterogeneous / Dissolved
02-02-900-S041 - B / *1214573PLM_103*	12x12 Vinyl floor tiles grey with dark grey streaks; *mastic*	None Detected	3% Cellulose	97% Other	Black, Non Fibrous, Heterogeneous / Dissolved
02-02-900-S042 - A / *1214573PLM_42*	12x12 Vinyl floor tiles grey with abundant white and dark grey flecks; *tile*	None Detected		100% Other	Tan, Non Fibrous, Heterogeneous / Dissolved
02-02-900-S042 - B / *1214573PLM_104*	12x12 Vinyl floor tiles grey with abundant white and dark grey flecks; *mastic*	None Detected	2% Cellulose	98% Other	Black, Non Fibrous, Heterogeneous / Dissolved

Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommended that analysis of floor tiles, vermiculite, and/or heterogeneous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by NVLAP or any other agenc

Dorlos Ammerman (116)
Analyst

Nathaniel Durham, MS or Approved Signatory

Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020

NVLAP Lab Code: 200664-0

Customer: Pinchin LeBlanc Environmental
27 Austin St
2nd Flr
St Johns, NL A1B 4C3

Attn: Nicole Power

Project: 02-02-900

Lab Order ID: 1214573
Analysis ID: 1214573PLM
Date Received: 9/4/2012
Date Reported: 9/10/2012

Sample ID / *Lab Sample ID*	Description / *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes / Treatment
02-02-900-S043 / *1214573PLM_43*	Drywall joint compound	**3% Chrysotile**		**97% Other**	Tan, White Non Fibrous Homogeneous / Crushed
02-02-900-S044 - A / *1214573PLM_44*	12x12 Vinyl floor tiles light yellow with dark yellow and white specks / *tile*	**None Detected**		**100% Other**	Yellow Non Fibrous Heterogeneous / Dissolved
02-02-900-S044 - B / *1214573PLM_105*	12x12 Vinyl floor tiles light yellow with dark yellow and white specks / *mixed mastics*	**None Detected**	**2% Cellulose**	**98% Other**	Yellow, Black Non Fibrous Heterogeneous / Dissolved
02-02-900-S045 - A / *1214573PLM_45*	12x12 Vinyl floor tiles white and yellow streaks / *tile*	**None Detected**		**100% Other**	Tan Non Fibrous Heterogeneous / Dissolved
02-02-900-S045 - B / *1214573PLM_106*	12x12 Vinyl floor tiles white and yellow streaks / *mastic*	**None Detected**	**4% Cellulose**	**96% Other**	Black Non Fibrous Heterogeneous / Dissolved
02-02-900-S046 - A / *1214573PLM_46*	12x12 Vinyl floor tiles white with abundant grey flecks / *tile*	**None Detected**		**100% Other**	White Non Fibrous Heterogeneous / Dissolved
02-02-900-S046 - B / *1214573PLM_107*	12x12 Vinyl floor tiles white with abundant grey flecks / *mastic*	**None Detected**	**3% Cellulose**	**97% Other**	Black Non Fibrous Heterogeneous / Dissolved
02-02-900-S047 / *1214573PLM_47*	Drywall joint compound	**None Detected**		**100% Other**	Tan Non Fibrous Homogeneous / Crushed

Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommended that analysis of floor tiles, vermiculite, and/or heterogeneous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by NVLAP or any other agenc

Dorlos Ammerman (116)
Analyst

Nathaniel Durham, MS or Approved Signatory

Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020

NVLAP Lab Code: 200664-0

Customer: Pinchin LeBlanc Environmental
27 Austin St
2nd Flr
St Johns, NL A1B 4C3

Attn: Nicole Power

Project: 02-02-900

Lab Order ID: 1214573
Analysis ID: 1214573PLM
Date Received: 9/4/2012
Date Reported: 9/10/2012

Sample ID / *Lab Sample ID*	Description / *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes / Treatment
02-02-900-S048 / *1214573PLM_48*	2x2 Acoustic ceiling tile pinhole and fleck pattern	None Detected	50% Cellulose 30% Fiber Glass	10% Perlite 10% Other	Tan, White Fibrous Heterogeneous / Crushed
02-02-900-S049 / *1214573PLM_49*	Drywall joint compound	None Detected		100% Other	Tan Non Fibrous Homogeneous / Crushed
02-02-900-S050 - A / *1214573PLM_50*	12x12 Vinyl floor tiles grey with brown streaks / *tile*	2% Chrysotile		98% Other	Gray Non Fibrous Heterogeneous / Dissolved
02-02-900-S050 - B / *1214573PLM_108*	12x12 Vinyl floor tiles grey with brown streaks / *mastic*	None Detected	3% Cellulose	97% Other	Black Non Fibrous Heterogeneous / Dissolved
02-02-900-S051 / *1214573PLM_51*	Ceiling plaster	None Detected		100% Other	White Non Fibrous Heterogeneous / Crushed
02-02-900-S052 / *1214573PLM_52*	Textured ceiling coat	None Detected		100% Other	White Non Fibrous Heterogeneous / Crushed
02-02-900-S053 / *1214573PLM_53*	Foil backed heatsheild for incandescent fixture	40% Chrysotile	40% Cellulose	20% Other	Silver, Tan Fibrous Heterogeneous / Teased
02-02-900-S054 / *1214573PLM_54*	Textured ceiling coat	None Detected		100% Other	White Non Fibrous Heterogeneous / Crushed

Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommended that analysis of floor tiles, vermiculite, and/or heterogeneous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by NVLAP or any other agenc

Dorlos Ammerman (116)
Analyst

Nathaniel Durham, MS or Approved Signatory

Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020

NVLAP Lab Code: 200664-0

Customer: Pinchin LeBlanc Environmental
27 Austin St
2nd Flr
St Johns, NL A1B 4C3

Attn: Nicole Power

Project: 02-02-900

Lab Order ID: 1214573
Analysis ID: 1214573PLM
Date Received: 9/4/2012
Date Reported: 9/10/2012

Sample ID / *Lab Sample ID*	Description / *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes / Treatment
02-02-900-S055 - A / *1214573PLM_55*	12x12 Vinyl floor tiles red with abundant white streaks / *tile*	**3% Chrysotile**		**97% Other**	Red, Non Fibrous, Heterogeneous / Dissolved
02-02-900-S055 - B / *1214573PLM_109*	12x12 Vinyl floor tiles red with abundant white streaks / *mastic*	**None Detected**	**2% Cellulose**	**98% Other**	Black, Non Fibrous, Heterogeneous / Dissolved
02-02-900-S056 / *1214573PLM_56*	Drywall joint compound	**None Detected**		**100% Other**	White, Non Fibrous, Homogeneous / Crushed
02-02-900-S057 / *1214573PLM_57*	Drywall joint compound	**3% Chrysotile**		**97% Other**	Tan, Non Fibrous, Homogeneous / Crushed
02-02-900-S058 / *1214573PLM_58*	Drywall joint compound	**3% Chrysotile**		**97% Other**	Tan, Non Fibrous, Homogeneous / Crushed
02-02-900-S059 - A / *1214573PLM_59*	12x12 Vinyl floor tiles white with brown streaks / *tile*	**None Detected**		**100% Other**	White, Non Fibrous, Heterogeneous / Dissolved
02-02-900-S059 - B / *1214573PLM_110*	12x12 Vinyl floor tiles white with brown streaks / *mastic*	**None Detected**	**3% Cellulose**	**97% Other**	Black, Non Fibrous, Heterogeneous / Dissolved
02-02-900-S060 / *1214573PLM_60*	Drywall joint compound	**3% Chrysotile**		**97% Other**	Tan, Non Fibrous, Homogeneous / Crushed

Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommended that analysis of floor tiles, vermiculite, and/or heterogeneous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by NVLAP or any other agenc

Dorlos Ammerman (116)
Analyst

Nathaniel Durham, MS or Approved Signatory

Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020

NVLAP Lab Code: 200664-0

Customer: Pinchin LeBlanc Environmental
27 Austin St
2nd Flr
St Johns, NL A1B 4C3

Attn: Nicole Power

Project: 02-02-900

Lab Order ID: 1214573
Analysis ID: 1214573PLM
Date Received: 9/4/2012
Date Reported: 9/10/2012

Sample ID *Lab Sample ID*	Description *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes Treatment
02-02-900-S061 *1214573PLM_61*	Vinyl sheet flooring dark blue *vinyl only*	None Detected		100% Other	Blue Non Fibrous Homogeneous Ashed
02-02-900-S062 *1214573PLM_62*	Drywall joint compound	None Detected		100% Other	Tan Non Fibrous Homogeneous Crushed
02-02-900-S063 *1214573PLM_63*	Mastic on furnace ductwork	None Detected	2% Synthetic Fibers	98% Other	Gray Non Fibrous Heterogeneous Dissolved
02-02-900-S064 - A *1214573PLM_64*	12x12 Vinyl floor tiles pale yellow with abundant yellow and white flecks *tile*	None Detected		100% Other	Yellow Non Fibrous Heterogeneous Dissolved
02-02-900-S064 - B *1214573PLM_111*	12x12 Vinyl floor tiles pale yellow with abundant yellow and white flecks *mastic*	None Detected	3% Cellulose	97% Other	Black Non Fibrous Heterogeneous Dissolved
02-02-900-S065 - A *1214573PLM_65*	Vinyl sheet flooring, dark grey flecks *vinyl*	None Detected	15% Cellulose	85% Other	Brown Fibrous Heterogeneous Dissolved
02-02-900-S065 - B *1214573PLM_112*	Vinyl sheet flooring, dark grey flecks *mastic*	None Detected		100% Other	Yellow Non Fibrous Heterogeneous Dissolved
02-02-900-S066 - A *1214573PLM_66*	Vinyl sheet flooring pale yellow with brown flecks *vinyl*	None Detected	15% Cellulose	85% Other	Yellow Fibrous Heterogeneous Dissolved

Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommended that analysis of floor tiles, vermiculite, and/or heterogeneous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by NVLAP or any other agenc

Dorlos Ammerman (116)
Analyst

Nathaniel Durham, MS or Approved Signatory

Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020

NVLAP Lab Code: 200664-0

Customer: Pinchin LeBlanc Environmental
27 Austin St
2nd Flr
St Johns, NL A1B 4C3

Attn: Nicole Power

Project: 02-02-900

Lab Order ID: 1214573
Analysis ID: 1214573PLM
Date Received: 9/4/2012
Date Reported: 9/10/2012

Sample ID *Lab Sample ID*	Description *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes Treatment
02-02-900-S066 - B *1214573PLM_113*	Vinyl sheet flooring pale yellow with brown flecks *mastic*	None Detected		100% Other	Yellow Non Fibrous Heterogeneous Dissolved
02-02-900-S067 *1214573PLM_67*	Drywall joint compound	None Detected		100% Other	White Non Fibrous Homogeneous Crushed
02-02-900-S068 *1214573PLM_68*	Drywall joint compound	3% Chrysotile		97% Other	Tan Non Fibrous Homogeneous Crushed
02-02-900-S069 *1214573PLM_69*	Vinyl sheet flooring white with grey and brown mottles	None Detected		100% Other	White Non Fibrous Heterogeneous Dissolved
02-02-900-S070 *1214573PLM_70*	Drywall joint compound	2% Chrysotile		98% Other	White Non Fibrous Homogeneous Crushed
02-02-900-S071 - A *1214573PLM_71*	Vinyl sheet flooring brown stone pattern *vinyl*	None Detected	15% Cellulose	85% Other	Brown Fibrous Heterogeneous Dissolved
02-02-900-S071 - B *1214573PLM_114*	Vinyl sheet flooring brown stone pattern *mastic*	None Detected		100% Other	Yellow Non Fibrous Heterogeneous Dissolved
02-02-900-S072 *1214573PLM_72*	Drywall joint compound	3% Chrysotile		97% Other	Tan, White Non Fibrous Homogeneous Crushed

Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommended that analysis of floor tiles, vermiculite, and/or heterogeneous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by NVLAP or any other agenc

Dorlos Ammerman (116)
Analyst

Nathaniel Durham, MS or Approved Signatory

Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020

NVLAP Lab Code: 200664-0

Customer: Pinchin LeBlanc Environmental
27 Austin St
2nd Flr
St Johns, NL A1B 4C3

Attn: Nicole Power

Project: 02-02-900

Lab Order ID: 1214573
Analysis ID: 1214573PLM
Date Received: 9/4/2012
Date Reported: 9/10/2012

Sample ID *Lab Sample ID*	Description *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes Treatment
02-02-900-S073 *1214573PLM_73*	Drywall joint compound	**3% Chrysotile**		**97% Other**	Tan Non Fibrous Homogeneous Crushed
02-02-900-S074 *1214573PLM_74*	Drywall joint compound	**3% Chrysotile**		**97% Other**	Tan Non Fibrous Homogeneous Crushed
02-02-900-S075 *1214573PLM_75*	Ceiling plaster	**None Detected**		**100% Other**	White Non Fibrous Heterogeneous Crushed
02-02-900-S076 - A *1214573PLM_76*	Ceiling plaster *finish*	**None Detected**		**100% Other**	White Non Fibrous Heterogeneous Crushed
02-02-900-S076 - B *1214573PLM_115*	Ceiling plaster *base*	**None Detected**		**100% Other**	Gray Non Fibrous Heterogeneous Crushed
02-02-900-S077 *1214573PLM_77*	Window sil plaster	**None Detected**		**100% Other**	White Non Fibrous Homogeneous Crushed
02-02-900-S078 *1214573PLM_78*	2nd floor ceiling plaster	**None Detected**		**100% Other**	White Non Fibrous Homogeneous Crushed
02-02-900-S079 *1214573PLM_79*	1st floor ceiling plaster	**None Detected**		**100% Other**	White Non Fibrous Homogeneous Crushed

Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommended that analysis of floor tiles, vermiculite, and/or heterogeneous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by NVLAP or any other agenc

Dorlos Ammerman (116)
Analyst

Nathaniel Durham, MS or Approved Signatory

Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020

NVLAP Lab Code: 200664-0

Customer: Pinchin LeBlanc Environmental
27 Austin St
2nd Flr
St Johns, NL A1B 4C3

Attn: Nicole Power

Project: 02-02-900

Lab Order ID: 1214573
Analysis ID: 1214573PLM
Date Received: 9/4/2012
Date Reported: 9/10/2012

Sample ID / *Lab Sample ID*	Description / *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes / Treatment
02-02-900-S080	Fire proofing	None Detected	65% Mineral Wool	35% Other	Gray Fibrous Heterogeneous
1214573PLM_80					Crushed
02-02-900-S081 - A	Pebble stone 12x12 vinyl floor tiles	None Detected		100% Other	Brown Non Fibrous Heterogeneous
1214573PLM_81	*tile*				Dissolved
02-02-900-S081 - B	Pebble stone 12x12 vinyl floor tiles	None Detected	2% Cellulose	98% Other	Black Non Fibrous Heterogeneous
1214573PLM_116	*mastic*				Dissolved
02-02-900-S082	Parging cement on water tanks and elbow pipes	25% Chrysotile		75% Other	White Fibrous Heterogeneous
1214573PLM_82					Teased

Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommended that analysis of floor tiles, vermiculite, and/or heterogeneous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by NVLAP or any other agenc

Dorlos Ammerman (116)
Analyst

Nathaniel Durham, MS or Approved Signatory

Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020

NVLAP Lab Code: 200664-0

Customer: Pinchin LeBlanc Environmental
27 Austin St
2nd Flr
St Johns NL A1B 4C3

Attn: Dawn Benteau
Paul Staeben

Project: 02-02-00900; Engineering Building

Lab Order ID: 1308169
Analysis ID: 1308169_PLM
Date Received: 5/2/2013
Date Reported: 5/7/2013

Sample ID / *Lab Sample ID*	Description / *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes / Treatment
02-02-900-S083 - A	12x12 Vinyl Floor Tiles - Orange With Brown Flecks	None Detected		100% Other	Orange Non Fibrous Heterogeneous
1308169PLM_1	*tile*				Dissolved
02-02-900-S083 - B	12x12 Vinyl Floor Tiles - Orange With Brown Flecks	None Detected	3% Cellulose	97% Other	Yellow Non Fibrous Heterogeneous
1308169PLM_2	*mastic*				Dissolved

Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommended that analysis of floor tiles, vermiculite, and/or heterogeneous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. government. Estimated MDL is 0.1%.

Ired Gulley (2)

Analyst

Approved Signatory

APPENDIX II

LEAD PAINT ANALYTICAL REPORT

Analysis for Lead Concentration in Paint Chips

by Flame Atomic Absorption Spectroscopy
EPA SW-846 3rd Ed. Method No. 3050B/Method No. 7420

AIHA LAP, LLC
ACCREDITED LABORATORY
ENVIRONMENTAL LEAD
ISO/IEC 17025:2005
www.aihaaccreditedlabs.org
LAB #173190

Customer: Pinchin LeBlanc Environmental
27 Austin St
2nd Flr
St Johns NL A1B 4C3

Attn: Dawn Benteau

Project: 02-02-900

Lab Order ID: 1214516
Analysis ID: 1214516_PBP
Date Received: 9/4/2012
Date Reported: 9/11/2012

Sample ID *Lab Sample ID*	Description *Lab Notes*	Mass *(g)*	Analytical Sensitivity *(% by weight)*	Concentration *(% by weight)*
02-02-900-L001 1214516PBP_1	White wall paint (engineering bld.)	0.0421	0.003%	**0.025%**
02-02-900-L002 1214516PBP_2	*cream wall paint*	0.0519	0.003%	**0.26%**
02-02-900-L003 1214516PBP_3	*green wall paint*	0.0274	0.005%	**0.067%**
02-02-900-L004 1214516PBP_4	*very light grey paint*	0.0624	0.002%	**< 0.006%**
02-02-900-L005 1214516PBP_5	*dark blue wall paint*	0.0636	0.002%	**0.041%**
02-02-900-L006 1214516PBP_6	*blue wall paint*	0.0367	0.004%	**0.022%**
02-02-900-L007 1214516PBP_7	*navy blue wall paint*	0.0464	0.003%	**< 0.009%**
02-02-900-L008 1214516PBP_8	*aqua green wall paint*	0.0415	0.003%	**< 0.01%**
02-02-900-L009 1214516PBP_9	*red wall paint*	0.0628	0.002%	**< 0.006%**
02-02-900-L010 1214516PBP_10	*light grey wall paint*	0.0687	0.002%	**< 0.006%**

The quality control samples run with the samples in this report have passed all AIHA required specifications unless otherwise noted. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by AIHA or any other agency of the U.S. government.

Melissa Sharps (13)
Analyst

Laboratory Director

Analysis for Lead Concentration in Paint Chips

by Flame Atomic Absorption Spectroscopy
EPA SW-846 3rd Ed. Method No. 3050B/Method No. 7420

AIHA LAP, LLC ACCREDITED LABORATORY ENVIRONMENTAL LEAD ISO/IEC 17025:2005 www.aihaaccreditedlabs.org LAB #173190

Customer: Pinchin LeBlanc Environmental
27 Austin St
2nd Flr
St Johns NL A1B 4C3

Attn: Dawn Benteau

Project: 02-02-900

Lab Order ID: 1214516
Analysis ID: 1214516_PBP
Date Received: 9/4/2012
Date Reported: 9/11/2012

Sample ID *Lab Sample ID*	Description *Lab Notes*	Mass *(g)*	Analytical Sensitivity *(% by weight)*	Concentration *(% by weight)*
02-02-900-L011 1214516PBP_11	*pink wall paint*	0.0572	0.002%	**< 0.007%**
02-02-900-L012 1214516PBP_12	*light green wall paint*	0.0532	0.003%	**0.11%**
02-02-900-L013 1214516PBP_13	(Yellow wall paint) engineering bld.	0.0494	0.003%	**< 0.008%**

The quality control samples run with the samples in this report have passed all AIHA required specifications unless otherwise noted. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by AIHA or any other agency of the U.S. government.

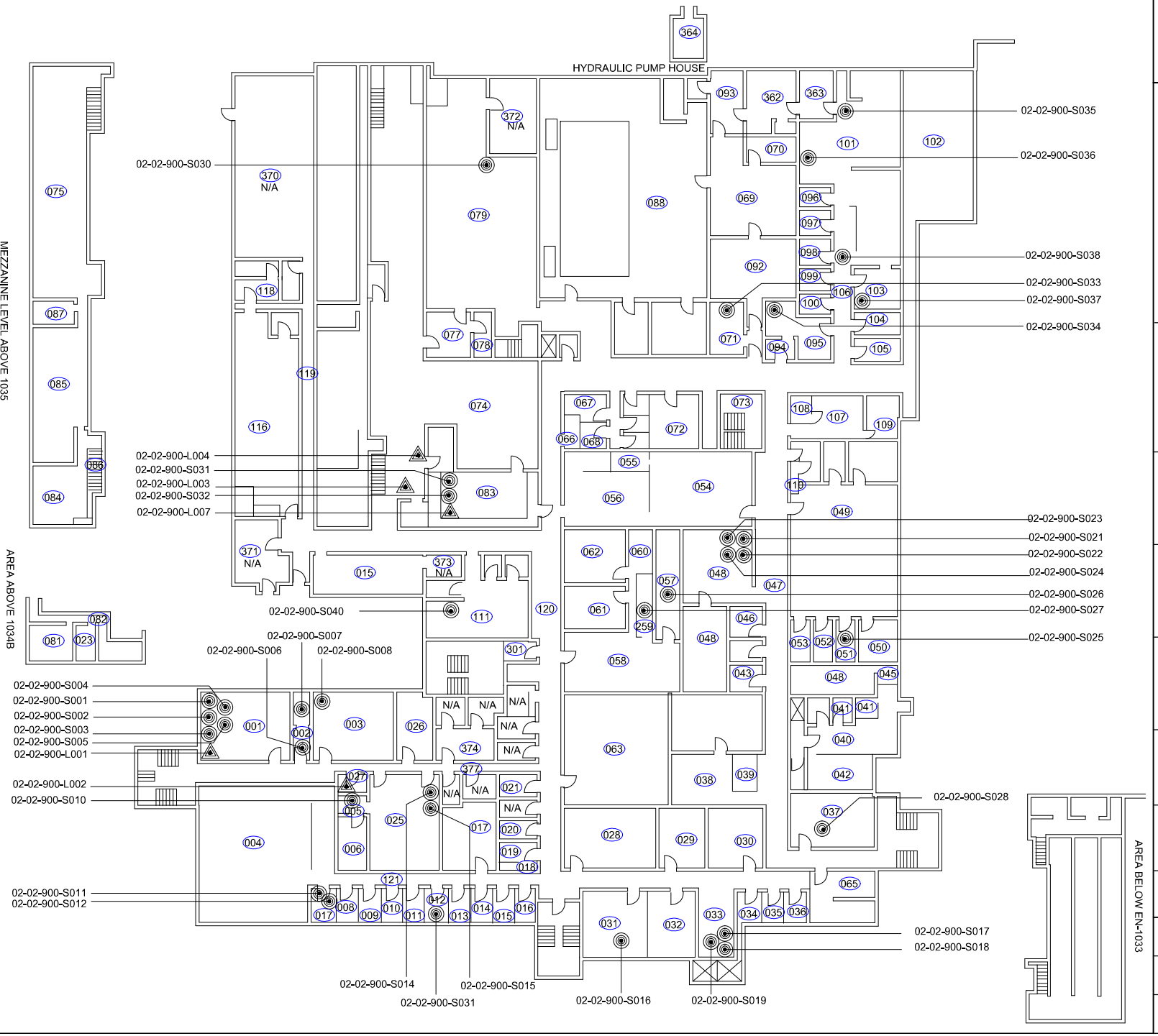
Melissa Sharps (13)

Analyst

Laboratory Director

APPENDIX III

SITE DRAWINGS



PINCHIN LEBLANC ENVIRONMENTAL

LEGEND:

- XXX — PINCHIN LOCATION NUMBER
- ◎ — ASBESTOS SAMPLE ID NUMBER
- △ — LEAD SAMPLE ID NUMBER
- **N/A** — NOT ACCESSIBLE

CLIENT:

MEMORIAL UNIVERSITY OF NEWFOUNDLAND

PROJECT:

ASBESTOS AND LEAD PAINT BUILDING MATERIALS SURVEY

SITE ADDRESS:

ENGINEERING BUILDING,
ST. JOHN'S CAMPUS,
NEWFOUNDLAND AND LABRADOR

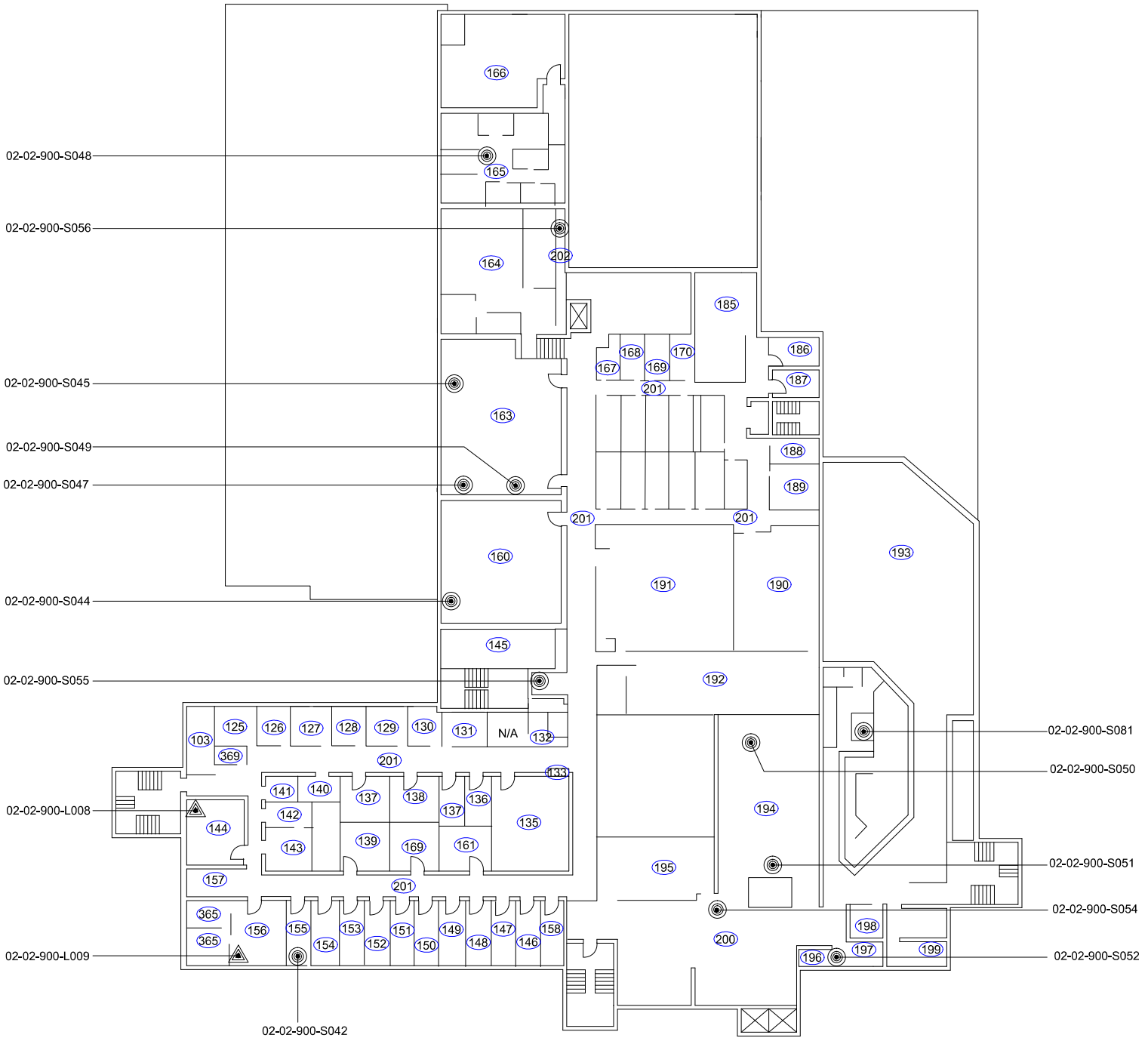
DRAWING NAME:

SAMPLE LOCATIONS
LEVEL 1

REFERENCE:

PLEL SITE SURVEY

DATE:	PROJECT #:
OCTOBER 2012	02 - 02 - 00900
SCALE: N.T.S.	FIGURE #: 1
DRAWN BY: A. ANISCIKLI	
CHECKED BY: T. HARDY	



PINCHIN LEBLANC ENVIRONMENTAL

LEGEND:

XXX PINCHIN LOCATION NUMBER

ASBESTOS SAMPLE ID NUMBER

LEAD SAMPLE ID NUMBER

N/A NOT ACCESSIBLE

N

CLIENT:

MEMORIAL UNIVERSITY OF NEWFOUNDLAND

PROJECT:

ASBESTOS AND LEAD PAINT BUILDING MATERIALS SURVEY

SITE ADDRESS:

ENGINEERING BUILDING,
ST. JOHN'S CAMPUS,
NEWFOUNDLAND AND LABRADOR

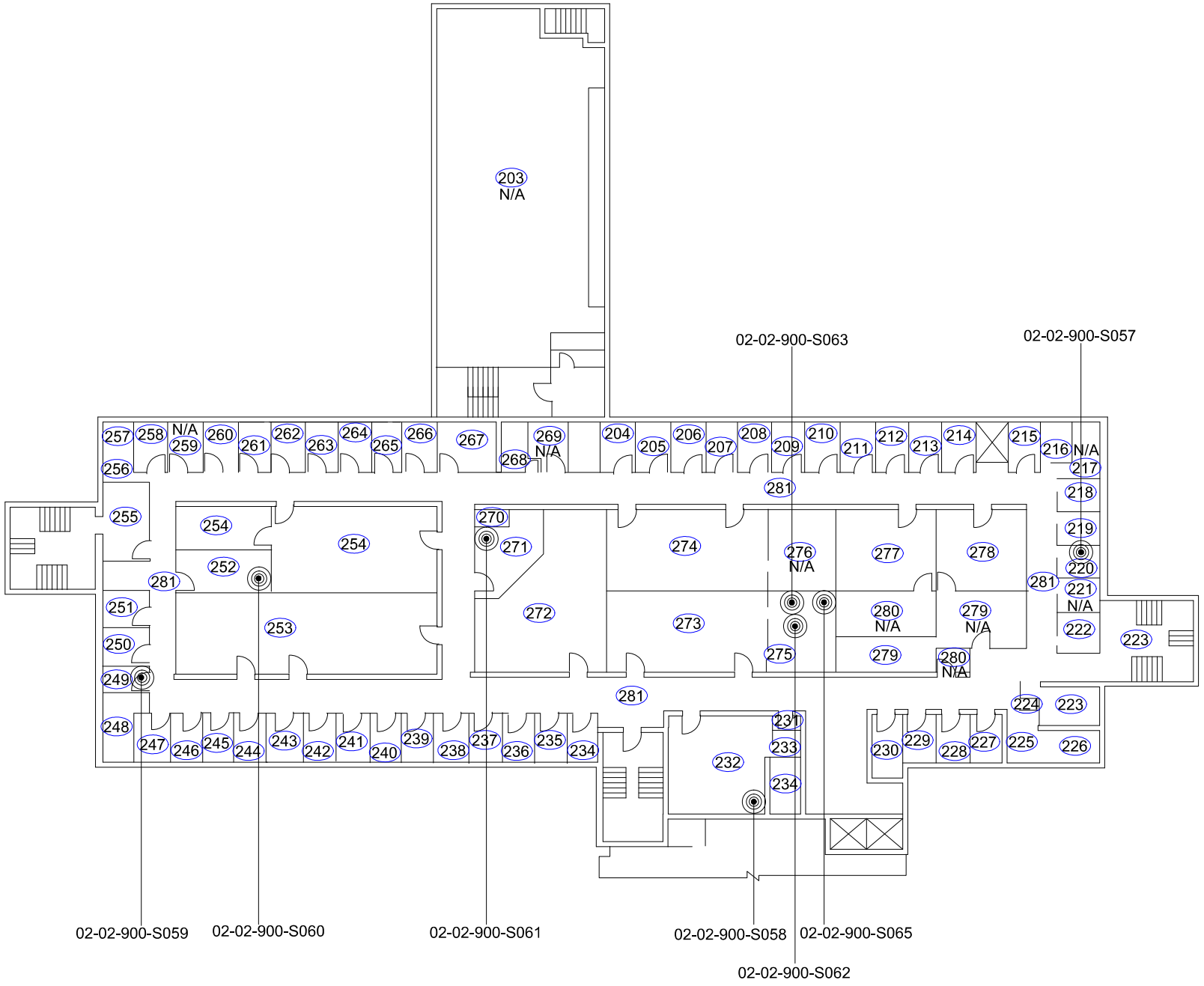
DRAWING NAME:

SAMPLE LOCATIONS
LEVEL 2

REFERENCE:

PLEL SITE SURVEY

DATE:	PROJECT #:
OCTOBER 2012	02 - 02 - 00900
SCALE: N.T.S.	FIGURE #: 2
DRAWN BY: A. ANISCIKLI	
CHECKED BY: T. HARDY	



PINCHIN LEBLANC ENVIRONMENTAL

LEGEND:

- XXX — PINCHIN LOCATION NUMBER
- ◎ — ASBESTOS SAMPLE ID NUMBER
- △ — LEAD SAMPLE ID NUMBER
- **N/A** — NOT ACCESSIBLE

N

CLIENT:

MEMORIAL UNIVERSITY OF NEWFOUNDLAND

PROJECT:

ASBESTOS AND LEAD PAINT BUILDING MATERIALS SURVEY

SITE ADDRESS:

ENGINEERING BUILDING,
ST. JOHN'S CAMPUS,
NEWFOUNDLAND AND LABRADOR

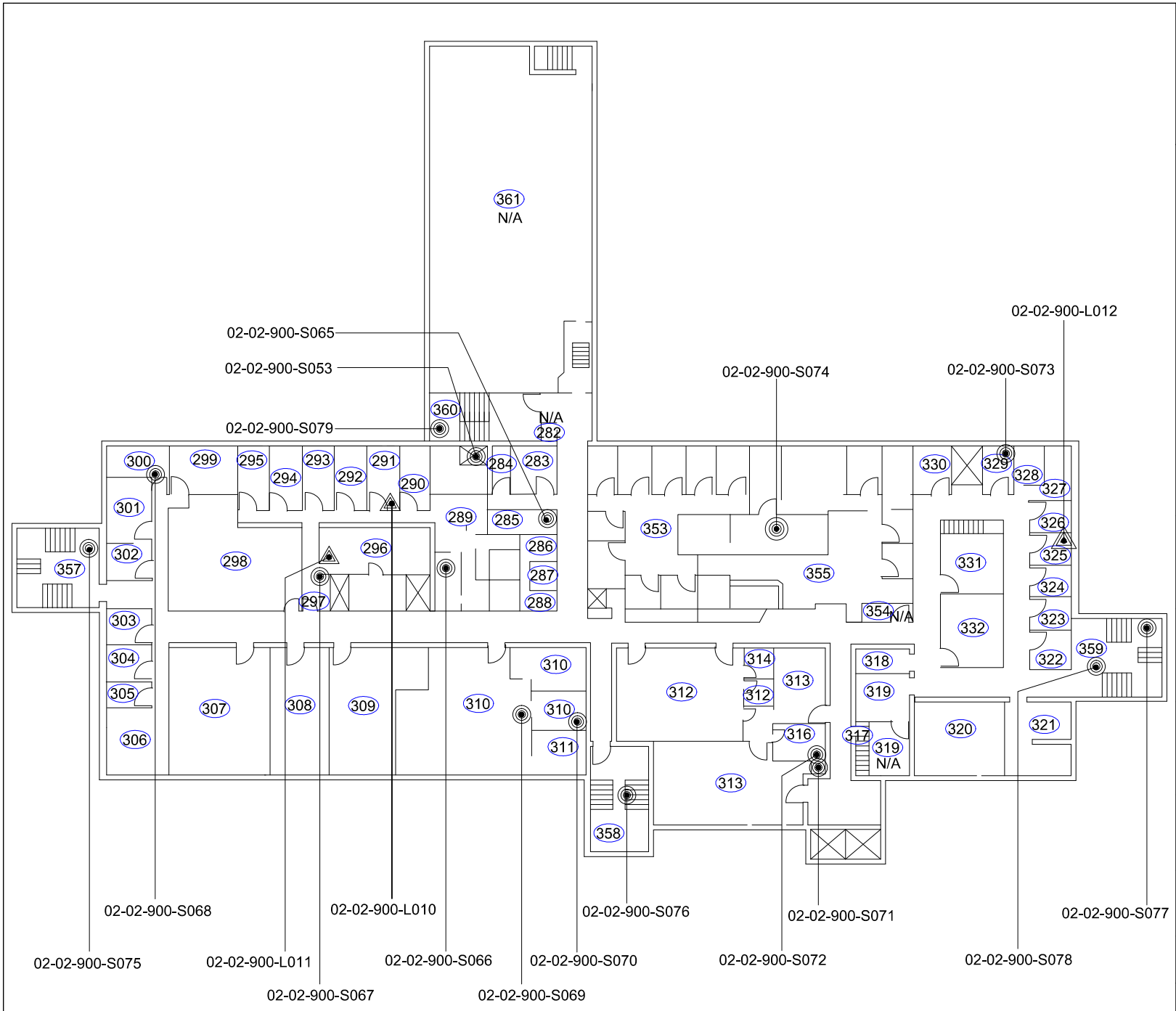
DRAWING NAME:

SAMPLE LOCATIONS
LEVEL 3

REFERENCE:

PLEL SITE SURVEY

DATE:	PROJECT #:
OCTOBER 2012	02 - 02 - 00900
SCALE: N.T.S.	FIGURE #: 3
DRAWN BY: A. ANISCIKLI	
CHECKED BY: T. HARDY	



PINCHIN LEBLANC ENVIRONMENTAL

LEGEND:

- XXX — PINCHIN LOCATION NUMBER
- ASBESTOS SAMPLE ID NUMBER
- LEAD SAMPLE ID NUMBER
- N/A — NOT ACCESSIBLE

CLIENT:

MEMORIAL UNIVERSITY OF NEWFOUNDLAND

PROJECT:

ASBESTOS AND LEAD PAINT BUILDING MATERIALS SURVEY

SITE ADDRESS:

ENGINEERING BUILDING,
ST. JOHN'S CAMPUS,
NEWFOUNDLAND AND LABRADOR

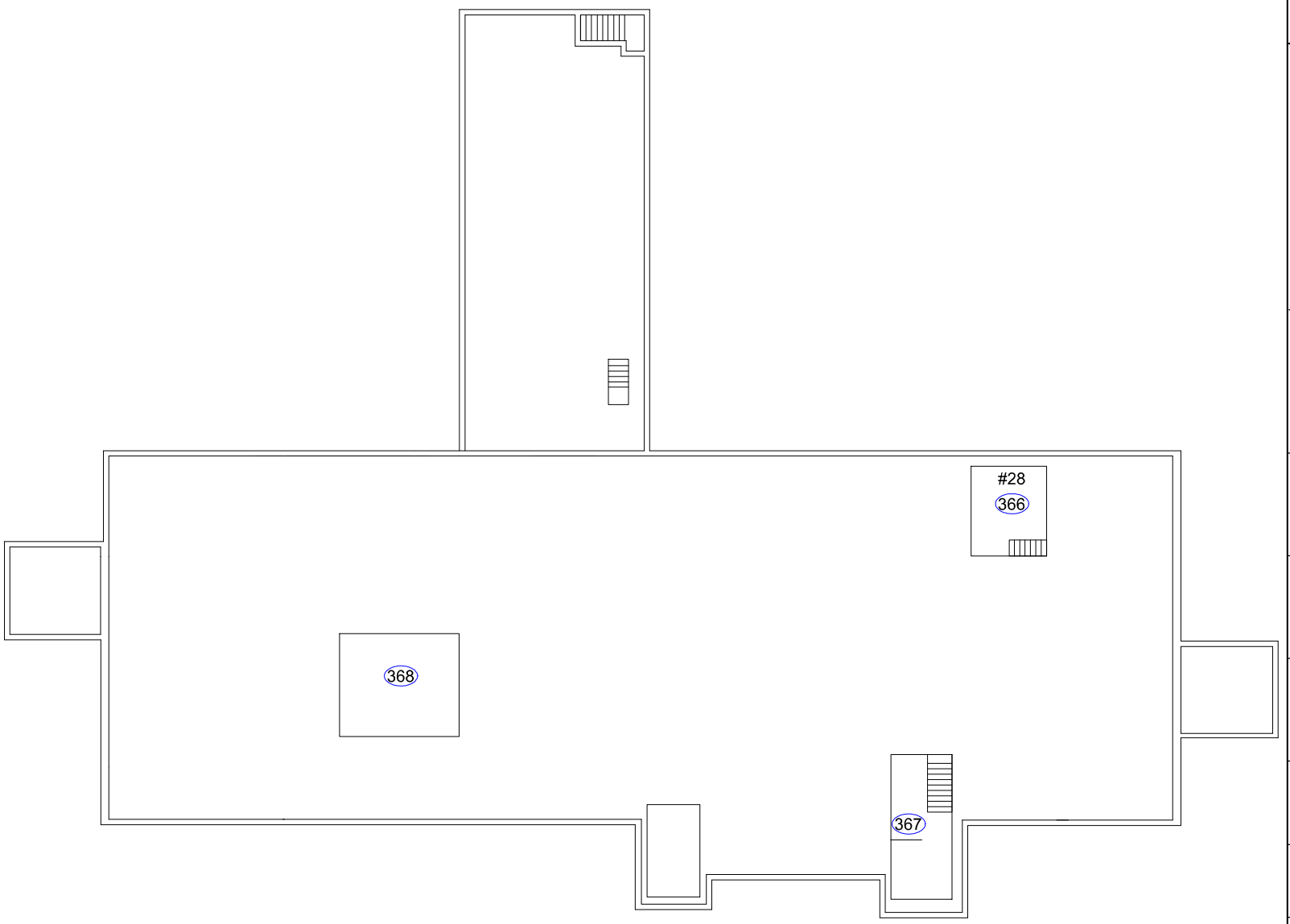
DRAWING NAME:

SAMPLE LOCATIONS
LEVEL 4

REFERENCE:

PLEL SITE SURVEY

DATE:	PROJECT #:
OCTOBER 2012	02 - 02 - 00900
SCALE: N.T.S.	FIGURE #: 4
DRAWN BY: A. ANISCIKLI	
CHECKED BY: T. HARDY	



PINCHIN LEBLANC ENVIRONMENTAL

LEGEND:

XXX PINCHIN LOCATION NUMBER

ASBESTOS SAMPLE ID NUMBER

LEAD SAMPLE ID NUMBER

N/A NOT ACCESSIBLE

N

CLIENT:

MEMORIAL UNIVERSITY OF NEWFOUNDLAND

PROJECT:

ASBESTOS AND LEAD PAINT BUILDING MATERIALS SURVEY

SITE ADDRESS:

ENGINEERING BUILDING,
ST. JOHN'S CAMPUS,
NEWFOUNDLAND AND LABRADOR

DRAWING NAME:

SAMPLE LOCATIONS
LEVEL 5

REFERENCE:

PLEL SITE SURVEY

DATE:	PROJECT #:
OCTOBER 2012	02 - 02 - 00900
SCALE: N.T.S.	FIGURE #: 5
DRAWN BY: A. ANISCIKLI	
CHECKED BY: T. HARDY	

APPENDIX IV

SAMPLE LOG

ASBESTOS BULK SAMPLING FORM

Sample #:	S001	**Date Sampled:**	July 25, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN1052	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	X12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: Greenish blue with large white and green specks	

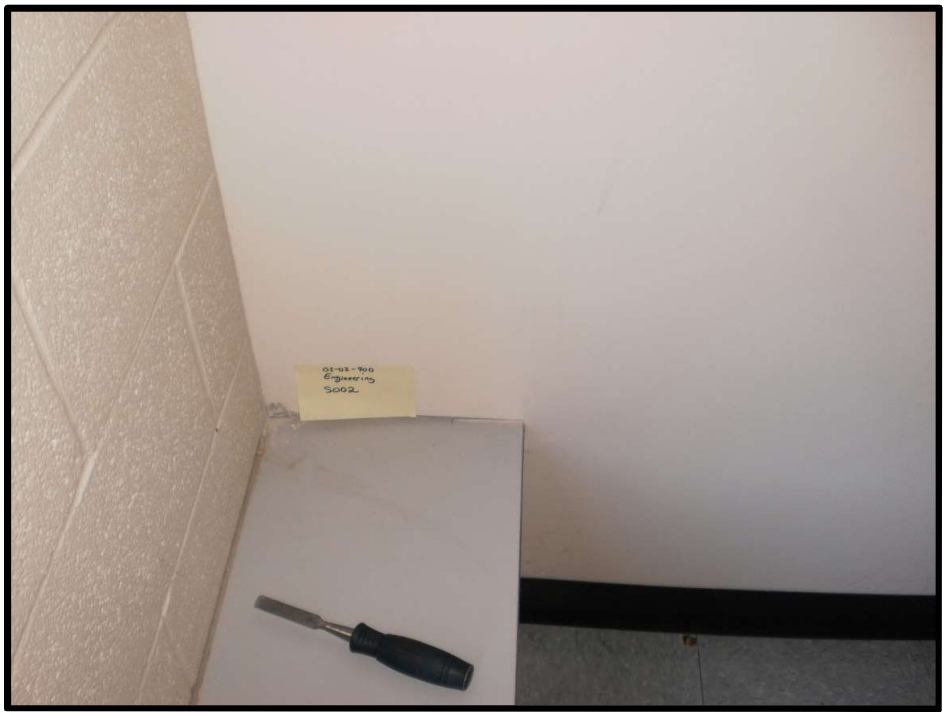


ASBESTOS BULK SAMPLING FORM

Sample #:	S002	**Date Sampled:**	July 25, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN1052	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	X Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	X DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	

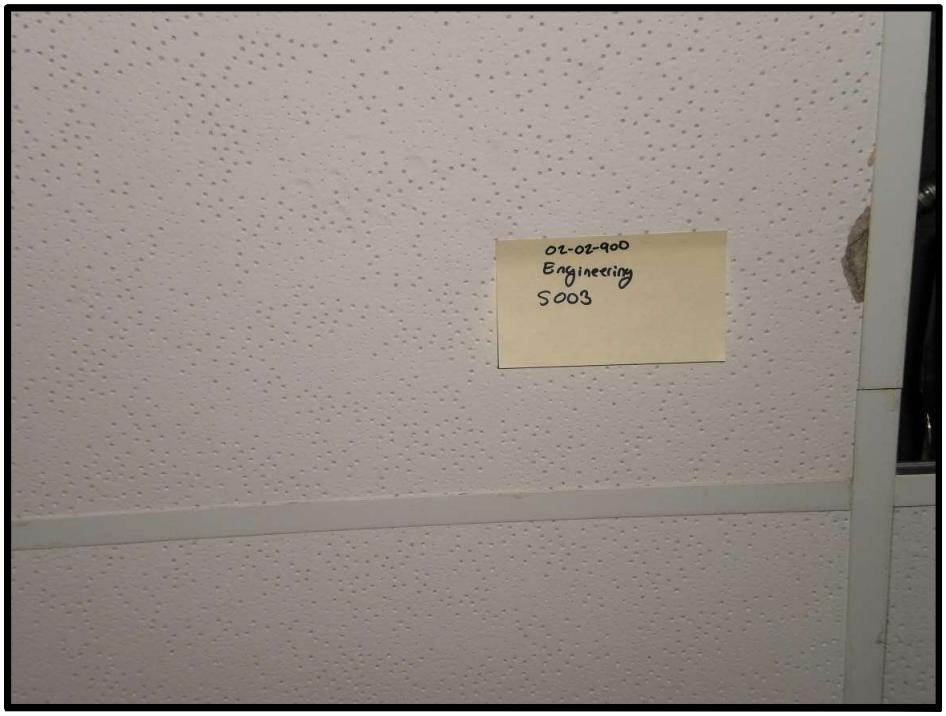


ASBESTOS BULK SAMPLING FORM

Sample #:	S003	**Date Sampled:**	July 25, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN1052	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	X Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	X Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: 2' x 4' pinhole	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	

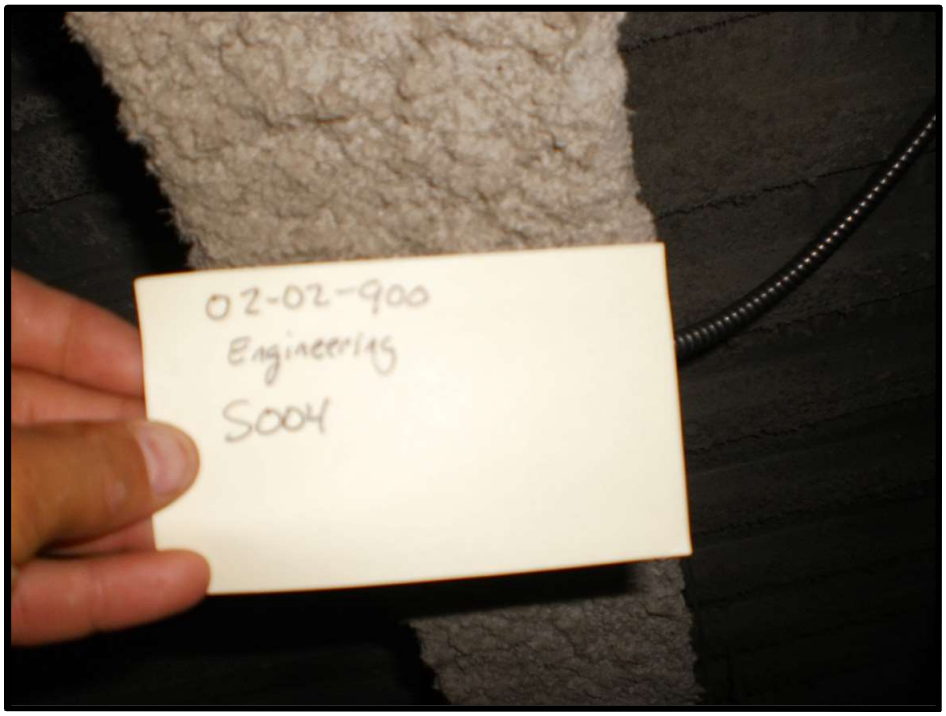


ASBESTOS BULK SAMPLING FORM

Sample #:	S004	**Date Sampled:**	July 25, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN1052	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	X Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		X Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		X Deck F. P. ing	Colour: _____	

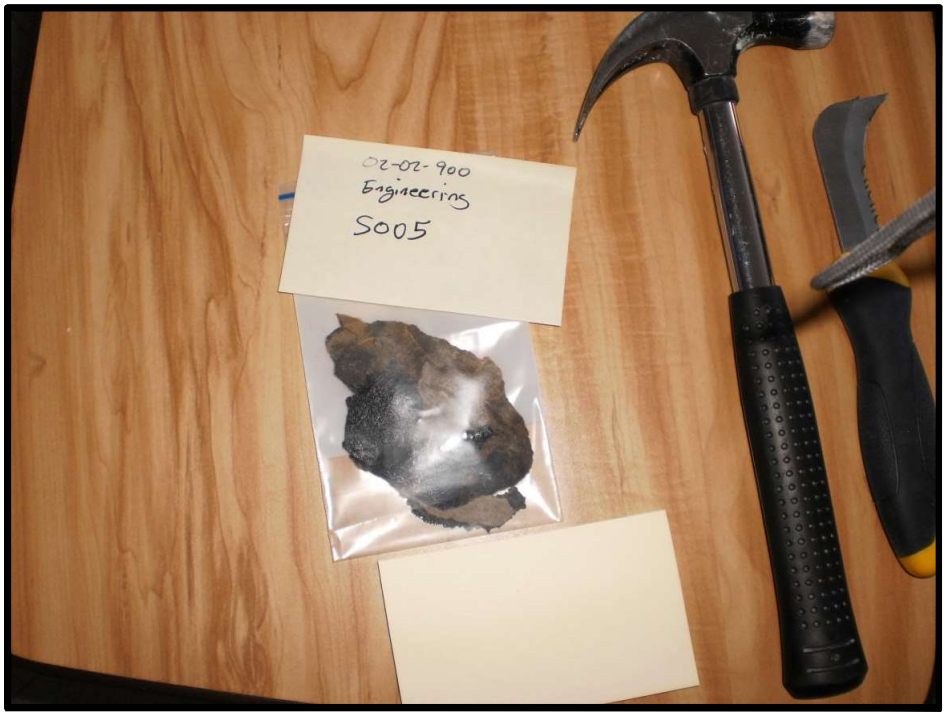


ASBESTOS BULK SAMPLING FORM

Sample #:	S005	**Date Sampled:**	July 25, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN1052	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	X Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	X Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	



ASBESTOS BULK SAMPLING FORM

Sample #:	S006	**Date Sampled:**	July 25, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN1051A	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	X12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: White with blue streaks	

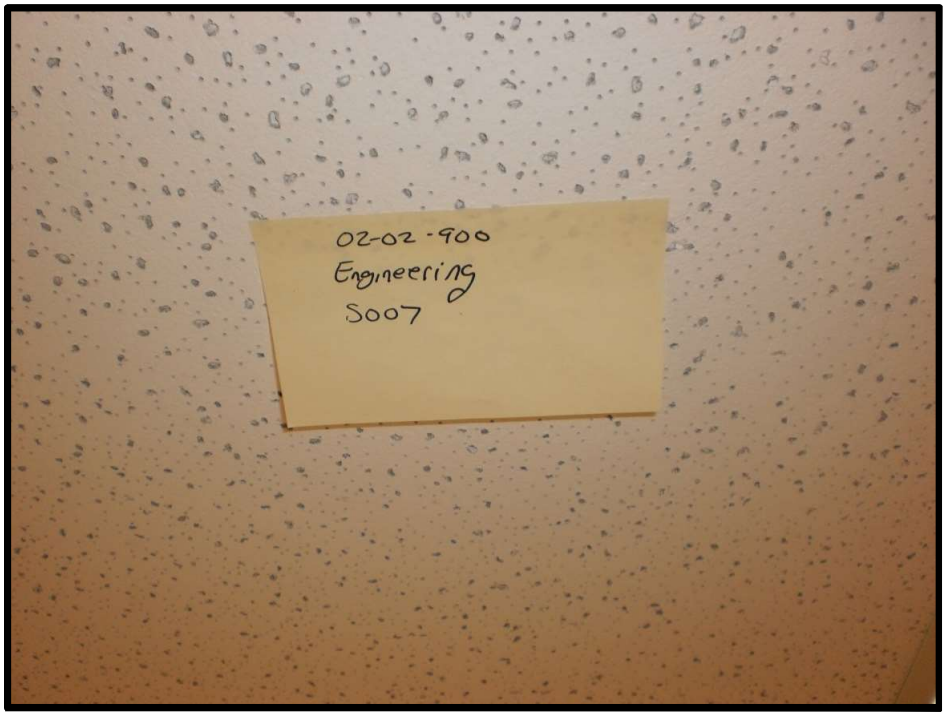


ASBESTOS BULK SAMPLING FORM

Sample #:	S007	**Date Sampled:**	July 25, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN1051A	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	X Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	X Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: 2' x 2' pinhole fleck	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	

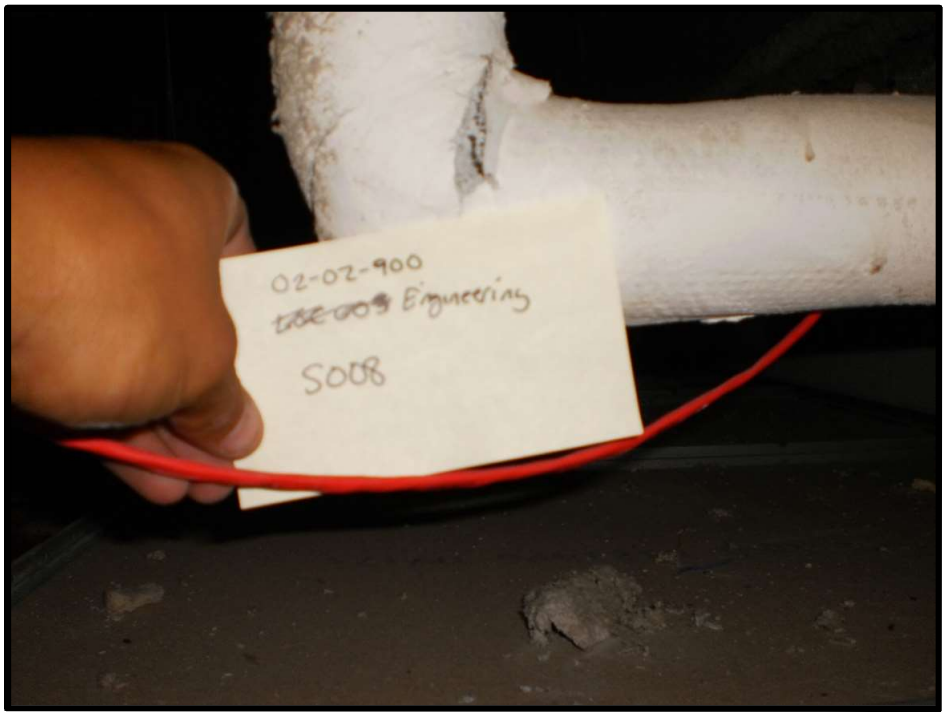


ASBESTOS BULK SAMPLING FORM

Sample #:	S008	**Date Sampled:**	July 25, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN1051	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
X Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	X Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	



ASBESTOS BULK SAMPLING FORM

Sample #:	S009	**Date Sampled:**	July 25, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN1053	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	X12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: Blue with white streaks	



ASBESTOS BULK SAMPLING FORM

Sample #:	S010	**Date Sampled:**	July 25, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN1053	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	X Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	X Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous:2' x 4' pinhole fleck	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	



ASBESTOS BULK SAMPLING FORM

Sample #:	S011	**Date Sampled:**	July 25, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN1056	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	X12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: Light brown with large white streaks	

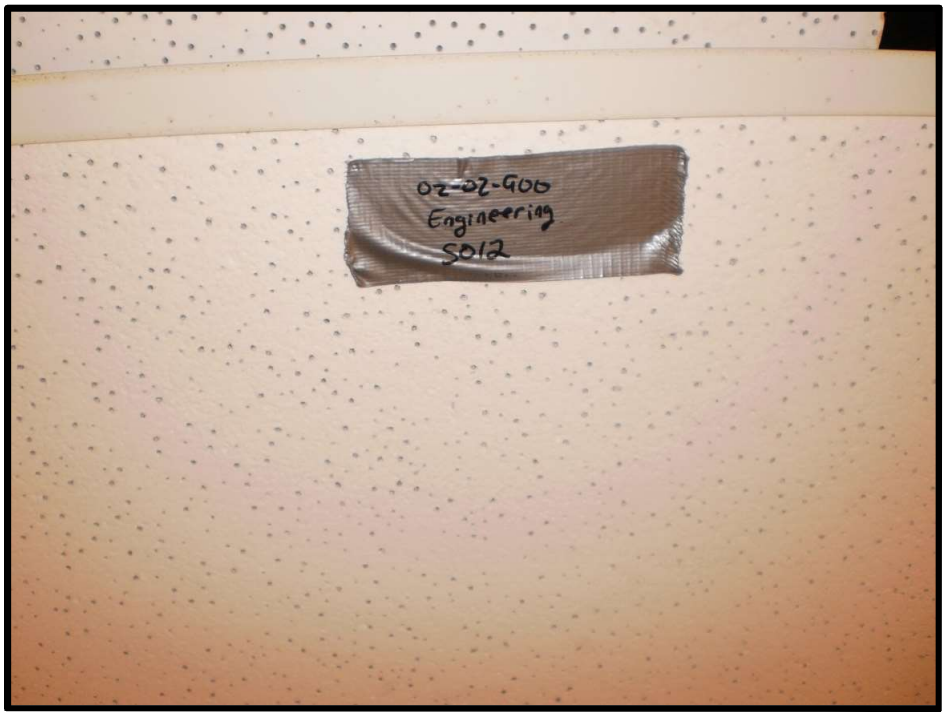


ASBESTOS BULK SAMPLING FORM

Sample #:	S012	**Date Sampled:**	July 25, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN1056	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	X Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	X Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: 2' x 2' pinhole	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	



ASBESTOS BULK SAMPLING FORM

Sample #:	S013	**Date Sampled:**	July 25, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN 1061	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	X12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: Very light brown with large brown streaks	



ASBESTOS BULK SAMPLING FORM

Sample #:	S014	**Date Sampled:**	July 25, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN1049	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	X Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	X DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	



ASBESTOS BULK SAMPLING FORM

Sample #:	S015	**Date Sampled:**	July 25, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN1049	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	X Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: Levelling compound on ductwork	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	



ASBESTOS BULK SAMPLING FORM

Sample #:	S016	**Date Sampled:**	July 26, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN1001	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		X Other (counter)
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: Black	



ASBESTOS BULK SAMPLING FORM

Sample #:	S017	**Date Sampled:**	July 26, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN1001	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	X12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: Aqua colour with white and green flecks	



ASBESTOS BULK SAMPLING FORM

Sample #:	S018	**Date Sampled:**	July 26, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN1C01	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	X12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: Green with thick green streaks	



ASBESTOS BULK SAMPLING FORM

Sample #:	S019	**Date Sampled:**	July 26, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN1C01	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	X 12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: Green with thick white streaks	



ASBESTOS BULK SAMPLING FORM

Sample #:	S020	**Date Sampled:**	July 26, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room 1015B	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	X12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: White with abundant grey flecks	



ASBESTOS BULK SAMPLING FORM

Sample #:	S021	**Date Sampled:**	July 26, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room 1017A	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	X12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: Brown with abundant grey specks	



ASBESTOS BULK SAMPLING FORM

Sample #:	S022	**Date Sampled:**	July 26, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room 1019A	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	X12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: White mottled brown	

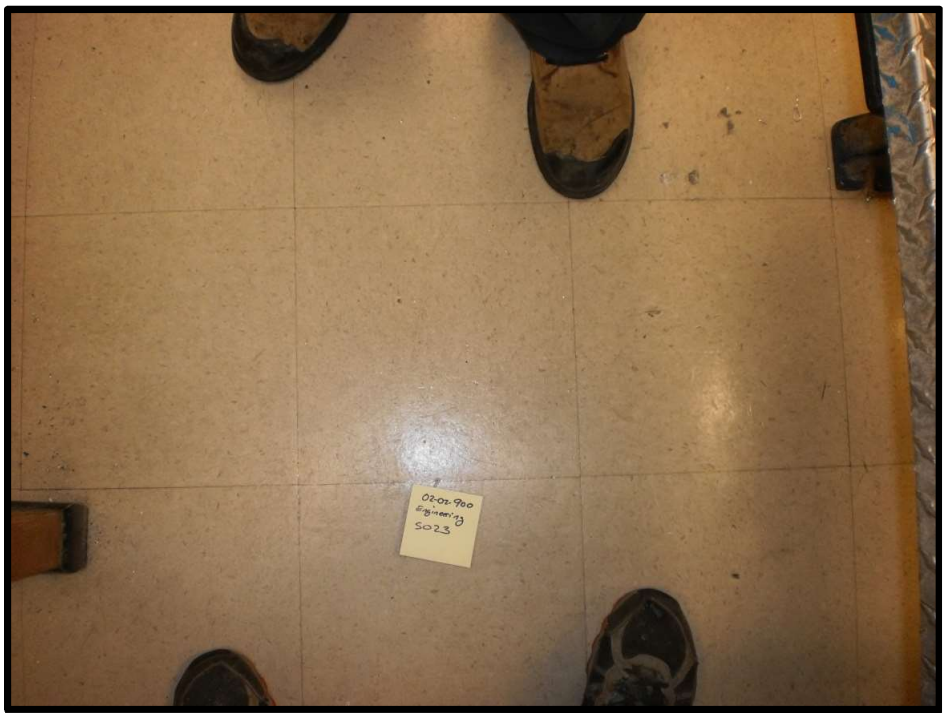


ASBESTOS BULK SAMPLING FORM

Sample #:	S023	**Date Sampled:**	July 26, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN1019A	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	X12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: Light brown with red streaks	

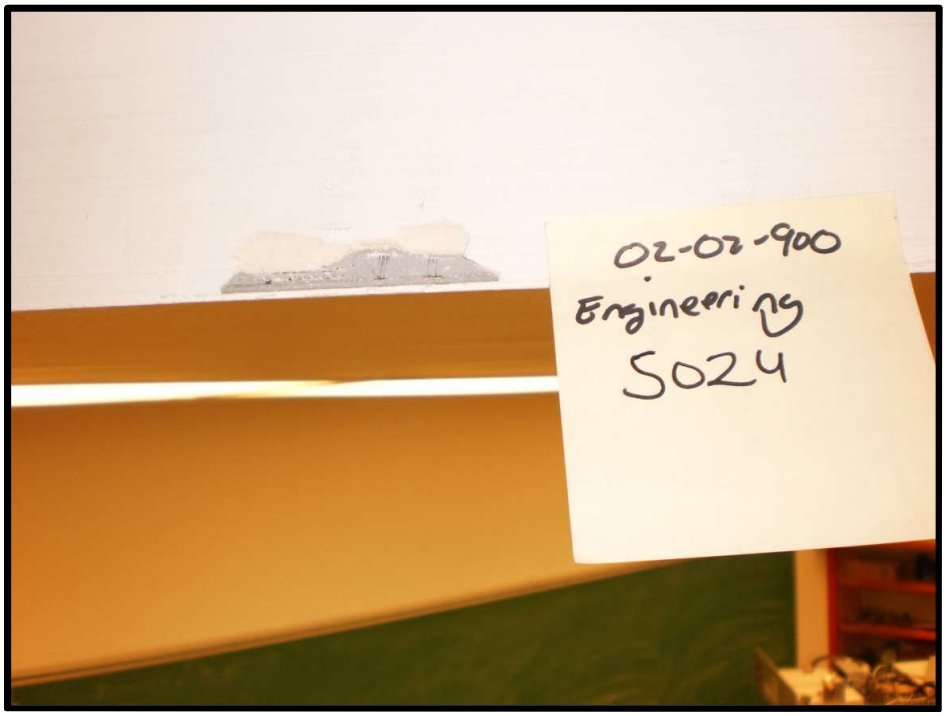


ASBESTOS BULK SAMPLING FORM

Sample #:	S024	**Date Sampled:**	July 26, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN1019A	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	X Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	X DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	



ASBESTOS BULK SAMPLING FORM

Sample #:	S025	**Date Sampled:**	July 26, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN1020B	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		X Other (fume hood)
☐ Tank Insulation	X Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	



ASBESTOS BULK SAMPLING FORM

Sample #:	S026	**Date Sampled:**	July 26, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN1038F	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	X 12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: Cream and brown streaks	



ASBESTOS BULK SAMPLING FORM

Sample #:	S027	**Date Sampled:**	July 26, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN1038	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	X Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	X DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	



ASBESTOS BULK SAMPLING FORM

Sample #:	S028	**Date Sampled:**	July 26, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN1010	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	X12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: White with large brown specks	

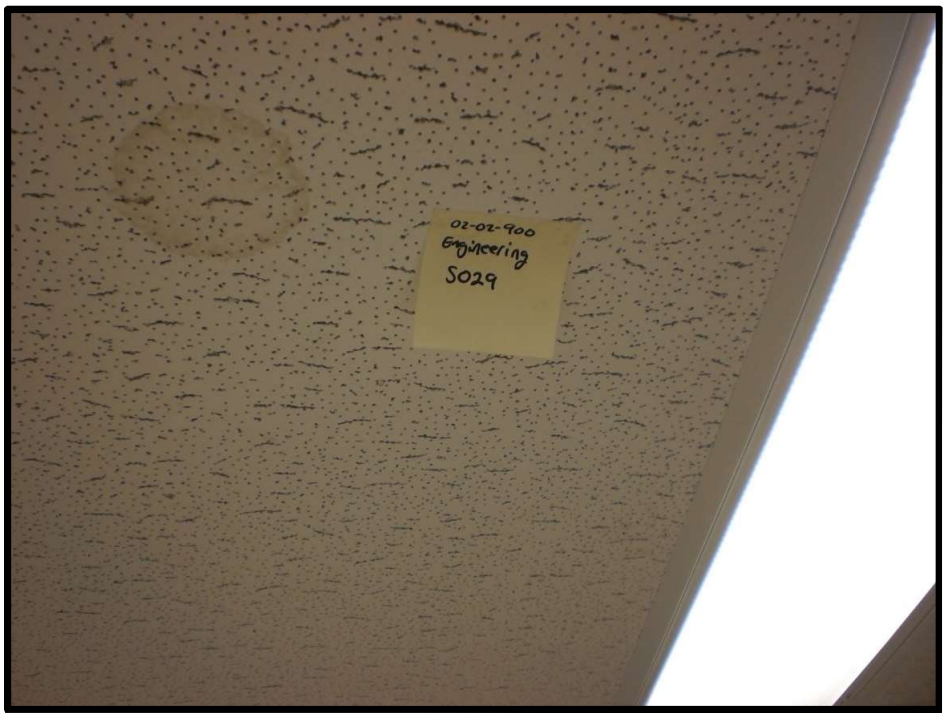


ASBESTOS BULK SAMPLING FORM

Sample #:	S029	**Date Sampled:**	July 26, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN1034B	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	X Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	X Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: 2' x 4' pinhole fissure	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	



ASBESTOS BULK SAMPLING FORM

Sample #:	S030	**Date Sampled:**	July 26, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN1034	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
X Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		X Other (open area)
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	

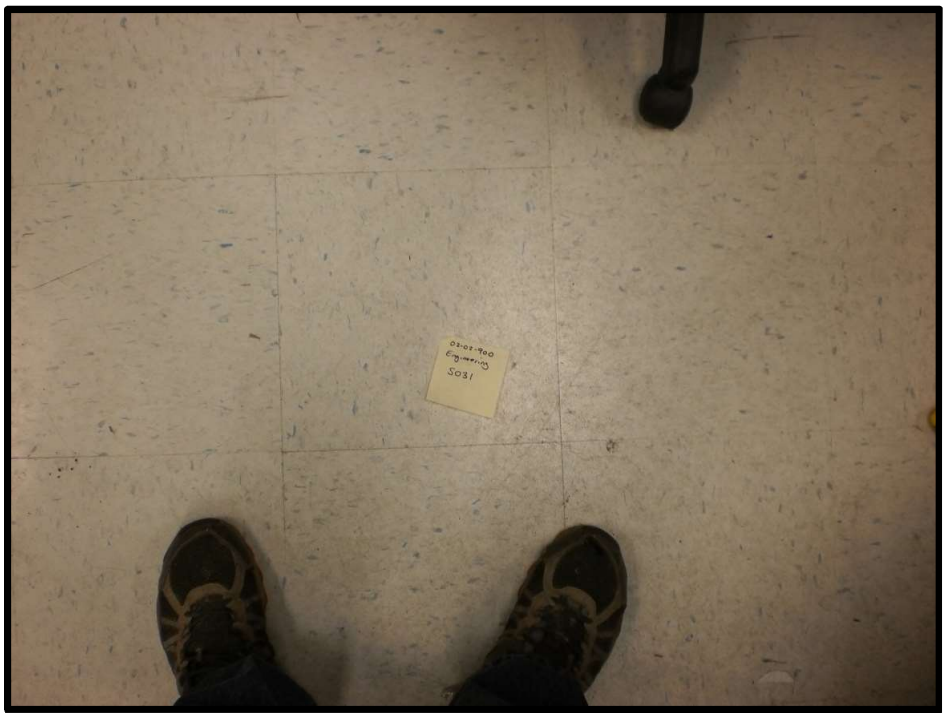


ASBESTOS BULK SAMPLING FORM

Sample #:	S031	**Date Sampled:**	July 26, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room 1035E	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	X12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: White with light blue specks	



ASBESTOS BULK SAMPLING FORM

Sample #:	S032	**Date Sampled:**	July 26, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN1035E	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	X Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	X DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	



ASBESTOS BULK SAMPLING FORM

Sample #:	S033	**Date Sampled:**	July 27, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN1026A	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	X12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: Green with white and brown specks	



ASBESTOS BULK SAMPLING FORM

Sample #:	S034	**Date Sampled:**	July 27, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN1023A	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	X12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: Grey with dark grey streaks	

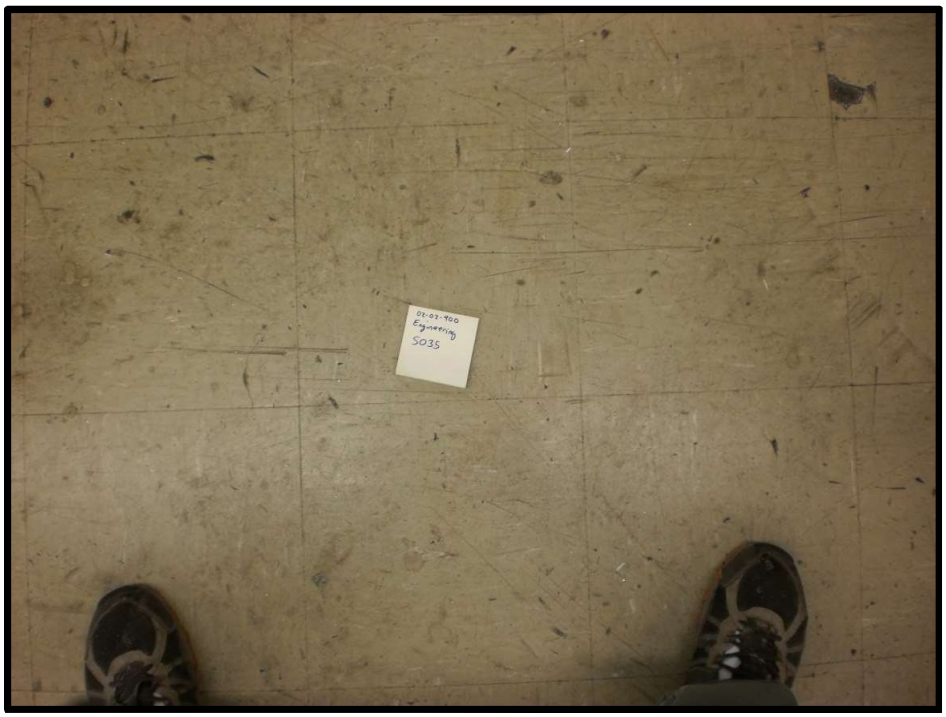


ASBESTOS BULK SAMPLING FORM

Sample #:	S035	**Date Sampled:**	July 27, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN1023F	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	X12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: Brown with white and dark brown specks	

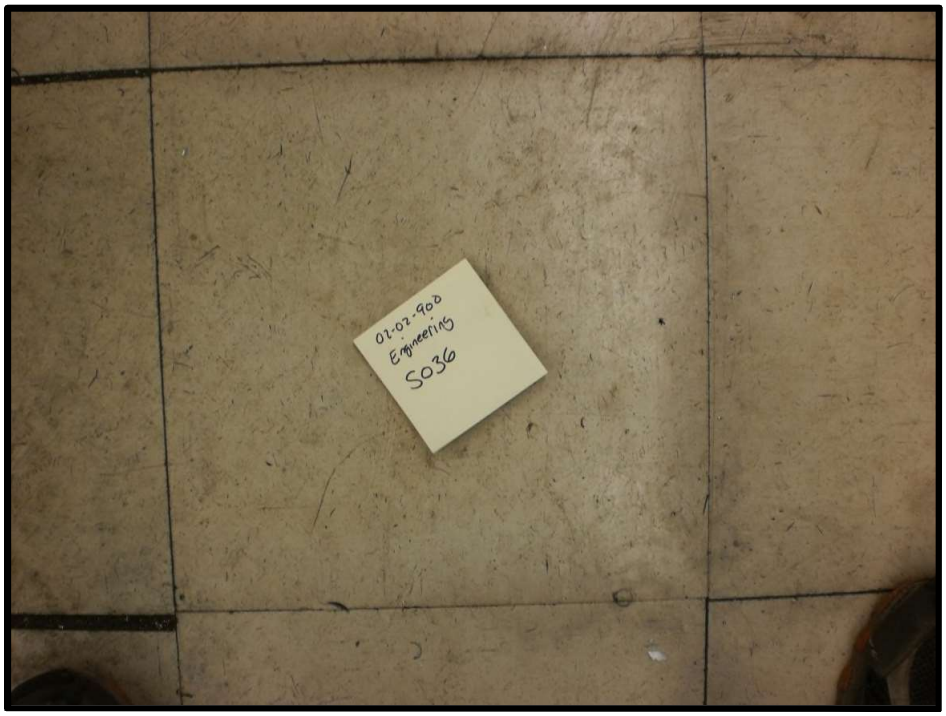


ASBESTOS BULK SAMPLING FORM

Sample #:	S036	**Date Sampled:**	July 27, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN1023F	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	X12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: White_	



ASBESTOS BULK SAMPLING FORM

Sample #:	S037	**Date Sampled:**	July 27, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN1023L/M	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	X Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	X DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	

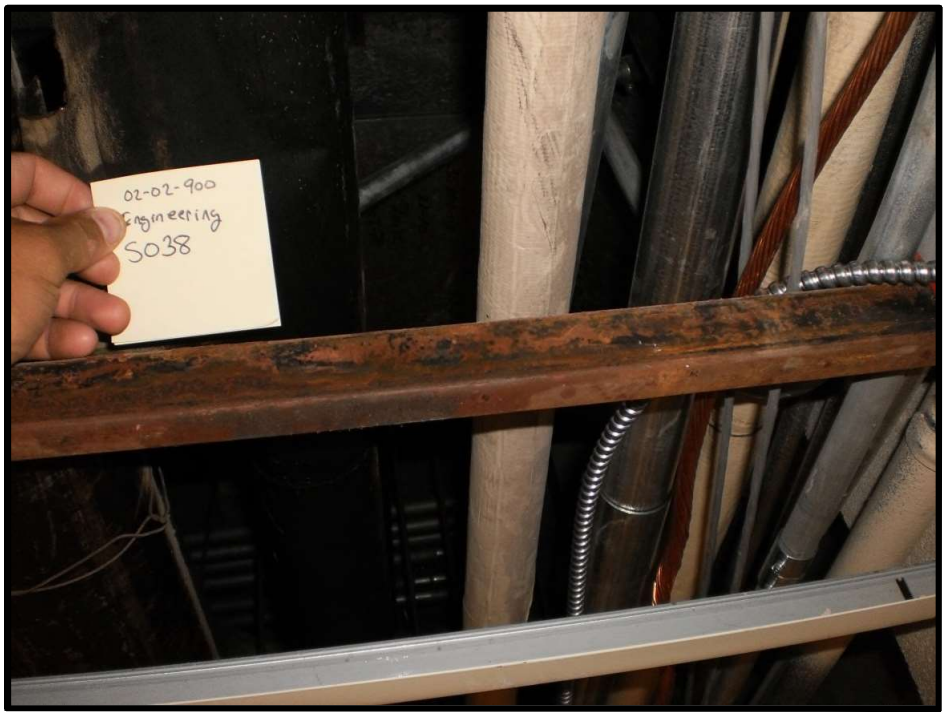


ASBESTOS BULK SAMPLING FORM

Sample #:	S038	**Date Sampled:**	July 27, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room 1023 (hallway)	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	X Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: Tar paper	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	

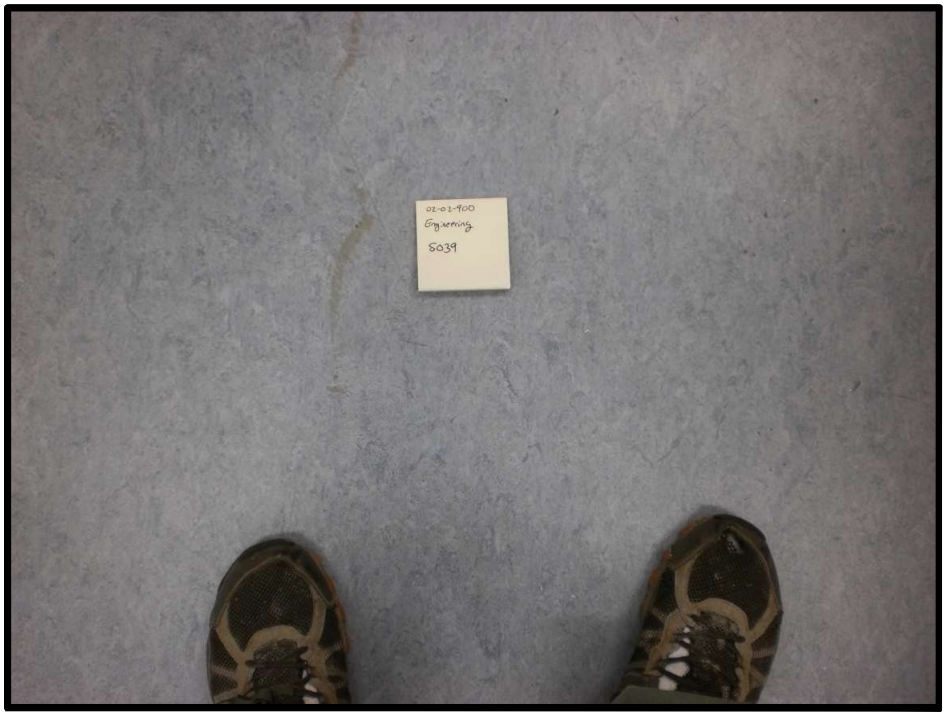


ASBESTOS BULK SAMPLING FORM

Sample #:	S039	**Date Sampled:**	July 27, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN1020E	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	X Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: Blue wave pattern	

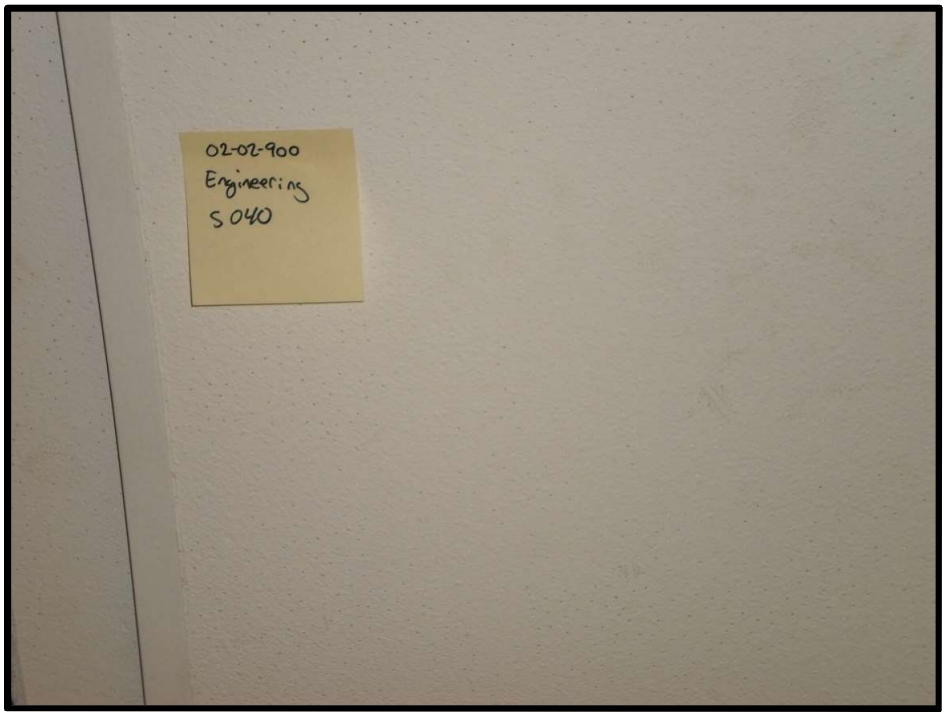


ASBESTOS BULK SAMPLING FORM

Sample #:	S040	**Date Sampled:**	July 27, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN1037	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	X Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	X Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: 2' x 4' pinhole	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	

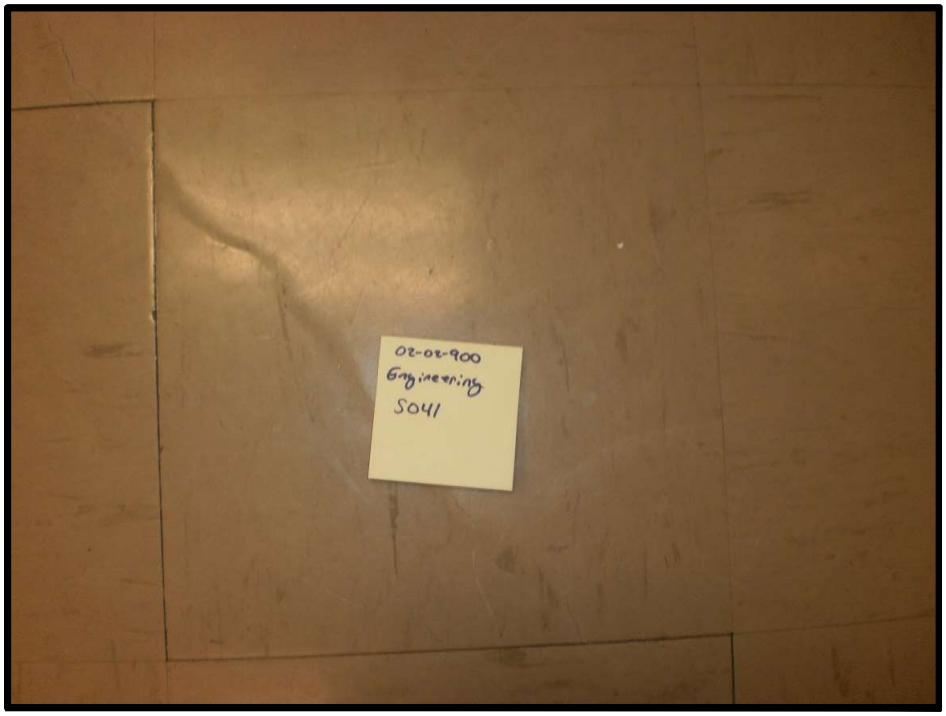


ASBESTOS BULK SAMPLING FORM

Sample #:	S041	**Date Sampled:**	July 30, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN2025	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	X12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: Grey with dark grey streaks	

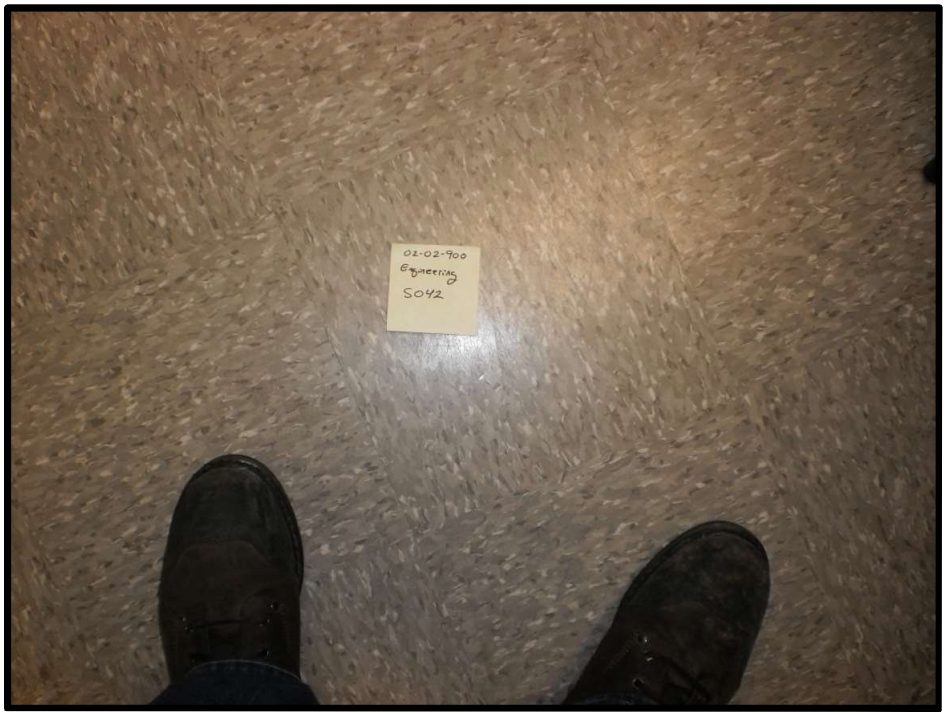


ASBESTOS BULK SAMPLING FORM

Sample #:	S042	**Date Sampled:**	July 30, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN2020	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	X12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: Grey with abundant white and dark grey flecks	



ASBESTOS BULK SAMPLING FORM

Sample #:	S043	**Date Sampled:**	July 30, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN2018A	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	X Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	X DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	



ASBESTOS BULK SAMPLING FORM

Sample #:	S044	**Date Sampled:**	July 30, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN2048	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	X12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: Light yellow with dark yellow and white specks	



ASBESTOS BULK SAMPLING FORM

Sample #:	S045	**Date Sampled:**	July 30, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN2050	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	X12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: White with yellow streaks	

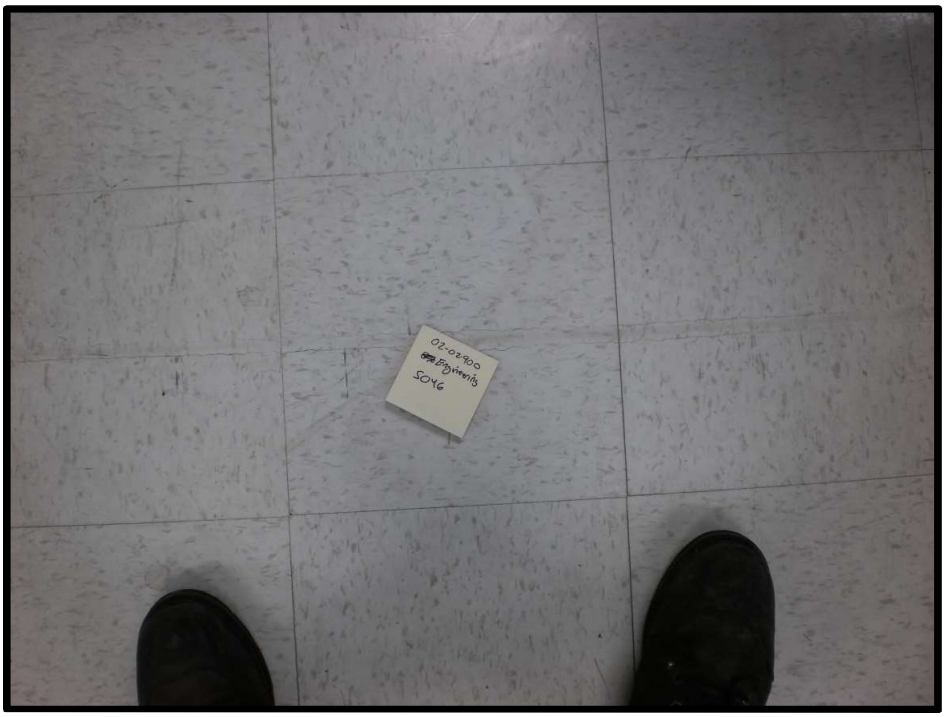


ASBESTOS BULK SAMPLING FORM

Sample #:	S046	**Date Sampled:**	July 30, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room EN2050	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	X12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: White with abundant grey specks	



ASBESTOS BULK SAMPLING FORM

Sample #:	S047	**Date Sampled:**	July 30, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	163, Room EN2050	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	X Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	X DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	

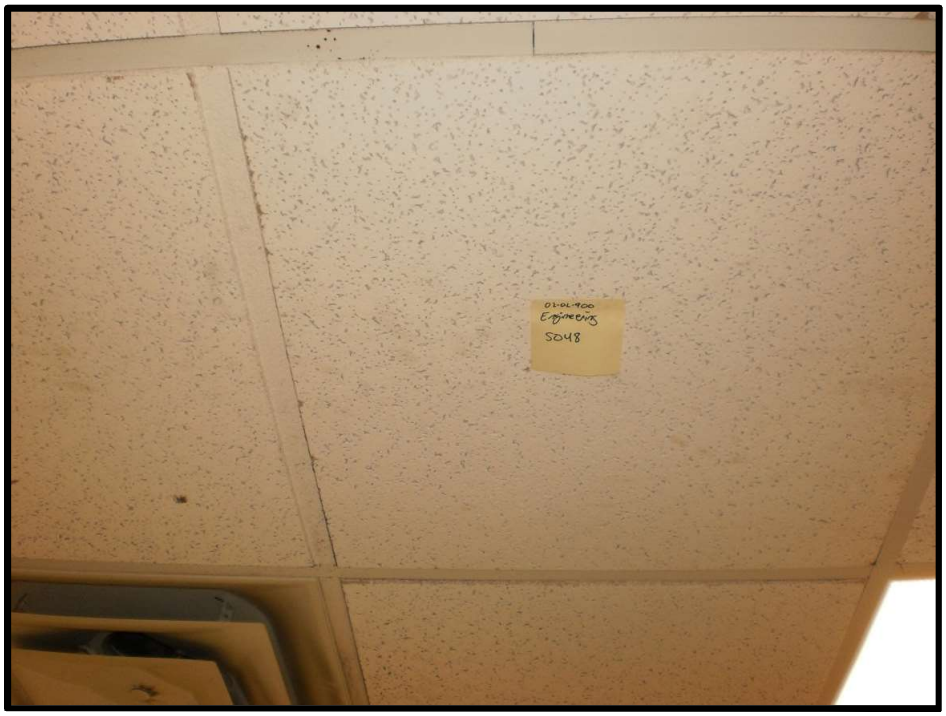


ASBESTOS BULK SAMPLING FORM

Sample #:	S048	**Date Sampled:**	July 30, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	165, Room EN2077	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	X Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	X Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: 2' x 4' pinhole fleck	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	



ASBESTOS BULK SAMPLING FORM

Sample #:	S049	**Date Sampled:**	July 30, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	191, room EN2043	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	X Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	X DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	

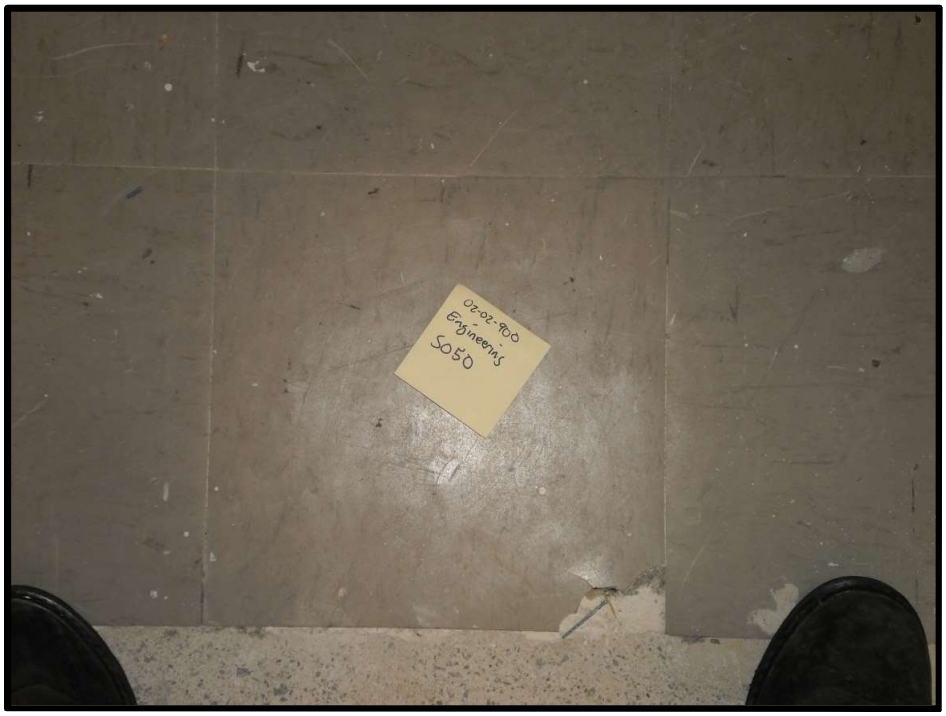


ASBESTOS BULK SAMPLING FORM

Sample #:	S050	**Date Sampled:**	July 30, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	194, room EN2006	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	X12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	



ASBESTOS BULK SAMPLING FORM

Sample #:	S051	**Date Sampled:**	July 30, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	194, room 2006	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	X Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	X Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	

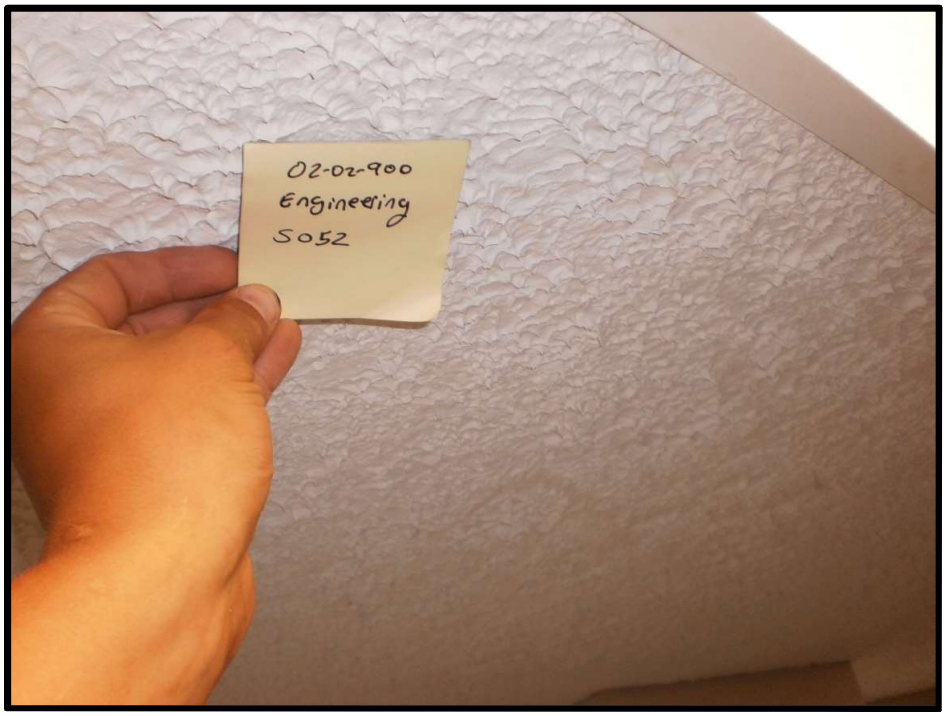


ASBESTOS BULK SAMPLING FORM

Sample #:	S052	**Date Sampled:**	July 31, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	196, room 2000	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	X Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	X Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	



ASBESTOS BULK SAMPLING FORM

Sample #:	S053	**Date Sampled:**	July 31, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	196, room 2000	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		X Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: Heat Shield	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	

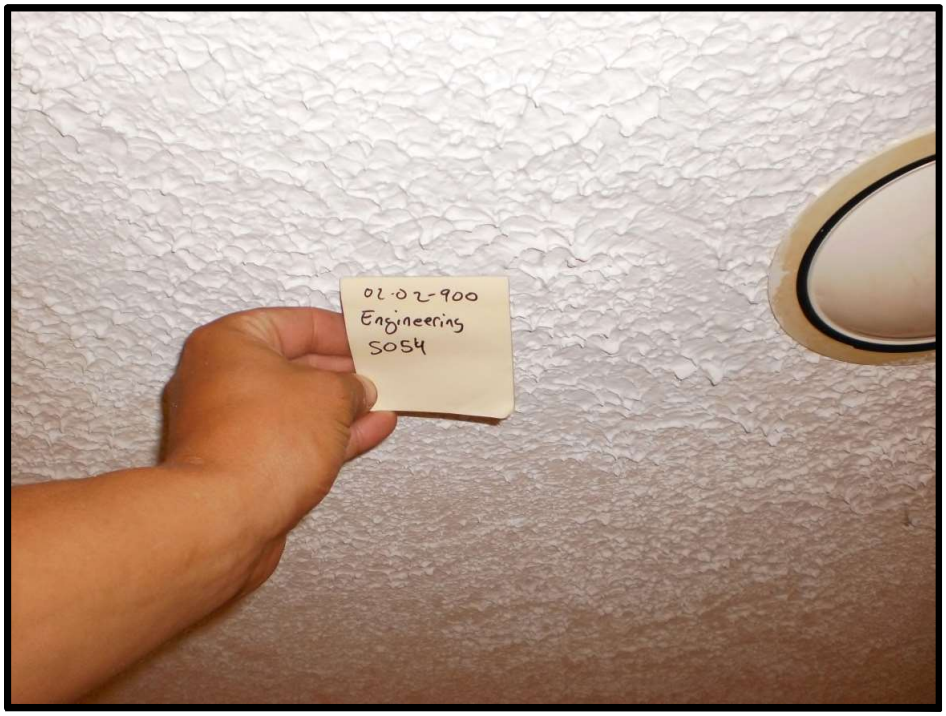


ASBESTOS BULK SAMPLING FORM

Sample #:	S054	**Date Sampled:**	July 31, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	200, room 2C01	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	X Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	X Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	

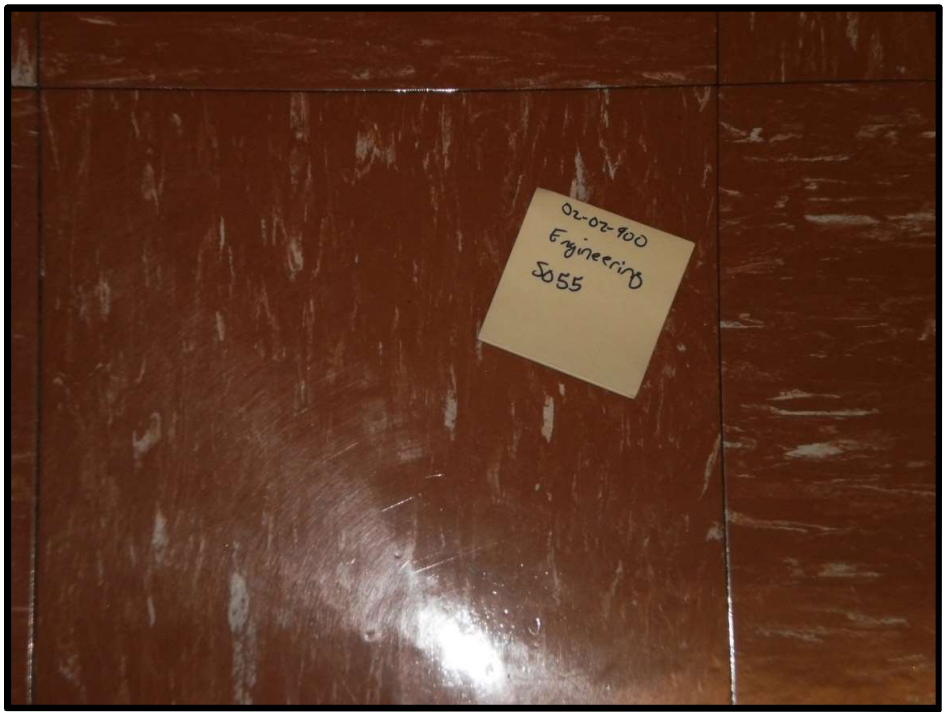


ASBESTOS BULK SAMPLING FORM

Sample #:	S055	**Date Sampled:**	July 31, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	201, room 2C02	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	X12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: Red with abundant white streaks	



ASBESTOS BULK SAMPLING FORM

Sample #:	S056	**Date Sampled:**	July 31, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	202, room EN2002A	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	X Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	X DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	



ASBESTOS BULK SAMPLING FORM

Sample #:	S057	**Date Sampled:**	July 31, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	220, room 3014	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	X Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	X DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	



ASBESTOS BULK SAMPLING FORM

Sample #:	S058	**Date Sampled:**	July 31, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	232, room 3076	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	X Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	X DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	

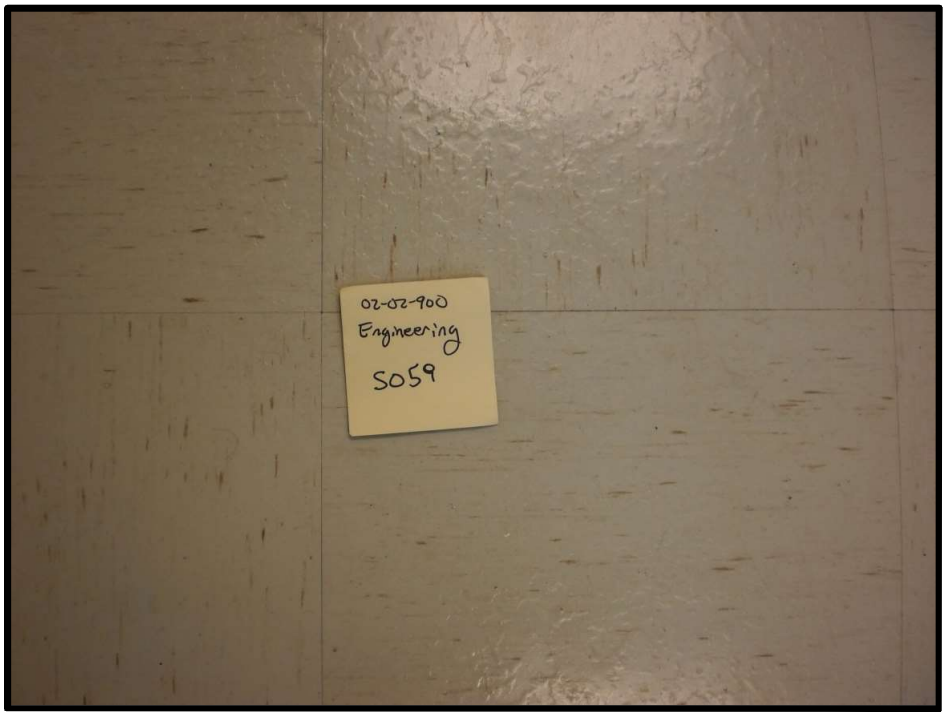


ASBESTOS BULK SAMPLING FORM

Sample #:	S059	**Date Sampled:**	July 31, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	249, room EN3052	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	X12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: White with brown flecks	



ASBESTOS BULK SAMPLING FORM

Sample #:	S060	**Date Sampled:**	July 31, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	450, room 3054	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	X Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	X DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	

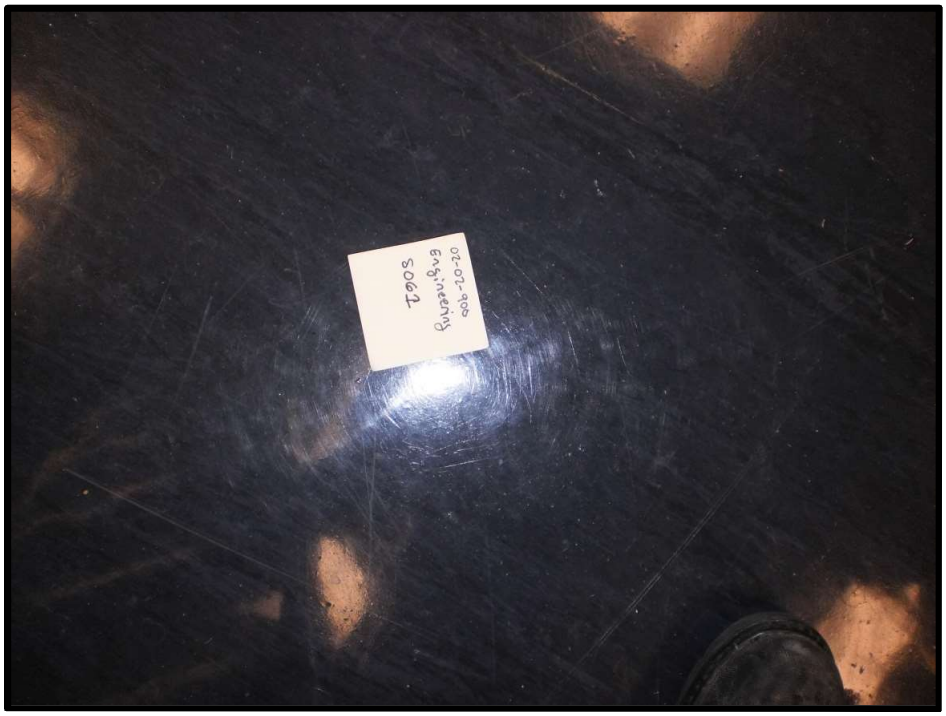


ASBESTOS BULK SAMPLING FORM

Sample #:	S061	**Date Sampled:**	July 31, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	271, room EN3058	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	X Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: Dark blue_	

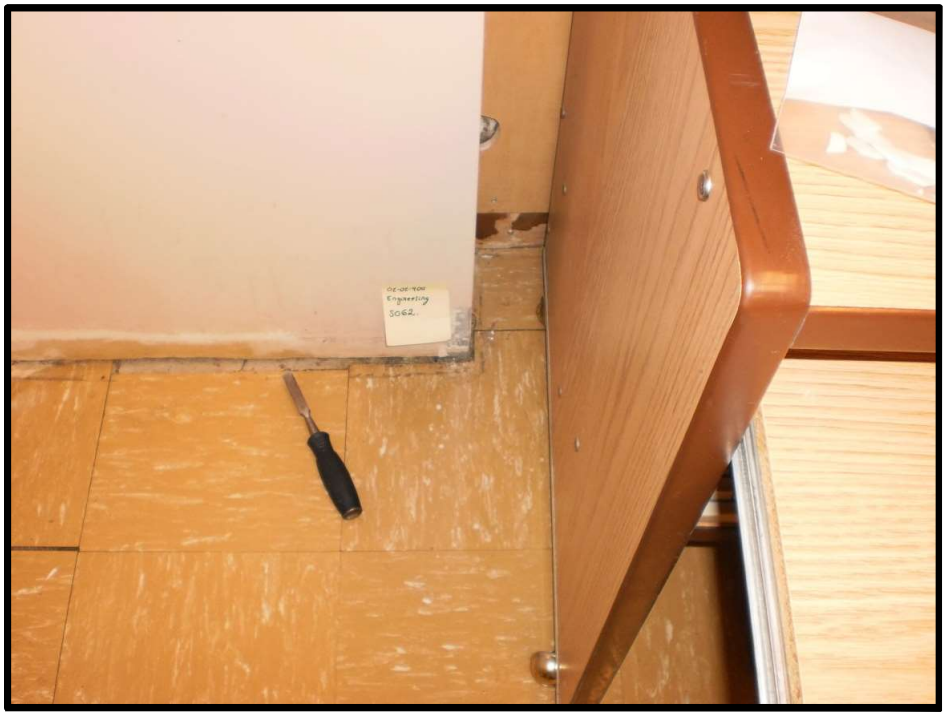


ASBESTOS BULK SAMPLING FORM

Sample #:	S062	**Date Sampled:**	July 31, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	275, room EN3000A	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	X Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	X DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	



ASBESTOS BULK SAMPLING FORM

Sample #:	S063	**Date Sampled:**	July 31, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	275, room EN3000A	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vainly Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		X Other (ductwork)
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: Mastic	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	

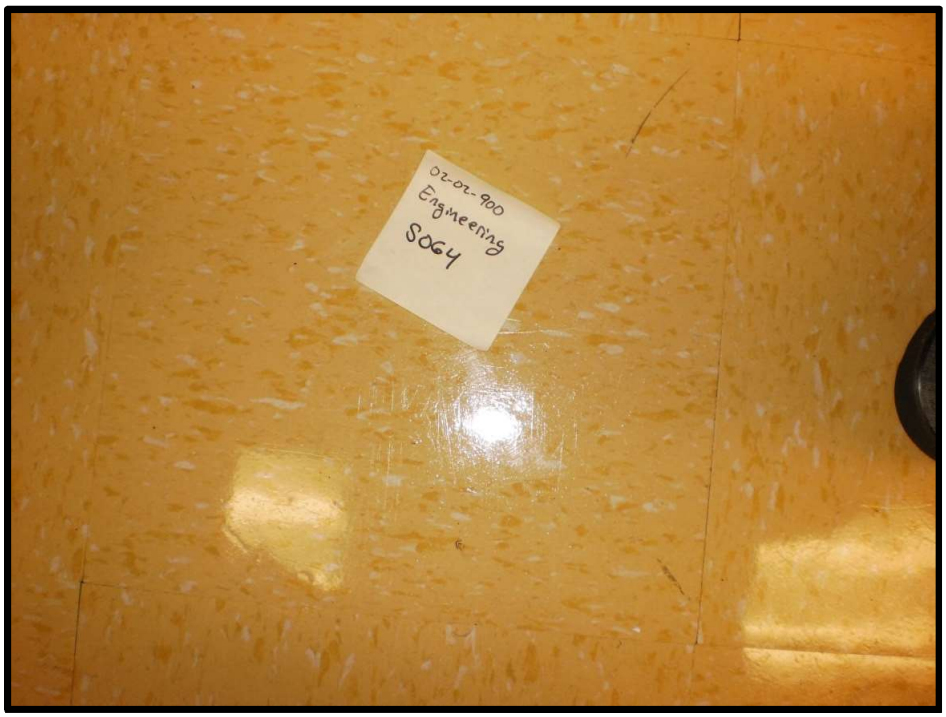


ASBESTOS BULK SAMPLING FORM

Sample #:	S064	**Date Sampled:**	July 31, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	275, room EN3000A	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	X12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: Pale yellow with white and yellow flecks	

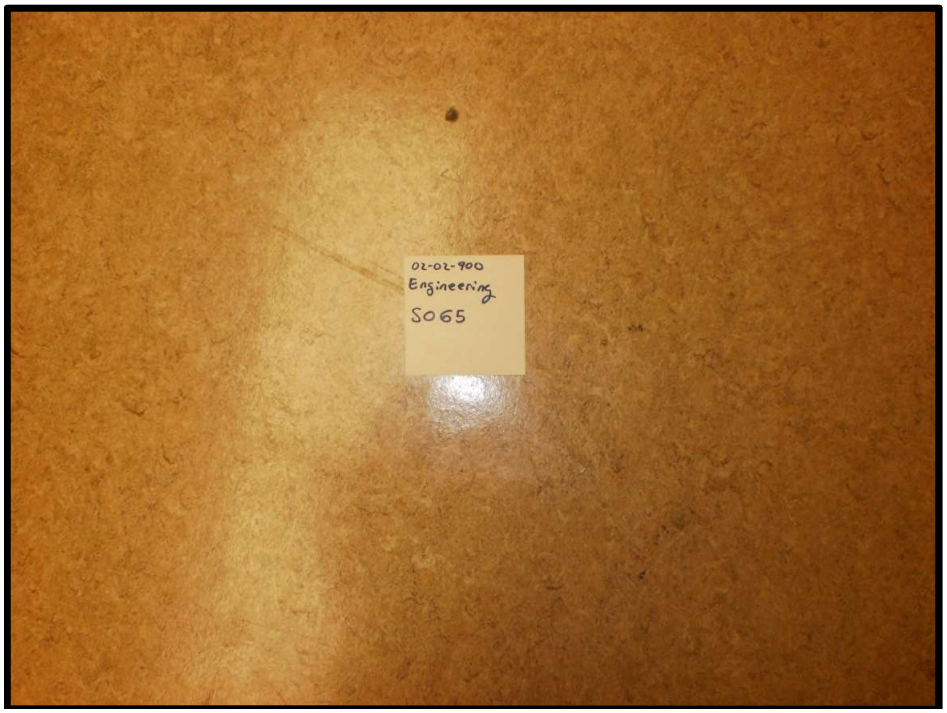


ASBESTOS BULK SAMPLING FORM

Sample #:	S065	**Date Sampled:**	July 31, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	285, room 4028	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	X Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: Brown with light grey fleck	

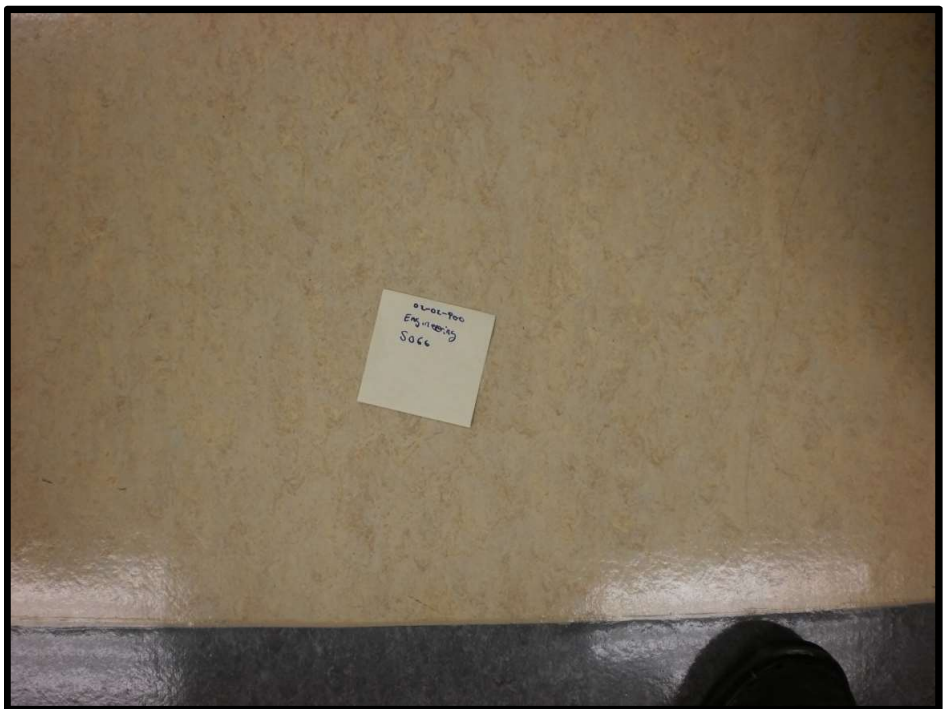


ASBESTOS BULK SAMPLING FORM

Sample #:	S066	**Date Sampled:**	August 1, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	289, room 4030	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	X Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: Pale yellow with light brown	



ASBESTOS BULK SAMPLING FORM

Sample #:	S067	**Date Sampled:**	August 1, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	297, room 4032	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	X Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	X DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	



ASBESTOS BULK SAMPLING FORM

Sample #:	S068	**Date Sampled:**	August 1, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	300, room EN4042	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	X Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	X DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	

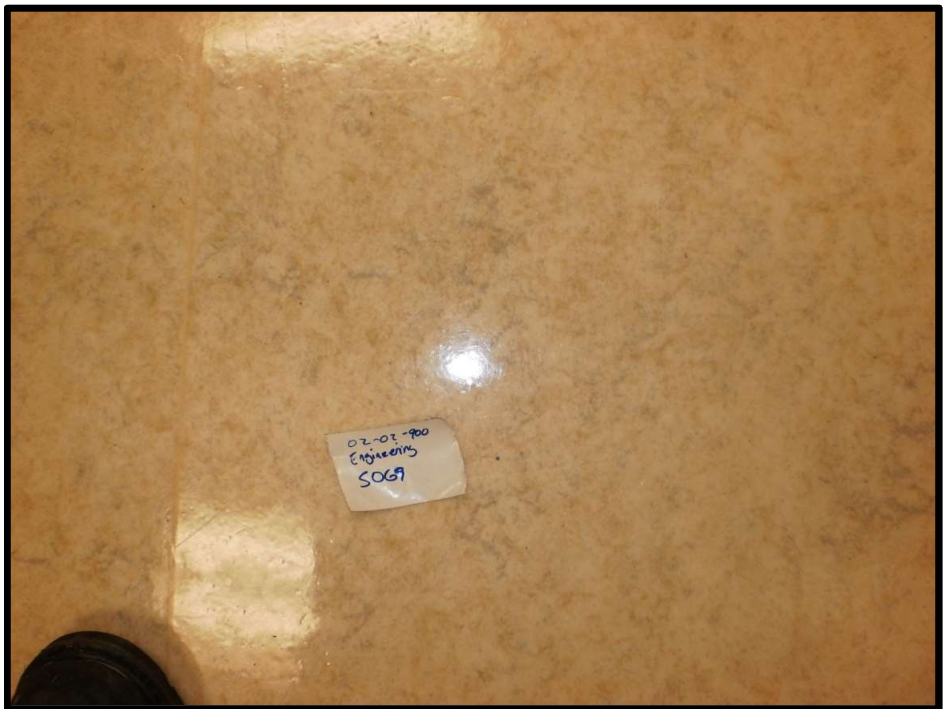


ASBESTOS BULK SAMPLING FORM

Sample #:	S069	**Date Sampled:**	August 1, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	310, room EN4029	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	X Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	



ASBESTOS BULK SAMPLING FORM

Sample #:	S070	**Date Sampled:**	August 1, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	310, room EN4029	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	X Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	X Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	

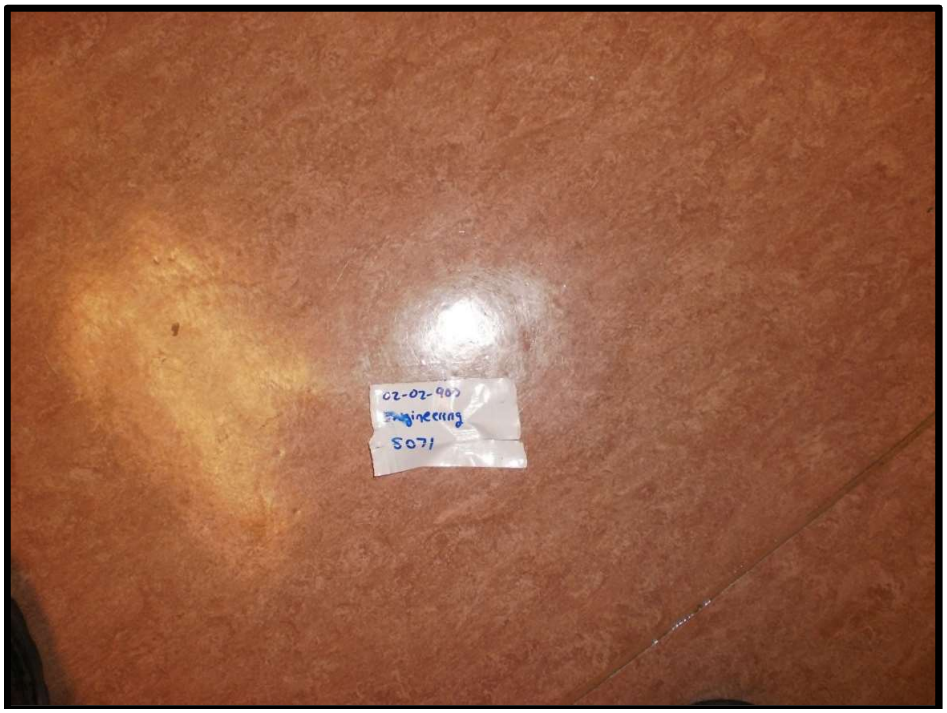


ASBESTOS BULK SAMPLING FORM

Sample #:	S071	**Date Sampled:**	August 1, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	316	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	X Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: Brown stone	



ASBESTOS BULK SAMPLING FORM

Sample #:	S072	**Date Sampled:**	August 1, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	316	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	X Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	X DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	

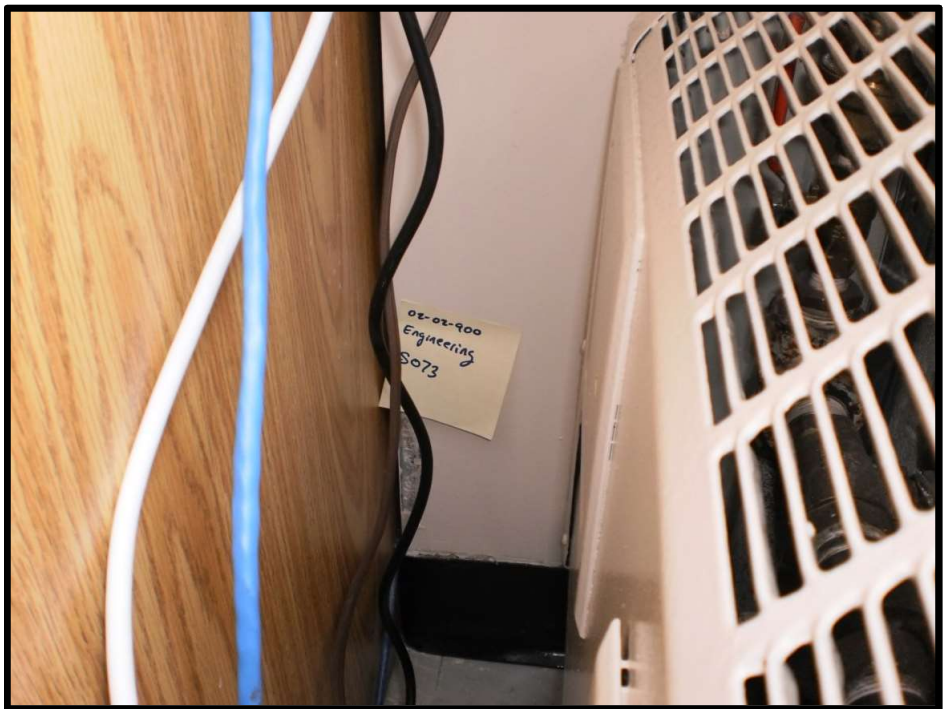


ASBESTOS BULK SAMPLING FORM

Sample #:	S073	**Date Sampled:**	August 1, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	329	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	X Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	X DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	



ASBESTOS BULK SAMPLING FORM

Sample #:	S074	**Date Sampled:**	August 1, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	355	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	X Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	X DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	



ASBESTOS BULK SAMPLING FORM

Sample #:	S075	**Date Sampled:**	August 1, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	357	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	X Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	X Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	



ASBESTOS BULK SAMPLING FORM

Sample #:	S076	**Date Sampled:**	August 1, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	358	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	X Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	X Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	

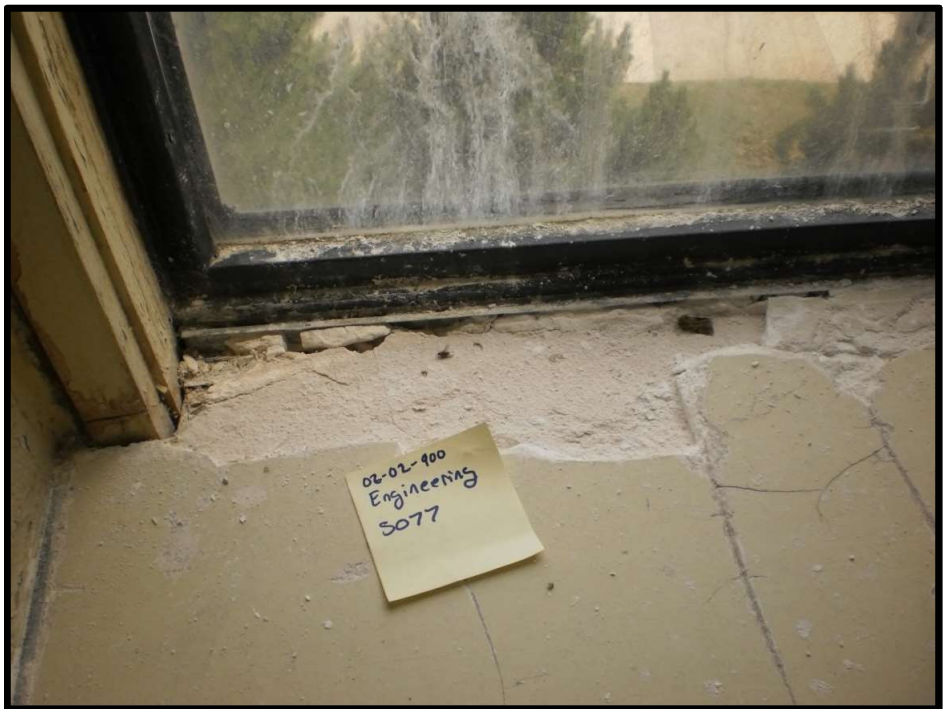


ASBESTOS BULK SAMPLING FORM

Sample #:	S077	**Date Sampled:**	August 1, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	359	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	X Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	X Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	

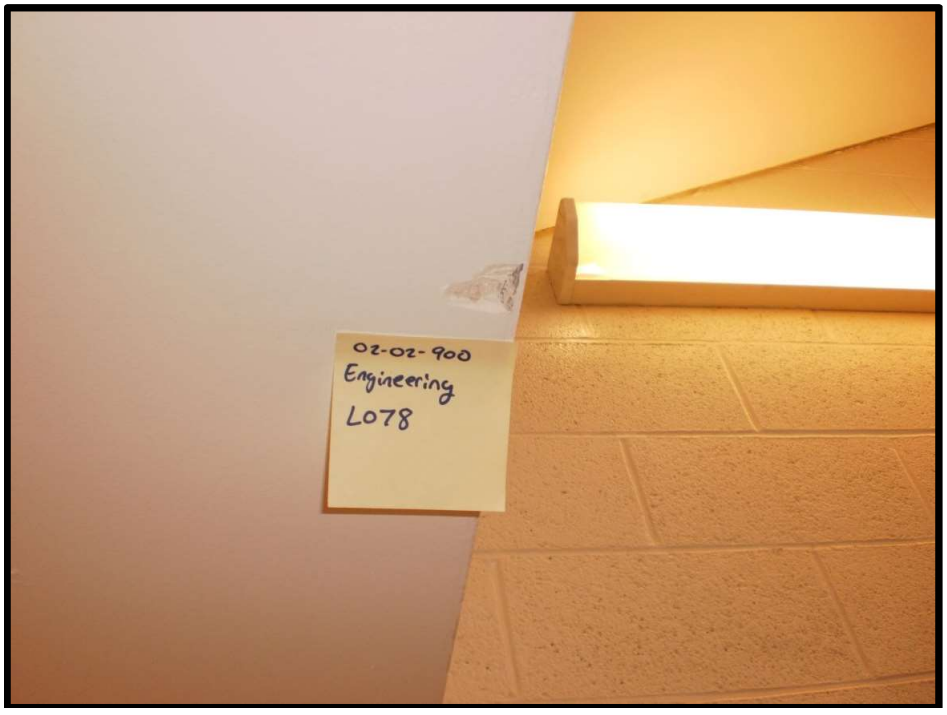


ASBESTOS BULK SAMPLING FORM

Sample #:	S078	**Date Sampled:**	August 1, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	359	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	X Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	X Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	

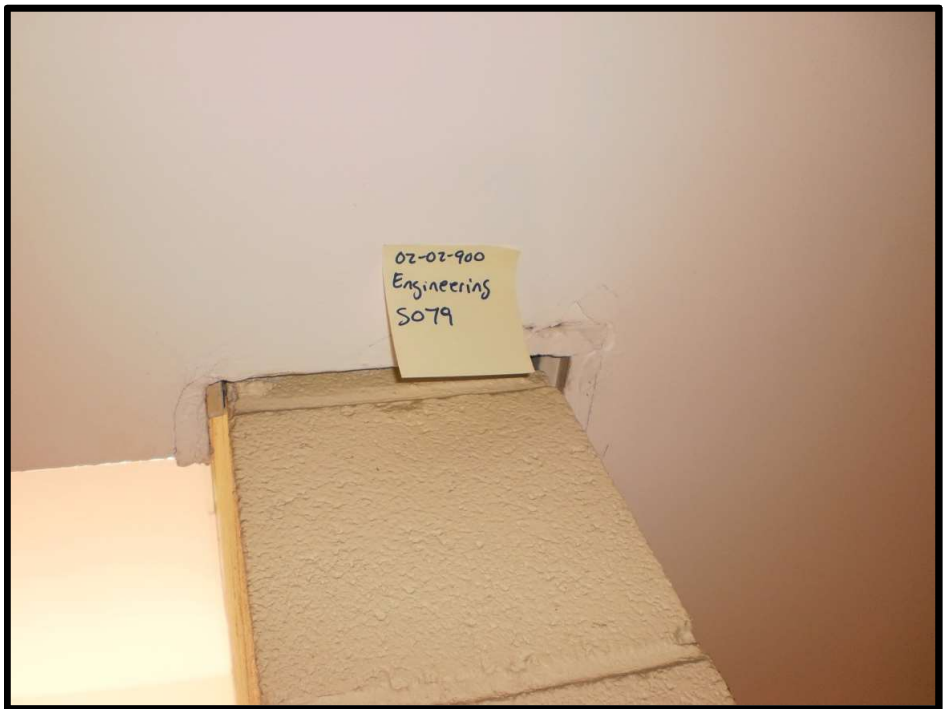


ASBESTOS BULK SAMPLING FORM

Sample #:	S079	**Date Sampled:**	August 1, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	360	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	X Ceiling
☐ Transite Pipe	☐ Mastic	X DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	

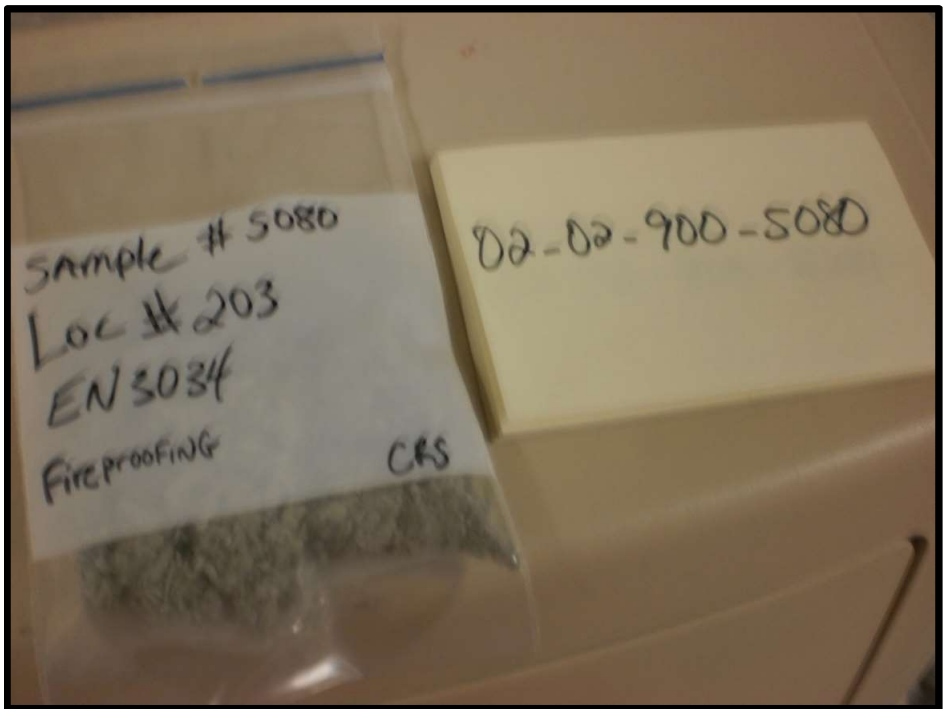


ASBESTOS BULK SAMPLING FORM

Sample #:	S080	**Date Sampled:**	August 10, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Curtis Snelgrove
Location:	203, room EN3034	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	X Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: Fireproofing	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	

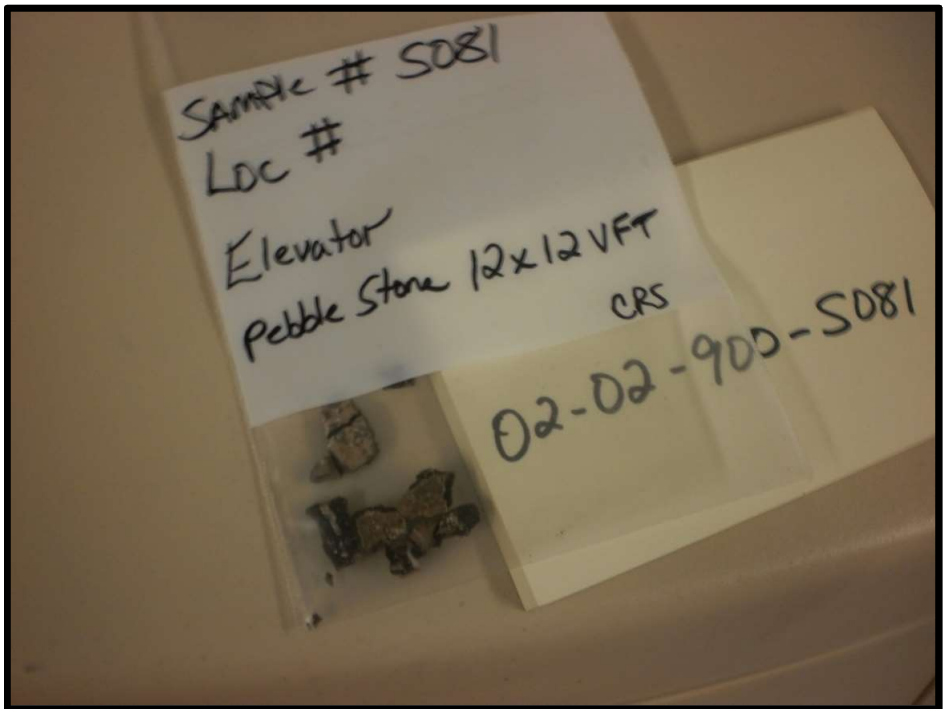


ASBESTOS BULK SAMPLING FORM

Sample #:	S081	**Date Sampled:**	August 10, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Curtis Snelgrove
Location:	Elevator	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	X12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: Pebble stone pattern	

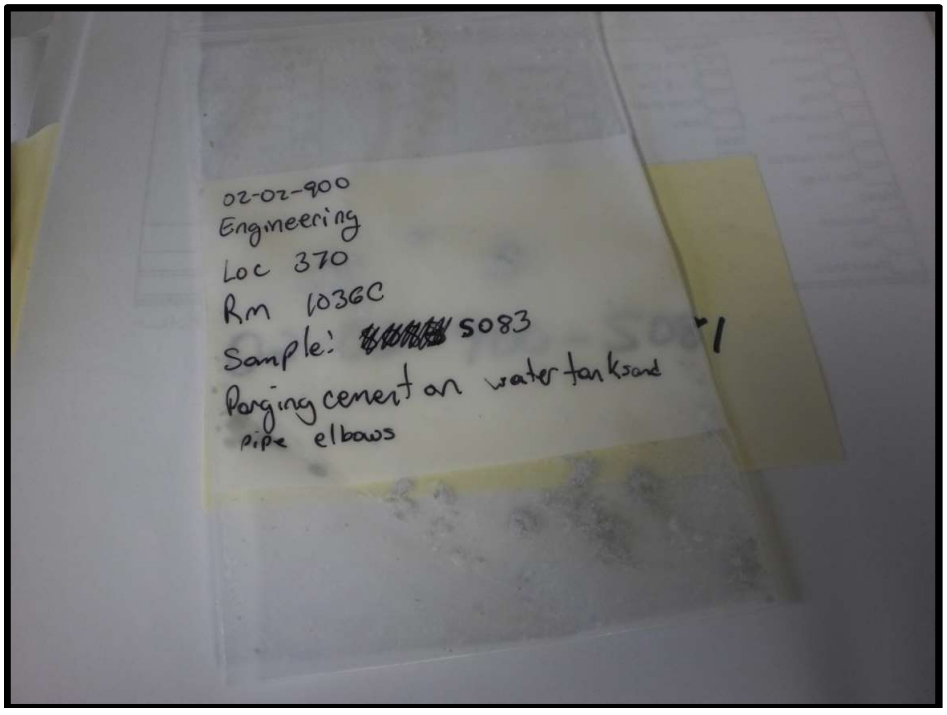


ASBESTOS BULK SAMPLING FORM

Sample #:	S082	**Date Sampled:**	August 13, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	EN1036C	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
X Insulation	☐12'x12' Tile	☐ Textured	☐ Shingle	☐ Floor
X Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
X Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		X Other (tank)
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	



ASBESTOS BULK SAMPLING FORM

Sample #:	S083	**Date Sampled:**	August 13, 2012
Building :	Engineering and Applied Sciences	**Sampler:**	Trent Hardy
Location:	Room 2042	**Analysis:**	SAI - PLM
MUN Project #:	02-02-900	**Work Order #:**	

Bulk Sampling Parameters

Pipe/Tank	Flooring	Ceiling	Roofing	Location
☐ Insulation	X 12'x12' Tile	☐ Textured	☐ Shingle	X Floor
☐ Elbow	☐ 9'x9'Tile	☐ Stucco	☐ Rolled	☐ Wall Orientation
☐ Fitting	☐ Vinyl Sheet	☐ Popcorn	☐ Felt	☐ Ceiling
☐ Transite Pipe	☐ Mastic	☐ DWJC	☐ Tar	☐ Above Ceiling
☐ Gasket	**Wall**	☐ Plaster		☐ Other
☐ Tank Insulation	☐ Transite Panel	☐ Acoustic Tile (Dropped)		
☐ Pipe Wrap	☐ Textured Wall	☐ Acoustic Tile (Glued-on)		
HVAC	☐ Plaster	☐ Mastic	Miscellaneous: _____	
☐ Insulation	☐ DWJC	**Structural**		
☐ Tape		☐ Steel F. P. ing	No. of Phases: _____	
☐ Paper Wrap		☐ Deck F. P. ing	Colour: _____	

PART 1 - GENERAL

1.1 SUMMARY

.1 Types of items described in this Section:
- .1 Demolition and removal of selected portions of building or structure.
- .2 Demolition and removal of selected site elements.
- .3 Salvage of existing items to be reused or recycled.

.2 Types of items you will not find described in this Section:
- .1 Use of premises, and phasing, and Owner-occupancy requirements.
- .2 Photographic Documentation for preconstruction photographs taken before selective demolition operations.
- .3 Temporary Facilities and Controls for temporary construction and environmental-protection measures for selective demolition operations.
- .4 Cutting and Patching for cutting and patching procedures.
- .5 Construction Waste Management and Disposal for disposal of demolished materials.

1.2 DEFINITIONS

.1 Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

.2 Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.

.3 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

.4 Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.3 MATERIALS OWNERSHIP

.1 Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.
- .1 Coordinate with Owner's archaeologist, who will establish special procedures for removal and salvage.

1.4 SUBMITTALS

.1 Schedule of Selective Demolition Activities: Indicate the following:
- .1 Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's building managers and other tenants' on-site operations are uninterrupted.
- .2 Interruption of utility services. Indicate how long utility services will be interrupted.
- .3 Coordination for shutoff, capping, and continuation of utility services.
- .4 Use of elevator and stairs.
- .5 Locations of proposed dust- and noise-control temporary partitions and means of egress, including for other tenants affected by selective demolition operations.
- .6 Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- .7 Means of protection for items to remain and items in path of waste removal from building.

.2 Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.

.3 Predemolition Photographs or Videotapes: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by selective demolition operations. Comply with Division 01 Section *Photographic Documentation*. Submit before Work begins.

.4 Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
.1 Comply with submittal requirements in Division 01 Section "*Construction Waste Management and Disposal*."

1.5 QUALITY ASSURANCE

.1 Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

.2 Standards: Comply with ANSI A10.6, NFPA 241, NBCC, and NFCC.

.3 Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 01 Section *Project Management and Coordination*. Review methods and procedures related to selective demolition including, but not limited to, the following:
.1 Inspect and discuss condition of construction to be selectively demolished.
.2 Review structural load limitations of existing structure.
.3 Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
.4 Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
.5 Review areas where existing construction is to remain and requires protection.

1.6 PROJECT CONDITIONS

.1 Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
.1 Comply with requirements specified in Division 01 Section *Summary*.

.2 Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
.1 Before selective demolition, Owner will remove the following items:
.1 Items as selected by the Owner.

.3 Notify Owner's Representative of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

.4 Hazardous Materials: It may be possible hazardous materials could be present in construction to be selectively demolished. A report on the presence of hazardous materials is attached for review and use (If no report is attached, request clarification from Owner's Representative. Examine report to become aware of locations where hazardous materials are present.
.1 Hazardous material remediation is specified elsewhere in the Contract Documents.
.2 Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.

.5 Storage or sale of removed items or materials on-site is not permitted.

.6 Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
.1 Maintain fire-protection facilities in service during selective demolition operations.

1.7 WARRANTY

.1 Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verify that utilities have been disconnected and capped.

.2 Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

.3 Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

.4 When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Owner's Representative.

.5 Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.

.6 Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.
.1 Comply with requirements specified in Division 01 Section "*Photographic Documentation*."
.2 Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

.7 Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

.1 Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
.1 Comply with requirements for existing services/systems interruptions specified in Division 01 Section *Summary*.

.2 Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
.1 Arrange to shut off indicated utilities with utility companies.
.2 If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

.3 Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
.1 Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

3.3 PREPARATION

.1 Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
.1 Comply with requirements for access and protection specified in Division 01 Section *Temporary Facilities and Controls*.

.2 Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
.1 Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
.2 Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
.3 Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
.4 Cover and protect furniture, furnishings, and equipment that have not been removed.
.5 Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 01 Section *Temporary Facilities and Controls*.

.3 Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
.1 Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

.1 General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
.1 Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
.2 Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
.3 Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
.4 Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
.5 Maintain adequate ventilation when using cutting torches.
.6 Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
.7 Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
.8 Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

.9 Dispose of demolished items and materials promptly. Comply with requirements in Division 01 Section *Construction Waste Management and Disposal*.

.2 Reuse of Building Elements: Project has been designed to result in end-of-Project rates for reuse of building elements as follows. Do not demolish building elements beyond what is indicated on Drawings without Owner's Representative's approval.

.3 Removed and Salvaged Items:
- .1 Clean salvaged items.
- .2 Pack or crate items after cleaning. Identify contents of containers.
- .3 Store items in a secure area until delivery to Owner.
- .4 Transport items to Owner's storage area designated by Owner.
- .5 Protect items from damage during transport and storage.

.4 Removed and Reinstalled Items:
- .1 Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
- .2 Pack or crate items after cleaning and repairing. Identify contents of containers.
- .3 Protect items from damage during transport and storage.
- .4 Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

.5 Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Owner's Representative, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

.1 Concrete: Demolish in small sections. Cut concrete to a depth of at least 19 mm at junctures with construction to remain, using power-driven saw. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete indicated for selective demolition. Neatly trim openings to dimensions indicated.

.2 Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals, using power-driven saw, then remove concrete between saw cuts.

.3 Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

.4 Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

.5 Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI-WP and its Addendum.
- .1 Remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI.

.6 Roofing: Remove no more existing roofing than can be covered in one day by new roofing and so that building interior remains watertight and weather tight. Refer to Division 07 for new roofing requirements.
- .1 Remove existing roof membrane, flashings, copings, and roof accessories.
- .2 Remove existing roofing system down to substrate.

.7 Air-Conditioning Equipment: Remove equipment without releasing refrigerants.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

.1 General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an approved landfill.
- .1 Do not allow demolished materials to accumulate on-site.
- .2 Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- .3 Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- .4 Comply with requirements specified in Division 01 Section *Construction Waste Management and Disposal*.

.2 Burning: Do not burn demolished materials.

.3 Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

.1 Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.8 SELECTIVE DEMOLITION SCHEDULE

.1 Existing Construction to Be Removed: As noted in contract documents.

.2 Existing Items to Be Removed and Salvaged: As noted in contract documents.

.3 Existing Items to Be Removed and Reinstalled: As noted in contract documents.

.4 Existing Items to Remain: As noted in contract documents.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 Types of items described in this Section:
- .1 Requirements and procedures for asbestos abatement of minor amounts of chrysotile asbestos-containing materials of the type describe within.
  - .1 Removing suspended ceilings, as indicated.
  - .2 Removal of asbestos containing material from piping and equipment.
  - .3 Enclosure of friable asbestos containing material.
  - .4 Application of tape or sealant or other covering to pipe and boiler insulation containing asbestos.

.2 Types of items you will not find described in this Section:
- .1 Submittal Procedures.
- .2 Health and Safety Requirements.
- .3 Construction/Demolition Waste Management and Disposal.

.3 References
- .1 Canadian General Standards Board (CGSB).
  - .1 CAN/CGSB-1.205-94, Sealer for Application of Asbestos Fibre Releasing Materials.
- .2 Department of Justice Canada (Jus).
  - .1 Canadian Environmental Protection Act, 1999 (CEPA).
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
  - .1 Material Safety Data Sheets (MSDS).
- .4 Transport Canada (TC).
  - .1 Transportation of Dangerous Goods Act, 1992 (TDGA).
- .5 Underwriters' Laboratories of Canada (ULC).

1.2 DEFINITIONS

.1 HEPA vacuum: High Efficiency Particulate Air filtered vacuum equipment with filter system capable of collecting and retaining fibres greater than 0.3 microns in any dimension at 99.97% efficiency.

.2 Amended Water: water with non-ionic surfactant wetting agent added to reduce water tension to allow wetting of fibres.

.3 Asbestos Containing Materials (ACMs): materials identified under *Existing Conditions* Article, including fallen materials and settled dust.

.4 Minor Amounts of ACMs: less than or equal to 0.1 m2 of friable material containing chrysotile asbestos.

.5 Asbestos Work Area: area where work takes place which will, or may disturb ACMs.

.6 Authorized Visitors: Owner's Representatives, or designated representatives, and representatives of regulatory agencies.

.7 Friable Material: material that when dry can be crumbled, pulverized or powdered by hand pressure and includes such material that is crumbled, pulverized or powdered.

.8 Occupied Area: any area of building or work site that is outside Asbestos Work Area.

.9 Polyethylene: polyethylene sheeting or rip proof polyethylene sheeting with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide protection and isolation.

.10 Glove Bag: prefabricated glove bag as follows:

.1 Minimum thickness 0.25 mm (10 mil) polyvinyl-chloride bag.
.2 Integral 0.25 mm (10 mil) thick polyvinyl-chloride gloves and elastic ports.
.3 Equipped with reversible double pull double throw zipper on top and at approximately mid-section of the bag.
.4 Straps for sealing ends around pipe.
.5 Must incorporate internal closure strip if it is to be moved or used in more than one specific location.

.11 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Must have appropriate capacity for scope of work.

1.3 SUBMITTALS

.1 Submit proof satisfactory to Owner's Representative that suitable arrangements have been made to dispose of asbestos containing waste in accordance with requirements of authority having jurisdiction.

.2 Submit Provincial/Territorial and/or local requirements for Notice of Project Form.

.3 Submit proof of Contractor's Asbestos Liability Insurance.

.4 Submit to Owner's Representative necessary permits for transportation and disposal of asbestos containing waste and proof that asbestos containing waste has been received and properly disposed.

.5 Submit proof satisfactory to Owner's Representative that employees have had instruction on hazards of asbestos exposure, respirator use, dress, entry and exit from Asbestos Work Area, and aspects of work procedures and protective measures.

.6 Submit proof that supervisory personnel have attended asbestos abatement course, of not less than two days duration, approved by Owner's Representative. Minimum of one supervisor for every ten workers.

.7 Submit Worker's Compensation Board status and transcription of insurance.

.8 Submit documentation including test results, fire and flammability data, and Material Safety Data Sheets (MSDS) for chemicals or materials including:
.1 encapsulants;
.2 amended water;
.3 slow drying sealer.

1.4 QUALITY ASSURANCE

.1 Regulatory Requirements: comply with Federal, Provincial/Territorial and local requirements pertaining to asbestos, provided that in case of conflict among these requirements or with these specifications more stringent requirement applies. Comply with regulations in effect at the time work is performed.

.2 Health and Safety:
.1 Do construction occupational health and safety in accordance with *Health and Safety Requirements*.
.2 Safety Requirements: worker and visitor protection.
.1 Protective equipment and clothing to be worn by workers while in Asbestos Work Area include:

.1 Non-powered reusable or replaceable filter type respirator equipped with HEPA filter cartridges, personally issued to worker and marked as to efficiency and purpose, suitable for protection against asbestos and acceptable to Provincial Authority having jurisdiction.

.2 Disposable type protective clothing that does not readily retain or permit penetration of asbestos fibres, consisting of full body covering including head covering with snug fitting cuffs at wrists, ankles, and neck.

.2 Eating, drinking, chewing, and smoking are not permitted in Asbestos Work Area.

.3 Before leaving Asbestos Work Area, dispose of protective clothing as contaminated waste as specified.

.4 Ensure workers wash hands and face when leaving Asbestos Work Area. Facilities for washing are located.

.5 Ensure that no person required to enter an Asbestos Work Area has facial hair that affects seal between respirator and face.

.3 Visitor Protection:

.1 Provide protective clothing and approved respirators to Authorized Visitors to work areas.

.2 Instruct Authorized Visitors in the use of protective clothing, respirators and procedures.

.3 Instruct Authorized Visitors in proper procedures to be followed in entering into and exiting from Asbestos Work Area.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Place materials defined as hazardous or toxic in designated containers.

.2 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.

.3 Fold up metal banding, flatten and place in designated area for recycling.

.4 Disposal of asbestos waste generated by removal activities must comply with Federal, Provincial, Territorial and Municipal regulations. Dispose of asbestos waste in sealed double thickness 6 ml bags or leak proof drums. Label containers with appropriate warning labels.

.5 Provide manifests describing and listing waste created. Transport containers by approved means to licensed landfill for burial.

1.6 EXISTING CONDITIONS

.1 Results of tests of asbestos containing materials to be handled, removed, or otherwise disturbed and disposed of during this Project are bound into this specification manual. These are for general information only and are not necessarily representative of asbestos containing materials covered within scope of this Project.

1.7 SCHEDULING

.1 Not later than ten (10) days before beginning Work on this Project notify following in writing:

.1 Appropriate Regional or Zone Director of Medical Services Branch, Health Canada.

.2 Regional Office of Labour Canada.

.3 Provincial/Territorial, Department of Labour.

.4 Disposal Authority.

.2 Inform sub trades of presence of friable asbestos containing materials identified in *Existing Conditions*.

.3 Submit to Owner's Representative copy of notifications prior to start of Work.

1.8 OWNER'S INSTRUCTIONS

.1 Before beginning Work, provide to Owner's Representative satisfactory proof that every worker has had instruction and training in hazards of asbestos exposure, in personal hygiene including dress and showers, in entry and exit from Asbestos Work Area, in aspects of work procedures including glove bag procedures, and in use, cleaning, and disposal of respirators and protective clothing.

.2 Instruction and training related to respirators includes, at minimum:
- .1 Proper fitting of equipment.
- .2 Inspection and maintenance of equipment.
- .3 Disinfecting of equipment.
- .4 Limitations of equipment.

.3 Instruction and training must be provided by competent, qualified person.

.4 Supervisory personnel to complete required training.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Drop and Enclosure Sheets.
- .1 Polyethylene: 0.15 mm thick.
- .2 FR polyethylene: 0.15 mm thick woven fibre reinforced fabric bonded both sides with polyethylene.

.2 Wetting Agent: 50% polyoxyethylene ester and 50% polyoxyethylene ether mixed with water in concentration to provide thorough wetting of asbestos containing material.

.3 Waste Containers: contain waste in two separate containers.
- .1 Inner container: 0.15 mm thick sealable polyethylene bag or where glove bag method is used, glove bag itself.
- .2 Outer container: sealable metal or fibre type where there are sharp objects included in waste material; otherwise outer container may be sealable metal or fibre type or second 0.15 mm thick sealable polyethylene bag.
- .3 Labelling requirements: affix preprinted cautionary asbestos warning, in both official languages, that is visible when ready for removal to disposal site.

.4 Glove bag:
- .1 Acceptable materials: safe-T-Strip products in configuration suitable for Work, or Alternative material approved by addendum during tendering period in accordance with Instructions to Tenderers.
- .2 Glove bags intended for use in more than one location must be equipped with reversible, double pull, double throw zipper on top and at approximately mid-section of bag.

.5 Tape: tape suitable for sealing polyethylene to surfaces under both dry and wet conditions using amended water.

.6 Slow - drying sealer: non-staining, clear, water - dispersible type that remains tacky on surface for at least 8 hours and designed for purpose of trapping residual asbestos fibres.
- .1 Sealer: flame spread and smoke developed rating less than 50.

.7 Encapsulants: Type 2 surface film forming or Type 1 penetrating type Class A water based conforming to CAN/CGSB-1.205 and approved by the Fire Commissioner of Canada.

PART 3 - EXECUTION

3.1 SUPERVISION

.1 Minimum of one Supervisor for every ten workers is required.

.2 Approved Supervisor must remain within Asbestos Work Area during disturbance, removal, or other handling of asbestos containing materials.

3.2 PROCEDURES

.1 Do construction occupational health and safety in accordance with *Health and Safety Requirements*.

.2 Before beginning Work, at each access to Asbestos Work Area, install warning signs in both official languages in upper case *Helvetica Medium* letters reading as follows, where number in parentheses indicates font size to be used : *CAUTION ASBESTOS HAZARD AREA (25 mm) / NO UNAUTHORIZED ENTRY (19 mm) / WEAR ASSIGNED PROTECTIVE EQUIPMENT (19 mm) / BREATHING ASBESTOS DUST MAY CAUSE SERIOUS BODILY HARM (7 mm)*.

.3 Before beginning Work remove visible dust from surfaces in work area where dust is likely to be disturbed during course of work.
- .1 Use HEPA vacuum, or damp cloths where damp cleaning does not create hazard and is otherwise appropriate.
- .2 Do not use compressed air to clean up or remove dust from any surface.

.4 Prevent spread of dust from Asbestos Work Area using measures appropriate to work to be done.
- .1 Use FR polyethylene drop sheets over flooring such as carpeting that absorbs dust and over flooring in work areas where dust or contamination cannot otherwise be safely contained.
- .2 When removing suspended ceilings and walls themselves do not enclose work area and when removing asbestos containing material from piping or equipment and *glove bag* method is not used erect enclosure of polyethylene sheeting around work area, shut off mechanical ventilation system serving work area and seal ventilation ducts to and from work area.

.5 Before removing suspended ceilings, remove friable material on upper surfaces using HEPA vacuum equipment.
- .1 Remove and clean surfaces of ceiling panels using HEPA vacuum, wrap clean panels in 0.10 mm thick polyethylene, and store in building as directed by Owner's Representative.
- .2 Clean *T* grid suspension system, disconnect, wrap in 0.10 mm thick polyethylene, and store in building as directed by Owner's Representative.

.6 Remove loose material by HEPA vacuum; thoroughly wet friable material containing asbestos to be removed or disturbed before and during Work unless wetting creates hazard or causes damage.
- .1 Use garden reservoir type low - velocity sprayer or airless spray equipment capable of producing mist or fine spray.
- .2 Perform Work in a manner to reduce dust creation to lowest levels practicable.

.7 Pipe Insulation Removal Using Glove Bag:
- .1 Place tools necessary to remove insulation in tool pouch. Wrap bag around pipe and close zippers. Seal bag to pipe with cloth straps.
- .2 Place hands in gloves and use necessary tools to remove insulation. Arrange insulation in bag to obtain full capacity of bag.
- .3 Insert nozzle of garden reservoir type sprayer into bag through valve and wash down pipe and interior of bag thoroughly. Wet surface of insulation in lower section of bag.

.4 When glove bags are intended for use at more than one location: after wash down and application of sealer, seal off waste in lower section of bag using zipper at mid-section of bag. Remove air from top section of bag through elasticized valve using HEPA vacuum. Remove bag from pipe, reinstall in new location, and reseal to pipe prior to opening lower section of bag. Repeat stripping operation.

.5 If bag is to be moved along pipe, first remove air from top section through elasticized valve using HEPA vacuum. Next loosen straps, move bag, re-seal to pipe using double pull zipper to pass hangers. Repeat stripping operation.

.6 To remove bag after completion of stripping, wash top section and tools thoroughly. Remove air from top section through elasticized valve using a HEPA vacuum. Pull polyethylene waste container over glove bag before removing from pipe. Release one strap and remove freshly washed tools. Place tools in water. Remove second strap and zipper. Fold over into waste container and seal.

.7 After removal of bag ensure that pipe is free of residue. Remove residue using HEPA vacuum or wet cloths. Ensure that surfaces are free of sludge which after drying could release asbestos dust into atmosphere. Seal exposed surfaces of pipe and ends of insulation with slow drying sealer to seal in any residual fibres.

.8 Upon completion of Work shift, cover exposed ends of remaining pipe insulation with polyethylene taped in place.

.8 Work is subject to visual inspection and air monitoring. Contamination of surrounding areas indicated by visual inspection or air monitoring will require complete enclosure and clean-up of affected areas.

.9 Clean-up:

.1 Frequently during Work and immediately after completion of work, clean up dust and asbestos containing waste using HEPA vacuum or by damp mopping.

.2 Place dust and asbestos containing waste in sealed dust tight waste bags. Treat drop sheets and disposable protective clothing as asbestos waste and wet and fold to contain dust and then place in waste bags.

.3 Immediately before their removal from Asbestos Work Area and disposal, clean each filled waste bag using damp cloths or HEPA vacuum and place in second clean waste bag.

.4 Seal and remove double bagged waste from site. Dispose of in accordance with requirements of Provincial/Territorial and Federal authority having jurisdiction. Supervise dumping and ensure that dump operator is fully aware of hazardous nature of material to be dumped and that guidelines and regulations for asbestos disposal are followed.

.5 Perform final thorough clean-up of Asbestos Work Areas and adjacent areas affected by Work using HEPA vacuum.

3.3 AIR MONITORING

.1 From beginning of Work until completion of cleaning operations, Owner's Representative to take air samples on daily basis outside of Asbestos Work Area enclosures in accordance with Health Canada recommendations.

.1 Contractor will be responsible for monitoring inside enclosure in accordance with applicable Provincial/Territorial Occupational Health and Safety Regulations.

.2 Samples for analysis of asbestos content in air shall be collected in accordance with NIOSH (National Institute of Occupational Safety and Health) Method 7400 Asbestos and Other Fibers by PCM.

.3 With respect to clearance sampling, at least 2,400 litres of air shall be drawn through each sample filter.

.4 A preliminary electronic copy of clearance sampling results shall be sent to asbestos@mun.ca as soon as possible.

.2 If air monitoring shows that areas outside Asbestos Work Area enclosures are contaminated, enclose, maintain and clean these areas in same manner as that applicable to Asbestos Work Area.

.3 Ensure that respiratory safety factors are not exceeded.

.4 During the course of Work, Owner's Representative to measure fibre content of air outside Work areas by means of fibrous aerosol monitors (FAM).

.1 When FAM readings exceed 0.25 f/cc, adopt more stringent Work procedures immediately and perform PCM test.

.5 Stop Work when PCM measurements exceed 0.01 f/cc and correct procedures.

END OF SECTION .02

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

.1 Types of items described in this Section:
- .1 Concrete masonry units (CMUs) (Non-decorative type).
- .2 Decorative concrete masonry units.
- .3 Acoustical concrete masonry units.
- .4 Calcium silicate masonry units (CSUMs)
- .5 Mortar and grout.
- .6 Reinforcing steel.
- .7 Masonry joint reinforcement.
- .8 Ties and anchors.
- .9 Embedded flashing.
- .10 Miscellaneous masonry accessories.
- .11 Cavity-wall insulation.

.2 Similar types of items not described in this Section:
- .1 Concrete building brick.
- .2 Pre-faced concrete masonry units.
- .3 Concrete facing brick.
- .4 Face brick.
- .5 Building (common) brick.
- .6 Hollow brick.
- .7 Glazed brick.
- .8 Structural-clay facing tile.
- .9 Firebox brick.
- .10 Clay flue lining units.
- .11 Stone trim units.

.3 Other types of items not described in this Section:
- .1 Dovetail slots for masonry anchors.
- .2 Glass block.
- .3 Furnishing cast stone trim.
- .4 Installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
- .5 Furnishing steel lintels and shelf angles for unit masonry.
- .6 Water repellents applied to unit masonry.
- .7 Exposed sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.
- .8 Wall vents (brick vents).
- .9 Interior brick flooring.
- .10 Chemical-resistant, interior brick flooring.
- .11 Stone window stools.
- .12 Exterior unit masonry paving.
- .13 Dry-laid, concrete unit retaining walls.
- .14 Air barrier in exterior masonry wall assemblies.
- .15 Firestopping at openings in masonry walls.

.16 Fire-resistive joint systems at heads of masonry walls.
.17 Sealing control and expansion joints in unit masonry.

1.3 DEFINITIONS

.1 Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 SUBMITTALS

.1 Product Data: For each type of product indicated.
.1 Provide manufacturer's installation instructions for calcium silicate masonry units.

.2 Shop Drawings: For the following:
.1 Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
.2 Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Show elevations of reinforced walls.

.3 Samples for Verification: For each type and colour of the following:
.1 Decorative concrete masonry units.
.2 Calcium silicate masonry units.
.3 Pigmented and coloured-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project**.** Label Samples to indicate types and amounts of pigments used.
.4 Weep holes/vents.
.5 Accessories embedded in masonry.

.4 Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

.5 Sustainability Submittals: For those products and materials required to meet the regional materials requirement specified herein, indicate location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

1.5 QUALITY ASSURANCE

.1 Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and colour, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.

.2 Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including colour for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.

.3 Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per CAN/ULC-S101 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

.4 Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
.1 Build mockups for each type of exposed unit masonry construction in sizes approximately 1500 mm long by 1200 mm high by full thickness, including face and backup wythes and accessories.
.1 Include a sealant-filled joint at least 400 mm long in each exterior wall mockup.

.2 Include lower corner of window opening at upper corner of exterior wall mockup. Make opening approximately 300 mm wide by 400 mm high.
.3 Include through-wall flashing installed for a 600 mm length in corner of exterior wall mockup approximately 400 mm down from top of mockup; with a 300 mm length of flashing left exposed to view (omit masonry above half of flashing).
.4 Include studs, sheathing, veneer anchors, flashing, and weep holes in exterior masonry-veneer wall mockup.

.2 Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.
.3 Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
.4 Protect accepted mockups from the elements with weather-resistant membrane.
.5 Approval of mockups is for colour, texture, and blending of masonry units; relationship of mortar and sealant colours to masonry unit colours; tooling of joints; and aesthetic qualities of workmanship.
.1 Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Owner's Representative in writing.
.6 Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

.5 Reinforcing Steel:
.1 Upon request, provide Owner's Representative with certified copy of mill test report of reinforcement steel and connectors, showing physical and chemical analysis.
.2 Upon request inform Owner's Representative of proposed source of material to be supplied.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

.2 Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

.3 Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

.4 Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

.5 Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

.6 Ship reinforcement and connectors, clearly identified in accordance with drawings.

1.7 PROJECT CONDITIONS

.1 Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
.1 Extend cover a minimum of 600 mm down both sides and hold cover securely in place.
.2 Where 1 wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 600 mm down face next to unconstructed wythe and hold cover in place.

.2 Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

.3 Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
  .1 Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
  .2 Protect sills, ledges, and projections from mortar droppings.
  .3 Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
  .4 Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

.4 Cold weather requirements.
  .1 Supplement Clause 5.15.2 of CSA-A371 with following requirements.
    .1 Maintain temperature of mortar between 5 degrees C and 50 degrees C until batch is used or becomes stable.
    .2 Maintain ambient temperature between 5 degrees C and 50 degrees C and protect site from wind chill.
  .2 Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 4 deg C and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

.5 Hot weather requirements.
  .1 Protect freshly laid masonry from drying too rapidly, by means of waterproof, non-staining coverings.
  .2 Keep masonry dry using waterproof, non-staining coverings that extend over walls and down sides sufficient to protect walls from wind driven rain, until masonry work is completed and protected by flashings or other permanent construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

.1 In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  .1 Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

2.2 MASONRY UNITS, GENERAL

.1 Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not uses units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

2.3 CONCRETE MASONRY UNITS (CMUs)

.1 Regional Materials: Use only products that have been manufactured within 800 km of Project site from aggregates that have been extracted, harvested, or recovered, as well as manufactured, within 800 km of Project site, whenever these products are available.

.2 Shapes: Provide shapes indicated and as follows:
  .1 Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
  .2 Provide bullnose units for outside corners, unless otherwise indicated.

.3 Integral Water Repellent: Provide units made with integral water repellent where units could be exposed to the weather.
  .1 Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive according to ASTM E 514, with test period extended to 24 hours, show no visible water or leaks on the back of test specimen.
    .1 Available Products:
      .1 Addiment Incorporated; Block Plus W-10.
      .2 Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block.
      .3 Master Builders, Inc.; Rheopel.

.4 Concrete Masonry Units: CAN3-A165 Series (CAN3-A165.1).
  .1 Classification: H/ 15/ A/ M; unless otherwise noted.
  .2 Size: modular.

.5 Decorative Concrete masonry Units: CAN3-A165 Series (CAN3-A165.1).
  .1 Face: split face, split ribbed, single and triple scored face, and other features as indicated.
  .2 Classification: H/ 15/ A/ M; unless otherwise noted.
  .3 Size: modular.
  .4 Colour: As indicated.

.6 Acoustical Concrete masonry Units: CAN3-A165 Series (CAN3-A165.1) purpose made with slots to provide the acoustical characteristics specified.
  .1 Classification: H/15/B/M
  .2 Size: modular.
  .3 Configuration: block containing two slots with noncombustible fibrous filler elements.
  .4 Acoustical properties: Manufacturer’s standard, unless otherwise indicated.

2.4 CALCIUM SILICATE MASONRY UNITS (CSUM)

.1 Products: Subject to compliance with requirements, provide one of the following:
  .1 Arriscraft International Inc.; Renaissance Masonry Units; and
  .2 Approved alternate.

.2 Calcium Silicate Masonry Units: to CSA A82.3, Grade SW; solid units that have been pressure formed and autoclaved; having the following typical average properties when tested to the identified standard:
  .1 Compressive Strength: 45.5 MPa, to ASTM C170.
  .2 Absorption: 8.8 percent, to ASTM C97.
  .3 Density: 2070 kg/m3, to ASTM C97.
  .4 Modulus of Rupture: 5.3 MPa, to ASTM C99.

.3 Shapes, Sizes, Finishes, and Colours:
  .1 90 mm bed depth;
  .2 Modular sizes as indicated on drawings;
  .3 Special shapes as indicated.

.4 Finish: on exposed faces and ends:
  .1 Sandblasted finish, unless otherwise noted in the *Finishes Legends*;

.5 Colour: provide colour indicated in the *Finishes Legends*.

2.5 CONCRETE AND MASONRY LINTELS

.1 General: Provide either concrete or masonry lintels, at Contractor's option, complying with requirements below.

.2 Concrete Lintels: Precast or formed-in-place concrete lintels complying with requirements in Division 3 Section *Cast-in-Place Concrete*.

.3 Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam concrete masonry units with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.6 MORTAR AND GROUT MATERIALS

.1 Use same brands of materials and source of aggregate for entire project.

.2 Mortar: CSA A179; natural colour unless otherwise noted.

.3 Non-staining mortar: use non-staining masonry cement for cementitious portion of specified mortar type.

.4 Mortar Colouring: ground coloured natural aggregates or metallic oxide pigments.
.1 Colour: natural unless otherwise indicated in the *Finishes Legends*.

.5 Aggregate: aggregate passing 1.18 mm sieve, where 6 mm thick joints are indicated.

.6 Grout: to CSA A179, Table 3.

.7 Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
.1 Available Products:
.1 Addiment Incorporated; Mortar Kick.
.2 Euclid Chemical Company (The); Accelguard 80.
.3 Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Morset.
.4 Sonneborn, Div. of ChemRex; Trimix-NCA.

.8 Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.
.1 Available Products:
.1 Addiment Incorporated; Mortar Tite.
.2 Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.
.3 Master Builders, Inc.; Colour Cure Mortar Admix or Rheomix Rheopel.

.9 Water: Potable.

2.7 REINFORCEMENT

.1 Bar reinforcement: to CSA-A371 and CAN/CSA G30.18.
.1 Fabricate reinforcing in accordance with CAN/CSA-A23.1 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Ontario.

.2 Masonry Joint Reinforcement, General: CSA-A371 and CSA G30.14.
.1 Interior Walls: Mill- galvanized, carbon steel.

.2 Exterior Walls: Hot-dip galvanized carbon or stainless steel.
.3 Provide in lengths of not less than 3 m.

.3 Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

.4 Masonry Joint Reinforcement for Multiwythe Masonry:
.1 Ladder type with 1 side rod at each face shell of hollow masonry units more than 100 mm in width, plus 1 side rod at each wythe of masonry 100 mm or less in width.

2.8 TIES, ANCHORS, CONNECTORS

.1 Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with eight subparagraphs below, unless otherwise indicated.
.1 Mill-Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 641/A 641M, Class 1 coating.
.2 Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153/A 153M, Class B-2 coating.
.3 Stainless-Steel Wire: ASTM A 580/A 580M, Type 304 or 316.
.4 Galvanized Steel Sheet: ASTM A 653/A 653M, Commercial Steel, Z180 zinc coating.
.5 Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M.
.6 Stainless-Steel Sheet: ASTM A 666, Type 304 or 316.
.7 Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
.8 Stainless Steel bars: ASTM A 276 or ASTM a 666, Type 304.

.2 Connectors, General: to CSA-A370 and CSA-S304.

.3 Rigid Connectors: Fabricate from steel bars 38 mm wide by 6.4 mm thick by 600 mm long, with ends turned up 50 mm or with cross pins, unless otherwise indicated.
.1 Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.

.4 Partition Top Anchors: 2.5 mm thick metal plate with 10 mm diameter metal rod 150 mm long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube; unless otherwise indicated. Fabricate from steel, hot-dip galvanized after fabrication.

.5 Adjustable Masonry-Veneer Anchors
.1 General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:
.1 Structural Performance Characteristics: Capable of withstanding a 445-N load in both tension and compression without deforming or developing play in excess of 1.3 mm.
.2 Screw-Attached, Masonry-Veneer Anchors for Steel Stud Back-up: Units consisting of a wire tie and a metal anchor section; with insulation retainer.
.1 Fabricate sheet metal anchor sections and other sheet metal parts from 1.7 mm minimum thick, steel sheet, galvanized after fabrication.
.2 Wire Ties: Triangular-, rectangular-, or T-shaped wire ties fabricated from 4.8 mm minimum diameter, hot-dip galvanized steel or stainless-steel wire.
.3 Available Products:
.1 Blok-Lok BL607
.3 Embedded-Attached Masonry-Veneer Anchors for Unit Masonry Back-up: Units consisting of a wire tie and a metal anchor section, galvanized steel, with insulation retainer.
.1 Fabricate sheet metal anchor sections and other sheet metal parts from 1.7 mm thick, steel sheet, galvanized after fabrication.
.2 Fabricate wire connector sections from 4.8 mm diameter, hot-dip galvanized, and carbon -steel wire.

.3 Available Products:
.1 Blok-Lok BL507

.4 Polymer-Coated, Steel Drill Screws for Steel Studs: ASTM C 954 except manufactured with hex washer head and neoprene washer, 4.8 mm diameter by length required to penetrate steel stud flange with not less than 3 exposed threads, and with organic polymer coating with salt-spray resistance to red rust of more than 800 hours per ASTM B 117.
.1 Available Products:
.1 ITW Buildex; Teks Maxiseal with Climaseal finish.
.2 Textron Inc., Textron Fastening Systems; Elco Dril-Flex with Stalgard finish.

.5 Tie System for Concrete: stainless steel spiral bits, with insulation retainer Back-up
.1 Spira-Lok Helitical Wall Ties System; or equivalent.

2.9 MISCELLANEOUS ANCHORS

.1 Anchor Bolts: Headed or L-shaped steel bolts complying with ASTM F 568M, Property Class 4.6; with ASTM A 563M hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

.2 Postinstalled Anchors: Provide chemical or torque-controlled expansion anchors, with capability to sustain, without failure, a load equal to six times the load imposed when installed in solid or grouted unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
.1 Corrosion Protection for installations inside of the building envelope's vapour barrier: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (5 microns).
.2 Corrosion Protection for other locations: Stainless-steel components complying with ASTM F 738M and ASTM F 836M, Alloy Group 1 or 4 for bolts and nuts; ASTM A 666 or ASTM A 276, Type 304 or 316, for anchors.

2.10 EMBEDDED FLASHING MATERIALS

.1 Metal Flashing: Provide metal flashing, where flashing is exposed or partly exposed and where indicated, complying with Division 7 Section *Sheet Metal Flashing and Trim* and as follows:
.1 Metal Drip Edges: Fabricate from metal flashing. Extend at least 75 mm into wall and 13 mm out from wall, with outer edge bent down 30 degrees and hemmed.
.2 Metal Flashing Terminations: Fabricate from metal flashing. Extend at least 75 mm into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 19 mm and down into joint 10 mm to form a stop for retaining sealant backer rod.

.2 Flexible Flashing: For flashing not exposed to the exterior, use the following, unless otherwise indicated:
.1 Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 1.0 mm.

.3 Masonry Cavity Firestop: Firestop masonry cavities indicated by installing continuous sheet metal back-up to flexible flashing consisting of commercial quality sheet to ASTM A653-M96, with Z275 designation zinc coating, 0.38 mm minimum thickness. Overlap joins by 50 mm.
.1 Locations: Masonry cavities containing foam insulations.

.4 Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.11 MISCELLANEOUS MASONRY ACCESSORIES

.1 Compressible Filler: Premoulded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene, urethane, or PVC.

.2 Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

.3 Weep/Vent Products: Use one of the following, unless otherwise indicated:
- .1 Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 3 mm less than depth of outer wythe, in colour selected from manufacturer's standard.
- .2 Aluminium Weep Hole/Vent: One-piece, L-shaped units made from sheet aluminium, designed to fit into a head joint and consisting of a vertical channel with louvers stamped in web and with a top flap to keep mortar out of the head joint; painted before installation to comply with Division 9 painting Sections in colour approved by Owner's Representative to match that of mortar.
- .3 Vinyl Weep Hole/Vent: One-piece, offset, T-shaped units made from flexible, injection-moulded PVC, designed to fit into a head joint and consisting of a louvered vertical leg, flexible wings to seal against ends of masonry units, and a top flap to keep mortar out of the head joint; in colour approved by Owner's Representative to match that of mortar.

.4 Cavity Drainage Material: choice of
- .1 Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
- .2 6 mm washed pea gravel, free of fines.

2.12 CAVITY-WALL INSULATION

.1 Polyisocyanurate Board Insulation: ASTM C 1289, Type I (aluminium-foil-faced), Class 2 (glass-fibre-reinforced).

.2 Adhesive: Type recommended by insulation board manufacturer for application indicated.

2.13 MASONRY CLEANERS

.1 Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discolouring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

2.14 MORTAR AND GROUT MIXES

.1 General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
- .1 Do not use calcium chloride in mortar or grout.
- .2 Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar colour is consistent.

.2 Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

.3 Mortar for Unit Masonry: Comply with CSA 179 Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.
- .1 For reinforced masonry, use Type S.

.2 For exterior, above-grade, load-bearing and non-load-bearing walls, and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.

.4 Pigmented Mortar: Use coloured cement product.
.1 Pigments shall not exceed 10 percent of Portland cement by weight.

.5 Coloured-Aggregate Mortar: Produce required mortar colour by using coloured aggregates and natural colour or white cement as necessary to produce required mortar colour.

.6 Pointing Mortar: 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 ball. Allow to stand for not less than 1 hour and not more than 2 hours then remix with sufficient water to produce mortar of proper consistency for pointing.

.7 Mortar for Calcium Silicate Masonry Units: to CSA A179, Proportion specification, 1 part Portland cement, 1 part hydrated lime, 6 parts mortar aggregate by volume for both cementitious materials and aggregate; integral colour as selected by Owner's Representative.

.8 Grout for Unit Masonry: to CSA A179, Table 3.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
.1 For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
.2 Verify that reinforcing dowels are properly placed.

.2 Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

.3 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

.1 Do masonry work in accordance with CSA-A371 except where specified otherwise.

.2 Calcium silicate masonry units: install in accordance with manufacturer’s installation instructions including requirement to dampen units when necessary to ensure an adequate bond.

.3 Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

.4 Build chases and recesses to accommodate items specified in this and other Sections.

.5 Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

.6 Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

.7 Select and arrange units for exposed unit masonry to produce a uniform blend of colours and textures.
- .1 Mix units from several pallets or cubes as they are placed.

.8 Matching Existing Masonry: Match coursing, bonding, colour, and texture of existing masonry.

.9 Comply with construction tolerances in notes to Clause 5.3 of CSA-A371 and with the following:
- .1 For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 3 mm in 3 m, 6 mm in 6 m, or 12 mm maximum.
- .2 For vertical alignment of exposed head joints, do not vary from plumb by more than 6 mm in 3 m, or 12 mm maximum.
- .3 For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 3 mm in 3 m, 6 mm in 6 m, or 12 mm maximum.
- .4 For exposed bed joints, do not vary from thickness indicated by more than plus or minus 3 mm, with a maximum thickness limited to 12 mm. Do not vary from bed-joint thickness of adjacent courses by more than 3 mm.
- .5 For exposed head joints, do not vary from thickness indicated by more than plus or minus 3 mm. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 3 mm.
- .6 For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1.5 mm except due to warpage of masonry units within tolerances specified for warpage of units.
- .7 For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1.5 mm from one masonry unit to the next.

3.3 LAYING MASONRY WALLS

.1 Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

.2 Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 100 mm horizontal face dimensions at corners or jambs.

.3 Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 100 mm. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 100 mm horizontal face dimensions at corners or jambs.

.4 Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

.5 Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

.6 Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.

.7 Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

.8 Fill cores in hollow concrete masonry units with grout 600 mm under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

.9 Supply and install Partition Top Anchors and lateral support and anchorage where masonry walls terminate at the underside of the structure in accordance with CSA-S304.1 spaced at 1200 mm maximum, and as indicated.

.10 Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.
- .1 Install compressible filler in joint between top of partition and underside of structure above.
- .2 At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 7 Section "*Fire Stop Systems*."

3.4 MORTAR BEDDING AND JOINTING

.1 Lay hollow concrete masonry units as follows:
- .1 With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
- .2 With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
- .3 With webs fully bedded in mortar in grouted masonry, including starting course on footings.
- .4 With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

.2 Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

.3 Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

.4 Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

3.5 MASONRY JOINT REINFORCEMENT

.1 General: Supply and install masonry reinforcement in accordance with CSA-A370, CSA-A371, and CSA-S304.1 unless indicated otherwise.

.2 Notify Owner's Representative 48 hours before concealing reinforcement and connectors with the placement of concrete, mortar, or grout.

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

.4 General: Install entire length of longitudinal side rods in mortar with a minimum cover of 16 mm on exterior side of walls, 13 mm elsewhere. Lap reinforcement a minimum of 150 mm.
- .1 Space reinforcement not more than 400 mm o.c.
- .2 Space reinforcement not more than 200 mm o.c. in foundation walls and parapet walls.
- .3 Provide reinforcement not more than 200 mm above and below wall openings and extending 300 mm beyond openings.
  - .1 Reinforcement above is in addition to continuous reinforcement.

.5 Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

.6 Provide continuity at wall intersections by using prefabricated T-shaped units.

.7 Provide continuity at corners by using prefabricated L-shaped units.

.8 Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.6 ANCHORING MASONRY TO STRUCTURAL MEMBERS

.1 General: Supply and install masonry connectors in accordance with CSA-A370, CSA-A371, CAN/CSA-A23.1, and CSA-S304.1 unless indicated otherwise.

.2 Notify Owner's Representative 48 hours before concealing reinforcement and connectors with the placement of concrete, mortar, or grout.

.3 Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:
- .1 Provide an open space not less than 13 mm in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar and other rigid materials.
- .2 Anchor masonry to structural members with connectors embedded in masonry joints and attached to structure.
- .3 Space connectors as indicated, but not more than 600 mm o.c. vertically and 900 mm o.c. horizontally.

3.7 CAVITY WALL INSULATION

.1 Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 300 mm o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.
- .1 Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.8 ANCHORING MASONRY VENEERS

.1 Tie masonry veneer to backing in accordance with NBC, CSA-S304.1, and CSA-A371, and as indicated.

.2 Anchor masonry veneers to wall framing and concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:
- .1 Fasten connector through sheathing to wall framing and to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
- .2 Embed connector sections and continuous wire in masonry joints.
- .3 Locate anchor sections to allow maximum vertical differential movement of ties up and down.
- .4 Space connectors as indicated, but not more than 600 mm o.c. vertically and 800 mm o.c. horizontally. Install additional anchors within 300 mm of openings and at intervals, not exceeding 200 mm, around perimeter.

3.9 CONTROL AND EXPANSION JOINTS

.1 General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

.2 Form control joints in concrete masonry using one of the following methods:

.1 Fit bond-breaker strips into hollow contour in ends of concrete masonry units on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
.2 Install preformed control-joint gaskets designed to fit standard sash block.
.3 Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
.4 Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.

.3 Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 7 Section *Joint Sealants*, but not less than 10 mm.
.1 Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.10 LINTELS

.1 Install steel lintels where indicated.

.2 Provide concrete or masonry lintels where shown and where openings of more than 300 mm for brick-size units and 600 mm for block-size units are shown without structural steel or other supporting lintels.

.3 Provide minimum bearing of 200 mm at each jamb, unless otherwise indicated.

.4 Reinforce masonry lintels and bond beams as indicated.

.5 Place and grout reinforcement in accordance with CSA-S304.1, CSA-A371, and CSA-A179.

3.11 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

.1 General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.

.2 Install flashing as follows, unless otherwise indicated:
.1 Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
.2 At multi-wythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 200 mm, and 38 mm into the inner wythe.
.3 At masonry-veneer walls, extend flashing through veneer, across air space behind veneer, and up face of sheathing at least 200 mm; with upper edge tucked under building paper or building wrap, lapping at least 100 mm.
.4 At lintels and shelf angles, extend flashing a minimum of 150 mm into masonry at each end. At heads and sills, extend flashing 150 mm at ends and turn up not less than 50 mm to form end dams.
.5 Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 13 mm back from outside face of wall and adhere flexible flashing to top of metal drip edge.

.3 Masonry Cavity Firestop: Locate sheet metal firestop immediately underneath the Masonry Cavity Flashing. Extend sheet metal firestop 50 mm under veneer, across air space behind veneer and up face of sheathing at least 50 mm and mechanically secure to back-up at 600 mm o.c., lapping at least 100 mm.

.4 Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:
- .1 Use specified weep/vent products to form weep holes.
- .2 Space weep holes 600 mm o.c., unless otherwise indicated.

.5 Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in Part 2 *Miscellaneous Masonry Accessories* Article.
- .1 Place pea gravel in cavities as soon as practical to a height equal to height of first course above top of flashing, but not less than 50 mm , to maintain drainage.

.6 Install vents in head joints in exterior wythes of first course of masonry immediately below embedded flashing and as follows.
- .1 Space vents 600 mm o.c., unless otherwise indicated.
- .2 Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.12 REINFORCED UNIT MASONRY INSTALLATION

.1 Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
- .1 Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
- .2 Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

.2 Supply and install masonry reinforcement in accordance with CSA-A370, CSA-A371, and CSA-S304.1 unless indicated otherwise.
- .1 Fabricate reinforcing in accordance with CAN/CSA-A23.1 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Ontario.
- .2 Do not field bend reinforcement and connectors except where indicated or authorized by Owner's Representative.
- .3 When field bending is authorized, bend without heat, applying a slow and steady pressure.
- .4 Replace bars and connectors which develop cracks or splits.
- .5 Insure reinforcement is not continuous across movement joints unless otherwise indicated.

.3 Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
- .1 Do grout work in accordance with CSA A179 except where specified otherwise.
- .2 Limit height of vertical grout pours to not more than 1520 mm.
- .3 Notify Owner's Representative 48 hours before concealing reinforcement and connectors with the placement of concrete, mortar, or grout.

3.13 FIELD QUALITY CONTROL

.1 Inspectors: Owner may engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.

.2 Take representative samples of mortar for testing consistency of strength and colour according to CSA A179.

3.14 REPAIRING, POINTING, AND CLEANING

.1 Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

.2 Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

.3 In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

.4 Final Cleaning - General: After mortar is thoroughly set and cured, clean exposed masonry as follows:
- .1 Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
- .2 Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Owner's Representative‘s approval of sample cleaning before proceeding with cleaning of masonry.
- .3 Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
- .4 Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
- .5 Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
- .6 Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

.5 Final Cleaning - CSUM: Clean a 10 sq. m. area of wall designated by Owner's Representative as directed below and leave for one week. If no harmful effects appear and after mortar has set and cured, clean masonry as follows:
- .1 Protect windows, sills, doors, trim, and other work from damage.
- .2 Remove large particles with stiff fibre brushes or wood paddles without damaging surface. Saturate masonry with clean water and flush off loose mortar and dirt.
- .3 Scrub with solution of 25 ml trisodium phosphate and 25 ml household detergent dissolved in 1 L of clean water using stiff fibre brushes, then clean off immediately with clean water using hose.
- .4 Repeat cleaning process as often as necessary to remove mortar and other stains.

.6 Use alternative cleaning solutions and methods for difficult to clean masonry only after consultation with masonry unit manufacturer.

3.15 MASONRY WASTE DISPOSAL

.1 Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

.2 Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
- .1 Crush masonry waste to less than 100 mm in each dimension.
- .2 Mix masonry waste with at least two parts of specified fill material for each part of masonry waste.
- .3 Do not dispose of masonry waste as fill within 450 mm of finished grade.

.3 Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

.1 Types of items described in this Section:
- .1 Framing with dimension lumber.
- .2 Framing with engineered wood products.
- .3 Rooftop equipment bases and support curbs.
- .4 Wood blocking, cants, and nailers.
- .5 Wood furring.
- .6 Wood sleepers.
- .7 Backing panels for electrical equipment.

.2 Types of items you will not find described in this Section:
- .1 Interior wood stairs intended to be covered with tread and riser covers, excluding landings.
- .2 Elevated exterior decks including wood decking, stairs, guards, and support framing.
- .3 Utility shelving.
- .4 Heavy timber construction.
- .5 Sheathing, including wall, floor, and roof sheathing and plywood floor underlayment.
- .6 Building wrap.
- .7 Shop-fabricated wood trusses.

1.3 DEFINITIONS

.1 Exposed Framing: Framing not concealed by other construction.

.2 Dimension Lumber: Lumber of 38 mm actual or greater but less than 114 mm actual in least dimension.

.3 Lumber grading agencies, and the abbreviations used to reference them, include the following:
- .1 NLGA: National Lumber Grades Authority.

1.4 SUBMITTALS

.1 Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

.2 Sustainability Submittal:
- .1 Provide chain-of-custody certificates certifying that wood products comply with forest certification requirements. Include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.

1.5 QUALITY ASSURANCE

.1 Source Limitations for Engineered Wood Products: Obtain each type of engineered wood product through one source from a single manufacturer.

.2 Forest Certification: Provide lumber obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, *FSC Principles and Criteria for Forest Stewardship*.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

.1 Lumber: Lumber: unless specified otherwise, softwood, moisture content 19% (S-dry) or less.
  .1 In accordance with:
    .1 CAN/CSA-O141.
    .2 NLGA Standard Grading Rules for Canadian Lumber.
  .2 Factory mark each piece of lumber with grade stamp of grading agency.
  .3 For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
  .4 Provide dressed lumber, S4S, unless otherwise indicated.
  .5 Forestry Stewardship Council (FSC) certified.

.2 Engineered Wood Products:
  .1 Glulam in accordance with Structural Glued-Laminated Timber CAN/CSA-O122.
  .2 Wood I-joists in accordance with Prefabricated Wood I-Joists ASTM D 5055.
  .3 Structural Composite Lumber (SCL) in accordance with ASTM D 5456.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

.1 Preservative Treatment by Pressure Process: to CSA O80 Series 2, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated with inorganic boron (SBX).
  .1 Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
  .2 For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colourants, bleed through, or otherwise adversely affect finishes.

.2 Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

.3 Mark lumber with treatment quality mark of an inspection agency approved by the Canadian Lumber Standards Accreditation Board.
  .1 For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.

.4 Application: Treat items indicated on Drawings, and the following, unless otherwise noted.
  .1 Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapour barriers, and waterproofing.
  .2 Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete.
  .3 Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
  .4 Wood framing members that are less than 460 mm above the ground in crawlspaces or unexcavated areas.
  .5 Wood floor plates that are installed over concrete slabs-on-grade.

.5 Surface treat wood materials with wood preservative and not pressure treated when wood materials are in direct contact with modified bituminous roofing membranes.

2.3 DIMENSION LUMBER FRAMING

.1 Maximum Moisture Content: 19 percent.

.2 Non-Load-Bearing Interior Partitions: No. 2 grade and the following species:
.1 Spruce-pine-fir; NLGA.

.3 Framing Other Than Non-Load-Bearing Interior Partitions: No. 2 grade and the following species:
.1 Spruce-pine-fir; NLGA.

.4 Ceiling Joists (Non-Load-Bearing): Construction or No. 2 grade and the following species:
.1 Spruce-pine-fir; NLGA.

.5 Joists, Rafters, and other framing not listed above: No. 1 or No. 2 grade and the following species:
.1 Spruce-pine-fir; NLGA.

.6 Exposed Framing Indicated to Receive a Stained or Natural Finish: Provide material hand-selected for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain, and wane.
.1 Species and Grade: Spruce-pine-fir, No. 1 grade; NLGA.

2.4 ENGINEERED WOOD PRODUCTS

.1 Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, to Structural Glued-Laminated Timber CAN/CSA-O122 and manufactured with an exterior-type adhesive containing no urea formaldehyde.

.2 Parallel-Strand Lumber: Structural composite lumber made from wood strand elements with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive and containing no urea formaldehyde.

.3 Wood I-Joists: Prefabricated units, I-shaped in cross section, made with solid or structural composite lumber flanges and wood-based structural panel webs, let into and bonded to flanges. Provide units complying with material requirements of and with structural capacities established and monitored according to ASTM D 5055.
.1 Provide I-joists manufactured without urea formaldehyde.
.2 Structural Properties: Provide units with depths and design values not less than those indicated.

.4 Rim Boards: Product designed to be used as a load-bearing member and to brace wood I-joists at bearing ends, complying with research/evaluation report for I-joists.
.1 Manufacturer: Provide products by same manufacturer as I-joists.
.2 Material: All-veneer product glued-laminated wood or product made from any combination solid lumber, wood strands, and veneers. Provide rim boards made without urea formaldehyde.
.3 Thickness: 32 mm, unless otherwise noted.

2.5 MISCELLANEOUS LUMBER

.1 General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

.1 Blocking.
.2 Nailers.
.3 Rooftop equipment bases and support curbs.
.4 Cants.
.5 Furring.

.2 For items of dimension lumber size, provide Standard grade lumber with 19 percent maximum moisture content and the following species:
.1 Spruce-pine-fir; NLGA.

.3 For exposed boards, provide lumber with 19 percent maximum moisture content and the following species and grades:
.1 Spruce-pine-fir, No. 1 Common grade, NLGA.

.4 For concealed boards, provide lumber with 19 percent maximum moisture content and the following species and grades:
.1 Spruce -pine-fir, Standard grade, NLGA.

.5 For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

.6 For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

.7 For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.6 BACKING PANELS FOR ELECTRICAL EQUIPMENT

.1 Telephone and Electrical Equipment Backing Panels: G1S plywood to CSA O151, fire-retardant treated in other than wood structured buildings, in thickness indicated or, if not indicated, not less than 18.5 mm thickness.

2.7 FASTENERS

.1 General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
.1 Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M or of Type 304 stainless steel.
.1 Do not use electro-plated galvanized fasteners.

.2 Nails, Brads, and Staples: CSA B111.

.3 Power-Driven Fasteners: NES NER-272.

.4 Wood Screws: ASME B18.6.1.

.5 Lag Bolts: ASME B18.2.3.8M.

.6 Bolts: Steel bolts complying with ASTM F 568M, Property Class 4.6; with ASTM A 563M hex nuts and, where indicated, flat washers.

.1 Anchor bolts: 12.5 mm diameter x 250 mm long.

.7 Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
.1 Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2.8 METAL FRAMING ANCHORS

.1 Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, Z180 coating designation, unless otherwise noted.
.1 Provide anchors with Z550 coating when in contact with wood treated with preservative.

.2 Joist Hangers: U-shaped joist hangers with 50 mm long seat and 32 mm wide nailing flanges at least 85 percent of joist depth.
.1 Thickness: as required but not less than 1.3 mm.

.3 I-Joist Hangers: U-shaped joist hangers with 50 mm long seat and 32 mm wide nailing flanges full depth of joist. Nailing flanges provide lateral support at joist top chord.
.1 Thickness: as required but not less than 1.3 mm.

.4 Top Flange Hangers: U-shaped joist hangers, full depth of joist, formed from metal strap with tabs bent to extend over and be fastened to supporting member.
.1 Thickness: as required but not less than 1.3 mm.

.5 Post Bases: Adjustable-socket type for bolting in place with standoff plate to raise post 25 mm above base and with 50 mm minimum side cover, socket 1.6 mm thick, and standoff and adjustment plates 2.8 mm thick.

.6 Joist Ties: Flat straps, with holes for fasteners, for tying joists together over supports.
.1 Width: 32 mm.
.2 Thickness: 1.3 mm.
.3 Length: 600 mm.

.7 Rafter Tie-Downs: Bent strap tie for fastening rafters or roof trusses to wall studs below, 38 mm wide by 1.3 mm thick.

2.9 MISCELLANEOUS MATERIALS

.1 Sill-Sealer Gaskets: Closed-cell neoprene foam, 6.4 mm thick, selected from manufacturer's standard widths to suit width of sill members indicated.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

.1 Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.

.2 Framing Standard: Comply with more stringent of *NBCC 2005 Part 9* and these specifications.

.3 Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

.4 Metal Framing Anchors: Install metal framing to comply with manufacturer's written instructions.

.5 Do not splice structural members between supports, unless otherwise indicated.

.6 Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

.7 Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Use longest practical lengths.

.8 Comply with manufacturer's instructions for applying field treatment to cut surfaces of preservative-treated lumber.
- .1 Use inorganic boron for items that are continuously protected from liquid water.
- .2 Use copper naphthenate for items not continuously protected from liquid water.

.9 Securely attach rough carpentry work to substrate by anchoring and fastening.

.10 Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.

.11 For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
- .1 Use finishing nails, unless otherwise indicated. Countersink nail heads and fill holes with wood filler.

3.2 ANCHOR BOLT AND SILL PLATE INSTALLATION

.1 Construct sill plates from wood treated with preservative.

.2 Anchor sill plates to concrete and masonry foundation using anchor bolts embedded into foundation.
- .1 Insure each individual sill plate segment is secured to concrete and masonry foundations with a minimum of two anchor bolts spaced not more than 1800 mm, within 300 mm of each end, and embedded into the foundation a minimum of 100 mm..
- .2 Provide full contact between sill plate and foundation. Fill any voids between the sill plate and concrete and masonry foundations with full bed of non-shrink structural grout.
- .3 Grind level any concrete and masonry imperfections preventing the level installation of the sill plate.

.3 Provide continuous sill-sealer gaskets between sill plates and concrete and masonry construction.

3.3 WOOD SLEEPER, BLOCKING, AND NAILER INSTALLATION

.1 Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved. Blocking for the following items includes, but is not limited to:
- .1 Handrails.
- .2 Grab bars.
- .3 Cabinetry.
- .4 Stair stringers.

.5 Wood panelling.
.6 M&E supports.

.2 Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

3.4 WOOD FURRING INSTALLATION

.1 Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

3.5 WALL AND PARTITION FRAMING INSTALLATION

.1 General: Provide single bottom plate and double top plates using members of 38 mm actual thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions. Fasten plates to supporting construction, unless otherwise indicated.
.1 For exterior walls, provide 38-by-140 mm actual size wood studs spaced 610 mm o.c., unless otherwise indicated.
.2 For interior partitions and walls, provide 38-by-89 mm actual size wood studs spaced 406 mm o.c., unless otherwise indicated.
.3 Provide continuous horizontal blocking at mid-height of partitions, using members of 38 mm actual thickness and of same width as wall or partitions.

.2 Construct corners and intersections with three or more studs.

.3 Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.
.1 For non-load-bearing partitions, provide double-jamb studs and headers not less than 89 mm actual depth for openings 1200 mm and less in width, 140 mm actual depth for openings 1200 to 1800 mm in width, 184 mm actual depth for openings 1800 to 3000 mm in width, and not less than 235 mm actual depth for openings 3 to 3.6 m in width.
.2 For load-bearing walls, provide double-jamb studs for openings 1500 mm and less in width, and triple-jamb studs for wider openings. Provide headers of depth indicated or, if not indicated, according to NBCC 2005 Part 9.

.4 Provide diagonal bracing in exterior walls, at both walls of each external corner and walls, at locations indicated, at 45-degree angle, full-story height, unless otherwise indicated. Use 19-by-89 mm actual- size boards, let-in flush with faces of studs.

3.6 FLOOR JOIST FRAMING INSTALLATION

.1 General: Install floor joists with crown edge up and support ends of each member with not less than 38 mm of bearing on wood or metal, or 76 mm on masonry. Attach floor joists as follows:
.1 Where supported on wood members, by toe nailing or by using metal framing anchors.
.2 Where framed into wood supporting members, by using wood ledgers as indicated or, if not indicated, by using metal joist hangers.

.2 Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 1200 mm.

.3 Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than 1/3 depth of joist; do not locate closer than 50 mm from top or bottom.

.4 Provide solid blocking of 38 mm actual thickness by depth of joist at ends of joists unless nailed to header or band.

.5 Lap members framing from opposite sides of beams, girders, or partitions not less than 102 mm or securely tie opposing members together. Provide solid blocking of 38 mm actual thickness by depth of joist over supports.

.6 Anchor members paralleling masonry with 6.4-by-32 mm metal strap anchors spaced not more than 2438 mm o.c., extending over and fastening to 3 joists. Embed anchors at least 102 mm into grouted masonry with ends bent at right angles and extending 102 mm beyond bend.

.7 Provide solid blocking between joists under jamb studs for openings.

.8 Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.
.1 Provide triple joists separated as above, under partitions receiving ceramic tile and similar heavy finishes or fixtures.

.9 Provide bridging of type indicated below, at intervals of 2438 mm o.c., between joists.
.1 Diagonal wood bridging formed from bevel-cut, 19-by-64 mm actual- size lumber, double-crossed and nailed at both ends to joists.

3.7 CEILING JOIST AND RAFTER FRAMING INSTALLATION

.1 Ceiling Joists: Install ceiling joists with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.
.1 Where ceiling joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail to ends of rafters and to top plate and nail to first joist or anchor with framing anchors or metal straps. Provide 19-by-184 mm actual- size or 38-by-89 mm actual- size stringers spaced 1200 mm o.c. crosswise over main ceiling joists.

.2 Rafters: Notch to fit exterior wall plates and toe nail or use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.
.1 At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and 50 mm deeper. Bevel ends of jack rafters for full bearing against valley rafters.
.2 At hips, provide hip rafter of size indicated or, if not indicated, of same thickness as regular rafters and 50 mm deeper. Bevel ends of jack rafters for full bearing against hip rafter.

.3 Provide collar beams (ties) as indicated or, if not indicated, provide 19-by-140 mm actual size boards between every third pair of rafters, but not more than 1219 mm o.c. Locate below ridge member, at third point of rafter span. Cut ends to fit roof slope and nail to rafters.

.4 Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions, if any.

3.8 PROTECTION

.1 Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply borate treatment. Apply borate solution by spraying

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

.1 Types of items described in this Section:
- .1 Wall sheathing: plywood, gypsum board, and board types.
- .2 Roof sheathing: plywood and board types.
- .3 Subflooring: plywood and board types.
- .4 Underlayment: plywood and board types.
- .5 Building wrap.
- .6 Sheathing joint-and-penetration treatment.
- .7 Flexible flashing at openings in sheathing.

.2 Types of items you will not find described in this Section:
- .1 Backing panels for electrical equipment.

1.3 SUBMITTALS

.1 Product Data: For building wrap, flexible flashings, and joint-and-penetration treatment. Include manufacturer's installation instructions.

.2 Sustainability Submittals:
- .1 For adhesives, including printed statement of VOC content.
- .2 For composite-wood products, documentation indicating that product contains no urea formaldehyde.
- .3 Chain-of-custody certificates certifying that products specified to be made from certified wood comply with forest certification requirements. Include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.

1.4 QUALITY ASSURANCE

.1 Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance by a testing and inspecting agency acceptable to authorities having jurisdiction.

.2 Source Limitations: Obtain building wrap and flexible flashing material from single source.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Stack plywood and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

.1 Lumber: unless specified otherwise, softwood, S4S, moisture content 19% (S-dry) or less in accordance with following standards:
  .1 CAN/CSA-O141.
  .2 NLGA Standard Grading Rules for Canadian Lumber.
  .3 Provide dressed lumber, S4S, unless otherwise indicated.

2.2 WOOD PANEL PRODUCTS, GENERAL

.1 Plywood panels: to CAN/CSA-O325.0.

.2 Douglas fir plywood (DFP): to CSA O121, standard construction.

.3 Canadian softwood plywood (CSP): to CSA O151, standard construction.

.4 Poplar plywood (PP): to CSA O153, standard construction.

.5 Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

.6 Factory mark panels to indicate compliance with applicable standard.

2.3 PRESERVATIVE-TREATED LUMBER AND PLYWOOD

.1 Preservative Treatment by Pressure Process: to CSA O80 Series.
  .1 Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

.2 Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

.3 Application: Treat items specifically indicated on drawings as pressure treated and lumber and plywood in contact with masonry or concrete.

2.4 WALL SHEATHING

.1 Plywood Wall Sheathing: DFP or CSP sheathing grade or PP standard sheathing grade, T&G edge.
  .1 Locations: Over wood framing, unless otherwise noted.

.2 Board Sheathing: NLGA Number 4 common grade or better, 19 mm thick.
  .1 Location: Only where specified on drawings.

.3 Glass-Mat Gypsum Wall Sheathing: ASTM C 1177/1177M.
  .1 Locations: Over steel stud framing and where specifically indicated on drawings.

2.5 ROOF SHEATHING

.1 Plywood Roof Sheathing: Plywood, DFP or CSP sheathing grade or PP standard sheathing grade, T&G edge.
  .1 Locations: Typical, unless otherwise indicated.

.2 Board Sheathing: NLGA Number 3 common grade or better, 19 mm thick.
  .1 Location: Only where specified on drawings.

2.6 SUBFLOORING AND UNDERLAYMENT

.1 Plywood Subflooring: Plywood, DFP or CSP sheathing grade or PP standard sheathing grade, T&G edge.
.1 Locations: Typical, unless otherwise indicated.

.2 Board Sub-Floor: NLGA Number 3 common grade or better, 19 mm thick.
.1 Location: Only where specified on drawings.

.3 Underlayment, General: Provide underlayment in nominal thicknesses indicated or, if not indicated, not less than 6.4 mm over smooth subfloors and not less than 9.5 mm over board or uneven subfloors.

.4 Plywood Underlayment: Plywood, DFP or CSP grade, or PP grade, square edge.
.1 Locations: Typical, unless otherwise indicated.

.5 Board Underlayment: NLGA Number 2 grade or better, 19 mm thick.
.1 Location: When specified on drawings.

2.7 FASTENERS

.1 General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
.1 For roof and wall sheathing and wood treated with preservative, provide fasteners with hot-dip zinc coating complying with A CAN/CSA-G164 or Type 304 stainless steel.

.2 Nails, Brads, and Staples: to CSA B111.

.3 Power-Driven Fasteners: NES NER-272.

.4 Wood Screws: ASME B18.6.1.

.5 Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
.1 For wall and roof sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

.6 Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
.1 For steel framing from 0.84 to 2.84 mm thick, attach sheathing to comply with ASTM C 954.

2.8 WEATHER-RESISTANT SHEATHING PAPER

.1 Building Wrap: spunbonded olefin type to CAN/CGSB-51.32.
.1 Air leakage rate at 75 Pa air pressure not greater than 0.02 L/s/m2.
.2 Water vapour transmission of greater than 1100 Ng/Pa.s.m2.
.3 Water penetration resistance of 200 cm minimum in accordance with AATCC-127.
.4 Allowable UV Exposure Time: Not less than three months.

.2 Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

2.9 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

.1 Sealant for Glass-Mat Gypsum Sheathing Board: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing, and recommended by tape and sheathing manufacturers for use with glass-fibre sheathing tape and for covering exposed fasteners.

.2 Sheathing Tape for Glass-Mat Gypsum Sheathing Board: Self-adhering glass-fibre tape, minimum 50 mm wide, 390 by 390 or 390 by 780 threads/m , of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing board and with a history of successful in-service use.

2.10 MISCELLANEOUS MATERIALS

.1 Adhesives for Field Gluing Panels to Framing: Formulation complying with CGSB-71.26, cartridge-loaded, that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.
.1 Use adhesives that have a VOC content of 70g/L or less.

.2 Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.6 mm.

.3 Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.

.4 Floor Underlayment Paper: purpose made heavy-weight underlayment flooring paper made from 100% recycled paper products.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

.1 Comply with requirements of NBC 1995 Part 9 supplemented by following paragraphs.

.2 Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

.3 Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.

.4 Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

.5 Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

.6 Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

.7 Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

.8 Install underlayment floor paper over top of subfloor when either or both the subfloor and the underlayment consist of board lumber.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

.1 Fastening Methods: Fasten panels as indicated below:
  .1 Subflooring:
    .1 Glue and nail to wood framing.
    .2 Screw to cold-formed metal framing.
    .3 Space panels 3 mm apart at edges and ends.
    .4 Install board type sub-flooring at 45 degrees to floor framing.
  .2 Wall and Roof Sheathing:
    .1 Nail to wood framing.
    .2 Screw to cold-formed metal framing.
    .3 Space panels 3 mm apart at edges and ends.
  .3 Underlayment:
    .1 Nail to subflooring.
    .2 Space panels 0.8 mm apart at edges and ends.
    .3 Install board-type underlayment perpendicular to the subfloor.
    .4 Fill and sand edge joints of underlayment receiving resilient flooring right before installing flooring.

3.3 GYPSUM SHEATHING INSTALLATION

.1 Comply with GA-253 and with manufacturer's written instructions.
  .1 Fasten gypsum sheathing to wood framing with screws.
  .2 Fasten gypsum sheathing to cold-formed metal framing with screws.
  .3 Install boards with a 9.5-mm gap where non-load-bearing construction abuts structural elements.
  .4 Install boards with a 6.4-mm gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

.2 Apply fasteners so heads bear tightly against face of sheathing boards but do not cut into facing.

.3 Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each steel stud.
  .1 Space fasteners approximately 200 mm o.c. and set back a minimum of 9.5 mm from edges and ends of boards.
  .2 For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

.4 Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.
  .1 Space fasteners approximately 200 mm o.c. and set back a minimum of 9.5 mm from edges and ends of boards.
  .2 For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

3.4 WEATHER-RESISTANT SHEATHING-PAPER INSTALLATION

.1 General: Cover sheathing with weather-resistant sheathing paper as follows:

.1 Cut back barrier 13 mm on each side of the break in supporting members at expansion- or control-joint locations.
.2 Apply barrier to cover vertical flashing with a minimum 100 mm overlap, unless otherwise indicated.

.2 Building Wrap: Comply with manufacturer's written instructions.
.1 Seal seams, edges, fasteners, and penetrations with tape.
.2 Extend into jambs of openings and seal corners with tape.

3.5 SHEATHING JOINT-AND-PENETRATION TREATMENT

.1 Seal gypsum board sheathing joints according to sheathing manufacturer's written instructions, except when adhered membrane is scheduled for application directly over top of panel.
.1 Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient quantity of sealant to completely cover joints and fasteners after towelling. Seal other penetrations and openings.

3.6 FLEXIBLE FLASHING INSTALLATION

.1 Apply flexible flashing at all framed openings and where indicated to comply with manufacturers written instructions.
.1 Prime substrates as recommended by flashing manufacturer.
.2 Lap seams and junctures with other materials at least 100 mm, except that at flashing flanges of other construction, laps need not exceed flange width.
.3 Lap flashing over weather-resistant building paper at bottom and sides of openings.
.4 Lap weather-resistant building paper over flashing at heads of openings.
.5 After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

.1 Types of items described in this Section:
- .1 Roof tear-off.
- .2 Removal of base flashings.

.2 Types of items not described in this Section:
- .1 Use of the premises and phasing requirements.
- .2 Temporary construction and environmental-protection measures for reroofing preparation.
- .3 HVAC equipment removal and reinstallation.
- .4 Electrical equipment disconnection and reconnection.

1.3 MATERIALS OWNERSHIP

.1 Except for items or materials indicated to be reused, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.

1.4 DEFINITIONS

.1 Roofing Terminology: Refer to ASTM D 1079 and glossary in NRCA's "*The NRCA Roofing and Waterproofing Manual*" for definition of terms related to roofing work in this Section.

.2 Existing Membrane Roofing System: Visit site for description of existing membrane roofing system. Items included in system, if present, include roofing membrane, roof insulation, surfacing, and components and accessories between deck and roofing membrane.

.3 Roof Tear-Off: Removal of existing membrane roofing system from deck.

.4 Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and reinstalled.

.5 Existing to Remain: Existing items of construction that are not indicated to be removed.

1.5 QUALITY ASSURANCE

.1 Installer Qualifications: Installer of new membrane roofing system.

.2 Reroofing Conference: Conduct conference at Project site.
- .1 Meet with Owner; Owner's Representative; Owner's insurer if applicable; testing and inspecting agency representative; roofing system manufacturer's representative; deck Installer; roofing Installer including project manager, superintendent, and foreman; and installers whose work interfaces with or affects reroofing including installers of roof accessories and roof-mounted equipment.

.2 Review methods and procedures related to roofing system tear-off and replacement including, but not limited to, the following:
- .1 Reroofing preparation, including membrane roofing system manufacturer's written instructions.
- .2 Temporary protection requirements for existing roofing system that is to remain during and after installation.
- .3 Existing roof drains and roof drainage during each stage of reroofing, and roof drain plugging and plug removal requirements.
- .4 Construction schedule and availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
- .5 Existing deck removal procedures and Owner notifications.
- .6 Condition and acceptance of existing roof deck and base flashing substrate for reuse.
- .7 Structural loading limitations of deck during reroofing.
- .8 Base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that will affect reroofing.
- .9 HVAC shutdown and sealing of air intakes.
- .10 Shutdown of fire-suppression, -protection, and -alarm and -detection systems.
- .11 Asbestos removal and discovery of asbestos-containing materials.
- .12 Governing regulations and requirements for insurance and certificates if applicable.
- .13 Existing conditions that may require notification of Owner's Representative before proceeding.

1.6 PROJECT CONDITIONS

.1 Owner will occupy portions of building immediately below reroofing area. Conduct reroofing so Owner's operations will not be disrupted. Provide Owner with not less than 72 hours' notice of activities that may affect Owner's operations.
- .1 Coordinate work activities daily with Owner so Owner can place protective dust or water leakage covers over sensitive equipment or furnishings, shut down HVAC and fire-alarm or -detection equipment if needed, and evacuate occupants from below the work area.
- .2 Before working over structurally impaired areas of deck, notify Owner to evacuate occupants from below the affected area. Verify that occupants below the work area have been evacuated before proceeding with work over the impaired deck area.

.2 Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.

.3 Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

.4 Conditions existing at time of inspection for bidding will be maintained by Owner as far as practical.
- .1 If a roof moisture survey of existing membrane roofing system is available, it will be noted on the drawings, and will be available for Contractor's reference.
- .2 Test Cuts:
  - .1 It is the bidders responsibility to confirm all existing conditions prior to bidding the Work. This includes the existing roof components, including multi-layered roofing systems (ie. Roof re-caps, flood coats, repairs, etc).
  - .2 If the results of an analysis of test cores from existing membrane roofing system are available, it will be noted on the drawings and will be available for Contractor's reference.
  - .3 If roof test cut information is not available, the Contractor will be permitted to perform their own test cuts, however, all test cuts must be supervised and coordinated by MUN’s representative. All methods of repairs to test cuts must be approved by MUN”s representative prior to conducting any test cuts.

.5 Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building.

.6 Hazardous Materials: It is not expected that hazardous materials such as asbestos-containing materials will be encountered in the Work.
- .1 If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Owner's Representative and Owner.

PART 2 - PRODUCTS

.1 Not used.

PART 3 - EXECUTION

3.1 PREPARATION

.1 Protect existing membrane roofing system that is indicated not to be reroofed.
- .1 Loosely lay 25 mm minimum thick, moulded expanded polystyrene (MEPS) insulation over the roofing membrane in areas indicated. Loosely lay 12 mm plywood or OSB panels over MEPS. Extend MEPS past edges of plywood or OSB panels a minimum of 25 mm.
- .2 Limit traffic and material storage to areas of existing roofing membrane that have been protected.
- .3 Maintain temporary protection and leave in place until replacement roofing has been completed. Remove temporary protection on completion of reroofing.

.2 Coordinate with Owner to shut down air-intake equipment in the vicinity of the Work. Cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.

.3 During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.

.4 Maintain roof drains in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof drains and conductors. Use roof-drain plugs specifically designed for this purpose. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.
- .1 If roof drains are temporarily blocked or unserviceable due to roofing system removal or partial installation of new membrane roofing system, provide alternative drainage method to remove water and eliminate ponding. Do not permit water to enter into or under existing membrane roofing system components that are to remain.

.5 Verify that rooftop utilities and service piping have been shut off before beginning the Work.

3.2 ROOF TEAR-OFF

.1 General: Notify Owner each day of extent of roof tear-off proposed for that day.

.2 Roof Tear-Off:
- .1 Remove existing roofing membrane and other membrane roofing system components down to the deck.
- .2 Remove cover boards, roof insulation, and substrate boards, unless otherwise noted on drawings.
- .3 Bitumen and felts that are firmly bonded to concrete decks are permitted to remain if felts are dry. Remove unadhered bitumen and felts and wet felts.
- .4 Remove excess asphalt from concrete deck.
- .5 Remove fasteners from deck or cut fasteners off slightly above deck surface.

3.3 DECK PREPARATION

.1 Inspect deck after tear-off of membrane roofing system.

.2 Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263 or by pouring 0.5 L of hot roofing asphalt on deck at start of each day's work and at start of each roof area or plane. Do not proceed with roofing work if moisture condenses under the plastic sheet or if asphalt test sample foams or can be easily and cleanly stripped after cooling.

.3 If broken or loose fasteners that secure deck panels to one another or to structure are observed or if deck appears or feels inadequately attached, immediately notify Owner's Representative. Do not proceed with installation until directed by Owner's Representative.

.4 If deck surface is not suitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify Owner's Representative. Do not proceed with installation until directed by Owner's Representative.

3.4 EXISTING BASE FLASHINGS

.1 Remove existing base flashings around parapets, curbs, walls, and penetrations.
.1 Clean substrates of contaminants such as asphalt, sheet materials, dirt, and debris.

.2 Do not damage metal counterflashings that are to remain. Replace metal counterflashings damaged during removal with counterflashings of same metal, weight or thickness, and finish.

.3 Inspect parapet sheathing for deterioration and damage. If parapet sheathing has deteriorated, immediately notify Owner's Representative.

3.5 DISPOSAL

.1 Collect demolished materials and place in containers. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
.1 Storage or sale of demolished items or materials on-site is not permitted.

.2 Transport and legally dispose of demolished materials off Owner's property.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

.1 Provide labour, materials, services and equipment necessary to complete the work of this section. Work includes, but is not limited to the following:
  .1 Supply and install new mineral wool blanket insulation within the new mechanical curbs, parapet walls, exterior wall cavities, and as indicated on the drawings.

.2 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 REFERENCES

.1 American Society for Testing and Materials, (ASTM).
  .1 ASTM C553, Specification for Mineral Fibre Blanket Thermal Insulation for Commercial and Industrial Applications.
  .2 ASTM C665, Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
  .3 ASTM C1320, Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.
  .4 ASTM E84, Test Method for Surface Burning Characteristics of Building Materials.

.2 Canadian Standards Association (CSA International).
  .1 CSA B111, Wire Nails, Spikes and Staples.

.3 Underwriters Laboratories of Canada (ULC).
  .1 CAN/ULC-S702, Standard for Mineral Fibre Insulation.

1.3 SUBMITTALS

.1 Product Data:
  .1 Submit manufacturer's printed product literature, specifications and data sheet.

.2 Manufacturer's Instructions:
  .1 Submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

.1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 MINERAL-WOOL BLANKET INSULATION (also known as "*Rockwool*"; slag-wool fibre, rock-wool fibre)

.1 Unfaced, Mineral-Wool Blanket Insulation
  .1 Semi-rigid mineral wool batt insulation to CSA/ULC-S702, made from basalt rock and slag, thickness and RSI value as indicated on drawings.
  .2 Acceptable product:
    .1 ROXUL Comfortbatt, as manufactured by ROXUL Inc.

PART 3 - EXECUTION

3.1 INSULATION INSTALLATION

.1 Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

.2 Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

.3 Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

.4 Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness. Do not compress insulation to fit into spaces.

.5 Keep insulation that is not rated as non-combustible construction a minimum of 75 mm from heat emitting devices and recessed light fixtures, and minimum 50 mm from sidewalls of CAN/ULC-S604 chimneys and CSA-B149.1 and CSA-B149.2 type B and L vents.

.6 Do not enclose insulation until it has been inspected by the Owner's Representative.

3.2 PROTECTION

.1 Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

3.3 CLEANING

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

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

.1 Provide labour, materials, services and equipment necessary to complete the work of this section. Work includes, but is not limited to the following:
- .1 The complete removal and replacement of the existing roof system located on the Engineering Building in the areas identified on the drawings.
- .2 Remove and dispose of the existing roof system, drains, curbs, metal flashings and all other related accessories to the limits shown on the drawings.
- .3 Supply and install new wood curbs as defined in Section 06 10 11 Rough Carpentry, and as indicated on the drawings.
- .4 Supply and install new roof drains, vent stacks, etc., as indicated on the drawings. Contractor to supply and install all material required to adjust existing fixtures as required to suit new roof height.
- .5 Prepare existing substrates, supply and install new vapour barrier.
- .6 Supply and install new insulation in accordance with Section 07 21 13 – Board Insulation, and as indicated on the drawings.
- .7 Supply and install new asphalt recover board.
- .8 Supply and install new 2 –ply modified bitumen roof membrane and flashings.
- .9 Fabricate and install new metal flashing as indicated on the drawings and as defined in Section 07 62 00 – Sheet Metal Flashing and Trim.
- .10 Perform all other work indicate on the drawings.

.2 **Roofing Contractor must provide minimum of 3 references for previous projects of similar size and construction. References to be submitted with Tender and Acceptance form using the provided appendix.**

.3 **Roofing membrane applicators must provide minimum 5 years proven experience. Proof of qualifications to be submitted and approved prior to commencing any site work as per Section 01 33 00, Submittal Procedures**.

1.2 RELATED DOCUMENTS

.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 SECTION INCLUDES

.1 Removal of existing roof system, including but not limited to pea gravel, bur membranes, flashing, metal counter flashing, and air/vapour barrier, exposing existing concrete deck.

.2 Provision of new air/vapour barrier, insulation (one uniform base layer of insulation and one tapered layer of insulation), asphalt recover board, 2 ply modified membranes, membrane flashing, metal counter flashing, vent stack flashing, roof drains and rain water leader pipe insulation.

1.4 DEFINITIONS

.1 Roofing Terminology: Refer to ASTM D 1079 and glossary of NRCA's *The NRCA Roofing and Waterproofing Manual* for definition of terms related to roofing work in this Section.

.2 Design Uplift Pressure: The uplift pressure, calculated according to procedures in SPRI's *Wind Load Design Guide for Fully Adhered and Mechanically Fastened Roofing Systems*, before multiplication by a safety factor.

.3 Factored Design Uplift Pressure: The uplift pressure, calculated according to procedures in SPRI's *Wind Load Design Guide for Fully Adhered and Mechanically Fastened Roofing Systems*, after multiplication by a safety factor.

1.5 PERFORMANCE REQUIREMENTS

.1 General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.

.2 Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.

.3 FM Global Listing: Provide roofing membrane, base flashings, and component materials that comply with requirements in FMG 4450 and FMG 4470 as part of a roofing system and that are listed in FMG's Approval Guide for Class 1 or non-combustible construction, as applicable. Identify materials with FMG markings.
.1 Fire/Windstorm Classification: Class 1A- 90.

1.6 SUBMITTALS

.1 Product data: for each type of product indicated. Submittal must indicate the products use, size, thickness, etc.

.2 Indicate in shop drawings flashings, control joints, tapered insulation details, roof drains and all required roofing materials.

.3 Provide layout for tapered insulation and crickets.

.4 Provide adhesive patterns and manufactures installation requirements (i.e. adhesive application rates, etc.) to exceed the required wind uplift ratings.

.5 Compatibility between components of roofing system is essential. Upon completion of Work, provide written declaration to Owner's Representative stating that materials and components, as assembled in system, meet this requirement.

.6 **Roofing Contractor must provide minimum of 3 references for previous projects of similar size and construction. References to be submitted with Tender and Acceptance form using the provided appendix.**

.7 **Roofing membrane applicators must provide minimum 5 years proven experience. Proof of qualifications to be submitted and approved prior to commencing any site work as per Section 01 33 00, Submittal Procedures.**

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Refer to Section 01 60 00 - Product Requirements for storage and handling requirements.

.2 Deliver roofing materials to Project site in original containers with seals unbroken and labelled with manufacturer's name, product brand name, and type, date of manufacture, and directions for storage.

.3 Store materials off-ground in weatherproof storage.

.4 Store materials in upright position. Store membrane rolls with selvage edge up, store as per manufacturer's requirements to meet warranty.

.5 Remove only in quantities required for same day use.

.6 Store adhesives and sealants as per manufacturer's recommendations.

.7 Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
.1 Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

.8 Protect roof materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with materials manufacturer's written instructions for handling, storing, and protecting during installation. Note: original packaging will not be permitted to be used as weather protection. Any material determined to be exposed to moisture will not be permitted to be installed as part of the roof system.

1.8 Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of roof deck.

1.9 ENVIRONMENTAL REQUIREMENTS

.1 Do not install roofing when temperature remains below -18°C for torch application, or to manufacturers' recommendations for mop application.

.2 Minimum temperature for solvent-based adhesive is -5°C.

.3 Install roofing on dry deck, free of snow and ice, use only dry materials and apply only during weather that will not introduce moisture into roofing system.

1.10 PROTECTION

.1 Fire Extinguishers: maintain one stored pressure rechargeable type with hose and shut-off nozzle, ULC labeled for A, B and C class protection. Size 9 kg on roof per torch applicator, within 10 m of torch applicator.

.2 Contractor to provide safety person on site at all times during the roofing process and shall remain on site two (2) hours after work has ceased or after torching has stopped.

.3 Remove only as much existing roofing as can be replaced by the end of each working day.

1.11 PROJECT CONDITIONS

.1 Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.12 WARRANTY

.1 Provide a written guarantee signed and issued in the name of The Owner by the Roofing System Manufacturer stating that roofing system is free from manufacturing defects and that the system will stay in place and remain leak proof for a period of ten (10) years from date of Substantial Certificate of Completion, subject to the standard limitations and conditions of the manufacturer. Standard Warranty includes roofing membranes, membrane flashings, roofing membrane accessories, roof insulation, fasteners/adhesives, cover boards, substrate board, vapour retarder and other components of roofing system (including parapet wall & curb construction).

.2 Provide a written guarantee, signed and issued in the name of the Owner by the Contractor, stating that the roofing application has been performed in compliance with the plans and specifications, and for two (2) years from the date

of Substantial Certificate of Completion, the Contractor shall repair, at no expense to the Owner, any defects which result of a failure to comply with the plans and specifications.

.3 Defective work shall include, but not limited to: leaking, wind uplift, delamination of roofing materials, reduction of thermal value due to moisture in insulation, crazing and ridging.

.4 Warranty to be non-prorated.

1.13 COMPATIBILITY

.1 Compatibility between components of roofing system is essential. Provide written declaration to Owner's Representative stating that materials and components, as assembled in system, meet this requirement.

1.14 QUALITY ASSURANCE

.1 Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty.

.2 Manufacturer Qualifications: A qualified manufacturer that has FM Global approval for roofing system identical to that used for this Project.

.3 Source Limitations: Obtain components for roofing system from or approved by roofing system manufacturer.

.4 **Roofing Contractor must provide minimum of 3 references for previous projects of similar size and construction. References to be submitted with Tender and Acceptance form using the provided appendix.**

.5 **Roofing membrane applicators must provide minimum 5 years proven experience. Proof of qualifications to be submitted and approved prior to commencing any site work as per Section 01 33 00, Submittal Procedures.**

.6 Refer to Section 01 33 00 – Submittal Procedures and Section 01 40 00 - Quality Requirements for submission procedures.

.7 Submit laboratory test reports certifying compliance of bitumens and membranes with specification requirements.

1.15 MOCK-UP

.1 Contractor to construct mock-up in accordance with Section 01 40 00 - Quality Requirements.

.2 **Mock up to be 10 m^2 minimum size showing typical roof installation method and workmanship for the vapour barrier, insulation, cover board and base/cap sheet membrane. Mock-up to include installation of new curb construction, illustrating the fastening requirements of the wood curb, as well as the installation of the modified membrane flashings. Mock up must permit the Owner's Representative to review the application of the adhesive on each layered component (i.e. insulation and cover board). Mock up to include the installation of the base/cap membrane flashing and well as the installation of the metal flashing**.

.3 Allow 48 hours for inspection of mock-up by Owner's Representative before proceeding with roofing work.

.4 Accepted mock up may form part of completed work.

.5 When accepted, mock-up will demonstrate minimum standard of quality required for this work.

PART 2 - PRODUCTS

2.1 AIR-VAPOUR BARRIER

.1 Torch applied air-vapour barrier composed of Styrene-Butadiene-Styrene (SBS) elastomeric polymer, prefabricated sheet, non-woven, polyester reinforcement, weighing 180 g/m ^{2}.
  .1 Type 2, fully adhered.
  .2 Top surface: sanded surface
  .3 Bottom surfaces: Polyethylene
  .4 Base sheet membrane properties:
    .1 Strain energy (longitudinal/transversal): 9.0/7.0 kN/m.
    .2 Breaking strength (longitudinal/transversal): 17.0/12.5 N/5 cm.
    .3 Ultimate elongation (longitudinal/transversal): 60/65 %.
    .4 Tear resistance: 60 N.
    .5 Cold bending at -30 degrees C : no cracking.
    .6 Static puncture resistance: > 400.
    .7 Dimensional Stability: -0.3 / 0.3 %.
  .5 Acceptable products:
    .1 Sopralene 180 SP 3.5, as manufactured by Soprema
    .2 Torchflex TP-180-SF-Base (3.0mm), as manufactured by IKO.
    .3 Approved alternate.

2.2 INSULATION

.1 Provide custom designed tapered insulation with minimum slope of 1.0 mm in 100 mm (1%). Taper insulation to drain, minimum RSI value at drain to be 1.3. Contractor to provide minimum 2 layers of insulation with joints staggered. Base layer of insulation to be minimum 38mm (1-1/2"). Provide custom designed tapered insulation crickets with minimum slope of 2%. Provide crickets to ensure positive drainage to roof drains.

.2 Polyisocyanurate Insulation and Asphalt Recover Board:
  .1 Polyisocyanurate Insulation:
    .1 To CAN/ULC-S704, glass reinforced felt facers, square edged and containing no CFC.
    .2 Insulation value thickness per cm based on values listed in the latest edition of NRC - Evaluation Listings.
    .3 Provide two layers of insulation installed with staggered joints.
    .4 Acceptable Products:
      .1 Sopra-Iso insulation, sheet size 4'x4', as manufactured by Soprema.
      .2 IkoTherm insulation, sheet size 4'x4', as manufactured by IKO.
      .3 Approved alternate.
  .2 Asphalt Cover Board: Semi-rigid asphalt roofing substrate composed of mineral core between glass fibre mats, 1200 x 1500mm sheets, minimum thickness 6.0 mm
    .1 Acceptable product:
      .1 Sopraboard, 6.4mm thickness, as manufactured by Soprema
      .2 Protectoboard 6mm, as manufactured by IKO.
      .3 Approved alternate

.3 Total assembly RSI value:
  .1 Minimum average RSI value of assembly insulation components to be 4.0. Insulation assembly components to consist of insulation and cover board.

2.3 BASE SHEET MEMBRANE

.1 Base Sheet: Base sheet: to CGSB-37.56-M, Styrene-Butadiene-Styrene (SBS) elastomeric polymer, prefabricated sheet, non woven, polyester reinforcement, weighing 180 g/m $^{2.}$
- .1 Type 2, fully adhered
- .2 Class P-plain surfaced
- .3 Grade 2
- .4 Top and bottom surfaces:
  - .1 Polyethylene/polyethylene
- .5 Base sheet membrane properties:
  - .1 Strain energy (longitudinal/transversal): 9.0/7.0 kN/m
  - .2 Breaking strength (longitudinal/transversal): 17.0/12.5 N/5 cm
  - .3 Ultimate elongation (longitudinal/transversal): 60/65 %
  - .4 Tear resistance: 60 N
  - .5 Cold bending at -30 degrees C : no cracking
  - .6 Static puncture resistance: > 400
  - .7 Dimensional Stability: -0.3 / 0.3 %
- .6 Acceptable products:
  - .1 Sopralene Flam 180 as manufactured by Soprema
  - .2 Torchflex TP-180-FF-Base, as manufactured by IKO
  - .3 Approved alternate

2.4 CAP SHEET MEMBRANE

.1 Cap sheet: to CGSB-37.56-M, Styrene-Butadiene-Styrene (SBS) elastomeric polymer, prefabricated sheet, glass, polyester reinforcement, weighing 250 g/m^2
- .1 Type 2, fully adhered
- .2 Class G-granule surfaced
- .3 Grade 2
- .4 Bottom surface polyethylene
- .5 Colour to be light grey unless otherwise indicated
- .6 Cap sheet membrane properties:
  - .1 Strain energy (longitudinal/transversal): 10.0/10.0 kN/m
  - .2 Breaking strength (longitudinal/transversal): 18.0/10.0 kN/m
  - .3 Ultimate elongation (longitudinal/transversal): 60/65 %
  - .4 Tear resistance: 75 N
  - .5 Cold bending at -30 degrees C: No cracking
  - .6 Static puncture resistance: > 420
  - .7 Dimensional Stability: -0.8 / -0.2 %
- .7 Acceptable products:
  - .1 Sopralene Flam 250 GR as manufactured by Soprema
  - .2 Torchflex TP-250-Cap, as manufactured by IKO
  - .3 Approved alternate

.2 Minimum total thickness if base sheet and cap sheet combined to be 5.8 mm. Cap sheet and base sheet to be of same manufacturer.

2.5 BASE SHEET MEMBRANE FLASHING

.1 To CGSB-37.56-M, Type 2, Class C, Grade 2, non-woven polyester reinforced 180g/m^2, self-adhesive membrane with polyethylene top face and release film under face.
- .1 Approved product:
  - .1 Sopralene Flam Stick as manufactured by Soprema

.2 Armourbond 180, as manufactured by IKO
.3 Approved alternate

2.6 SEALERS

.1 Mastic made of synthetic rubbers, plasticized with bitumen and solvents with aluminum pigments to provide greater resistance to U.V
.1 Acceptable products:
.1 Sopramastic as manufactured by Soprema
.2 AquaBarrier Mastic, as manufactured by IKO
.3 Approved alternate

.2 Waterproofing system for horizontal and vertical penetrations:
.1 Precast blocks consisting of polyester resin, sized to suit application.
.1 Acceptable products:
.1 Sopramastic Blocks, as manufactured by Soprema.
.2 Approved alternate.
.2 Polyether based, single component, water reactive elastomeric sealing mastic:
.1 Horizontal and vertical surfaces:
.1 Acceptable products:
.1 Sopramastic SP2, as manufactured by Soprema
.2 Approved alternate.
.2 Horizontal surfaces only:
.1 Acceptable products:
.1 Sopramastic PF, as manufactured by Soprema
.2 Approved alternate.

2.7 PRIMERS

.1 For self-adhesive membranes: as recommended by membrane manufacturer. A blend of elastomeric bitumen, volatile solvents and adhesive enhancing resins used to prime porous and non-porous substrates such as gypsum board, wood, concrete or metal to enhance the adhesion of self-adhesive membranes at temperatures above -10°C

.2 For heat welded membranes: as recommended by membrane manufacturer. A blend of elastomeric bitumen, volatile solvents and adhesive enhancing additives used to prime concrete or metal substrates to enhance the adhesion of torch-applied membranes.

2.8 ADHESIVES

.1 Roofing adhesive: low rise, dual-component, polyurethane adhesive, dispensed from a portable disposable pre-pressurized container.

2.9 FASTENERS

.1 For installation of protection/cover board at through-wall flashing (roof/wall) detail.
.1 Fasteners: minimum #14 mechanical fasteners made of case-hardened carbon steel with corrosion resistance coating, complying with FM standards. 75 mm diameter round or hexagon stress plates complying with CSA B35.3 and FM 4470 approval standards, diameter and lengths as required to suit total assembly thickness. Ensure fasteners have the following substrate penetration:
.1 For concrete/masonry: minimum 25 mm
.2 For wood substrates: minimum 25 mm

2.10 ROOF DRAINS

.1 As per section 22 42 01 – Plumbing Specialties and Accessories.

2.11 AUXILIARY ROOFING MEMBRANE MATERIALS

.1 General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing membrane.

.2 Metal Flashing Sheet: As per section 07 62 00 – Sheet Metal Flashing and Trim.

.3 Roofing Granules: Ceramic-coated roofing granules, No. 11 screen size with 100 percent passing 2.36 mm sieve and 98 percent of mass retained on 0.425 mm sieve, colour to match roofing membrane.

.4 Miscellaneous Accessories: Provide miscellaneous accessories recommended by roofing system manufacturer.

2.12 STACK FLASHINGS

.1 Stack flashings shall be one piece spun aluminum flashings, with separate spun aluminum cap. Sizes as required to suit conditions.
- .1 Metal flashing sleeve, with integral deck flange, uninsulated, and as follows:
- .2 Metal: Aluminum sheet, 1.6 mm thick, mill finished.
- .3 Height: 480 mm, unless otherwise noted.
- .4 Diameter: as required
- .5 Acceptable product:
  - .1 Removable Cap Stack Jack Flashings as manufactured by Thaler
  - .2 Approved alternate.

PART 3 - EXECUTION

3.1 WORKMANSHIP

.1 Do roofing work in accordance with applicable standard in Canadian Roofing Contractors Association (CRCA) Roofing Specification Manual, except where specified otherwise.

3.2 PROTECTION

.1 Cover walls and adjacent work where materials hoisted or used.

.2 Use warning signs and barriers. Maintain in good order until completion of work.

.3 Clean off drips and smears of bituminous material immediately.

.4 Dispose of rain water off roof and away from face of building until roof drains or hoppers installed and connected. Refer to Section 01 10 00, section “Environmental Procedures” for site drainage requirements.

.5 Protect roof from traffic and damage.

.6 At end of each day’s work or when stoppage occurs due to inclement weather, provide protection for completed work and store materials in weathertight enclosures.

.7 Install insulation promptly to avoid possibility of condensation beneath vapour retarder.

.8 Take necessary measures ensuring no penetration of the elements will occur to the building after commencement of work, including but not limited to water.

.9 Only remove quantities of existing roofing material and install quantities of new roofing materials per day that can be covered with waterproofing membranes.

3.3 EXAMINATION

.1 Examine substrates, areas, and conditions for compliance with the following requirements and other conditions affecting performance of roofing system:
- .1 Verify that concrete substrate is firm, smooth, dry and free of moisture, snow, ice or frost, and swept clean of dust and debris. Contractor must ensure that all existing membranes are removed from the concrete deck.
- .2 Ensure curbs have built and secured to the existing roof deck as per specifications. Coordinate height of roof curbs with Section 06 10 00 – Rough Carpentry and as indicated on the drawings.
- .3 Ensure all existing plumbing fixtures have been modified to suit new roof elevations relative to finished roof surface.
- .4 Proceed with installation only after unsatisfactory conditions have been corrected.
- .5 Do not install roofing materials during precipitation (rain, drizzle, snowfall, etc.).

3.4 PREPARATION

.1 Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

.2 Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

3.5 INSTALLATION, GENERAL

.1 Install roof system based on design wind uplift securement requirements for the building and site location (St. John’s, NL), using FM approved roofing adhesive placed in accordance with manufacturer’s recommendations.

.2 Roof system to meet FM Global wind uplift ratings: Fire/Windstorm Classification: Class 1A- 90.

3.6 AIR-VAPOUR BARRIER INSTALLATION

.1 Prime all surfaces to receive modified bituminous air-vapour barrier membrane as per manufacturer’s instructions.

.2 Starting at low point of roof, perpendicular to slope, unroll air-vapour barrier membrane, align and reroll from both ends.

.3 Unroll and torch air-vapour barrier membrane onto concrete deck taking care not to burn membrane or its reinforcement.

.4 Lap sheets 75 mm minimum for side and 150 mm minimum for end laps. Stagger end laps a minimum of 300mm

.5 Complete installation of self-adhered (SA) base sheet membrane flashing (air-vapour barrier location) prior to installing insulation:

.1 Prime all surfaces to receive SA base sheet membrane flashing as per manufacturer's instructions. Install SA base sheet membrane flashing at all intersections such as parapet walls, curbs, vent stacks, etc. Contractor to ensure SA base sheet membrane is installed such that it extends minimum 100mm above height of insulation and as indicated on drawings. Lap sheets 75 mm minimum for side and 150 mm minimum for end laps.

.6 Do membrane application in accordance with manufacturer's recommendations.

3.7 INSULATION INSTALLATION

.1 Comply with roofing system manufacturer's written instructions for installing roof insulation.

.2 Install insulation in accordance with shop drawings.

.3 Apply beads of roofing adhesive to air/vapour barrier in accordance with manufacturer's written instructions.

.4 Adhere insulation in adhesive and walk-in insulation boards to insure maximum contact with adhesive.

.5 Place boards in parallel rows with ends staggered, and in firm contact with one another. Fill gaps exceeding 6 mm with insulation.

.6 Cut end boards to suit.

.7 Adhere tapered insulation following the above procedures and as per manufacturer's written instructions.

.8 Adhere insulation crickets to ensure positive drainage to roof drains, and as indicated on drawings.

3.8 ASPHALT COVER BOARD INSTALLATION

.1 Apply beads of roofing adhesive to insulation in accordance with manufacturer's written instructions.

.2 Adhere asphalt recover board in adhesive and walk-in asphalt recover boards to insure maximum contact with adhesive

.3 Place boards in parallel rows with ends staggered and in firm contact with one another. Stagger joints from joints in insulation below a minimum of 150 mm in each direction. Tape joints if required by roofing system manufacturer.

.4 Cut end boards to suit.

3.9 BASE SHEET MEMBRANE INSTALLATION

.1 Starting at low point of roof, perpendicular to slope, unroll base sheet membrane, align and reroll from both ends.

.2 Unroll and torch base sheet membrane onto recover board taking care not to burn membrane or its reinforcement.

.3 Lap sheets 75 mm minimum for side and 150 mm minimum for end laps. Stagger end laps a minimum of 300mm.

.4 Install a reinforcement membrane diagonally (45°) around drains, vents, etc.. Provide minimum 150mm overlap onto roof membrane.

.5 Complete installation of self-adhered (SA) base sheet membrane flashing prior to installing cap sheet membrane:

.1 Prime all surfaces to receive SA base sheet membrane flashing as per manufacturer's instructions. Install SA base sheet membrane flashing at all intersections such as parapet walls, curbs, vent stacks, etc. and as indicated on drawings. Lap sheets 75 mm minimum for side and 150 mm minimum for end laps. Mechanically fasten top of SA base sheet membrane flashing securely at terminations and perimeter of roofing and as indicated on drawings. Seal termination of SA base sheet membrane flashing.

.6 Do membrane application in accordance with manufacturer's recommendations.

3.10 CAP SHEET MEMBRANE INSTALLATION

.1 Starting at low point on roof, perpendicular to slope, unroll cap sheet, align and reroll from both ends.

.2 Unroll and torch cap sheet onto base sheet taking care not to burn membrane or its reinforcement.

.3 Lap sheets 75 mm minimum for side laps and 150 mm minimum for end laps. Stagger end laps a minimum of 300mm. Degranulate cap sheet membrane end to receive end laps and membrane flashing.

.4 Application to be free of blisters, fishmouths and wrinkles

.5 Do membrane application in accordance with manufacturer's recommendations

3.11 MEMBRANE FLASHING INSTALLATION, TYPICAL

.1 Complete installation of flashing base sheet membrane flashing prior to installing membrane cap sheet.

.2 Install base and cap sheet membrane flashings onto substrate in 1 metre wide strips. Provide 75 mm minimum side lap and seal.

.3 Lap base sheet membrane flashing to base sheet membrane minimum 150 mm and seal by torch welding.

.4 Degranulate cap sheet membrane to receive cap sheet membrane flashing. Lap cap sheet membrane flashing to cap sheet membrane minimum 300 mm and seal by torch welding.

.5 Properly secure flashings to their support, without sags, blisters, fishmouths or wrinkles.

3.12 ROOF PENETRATIONS

.1 Install vent stack flashings and other roof penetration flashings and seal to membrane in accordance with the manufacturer's recommendations and details.

.2 Prime flange (top and bottom) with an approved primer prior to installation.

.3 Heat base sheet until bitumen is fluid, embed flange in base sheet membrane.

.4 Install a reinforcement membrane diagonally (45°) around drains, vents, etc.. Provide minimum 150mm overlap onto roof membrane.

3.13 ROOF DRAINS INSTALLATION

.1 Supply and install roof drains as detailed on the drawings and in accordance with manufacturer's recommendations and details.

.2 Installation of new drains is to include all required plumbing connections/modifications to existing plumbing.

.3 All new roof drains to be installed by certified plumber. Coordinate installation of roof drains so that work can be inspected by Owner's Representative prior to commencement of remaining roof work.

3.14 FIELD QUALITY CONTROL

.1 Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.

.2 Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements

3.15 PROTECTING AND CLEANING

.1 Protect roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Owner's Representative and Owner.

.2 Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

.3 Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

.4 Check drains to ensure cleanliness and proper function, and remove debris, equipment and excess material from site.

.5 Contractor to have a separate pair of footwear onsite to use if entering the building is required. The university will not tolerate additional cleaning due to roofing tar being brought into the building.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

.1 Provide labour, materials, services and equipment necessary to complete the work of this section. Work includes, but is not limited to the following:
  .1 Fabricate and install new galvanized steel through-wall and transition flashings, as indicated on the drawings.
  .2 Fabricate and install new prefinished steel flashings around the perimeter all new roof / parapet assemblies, and perimeter flashings, as detailed on the drawings.
  .3 Perform all other flashing related work as detailed on the drawings or specified herein

1.2 RELATED DOCUMENTS

.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 REFERENCES

.1 The Aluminum Association Inc. (AA)
  .1 Aluminum Sheet Metal Work in Building Construction.
  .2 AA DAF45, Designation System for Aluminum Finishes.

.2 American Society for Testing and Materials (ASTM International)
  .1 ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  .2 ASTM A792/A792M, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
  .3 ASTM D523, Standard Test Method for Specular Gloss.
  .4 ASTM D5796, Standard Test Method for Measurement of Dry Film Thickness of Thin Film Coil-Coated Systems by Destructive Means Using a Boring Device
  .5 ASTM D822, Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.

.3 Canadian General Standards Board (CGBS)
  .1 CAN/CGSB-93.1-M85, Sheet, Aluminium Alloy, Prefinished, Residential.
  .2 CAN/CGSB-93.4-92, Galvanized Steel and Aluminum-Zinc Alloy Coated Steel Siding Soffits and Fascia, Prefinished, Residential.
  .3 CAN/CGSB 1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

.4 American Architectural Manufacturers Association (AAMA)
  .1 AAMA 2605-05, Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
  .2 AAMA 620-02, Voluntary Specification for High Performance Organic Coatings on Coil Coated Architectural Aluminum Substrates.

.5 American National Standards Institute (ANSI)
  .1 ANSI B18.6.4-1981 (R1991), Screws, Tapping and Metallic Drive, Inch Series, Thread Forming and Cutting.
  .2 Copper in Architecture Handbook (1998), Copper Development Association (CDA) and Canadian Copper & Brass Development Association (CCBDA).

.6 Canadian Roofing Contractors Association (CRCA)
.1 Roofing Specifications Manual.

.7 Canadian Standards Association (CSA International)
.1 CSA B111, Wire Nails, Spikes and Staples.

1.4 PERFORMANCE REQUIREMENTS

.1 General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

.2 Fabricate and install roof edge flashing and copings capable of resisting forces according to recommendations in FMG Loss Prevention Data Sheet 1-49.

.3 Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.
.1 Temperature Change (Range): 67 deg C, ambient; 100 deg C, material surfaces.

1.5 SUBMITTALS

.1 Submit manufacturer's printed product literature for sheet metal flashing systems materials, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit samples for all sheet metal flashing materials proposed for use on this project, as follows:
.1 Submit duplicate, 150 x 150 mm sample(s) of each type of sheet metal material specified (in a range of manufacturer's standard colours to demonstrate colour match of new flashing material to new/existing cladding components and window systems (as indicated on the drawings), for review and final selection by the owner. Colour match shall be demonstrated and approved by owner prior to undertaking work.
.2 Allow for one re-submission of each colour should adjustment to proposed colour be required by the owner.
.3 Sample(s) to include reference to manufacturer's colour code, colour name and base metal flashing thickness.

1.6 QUALITY ASSURANCE

.1 Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

.2 Sheet Metal Flashing and Trim Standard: Comply with SMACNA's *Architectural Sheet Metal Manual* unless more stringent requirements are specified or shown on Drawings.

.3 Mock-ups: Build mock-ups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
.1 Construct mock-up of each type of sheet metal flashing and trim. Mock-up may be part of finished work approximately 3.0 m long, including supporting construction cleats, seams, attachments, underlayment, and accessories.
.2 Allow 48 hours for inspection of mock-up by Owner’s Representative.
.3 Approval of mock-ups does not constitute approval of deviations from the Contract Documents contained in mock-ups unless Owner’s Representative specifically approves such deviations in writing.

.4 Mock-up will be used to judge workmanship, substrate preparation, and material application
.5 Approved mock-ups may become part of the completed Work if undisturbed at time of Substantial Completion.
.6 When accepted, mock-up will demonstrate minimum standard of quality required for this work.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

.2 Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

PART 2 - PRODUCTS

2.1 PREFINISHED STEEL SHEET

.1 General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

.2 Prefinished sheet with a factory applied fluoropolymer 2-coat coating system, comprised of a corrosion inhibiting primer and a colour coat utilizing the polyvinylidene fluoride (PVDF) resins, supplemented as follows:
.1 Base sheet steel material: Apply polyvinylidene fluoride (PVDF) coating overtop of steel sheet containing the following coatings (note: base metal thickness as specified below):
.1 55% Aluminum-zinc (Galvalume) alloy coated sheet steel conforming to the requirements of ASTM A792/A792M, commercial quality, with a minimum coating weight of AZM150 150g/m2, minimum triple spot
.2 Grade: 33
.2 Class F1S
.3 Colour as selected by Owner's Representative from manufacturer's standard range to match existing/adjacent metal flashing.
.4 Specular gloss: 30 units +/- 5 in accordance with ASTM D523.
.5 Film thickness: Dry film thickness of 25um +/- 5um (1.0mils +/- 0.1mils) in accordance with ASTM D5796
.6 Resistance to accelerated weathering for caulk rating of 8, colour fade 5 units or less and erosion rate less than 20 % to ASTM D822 as follows:
.1 Outdoor exposure period 2500 hours.
.2 Humidity resistance exposure period 5000 hours.

.3 Base metal flashing thickness for use on this project is as follows:
.1 Metal parapet flashings: 0.61mm (0.024") thick
.2 Counterflashings and throughwall flashings: 0.46mm (0.018") thick

.4 Acceptable coating system:
.1 10,000 Series Finish, as manufactured by ArcelorMittal Dofasco Inc.

2.2 GALVANIZED METAL FLASHING

.1 Zinc coated (hot-dipped galvanized) steel sheet (for use as transition or closure flashing to support new S/A membrane installation as identified on the drawings): Continuous zinc coated steel sheet, commercial quality, conforming to ASTM A 653/A653M, supplemented as follows:

.1 Minimum zinc coating weight: Z275-275 g/m2 thick, minimum triple spot.
.2 Base metal thickness: 0.55mm (0.022") thick, profile as shown on the drawings

2.3 UNDERLAYMENT MATERIALS

.1 Self-Adhering, High-Temperature Sheet: Minimum 0.76 to 1.0 mm thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
.1 Thermal Stability: ASTM D 1970; stable after testing at 116 deg C.
.2 Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 29 deg C.

.2 Slip Sheet: Building paper, 0.16-kg/sq. m minimum, rosin sized.

2.4 MISCELLANEOUS MATERIALS

.1 General: Provide materials and types of fasteners, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal unless otherwise indicated.

.2 Isolation coating: alkali resistant bituminous paint.

.3 Plastic cement: to CAN/CGSB 37.5.

.4 Sealants: Refer to Section 07 92 00 – Joint Sealants.

.5 Cleats: of same material, and temper as sheet metal, minimum 50 mm wide or as indicated otherwise on the drawings. Thickness same as sheet metal being secured.

.6 Fasteners (all new flashing components): to CAN/CSA B111 and as described below:
.1 Exposed Fasteners: ACQ compatible, self-tapping sheet metal screws, complete with neoprene washers. Colour to match metal flashing being secured and of sufficient length to secure metal flashing to substrate (provide 1-1/2" minimum embeddment into substrate).
.2 Hidden fasteners: galvanized, ring threaded nails of length and thickness suitable for metal flashing application.
.3 Fasteners used for ACQ treated wood shall be manufactured from steel either galvanized in accordance with ASTM A653/A653M, G185 designation (coating thickness of 1.85oz/ft2, both sides), or be galvanized after manufacture in accordance with ASTM A123. Alternatively, the contractor may be permitted to use self-tapping stainless steel sheet metal screws (type 304 or 316) for use in ACQ treated lumber.
.4 Fasteners (for attachment of galvanized flashing into concrete or concrete block walls): Self tapping concrete screws, coated with a corrosion resistant finish compatible with galvanized sheet metal material. Acceptable product/coating:
.1 5mm (3/16") diameter with Phillips flat head and blue stalgard coating, as manufactured by Tapcon.
.2 5mm (3/16") diameter, stainless steel self-tapping concrete screws, as manufactured by Tapcon.
.3 Approved alternate.

.7 Washers: of same material as sheet metal, 1 mm thick with rubber packings.

.8 Touch-up paint: as recommended by prefinished material manufacturer.

.9 Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 13 mm wide and 3 mm thick.

.10 Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

.11 Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

.12 Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.5 FABRICATION, GENERAL

.1 General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's *Architectural Sheet Metal Manual* that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.
- .1 Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
- .2 Obtain field measurements for accurate fit before shop fabrication.
- .3 Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
- .4 Conceal fasteners and expansion provisions where possible.
- .5 Form pieces in 2400 mm maximum lengths. Make allowance for expansion at joints.
- .6 Hem exposed edges on underside 12 mm. Mitre and seal corners with sealant.

.2 Fabricate non-moving seams in metal flashing, as follows:
- .1 Fabricate all non-moving seams with either a "flat lock seam", or "flat lock cleated seams" or "single common lock" or "hook seams" as defined in the Copper Development Association handbook (see typical flashing details included in Figures 1 & 3, below).
- .2 Fabricate all joints in exposed flashings with standard "S" pocket seams (applicable only to flashings where the above noted locking seams cannot be performed), see typical flashing details included in Figure 1, below.

.3 Fabricate expansion joints in metal flashing, as follows:
- .1 Fabricate all dynamically moving expansion seams using either a "slip expansion seam" or "loose lock with sealant", as defined in the Copper Development Association handbook (see typical flashing details included in Figure 2, below).

.4 Separation of dissimilar metals/materials to prevent galvanic corrosion:
- .1 Apply isolation coating to all metal surfaces to be embedded in concrete or mortar.
- .2 Provide separation of metal from non-compatible metal or corrosive substrates by coating all concealed surfaces at locations of contact, with bituminous coating or other permanent separation (such as a S/A membrane), as approved by the Owner's Representative.

.5 No exposed or visible flashing work shall be unfinished (i.e. visible undersides, joints, etc...).

.6 Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

.7 Fabricate cleats and attachment devices of sizes as recommended by SMACNA's *Architectural Sheet Metal Manual* and by FM Gloabal Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

.8 Do not use graphite pencils to mark metal surfaces.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations, including product technical bulletins, handling, Storage and installation instructions, and datasheets.

3.2 EXAMINATION

.1 Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.
  .1 Verify compliance with requirements for installation tolerances of substrates.
  .2 Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

.2 For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

.3 Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION, GENERAL

.1 Coordinate all flashing work with other trades.

.2 Install sheet metal work in accordance with CRCA FL series details and as detailed on the drawings.

.3 Form and lock joints of all metal flashing as described above and in accordance with the typical details included in the Copper Development Association Handbook (details attached) or as shown on the drawings.

.4 Use concealed fastenings except where approved before installation by the Owner's Representative.

.5 Provide underlay under sheet metal. Secure in place and lap joints 100 mm.

.6 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs as detailed on the drawings.

.7 Install all metal flashing to provide a minimum of 50mm (2") overlapping joints.

.8 All new metal flashing must be continuously supported. Any unsupported metal flashing will not be accepted.

.9 Shingle and sequence all metal flashing installation to shed water away from building.

.10 Lock end joints and caulk with sealant.

.11 Where indicated, insert metal flashing into 25mm reglets or under cap flashing to form weather tight junction.

.12 Secure sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. as recommended by SMACNA's *Architectural Sheet Metal Manual* and by FM Gloabal Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

.13 Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.

.14 Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.

.15 Do not use graphite pencils to mark metal surfaces.

.16 Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.

.1 Coat back side of uncoated aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.

.2 Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet.

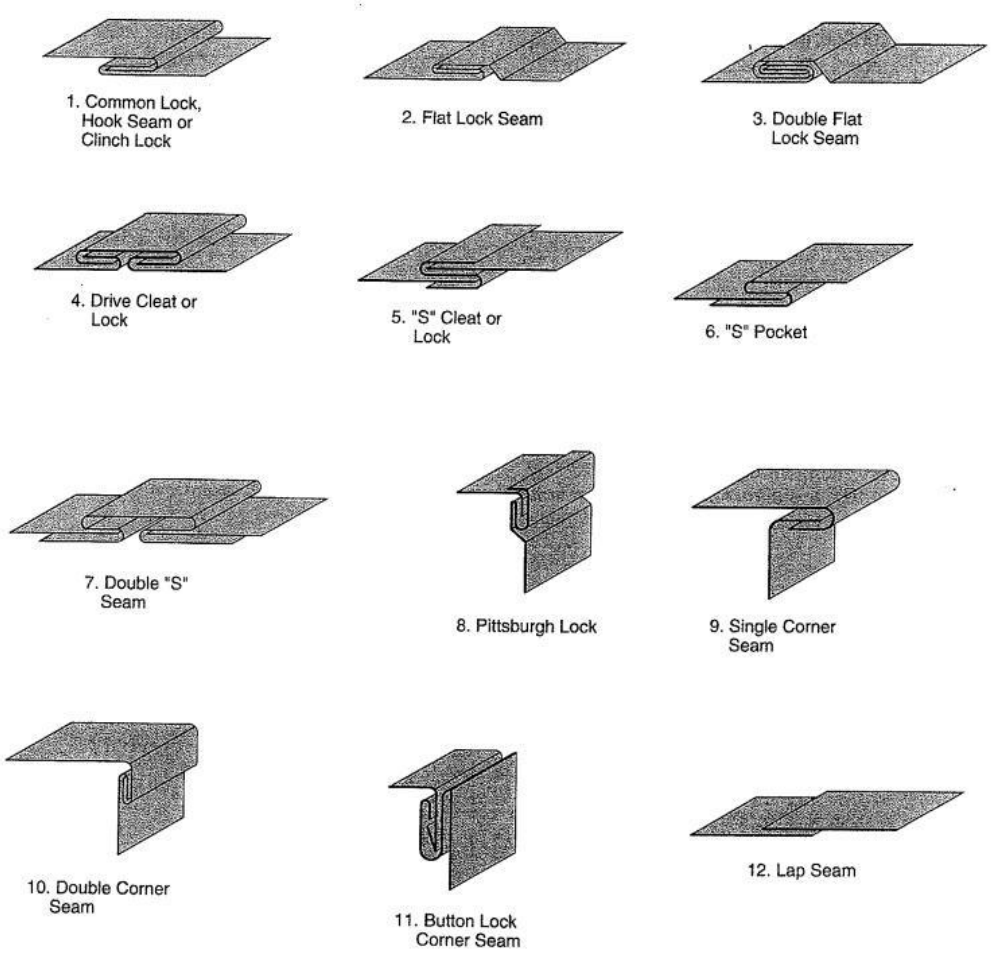


Figure 1 – Typical Flashing Joints-Seams

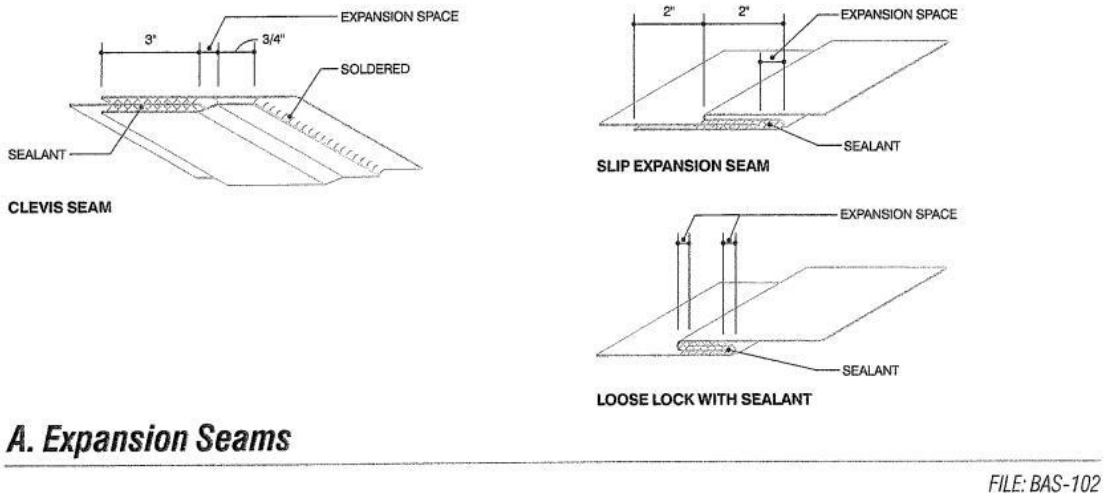


Figure 2 – Typical Expansion Seams
Note: Above details were taken from the Copper Development Association Handbook (CDA)

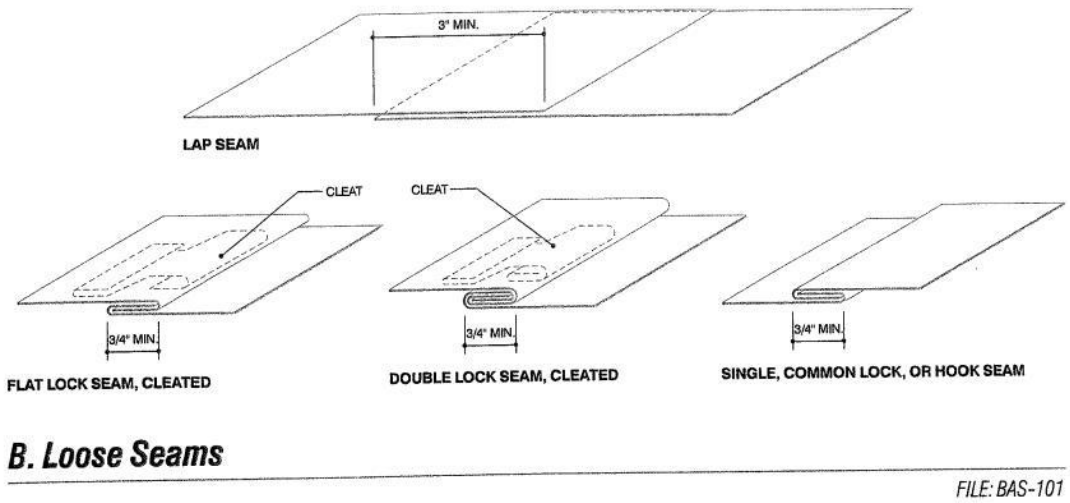


Figure 3 – Typical Loose Seams
Note: Above details were taken from the Copper Development Association Handbook (CDA)

3.4 CLEANING AND PROTECTION

.1 Clean off excess sealants.

.2 Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.

.3 Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

.1 Provide labour, materials, services and equipment necessary to complete the work of this section. Work includes, but is not limited to the following:

.1 Installation of new backer rod and exterior sealant all joints between metal flashing and cladding elements and all other joints as indicated on the drawings.

.2 Installation of new backer rod and sealant at all exterior control joints within brick masonry cladding.
.3 Installation of new sealant at all other locations as indicated on the drawings or specified herein.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)

.1 ASTM C 834-10, Standard Specification for Latex Sealants

.2 ASTM C 919-12, Standard Practice for Use of Sealants in Acoustical Applications.

.3 ASTM C 920-11, Standard Specification for Elastomeric Joint Sealants

.4 ASTM C 1193-12, Standard Guide for Use of Joint Sealants

.5 ASTM C 1521-09e1, Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints.

.2 Department of Justice Canada (Jus)
.1 Canadian Environmental Protection Act (CEPA).

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
.1 Material Safety Data Sheets (MSDS)

.4 Transport Canada (TC)
.1 Transportation of Dangerous Goods Act (TDGA).

1.3 SUBMITTALS

.1 Product Data: For each joint-sealant product indicated.

.2 Samples for Initial Selection: Manufacturer's colour charts consisting of strips of cured sealants showing the full range of colours available for each product exposed to view.

.3 Joint-Sealant Schedule: Include the following information:
.1 Joint-sealant application, joint location, and designation.
.2 Joint-sealant manufacturer and product name.
.3 Joint-sealant formulation.
.4 Joint-sealant colour.

.4 Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

.5 Warranties: Sample of special warranties.

1.4 QUALITY ASSURANCE

.1 Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

.2 Construct mock-up to show location, size, shape and depth of joints complete with back-up material, primer, caulking and sealant. Mock-up may be part of finished work. Mock-ups required includes the following:
.1 At one existing vertical exterior control joint within brick masonry cladding.
.2 At one perimeter/curb flashing detail.

.3 Allow 48 hours for inspection of mock-up by Owner's Representative before proceeding with sealant work.

.4 Mock-up will be used to judge workmanship, substrate preparation, operation of equipment and material application.

.5 When accepted, mock-up will demonstrate minimum standard of quality required for this Work..

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, handle, store and protect materials in accordance with Section 01 60 00 - Product Requirements.

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

1.6 PROJECT CONDITIONS

.1 Do not proceed with installation of joint sealants under the following conditions:
.1 When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 4.4˚C.
.2 When joint substrates are wet.

.2 Joint-Width Conditions:
.1 Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

.3 Joint-Substrate Conditions:
.1 Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.7 WARRANTY

.1 For the work of this Section, the contractor shall warrant all sealant installation work for a period of not less than 60 months (5 years) from the date of substantial completion.

.2 The manufacturer shall provide a material warranty for a period not less than 60 months (5 years) from the date of substantial completion.

.3 The Contractor shall provide a written installation warranty stating that the sealant will be free of defects related to workmanship, installation and material deficiency for the period noted above. The following shall be specifically covered under the warranty: water penetration, separation, scaling, debonding, crazing, cracking, bubbling, shrinkage, disintegration, pinholing, sagging, loss of adhesion, loss of cohesion, and staining of the adjoining or adjacent materials or surfaces.

.4 Correct all deficiencies or sealant failures immediately. Any repair(s) required under the warranty shall be carried out in accordance with the requirements of this specification section and recommendations of the manufacturer and

Owner's Representative. The contractor shall include as part of their material and installation warranty all costs associated with providing access to facilitate any replacement under the project warranties.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

.1 Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

.2 VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when:
- .1 Architectural Sealants: 250 g/L.
- .2 Sealant Primers for Nonporous Substrates: 250 g/L.
- .3 Sealant Primers for Porous Substrates: 775 g/L.

.3 Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- .1 Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.

.4 Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

.5 Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

.6 Colours of Exposed Joint Sealants: As selected by Owner's Representative from manufacturer's full range.

2.2 SEALANT MATERIAL DESIGNATIONS

.1 Type 1 Sealant (for use as exterior sealant): Single component, neutral-curing, low modulus, non-staining construction grade silicone sealant with +/- 50% movement capability, to ASTM C920:
- .1 Acceptable Material:
  - .1 Spectrem 2, as manufactured by Tremco Canada.
  - .2 Dow Corning 795, Silicone sealant.
  - .3 Approved alternate.
- .2 Sealant Colour:
  - .1 As selected and approved by the owner from the manufacturer's standard colour range.

2.3 SEALANT ACCESSORIES

.1 Preformed Compressible and Non-Compressible back-up materials.
- .1 High Density Foam:
  - .1 Extruded closed cell extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m^3 density, or neoprene foam backer, size as recommended by manufacturer.
- .2 Bond Breaker Tape:

.1 Polyethylene bond breaker tape which will not bond to sealant.

2.4 JOINT CLEANER

.1 Non-corrosive and non-staining type, compatible with joint forming materials and sealant recommended by sealant manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

.2 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

.1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.

.2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair work. Use ‘two cloth’ method for solvent cleaning.

.3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.

.4 Ensure joint surfaces are dry and frost free.

.5 Prepare surfaces in accordance with manufacturer's directions.

3.3 PRIMING

.1 Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

.2 Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.4 BACKUP MATERIAL

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

.2 Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.

3.5 INSTALLATION OF JOINT SEALANTS

.1 Sealant:
.1 Apply sealant in accordance with manufacturer's written instructions.

.2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.
.3 Apply sealant in continuous beads.
.4 Apply sealant using gun with proper size nozzle.
.5 Use sufficient pressure to fill voids and joints solid.
.6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.
.7 Tool exposed surfaces before skinning begins to give slightly concave shape.
.8 Remove excess compound promptly as work progresses and upon completion

.2 Curing:
.1 Cure sealants in accordance with sealant manufacturer's instructions.
.2 Do not cover up sealants until proper curing has taken place.

.3 Cleanup:
.1 Clean adjacent surfaces immediately and leave Work neat and clean.
.2 Remove excess and droppings, using recommended cleaners as work progresses.
.3 Remove masking tape after initial set of sealant.

3.6 CLEANING

.1 Clean adjacent surfaces immediately and leave Work neat and clean.

.2 Remove excess and droppings, using recommended cleaners as work progresses.

.3 Remove masking tape after initial set of sealant.

.4 Upon completion remove surplus materials, rubbish, tools and equipment.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 Types of items described in this Section:
- .1 Steel frame products including frames, transom frames (glazed or paneled), sidelight and window assemblies, fire-rated and non-rated.
- .2 Steel panels, fixed or removable, flush or rebated, similar in construction to steel doors, for use in steel frame product.
- .3 Steel doors, swing type, flush, with or without embossed face sheets, with or without glazed or louvered openings, fire-rated, with or without temperature rise ratings, and non-rated.

.2 Types of items you will not find described in this Section:
- .1 Unit Masonry for embedding anchors for hollow metal work into masonry construction.
- .2 Hollow metal doors and frames manufactured from stainless steel.
- .3 Detention Doors and Frames.
- .4 Sound Control Door Assemblies for packaged, acoustical hollow metal door and frame assemblies with STC ratings of 35 or more.
- .5 Door Hardware.
- .6 Field painting hollow metal doors and frames.
- .7 Lead-lined, hollow metal doors and frames.
- .8 Electrical connections including conduit and wiring for door controls and operators.

1.2 DEFINITIONS

.1 Minimum Thickness: Minimum thickness of base metal without coatings.

1.3 SUBMITTALS

.1 Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, and finishes.

.2 Shop Drawings: Include the following:
- .1 Elevations of each door design.
- .2 Details of doors, including vertical and horizontal edge details and metal thicknesses.
- .3 Frame details for each frame type, including dimensioned profiles and metal thicknesses.
- .4 Locations of reinforcement and preparations for hardware.
- .5 Details of each different wall opening condition.
- .6 Details of anchorages, joints, field splices, and connections.
- .7 Details of accessories.
- .8 Details of mouldings, removable stops, and glazing.
- .9 Details of conduit and preparations for power, signal, and control systems.

.3 Other Action Submittals:
- .1 Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

.4 Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labelled assemblies.

1.4 QUALITY ASSURANCE

.1 Except as otherwise specified, comply with requirements of Canadian Manufacturing Standards for Steel Doors and Frames published by the Canadian Steel Door and Frame Manufacturers' Association.

.2 Source Limitations: Obtain hollow metal work from single source from single manufacturer.

.3 Fire-Rated Door Assemblies: Assemblies complying with CAN4-S104-M that are listed and labelled by a qualified testing agency, for fire-protection ratings indicated.
.1 Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labelled fire-rated door assemblies except for size.

.4 Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with CAN4-S104-M that are listed and labelled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated. Label each individual glazed lite.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
.1 Provide additional protection to prevent damage to finish of factory-finished units.

.2 Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

.3 Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 102 mm high wood blocking. Do not store in a manner that traps excess humidity.
.1 Provide minimum 6 mm space between each stacked door to permit air circulation.

1.6 PROJECT CONDITIONS

.1 Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

.1 Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Steel
.1 Commercial grade steel to ASTM A924-97 (M-97), galvanized to ASTM A653-97 (M-97), Commercial Steel (CS), Type B, A40 (ZF120) minimum unless otherwise noted.
.2 Minimum steel thicknesses shall be in accordance with Appendix 1 of the CSDMA, *Recommended Specifications for Commercial Steel Door and Frame Products*.

.2 Door Core Materials
.1 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 required thickness.
.2 Fibreglass: Loose batt type, density 24 kg/m^3 minimum, conforming to ASTM C553 or ASTM C592.
.3 Polystyrene: Rigid extruded, fire retardant, closed cell board, Type 1, density: 16 to 32 kg/m^3, thermal values: RSI 1.06 (R 6.0) minimum, conforming to ASTM C578.
.4 Polystyrene: Rigid extruded fire retardant, closed cell board. Density; 16 to 32 kg/m^3, thermal values; RSI 1.0 (R 6.0) minimum, Type 1, in accordance with ASTM C578.
.5 Polyisocyanurate: Rigid foam. closed cell, faced board, thermal value: RSI 2.17 (R12.3) minimum, conforming to ASTM C1289

2.2 MISCELLANEOUS

.1 Primers
.1 Rust inhibitive touch-up only.

.2 Door Silencers
.1 Single stud rubber/neoprene type.

.3 Exterior Top Caps
.1 Rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19MA.

.4 Frame Thermal Breaks
.1 Rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19MA.

.5 Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

.6 Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.

.7 Grout: ASTM C 476, except with a maximum slump of 102 mm, as measured according to ASTM C 143/C 143M.

.8 Glazing: Comply with requirements in Division 08 Section *Glazing*.

.9 Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 0.4 mm dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibres, sulphur components, and other deleterious impurities.

2.3 FABRICATION – GENERAL

.1 Manufacturer door and frame products in accordance with the CSDMA's, *Recommended Dimensional Standards for Commercial Steel Doors and Frames*.

.2 Selected Door and Frame Requirements, unless noted otherwise (uno)

Item	Location		
	Interior, Unless noted otherwise	**Exterior, Unless noted otherwise**	**Steel Stiffened, where noted**
Steel Coating	A40 (ZF120) minimum; uno.	A40 (ZF120) minimum, uno. Provide G90 (Z275) coating where noted.	A40 (ZF120) minimum, uno. Provide G90 (Z275) coating where noted.
Doors			
Duty / Min. Steel Thickness	Medium duty / 1.3 mm (18 gauge nominal); uno.	Heavy duty / 1.6 mm (16 gauge nominal); uno.	Extra heavy duty / 2.0 mm (14 gauge nominal), uno.
Design	Flush panel, uno.	Flush panel, uno.	Flush panel, uno
Core,	Stiffened, insulated and sound deadened with hon-eycomb core laminated under pressure to each face sheet; uno.	Stiffened, insulated and sound deadened with poly-styrene or polyisocyanurate core laminated under pres-sure to each face sheet; uno.	Internally reinforced with continuous interlocking steel stiffeners at 150 mm on centre, securely welded to each face sheet at 150 mm on centre maximum, with voids between stiffen-ers filled and sound dead-ened with 24 kg/m3 loose batt type fibreglass materi-al.
Longitudinal Seams	Mechanically interlocked, adhesive assisted with edge seams tack welded, filled and sanded flush with no visible seam; uno.	Mechanically interlocked, adhesive assisted with edge seams tack welded, filled and sanded flush with no visible seam; uno.	Continuously welded the full height of the door filled and ground smooth with no visible seams.
Caps	None, uno.	PVC, uno. Provide steel caps where noted.	Steel cap.
Thermally Broken?	No	No, uno.	No.
Frames			
Duty / Min. Steel Thickness	Medium duty / 1.3 mm (18 gauge nominal); uno. Standard duty / 1.0 mm 20 gauge nominal) for hollow core doors.	Heavy duty / 1.6 mm (16 gauge nominal); uno.	Heavy duty / 1.6 mm (16 gauge nominal); uno.
Construction	Full face, punch-mitred, or saw mitred welded con-struction; uno.	Full face welded construc-tion.	Full face welded construc-tion.
Thermally Broken?	No	No, uno.	No.

2.4 FABRICATION - FRAME PRODUCTS

.1 General

.1 Provide frame mortised, blanked, reinforced, drilled, and tapped at the factory for templated hardware only, in accordance with the approved hardware schedule and templates provided by the hardware supplier.

.2 Protect mortised cut-outs with steel guard boxes except for dry wall applications.

.3 Reinforce frame where required, for surface mounted hardware, anchor hinges, thrust pivots, pivot reinforced hinges, or non-templated hardware.

.4 Provide anchorage appropriate to floor, wall, and frame construction. Each wall anchor shall be located immediately above or below each hinge reinforcement on the hinge jamb and directly opposite on the strike

jamb. For rebate opening heights up to and including 1520 mm provide two anchors, and an additional anchor for each additional 760 mm of height or fraction thereof, except as indicated below. Frames in previously placed concrete, masonry, or structural steel shall be provided with anchors located not more than 150 mm from the top and bottom of each jamb, and intermediate anchors at 660 mm on centre maximum. Fasteners for such anchors shall be provided by others.

.5 Provide minimum reinforcing, anchor and other component gauges in accordance with Table 1 of the CSDMA, *Recommended Specifications for Commercial Steel Door and Frame Products*.

.6 Prepare each door opening for single stud rubber door silencers, three 3 for single

.7 Provide fire-rated frame products for those openings requiring fire protection. Provide frames, transom and sidelight assemblies listed for conformance with CAN4-S104. Provide window assemblies listed for conformance with CAN4-S106. Ensure all fire-rated frame products bear the label of, and be listed by a nationally recognized testing agency having a factory inspection service. Labelling shall be in accordance with NFPA 80, the listing authority's policies and label materials, and identify the manufacturer. Construct fire-rated frame products as listed for labelling in the Follow-Up Service Procedures/Factory Inspection Manuals issued by the listing agency to individual manufacturers.

.8 For each grade frame indicated form from a steel sheet having a minimum thickness of:

.1 Standard Duty grade frames: 1.0 mm
.2 Medium Duty grade frames: 1.3 mm
.3 Heavy Duty and Extra Heavy Duty grade frames: 1.6 mm

.2 Welded Type

.1 Accurately mitre or mechanically join frame products.

.2 Ensure frame product perimeter corner joints shall be as defined in Appendix 2 of the CSDMA, *Recommended Specifications for Commercial Steel Door and Frame Products*, and as follows

.1 Profile welded; punch-mitred - continuously welded on the profile faces, rabbets, returns and soffit intersections, or saw-mitred - continuously welded on the profile faces, rabbets, returns, stops and soffit intersections. Punch or saw-mitred, at the manufacturer's discretion. All profile welded frame product exposed faces shall be filled and ground to a smooth, uniform, seamless surface.
.2 Face welded; continuously welded on the profile faces, with exposed faces filled and ground to a smooth, uniform, seamless surface.
.3 Tack welded; welded on the faces and returns, with exposed hairline joint intersections.

.3 Ensure joints at mullions, sills and center rails are:

.1 Coped accurately, butted and tightly fitted.
.2 At intersecting flush profile faces, securely welded, filled and ground to a smooth, uniform, seamless surface.
.3 At intersecting recessed profile faces, securely welded to concealed reinforcements, with exposed hairline face seams.
.4 At all other intersecting profile elements have exposed hairline face seams.

.4 Welding: to CSA W59.

.5 Ensure a floor anchor is securely attached to the inside of each jamb profile where frame product is to be installed prior to the adjacent partition. Provide each floor anchor s with two holes for securing to the floor. For conditions that do not permit the use of a floor anchor, substitute with an additional wall anchor, located within 150 mm of the base of the jamb.

.6 Weld in two temporary jamb spreaders per door opening to maintain proper alignment during shipment and handling. Do not be used for installation.

.7 Form glazing stops from steel channel, minimum 16 mm height, accurately fitted, butted at corners and fastened to frame sections with counter-sunk oval head sheet metal screws.

.8 When required due to site access or due to shipping limitations, fabricate frame product for large openings in sections as designated on the submittal drawings, with splice joints for field assembly and welding.

.9 Prior to shipment, mark each frame product with an identification number as shown on submittal drawings.

.3 Knocked-Down Type

.1 Ship knocked-down type frames unassembled.

.2 Ensure frames have mechanical joints which inter-lock securely and provide functionally satisfactory performance when assembled and installed in accordance with the manufacturer's published instructions.

.3 Where frame product is to be installed prior to the adjacent partition, securely attach a floor anchor to the inside of each jamb profile. Provide each floor anchor with two 2 holes for securing to the floor. For conditions that do not permit the use of a floor anchor, substitute with an additional wall anchor, located within 150 mm of the base of the jamb.

.4 Prior to shipment, mark each frame product with an identification number as shown on submittal drawings.

2.5 FABRICATION - DOORS

.1 General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with requirements of Canadian Manufacturing Standards for Steel Doors and Frames published by the Canadian Steel Door and Frame Manufacturers' Association except as noted.

.1 Longitudinal Edge Profile:

.1 Vertical Edges for Single-Acting Doors: Manufacturer's standard.

.2 Vertical Edges for Double-Acting Doors: Round vertical edges with 54 mm radius.

.2 Provide doors mortised, blanked, reinforced, drilled and tapped at the factory for templated hardware only, in accordance with the approved hardware schedule and templates provided by the hardware supplier.

.3 Factory prepare holes 12.7 mm diameter and larger, except for mounting and through-bolt holes.. Factory-prepare holes less than 12.7 mm when required for the function of the device (for knob, lever, cylinder, thumb or turn pieces) or when these holes over-lap function holes.

.4 Reinforce doors where required for surface mounted hardware, anchor hinges, thrust pivots, pivot reinforced hinges, or non-templated hardware.

.5 Provide top and bottom of doors with inverted, recessed, welded steel channels.

.6 Provide minimum reinforcing and component gauges in accordance with Table 1 of the CSDMA, *Recommended Specifications for Commercial Steel Door and Frame Products*.

.7 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.

.8 Provide fire-rated doors for those openings requiring fire protection. Provide products listed for conformance with CAN4-S104. Provide fire-rated doors bearing label of, and be listed by a nationally recognized testing agency having a factory inspection service. Labelling shall be in accordance with NFPA 80, the listing authority's policies and label materials, and shall identify the manufacturer. Construct fire-rated doors as listed for labelling in the Follow-Up Service Procedures/Factory Inspection Manuals issued by the listing agency to individual manufacturers.

.9 Prior to shipment, mark each door with an identification number as shown on the submittal drawings.

.10 For each grade door indicated form both face sheets for doors from a steel sheet having a minimum thickness of:

.1 Standard Duty grade doors: 1.0 mm

.2 Medium Duty grade doors: 1.3 mm

.3 Heavy Duty grade doors: 1.6 mm

.4 Extra Heavy Duty grade doors: 2.0 mm

2.6 HOLLOW METAL PANELS

.1 Provide hollow metal panels of same materials, construction, and finish as specified for adjoining hollow metal doors.

2.7 FRAME ANCHORS

.1 Jamb Anchors:

.1 Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 1.0 mm thick, with corrugated or perforated straps not less than 50 mm wide by 250 mm long; or wire anchors not less than 4.5 mm thick.

.2 Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 1.0 mm thick.

.3 Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.

.4 Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 9.5 mm diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

.2 Floor Anchors: Formed from same material as frames, not less than 1.0 mm thick, and as follows:

.1 Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

.2 Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 50 mm height adjustment. Terminate bottom of frames at finish floor surface.

2.8 STOPS AND MOULDINGS

.1 Mouldings for Glazed Lites in Doors: Minimum 0.8 mm thick, fabricated from same material as door face sheet in which they are installed.

.2 Fixed Frame Mouldings: Formed integral with hollow metal frames, a minimum of 16 mm high unless otherwise indicated.

.3 Loose Stops for Glazed Lites in Frames: Minimum 0.8 mm thick, fabricated from same material as frames in which they are installed.

.4 Terminated Stops: Where indicated on interior door frames, terminate stops 152 mm above finish floor with a 45-degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.

.1 Provide terminated stops only where indicated.

2.9 LOUVERS

.1 Provide louvers for interior doors, where indicated, with blades or baffles formed of 0.5 mm thick, cold-rolled steel sheet set into 0.8 mm thick steel frame.

.1 Sightproof Louver: Stationary louvers constructed with inverted V-shaped or Y-shaped blades.

.2 Fire-Rated Automatic Louvers: Louvers constructed with movable blades closed by actuating fusible link, and listed and labelled for use in fire-rated door assemblies of type and fire-resistance rating indicated by same testing and inspecting agency that established fire-resistance rating of door assembly.

2.10 ACCESSORIES

.1 Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

.2 Ceiling Struts: Minimum 6.4 mm thick by 25.4 mm wide steel.

.3 Grout Guards: Formed from same material as frames, not less than 0.4 mm thick.

2.11 FABRICATION

.1 Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

.2 Hollow Metal Doors:

.1 Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

.2 Glazed Lites: Factory cut openings in doors.

.3 Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 19 mm beyond edge of door on which astragal is mounted.

.3 Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

.1 Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
.2 Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
.3 Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
.4 Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
.5 Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
.6 Jamb Anchors: Provide number and spacing of anchors as follows:

.1 Masonry Type: Locate anchors not more than 457 mm from top and bottom of frame. Space anchors not more than 813 mm o.c. and as follows:

.1 Two anchors per jamb up to 1524 mm high.
.2 Three anchors per jamb from 1524 to 2286 mm high.
.3 Four anchors per jamb from 2286 to 3048 mm high.
.4 Four anchors per jamb plus 1 additional anchor per jamb for each 610 mm or fraction thereof above 3048 mm high.

.2 Stud-Wall Type: Locate anchors not more than 457 mm from top and bottom of frame. Space anchors not more than 813 mm o.c. and as follows:

.1 Three anchors per jamb up to 1524 mm high.
.2 Four anchors per jamb from 1524 to 2286 mm high.
.3 Five anchors per jamb from 2286 to 2438 mm high.
.4 Five anchors per jamb plus 1 additional anchor per jamb for each 610 mm or fraction thereof above 2438 mm high.
.5 Two anchors per head for frames above 1066 mm wide and mounted in metal-stud partitions.

.3 Compression Type: Not less than two anchors in each jamb.
.4 Postinstalled Expansion Type: Locate anchors not more than 152 mm from top and bottom of frame. Space anchors not more than 660 mm o.c.

.7 Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.

.1 Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
.2 Double-Door Frames: Drill stop in head jamb to receive two door silencers.

.4 Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

.5 Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cut-outs, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section *Door Hardware*.

.1 Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
.2 Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
.3 Coordinate locations of conduit and wiring boxes for electrical connections with Electrical sections.

.6 Stops and Mouldings: Provide stops and mouldings around glazed lites indicated. Form corners of stops and mouldings with butted or mitred hairline joints.

.1 Single Glazed Lites: Provide fixed stops and mouldings welded on secure side of hollow metal work.
.2 Multiple Glazed Lites: Provide fixed and removable stops and mouldings so that each glazed lite is capable of being removed independently.
.3 Provide fixed frame mouldings on outside of exterior and on secure side of interior doors and frames.
.4 Provide loose stops and mouldings on inside of hollow metal work.
.5 Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
.2 Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
.3 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

.1 Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
.2 Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:

.1 Squareness: Plus or minus 1.6 mm, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
.2 Alignment: Plus or minus 1.6 mm, measured at jambs on a horizontal line parallel to plane of wall.
.3 Twist: Plus or minus 1.6 mm, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
.4 Plumbness: Plus or minus 1.6 mm, measured at jambs on a perpendicular line from head to floor.

.3 Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

.1 General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
.2 Hollow Metal Frames: Install hollow metal frames of size and profile indicated.

.1 Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

.1 At fire-protection-rated openings, install frames according to NFPA 80.
.2 Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
.3 Install frames with removable glazing stops located on secure side of opening.
.4 Install door silencers in frames before grouting.
.5 Remove temporary braces necessary for installation only after frames have been properly set and secured.
.6 Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
.7 Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.

.2 Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

.1 Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

.3 Metal-Stud Partitions: Solidly pack mineral-fibre insulation behind frames.

.4 Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.

.5 Concrete Walls: Solidly fill space between frames and concrete with grout, but only when specifically noted. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.

.6 In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

.7 In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

.8 Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.

.9 Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

.1 Squareness: Plus or minus 1.6 mm, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.

.2 Alignment: Plus or minus 1.6 mm, measured at jambs on a horizontal line parallel to plane of wall.

.3 Twist: Plus or minus 1.6 mm, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.

.4 Plumbness: Plus or minus 1.6 mm, measured at jambs at floor.

.3 Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

.1 Non-Fire-Rated Standard Steel Doors:

.1 Jambs and Head: 3 mm plus or minus 1.6 mm.

.2 Between Edges of Pairs of Doors: 3 mm plus or minus 1.6 mm.

.3 Between Bottom of Door and Top of Threshold: Maximum 9.5 mm.

.4 Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 19 mm.

.2 Fire-Rated Doors: Install doors with clearances according to NFPA 80.

.4 Glazing: Comply with installation requirements in Division 08 Section *Glazing* and with hollow metal manufacturer's written instructions.

.1 Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 230 mm o.c. and not more than 50 mm o.c. from each corner.

3.4 ADJUSTING AND CLEANING

.1 Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

.2 Remove grout and other bonding material from hollow metal work immediately after installation.

.3 Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

.1 Types of items described in this Section:
- .1 Solid-core doors with wood-veneer faces.
- .2 Hollow-core doors with hardboard or MDF faces.
- .3 Shop priming and factory finishing flush wood doors.

.2 Types of items you will not find described in this Section:
- .1 Solid-core doors with hardboard, MDF, or plastic-laminate faces.
- .2 Hollow-core doors with wood-veneer and plastic-laminate faces.
- .3 Wood door frames including fire-rated wood door frames.
- .4 Factory fitting flush wood doors to frames and factory machining for hardware.
- .5 Requirements for veneers from the same flitches for both flush wood doors and wood paneling.
- .6 Exterior painting, interior painting and staining and transparent finishing for field finishing doors.
- .7 Lead-lined flush wood doors.
- .8 Glass view panels in flush wood doors.

1.3 SUBMITTALS

.1 Product Data: For each type of door indicated. Include details of core and edge construction, louvers, and trim for openings.

.2 Sustainability Submittals:
- .1 Chain-of-custody certificates certifying that flush wood doors comply with forest certification requirements. Include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.
- .2 For adhesives and composite wood products, indicating that product contains no urea formaldehyde.

.3 Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
- .1 Indicate dimensions and locations of cut-outs.
- .2 Indicate doors to be factory finished and finish requirements.
- .3 Indicate fire-protection ratings for fire-rated doors.

.4 Samples for Verification:
- .1 Factory finishes applied to actual door face materials, approximately 200 by 250 mm, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of colour and grain to be expected in the finished work.

.5 Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

.1 Non-Rated Wood Flush Doors: complying with CAN/CSA-O132.2 Series 90.

.2 Fire-Rated Wood Doors: Doors complying with CAN4-S104-M that are listed and labelled by a qualified testing agency, for fire-protection ratings indicated. .

.1 Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labelled fire-rated door assemblies except for size.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Comply with requirements of referenced standard and manufacturer's written instructions.

.2 For wood veneer doors, package doors individually in plastic bags or cardboard cartons.

1.6 PROJECT CONDITIONS

.1 Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weather tight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

.2 Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weather tight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 16 and 32 deg C and relative humidity between 43 and 70 percent during the remainder of the construction period.

1.7 WARRANTY

.1 Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

.1 Failures include, but are not limited to, the following:

.1 Warping (bow, cup, or twist) more than 6.4 mm in a 1067-by-2134 mm section.

.2 Telegraphing of core construction in face veneers exceeding 0.25 mm in a 76.2 mm span.

.2 Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.

.3 Warranty Period for Solid-Core Interior Doors: Life of installation.

.4 Warranty Period for Hollow-Core Interior Doors: One year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 DOOR CONSTRUCTION, GENERAL

.1 Low-Emitting Materials: provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.

.2 Particleboard-Core Doors: to CAN/CSA-O132.2 Series 90

.1 Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.

.2 Provide doors with either glued-wood-stave or structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.

.3 Mineral-Core Doors:

.1 Tested in accordance with CAN4 S104 or NFPA 252 to achieve rating as specified.

.2 Core: Non-combustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.

.3 Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.

.4 Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

.5 Pairs: Provide fire-retardant stiles that are listed and labelled for applications indicated without formed-steel edges and astragals. Comply with specified requirements for exposed edges.

.4 Hollow-Core Doors:

.1 Moulded residential-type panel doors fabricated moulded wood fibre facing, wood or MDF stiles and rails, and corrugated cell, bonded together to form a 3-ply structural attachment, internally reinforced for hardware, factory-machined to accommodate scheduled hardware, and primed with latex primer.

.1 Overall thickness: 35 mm.

2.2 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

.1 Interior Solid-Core Doors:

.1 Grade: Hardwood Veneer Grade II (Good).

.2 Species: Select white maple; unless otherwise noted.

.3 Cut: Quarter sliced, unless otherwise noted

.4 Match between Veneer Leaves: Slip match.

.5 Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.

.6 Exposed Vertical Edges: Same species as faces or a compatible species.

.7 Core: Particleboard.

.1 Substitute particleboard core with mineral core when required to achieve the fire rating specified.

.8 Construction: Seven plies, either bonded or non-bonded construction.

2.3 DOORS FOR OPAQUE FINISH

.1 Interior Solid-Core Doors:

.1 Grade: Sound (paint).

.2 Faces: Any closed-grain hardwood of mill option.

.3 Exposed Vertical Edges: Any closed-grain hardwood.

.4 Core: Particleboard.

.1 Substitute particleboard core with mineral core when required to achieve the fire rating specified.

.5 Construction: Five or seven plies. Stiles and rails are bonded to core, and then entire unit abrasive planed before veneering. Faces are bonded to core using a hot press.

.2 Interior Hollow-Core Doors:

.1 Panel design: see door elevation drawings.

.2 Manufacturers: Subject to compliance with requirements, provide products by one of the following:

.1 Masonite Corporation.

.2 Or approved alternate.

2.4 LOUVERS AND LIGHT FRAMES

.1 Wood Louvers: Provide door manufacturer's standard solid-wood louvers, unless otherwise indicated.

.1 Wood Species: Species compatible with door faces.

.2 Metal Louvers: Provide metal louvers only when specifically indicated.

.1 Blade Type: Vision-proof, inverted Y.

.2 Metal and Finish: Hot-dip galvanized steel, 1.0 mm thick, with baked-enamel- or powder-coated finish.

.3 Louvers for Fire-Rated Doors: Provide metal louvers with fusible link and closing device, listed and labelled for use in doors with fire-protection rating of 1-1/2 hours and less.
.1 Metal and Finish: Hot-dip galvanized steel, 1.0 mm thick, with baked-enamel- or powder-coated finish.

.4 Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads as follows, unless otherwise indicated.
.1 Wood Species: Species compatible with door faces.
.2 Profile: Manufacturer's standard shape.
.3 At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.

.5 Metal Frames for Light Openings in Fire-Rated Doors: Provide manufacturer's standard frame formed of 1.2 mm thick, cold-rolled steel sheet; with baked-enamel- or powder-coated finish; and approved for use in doors of fire-protection rating greater than 20 minutes.

2.5 FABRICATION

.1 Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
.1 Comply with requirements in NFPA 80 for fire-rated doors.

.2 Openings: Cut and trim openings through doors in factory.
.1 Light Openings: Trim openings with mouldings of material and profile indicated.
.2 Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 08 Section *Glazing*.
.3 Louvers: Factory-install louvers in prepared openings.

2.6 FACTORY FINISHING

.1 General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
.1 Finish faces, all four edges, edges of cut-outs, and mortises. Stains and fillers may be omitted on bottom edges, edges of cut-outs, and mortises.

.2 Factory finish doors only when specifically indicated.

.3 Transparent Factory Finish:
.1 Grade: Custom.
.2 Finish: AWI conversion varnish or catalyzed polyurethane system.
.3 Effect: Semi filled finish, produced by applying an additional finish coat to partially fill the wood pores.
.4 Staining: As selected by Owner's Representative from full range of manufacturer’s stain colour if not specifically indicated elsewhere.
.5 Sheen: Satin, unless otherwise noted.

.4 Opaque Factory Finish:
.1 Grade: Custom.
.2 Finish: AWI conversion varnish or catalyzed polyurethane system.
.3 Colour: As selected by Owner's Representative from full range of manufacturer’s colours if not specifically indicated elsewhere.
.4 Sheen: Semi gloss, unless otherwise noted.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Examine doors and installed door frames before hanging doors.
  .1 Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
  .2 Reject doors with defects.

.2 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

.1 Hardware: For installation, see Division 08 Section *Door Hardware*.

.2 Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.
  .1 Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

.3 Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cut-outs, and mortises after fitting and machining.
  .1 Clearances: Provide 3.2 mm at heads, jambs, and between pairs of doors. Provide 3.2 mm from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 6.4 mm from bottom of door to top of threshold unless otherwise indicated.
    .1 Comply with NFPA 80 for fire-rated doors.
  .2 Bevel non-fire-rated doors 3-1/2 degrees at lock and hinge edges.
  .3 Bevel fire-rated doors 3-1/2 degrees at lock edge; trim stiles and rails only to extent permitted by labelling agency.

.4 Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

.5 Doors indicated on drawing to be removed and reinstalled are to be stock piled on site as to avoid damage. Contractor to identify all doors to be reinstalled according to door schedule.

3.3 ADJUSTING

.1 Operation: Rehang or replace doors that do not swing or operate freely.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

.1 Types of items described in this Section:
- .1 Access doors and frames for walls and ceilings.
- .2 Floor access doors and frames, insulated and non-insulated.
- .3 Insulated attic access hatches, without access ladder.

.2 Types of items you will not find described in this Section:
- .1 Mortise or rim cylinder locks and master keying for access doors in walls and ceilings.
- .2 Connection of floor door drainage couplings to drains.
- .3 Blocking out openings for access doors and frames in concrete.
- .4 Anchoring and grouting access door frames set in masonry construction.
- .5 Roof hatches.
- .6 Suspended acoustical tile ceilings.
- .7 Heating and air-conditioning duct access doors.

.3 Precedent
- .1 This spec section shall take precedent over product specifications for similar access doors and frames found in Mechanical and Electrical Divisions for locations outlined in this Spec.

1.3 SUBMITTALS

.1 Product Data: For each type of access door and frame indicated. Include construction details, fire ratings, materials, individual components and profiles, and finishes.

.2 Access Door and Frame Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

1.4 QUALITY ASSURANCE

.1 Source Limitations: Obtain each type of access door(s) and frame(s) through one source from a single manufacturer.

.2 Fire-Rated Access Doors and Frames: Units complying with CAN4-S104-M that are identical to access door and frame assemblies tested for fire-test-response characteristics and that are listed and labeled by ULC or another testing and inspecting agency acceptable to authorities having jurisdiction:

.3 Size Variations: Obtain Owner's Representative's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

1.5 COORDINATION

.1 Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical (including but not limited to all concealed valves, balancing arms and controls, fire flaps, and fire

dampers), electrical (including but not limited to all concealed junction boxes, controls), or other concealed work, and indicate in the schedule specified in *Submittals* Article.

PART 2 - PRODUCTS

2.1 STEEL MATERIALS

.1 Steel Sheet: Uncoated or electrolytic zinc-coated, ASTM A 591/A 591M with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

.2 Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS) with ZF180 zinc-iron-alloy (galvannealed) coating or Z180 mill-phosphatized zinc coating; stretcher-leveled standard of flatness; with minimum thickness indicated representing specified thickness according to ASTM A 924/A 924M.

.3 Drywall Beads: Edge trim formed from 0.76-mm zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.

2.2 STAINLESS-STEEL MATERIALS

.1 Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304 or 316. Remove tool and die marks and stretch lines or blend into finish.
  .1 Finish: Manufacturer's standard.

2.3 ACCESS DOORS AND GRAMES IN GENERAL

.1 Provide fire rated door assemblies when installed in fire rated assemblies
  .1 Closing: automatic closing type.
  .2 Ratings:
    .1 45 minute assembly: 45 minute door rating.
    .2 1 hour assembly: 45 minute door rating.
    .3 1.5 hour assembly: 1 hour door rating.
    .4 2 hour assembly: 1 ½ hour door rating.

2.4 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

.1 Door: Minimum 1.5 mm thick sheet metal.

.2 Frame: Minimum 1.5 mm thick sheet metal

.3 Hinges: one of the following:
  .1 Spring-loaded, concealed-pin type.
  .2 Continuous piano.

.4 Latch: Cam latch; slam latch; or self-latching bolt operated by one of the following:
  .1 Hex head wrench.
  .2 Pinned hex head wrench.
  .3 Spanner head wrench.

.5 Doors in finished gypsum board wall and ceiling assemblies not otherwise having a tile finish.
  .1 Type: Flush access doors and trimless frames
  .2 Fabricated from one of the following:
    .1 Steel sheet.

.2 Metallic-coated steel sheet.
.3 Stainless-steel sheet.
.3 Door: Set flush with surrounding finish surfaces.
.4 Frame: With drywall bead flange.
.5 Rating: Fire rated when installed in fire rated assemblies.
.1 Automatic Closer: Spring type.

.6 Doors in wall assemblies having a tiled finish.
.1 Type: Recessed access doors and trimless frames.
.2 Fabricated from one of the following:
.1 Steel sheet.
.2 Metallic-coated steel sheet.
.3 Stainless-steel sheet.
.3 Locations: Wall access doors.
.4 Door: In the form of a pan recessed 25 mm for gypsum board and tile infill.
.5 Frame: With drywall bead for gypsum board surfaces.

.7 Doors in all other assemblies.
.1 Type: Flush access doors and frames with exposed trim.
.2 Materials: Fabricated from:
.1 Stainless-steel sheet.
.3 Door: Set flush with exposed face flange of frame.
.4 Frame: With 25 mm or 32 mm wide, surface-mounted trim.

2.5 FLOOR ACCESS DOORS AND FRAMES

.1 Floor Doors, General: Equip each door with adjustable counterbalancing springs, heavy-duty hold-open arm that automatically locks door open at 90 degrees, release handle with red vinyl grip that allows for one-handed closure, and recessed lift handle.

.2 Aluminum Floor Door: Single-leaf opening. Extruded-aluminum angle frame with 6.4 mm thick, diamond-pattern, aluminum tread plate door; non-watertight; loading capacity to support 7.2-kN/sq. m pedestrian live load.
.1 Locations: When hatch is installed in non-fire rated floor assemblies.

.3 Steel Angle-Frame Floor Door: Single-leaf opening. Galvanized structural-steel frame with 4.8 or 6.4 mm thick, diamond-pattern, galvanized structural-steel tread plate door; non-watertight; loading capacity to support 7.2 kN/sq. m pedestrian live load.
.1 Fire-Resistance Rating: Not less than that indicated.
.2 Finish painted in yellow with wording *FIRE DOOR - DO NOT STORE MATERIALS ON SURFACE*.
.3 Locations: When hatch is installed in fire-rated floor assemblies.

.4 Watertight Aluminum Floor Door: Single-leaf opening. Extruded-aluminum gutter frame with DN 40 drainage coupling and 6.4-mm- thick, diamond-pattern, aluminum tread plate door; watertight; loading capacity to support 7.2-kN/sq. m pedestrian live load.
.1 Locations: Only if a water tight hatch is indicated, and then only in non-fire-rated floor assemblies.

.5 Watertight Steel Gutter-Frame Floor Door: Single-leaf opening. Galvanized structural-steel channel frame forming gutter with DN 40 drainage coupling and 4.8- or 6.4-mm- thick, diamond-pattern, galvanized structural-steel tread plate door; watertight; loading capacity to support 7.2-kN/sq. m pedestrian live load.
.1 Fire-Resistance Rating: Not less than that indicated.
.2 Finish painted in yellow with wording *FIRE DOOR - DO NOT STORE MATERIALS ON SURFACE*.
.3 Locations: Only if a water tight hatch is indicated, and then only in fire rated floor assemblies.

.6 Hardware: Provide the following:
- .1 Hinges: Heavy-duty, aluminum butt hinges with stainless-steel pins.
- .2 Latch: Stainless-steel slam latch.
- .3 Lock: Keyed deadlock bolt
- .4 Hardware Material: Stainless steel, including latch and lifting mechanism assemblies, hold-open arms, and all brackets, hinges, pins, and fasteners.

.7 Insulation: Urethane with liner pan.
- .1 Locations: When hatch is installed in insulated floor assemblies.

2.6 INSULATED ATTIC ACCESS HATCHES

.1 Access Hatch: pre-fabricated attic access hatch consisting of door frame and trim, complete with steel door with polyurethane core for manual lifting, complete with magnetic weather stripping, 550 x 900 mm nominally.

2.7 FABRICATION

.1 General: Provide access door and frame assemblies manufactured as integral units ready for installation.

.2 Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

.3 Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
- .1 Exposed Flanges: Nominal 25 to 38 mm wide around perimeter of frame.
- .2 For trimless frames with drywall bead, provide edge trim for gypsum board and gypsum base securely attached to perimeter of frames.
- .3 Provide mounting holes in frames for attachment of units to metal or wood framing.
- .4 Provide mounting holes in frame for attachment of masonry anchors. Furnish adjustable metal masonry anchors.

.4 Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling.

.5 Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
- .1 For cylinder lock, furnish two keys per lock and key all locks alike.
- .2 For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

.6 Extruded Aluminum: After fabrication, apply manufacturer's standard protective coating on aluminum that will come in contact with concrete.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

.1 Comply with manufacturer's written instructions for installing access doors and frames.

.2 Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.

.3 Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.2 INSULATED ATTIC ACCESS HATCH

.1 Ensure structural framing is used to create the rough opening for the hatch. Secure hatch to the structural framing as per manufacturer requirements.

.2 Seal the ceiling's air/vapour barrier to frame of attic access hatch. Fill void between frame and adjacent framing with spray foam sealant.

3.3 ADJUSTING AND CLEANING

.1 Adjust doors and hardware after installation for proper operation.

.2 Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 Types of items described in this Section:
- .1 Commercial door hardware for the following:
  - .1 Swinging doors.
  - .2 Non-fire-rated sliding doors.
  - .3 Other doors to the extent indicated.
- .2 Cylinders for doors specified in other Sections.
- .3 Electrified door hardware.

.2 Types of items you will not find described in this Section:
- .1 Commercial door hardware for the following:
  - .1 Non-fire-rated folding doors.
- .2 Astragals provided as part of fire-rated labelled assemblies and for door silencers provided as part of hollow-metal frames.
- .3 Door silencers provided as part of aluminum frames.
- .4 Astragals and integral intumescent seals provided as part of fire-rated labelled flush wood door assemblies.
- .5 Astragals and integral intumescent seals provided as part of fire-rated labelled stile and rail wood door assemblies.
- .6 Access door hardware.
- .7 Door hardware provided as part of overhead door assemblies.
- .8 Door hardware provided as part of overhead grille assemblies.
- .9 Door silencers provided as part of hollow-metal detention frames.
- .10 Hinges and gasketing provided as part of sound-rated door assemblies.
- .11 Specialized entrance door hardware for aluminum-framed entrances and storefronts
- .12 Specialized entrance door hardware for all-glass entrances and storefronts.
- .13 Specialized entrance door hardware for automatic entrances
- .14 Specialized entrance door hardware for intensive care unit/critical care unit (ICU/CCU) entrances.
- .15 Detention door hardware.
- .16 Door hardware for doors in wire mesh partitions.
- .17 Plastic door protection units that match wall protection units.
- .18 Radiation protection for lead-lined astragals provided as part of fire-rated labelled assemblies.
- .19 Connections to electrical power system and for low-voltage wiring work.
- .20 Access control devices installed at door openings and provided as part of a security access system.
- .21 Detection devices installed at door openings and provided as part of an intrusion detection system.
- .22 Connections to building fire alarm system.

.3 Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.
- .1 Cylinders for locks specified in other Sections.

1.2 SUBMITTALS

.1 Product Data: Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.

.2 Shop Drawings: Details of electrified door hardware, indicating the following:
- .1 Wiring Diagrams: Power, signal, and control wiring. Include the following:
  - .1 System schematic.

.2 Point-to-point wiring diagram.
.3 Riser diagram.
.4 Elevation of each door.

.2 Detail interface between electrified door hardware and fire alarm, access control, security, and building control systems.

.3 Operation Narrative: Describe the operation of doors controlled by electrified door hardware.

.3 Qualification Data: For Architectural Hardware Consultant.

.4 Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.

.5 Warranty: Special warranty specified in this Section.

.6 Other Action Submittals:

.1 Door Hardware Sets: Prepared by or under the supervision of Architectural Hardware Consultant, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final door hardware sets with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

.1 Format: Comply with scheduling sequence and vertical format in DHI's *Sequence and Format for the Hardware Schedule*. Double space entries, and number and date each page.

.2 Content: Include the following information:

.1 Identification number, location, hand, fire rating, and material of each door and frame.

.2 Type, style, function, size, quantity, and finish of each door hardware item. Include description and function of each lockset and exit device.

.3 Complete designations of every item required for each door or opening including name and manufacturer.

.4 Fastenings and other pertinent information.

.5 Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.

.6 Explanation of abbreviations, symbols, and codes contained in schedule.

.7 Mounting locations for door hardware.

.8 Door and frame sizes and materials.

.9 Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.

.1 Sequence of Operation: Include description of component functions that occur in the following situations: authorized person wants to enter; authorized person wants to exit; unauthorized person wants to enter; unauthorized person wants to exit.

.10 List of related door devices specified in other Sections for each door and frame.

.3 Submittal Sequence: Submit the final door hardware sets at earliest possible date, particularly where approval of the door hardware sets must precede fabrication of other work that is critical in Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the door hardware sets.

.2 Keying Schedule: Prepared by or under the supervision of Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.

1.3 QUALITY ASSURANCE

.1 Installer Qualifications: An employer of workers trained and approved by lock manufacturer.

.1 Installer's responsibilities include supplying and installing door hardware and providing a qualified Architectural Hardware Consultant available during the course of the Work to consult with Contractor, Owner's Representative, and Owner about door hardware and keying.
.2 Installer shall have warehousing facilities in Project's vicinity.
.3 Scheduling Responsibility: Preparation of door hardware and keying schedules.
.4 Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

.2 Architectural Hardware Consultant Qualifications: A person who is currently certified by DHI as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.
.1 Electrified Door Hardware Consultant Qualifications: A qualified Architectural Hardware Consultant who is experienced in providing consulting services for electrified door hardware installations.

.3 Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.
.1 Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

.4 Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labelled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

.5 Electrified Door Hardware: Listed and labelled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

.6 Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section *Project Management and Coordination*. Review methods and procedures related to electrified door hardware including, but not limited to, the following:
.1 Inspect and discuss electrical roughing-in and other preparatory work performed by other trades.
.2 Review sequence of operation for each type of electrified door hardware.
.3 Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
.4 Review required testing, inspecting, and certifying procedures.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

.2 Tag each item or package separately with identification related to the final door hardware sets, and include basic installation instructions, templates, and necessary fasteners with each item or package.

.3 Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

.4 Deliver keys and permanent cores, when specified, to Owner by registered mail or overnight package service.
.1 Obtain name and mailing address from Owner's Representative.

1.5 COORDINATION

.1 Coordinate layout and installation of recessed pivots and closers with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 03.

.2 Templates: Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

.3 Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to power supplies, fire alarm system and detection devices, access control system, security system, and building control system.

.4 Existing Openings: Where new hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide for proper operation.

1.6 WARRANTY

.1 Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fails in materials or workmanship within specified warranty period.
- .1 Failures include, but are not limited to, the following:
  - .1 Structural failures including excessive deflection, cracking, or breakage.
  - .2 Faulty operation of operators and door hardware.
  - .3 Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
- .2 Warranty Period: Three years from date of Substantial Completion, except as follows:
  - .1 Electromagnetic and Delayed-Egress Locks: Five years from date of Substantial Completion.
  - .2 Exit Devices: Two years from date of Substantial Completion.
  - .3 Manual Closers: 10 years from date of Substantial Completion.
  - .4 Concealed Floor Closers: 10 years from date of Substantial Completion.

1.7 MAINTENANCE SERVICE

.1 Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

.2 Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair, or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door hardware operation. Provide parts and supplies same as those used in the manufacture and installation of original products.

1.8 EXTRA MATERIALS

.1 Furnish full-size units of door hardware described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
- .1 Door Hardware: None required.
- .2 Electrical Parts: None required.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

.1 General: Provide door hardware for each door to comply with requirements in this Section.

.1 Door Hardware Sets: Provide quantity, item, size, finish or colour indicated, and products complying with BHMA standard referenced.
.2 Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.

.2 Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 *Door Hardware Groups* Article or on drawings. Products are identified by using door hardware designations, as follows:
.1 Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 3 Door Hardware Groups Article.
.2 References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.

.3 In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
.1 Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 HINGES, GENERAL

.1 Quantity: Provide the following, unless otherwise indicated:
.1 Two Hinges: For doors with heights up to 1524 mm.
.2 Three Hinges: For doors with heights 1549 to 2286 mm.
.3 Four Hinges: For doors with heights 2311 to 3048 mm.
.4 For doors with heights more than 3048 mm, provide 4 hinges, plus 1 hinge for every 750 mm of door height greater than 3048 mm.

.2 Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

.3 Hinge Weight: Unless otherwise indicated, provide the following:
.1 Entrance Doors: Heavy-weight hinges.
.2 Doors with Closers: Antifriction-bearing hinges.
.3 Interior Doors: Standard-weight hinges.

.4 Hinge Base Metal: Unless otherwise indicated, provide the following:
.1 Exterior Hinges: Stainless steel, with stainless-steel pin.
.2 Interior Hinges: Steel, with steel pin .
.3 Hinges for Fire-Rated Assemblies: Steel, with steel pin.

.5 Hinge Options: Where indicated in door hardware sets or on Drawings:
.1 Hospital Tips: Slope ends of hinge barrel.
.2 Maximum Security Pin: Fix pin in hinge barrel after it is inserted.
.3 Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for out swinging exterior doors .
.4 Corners: Square.

.6 Electrified Functions for Hinges: Comply with the following:
.1 Power Transfer: Concealed PTFE-jacketed wires, secured at each leaf and continuous through hinge knuckle.
.2 Monitoring: Concealed electrical monitoring switch.
.3 Power Transfer and Monitoring: Concealed PTFE-jacketed wires, secured at each leaf and continuous through hinge knuckle, and with concealed electrical monitoring switch.

.7 Fasteners: Comply with the following:
.1 Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
.2 Wood Screws: For wood doors and frames.
.3 Threaded-to-the-Head Wood Screws: For fire-rated wood doors.
.4 Screws: Phillips flat-head; machine screws (drilled and tapped holes) for metal doors, wood screws for wood doors and frames. Finish screw heads to match surface of hinges.

2.3 HINGES

.1 Butts and Hinges: BHMA A156.1. Listed under Category A in BHMA's *Certified Product Directory*.

.2 Template Hinge Dimensions: BHMA A156.7.

.3 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
.1 Hager Companies (HAG).
.2 McKinney Products Company; an ASSA ABLOY Group company (MCK).
.3 Stanley Commercial Hardware; Div. of The Stanley Works (STH).
.4 Or approved alternate.

2.4 CONTINUOUS HINGES

.1 Standard: BHMA A156.26, Grade 1 .
.1 Listed under Category N in BHMA's *Certified Product Directory.*

.2 General: Minimum 3.0 mm thick, hinge leaves with minimum overall width of 102 mm; fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.
.1 Fire Pins: Steel pins to hold labelled fire doors in place if required by tested listing.

.3 Continuous, Barrel-Type Hinges: Hinge with knuckles formed around a pin that extends entire length of hinge.
.1 Base Metal for Exterior Hinges: Stainless steel.
.2 Base Metal for Interior Hinges: Aluminium.
.3 Base Metal for Hinges for Fire-Rated Assemblies: Steel.
.4 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
.1 Hager Companies (HAG).
.2 McKinney Products Company; an ASSA ABLOY Group company (MCK).
.3 Stanley Commercial Hardware; Div. of The Stanley Works (STH).
.4 Or approved alternate.

.4 Continuous, Gear-Type Hinges: Extruded-aluminium, pinless, geared hinge leaves; joined by a continuous extruded-aluminium channel cap; with concealed, self-lubricating thrust bearings.
.1 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
.1 Hager Companies (HAG).
.2 McKinney Products Company; an ASSA ABLOY Group company (MCK).
.3 Pemko Manufacturing Co. (PEM).
.4 Or approved alternate.

2.5 LOCKS AND LATCHES, GENERAL

.1 Accessibility Requirements: Where indicated to comply with accessibility requirements, comply with local accessibility regulations

.1 Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 22 N.

.2 Latches and Locks for Means of Egress Doors: Comply with NFPA 101. Latches shall not require more than 67 N to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.

.3 Electrified Locking Devices: BHMA A156.25.

.4 Lock Trim:
.1 Levers: Cast.
.1 **<Insert model number and description.>**
.2 Escutcheons (Roses): Cast.
.3 Dummy Trim: Match lever lock trim and escutcheons.
.4 Lockset Designs: **<Insert name(s) of manufacturer(s) and product name(s) designating lockset design(s) that other manufacturers must match>** or, if sets are provided by another manufacturer, provide designs that match those designated.

.5 Lock Throw: Comply with testing requirements for length of bolts required for labelled fire doors, and as follows:
.1 Bored Locks: Minimum 13 mm latch bolt throw.
.2 Mortise Locks: Minimum 19 mm latch bolt throw.
.3 Deadbolts: Minimum 25 mm bolt throw.

.6 Rebated Meeting Doors: Provide special rebated front and strike on locksets for rebated meeting stiles.

.7 Backset: 70 mm, unless otherwise indicated.

.8 Strikes: Manufacturer's standard strike with strike box for each latchbolt or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, and as follows:
.1 Strikes for Bored Locks and Latches: BHMA A156.2.
.2 Strikes for Mortise Locks and Latches: BHMA A156.13.
.3 Strikes for Interconnected Locks and Latches: BHMA A156.12.
.4 Strikes for Auxiliary Deadlocks: BHMA A156.5.
.5 Flat-Lip Strikes: For locks with three-piece antifriction latchbolt, as recommended by manufacturer.
.6 Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
.7 Aluminium-Frame Strike Box: Manufacturer's special strike box fabricated for aluminium framing.

2.6 MECHANICAL LOCKS AND LATCHES

.1 Lock Functions: Function numbers and descriptions indicated in door hardware sets comply with the following:
.1 Bored Locks: BHMA A156.2.
.2 Mortise Locks: BHMA A156.13.
.3 Interconnected Locks: BHMA A156.12.

.2 Bored Locks: BHMA A156.2, Grade 1 ; Series 4000. Listed under Category F in BHMA's *Certified Product Directory*.
.1 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
.1 Best Access Systems; Div. of The Stanley Works (BAS).
.2 Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company (CR).
.3 SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
.4 Schlage Commercial Lock Division; an Ingersoll-Rand Company (SCH).
.5 Yale Commercial Locks and Hardware; an ASSA ABLOY Group company (YAL).
.6 Or approved alternate.

.3 Mortise Locks: Stamped steel case with steel or brass parts; BHMA A156.13, Grade 1 ; Series 1000. Listed under Category F in BHMA's *Certified Product Directory.*

.1 Manufacturers: Subject to compliance with requirements, provide products by one of the following:

.1 Best Access Systems; Div. of The Stanley Works (BAS).
.2 Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company (CR).
.3 SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
.4 Schlage Commercial Lock Division; an Ingersoll-Rand Company (SCH).
.5 Yale Commercial Locks and Hardware; an ASSA ABLOY Group company (YAL).
.6 Or approved alternate

.4 Interconnected Locks: BHMA A156.12, Grade 1 ; Series 5000. Listed under Category F in BHMA's *Certified Product Directory.*

.1 .1 Manufacturers: Subject to compliance with requirements, provide products by one of the following:

.1 Schlage Commercial Lock Division; an Ingersoll-Rand Company (SCH).

2.7 AUXILIARY LOCKS AND LATCHES

.1 Auxiliary Locks: BHMA A156.5, Grade 1 . Listed under Category E in BHMA's *Certified Product Directory.*

.1 Manufacturers: Subject to compliance with requirements, provide products by one of the following:

.1 Best Access Systems; Div. of The Stanley Works (BAS).
.2 SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
.3 Schlage Commercial Lock Division; an Ingersoll-Rand Company (SCH).
.4 Yale Commercial Locks and Hardware; an ASSA ABLOY Group company (YAL).
.5 Or approved alternate.

2.8 ELECTROMECHANICAL LOCKS

.1 General: Grade 1for type of lock indicated; motor or solenoid driven.

.2 Manufacturers: Subject to compliance with requirements, provide products by one of the following:

.1 Best Access Systems; Div. of The Stanley Works (BAS).
.2 SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
.3 Schlage Commercial Lock Division; an Ingersoll-Rand Company (SCH).
.4 Yale Commercial Locks and Hardware; an ASSA ABLOY Group company (YAL).
.5 Or approved alternate.

2.9 EXIT LOCKS AND EXIT ALARMS

.1 Exit Locks: BHMA A156.29, Grade 1, surface mounted, battery powered, housed in metal case; with red-and-white lettering reading *EMERGENCY EXIT PUSH TO OPEN--ALARM WILL SOUND*. Include the following features:

.1 Low-battery alert.
.2 Outside key control.
.3 Audible alarm that sounds when unauthorized use of door occurs.
.4 Silent alarm with remote signal capability for connection to remote indicating panel.

.2 Stand-Alone Exit Alarms: BHMA A156.29, Grade 1, surface mounted on door. Include the following features:

.1 Low-battery alert.
.2 Outside key control.
.3 Automatic rearming after authorized use, with adjustable time delay.
.4 Remote signal capability for connection to remote indicating panel.

.3 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
.1 Detex Corporation (DTX).
.2 SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
.3 Or approved alternate.

2.10 DOOR BOLTS

.1 Bolt Throw: Comply with testing requirements for length of bolts required for labelled fire doors, and as follows:
.1 Half-Round Surface Bolts: Minimum 22 mm throw.
.2 Interlocking Surface Bolts: Minimum 24 mm throw.
.3 Fire-Rated Surface Bolts: Minimum 25 mm throw; listed and labelled for fire-rated doors.
.4 Dutch-Door Bolts: Minimum 19 mm throw.
.5 Mortise Flush Bolts: Minimum 19 mm throw.

.2 Dustproof Strikes: BHMA A156.16, Grade 1.

.3 Surface Bolts: BHMA A156.16, Grade 1 .
.1 Flush Bolt Heads: Minimum of 13 mm diameter rods of brass, bronze, or stainless steel with minimum 305 mm long rod for doors up to 2134 mm in height. Provide longer rods as necessary for doors exceeding 2134 mm.
.2 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
.1 Glynn-Johnson; an Ingersoll-Rand Company (GJ).
.2 Hager Companies (HAG).
.3 IVES Hardware; an Ingersoll-Rand Company (IVS).
.4 Stanley Commercial Hardware; Div. of The Stanley Works (STH).
.5 Or approved alternate.

.4 Manual Flush Bolts: BHMA A156.16, Grade 1 ; designed for mortising into door edge.
.1 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
.1 Glynn-Johnson; an Ingersoll-Rand Company (GJ).
.2 Hager Companies (HAG).
.3 IVES Hardware; an Ingersoll-Rand Company (IVS).
.4 Stanley Commercial Hardware; Div. of The Stanley Works (STH).
.5 Or approved alternate.

.5 Automatic and Self-Latching Flush Bolts: BHMA A156.3, Grade 1 ; designed for mortising into door edge.
.1 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
.1 Glynn-Johnson; an Ingersoll-Rand Company (GJ).
.2 Hager Companies (HAG).
.3 IVES Hardware; an Ingersoll-Rand Company (IVS).
.4 Or approved alternate.

2.11 EXIT DEVICES

.1 Exit Devices: BHMA A156.3, Grade 1 . Listed under Category G in BHMA's *Certified Product Directory.*

.2 Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with local accessibility regulations.
.1 Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 22 N.

.3 Exit Devices for Means of Egress Doors: Comply with NFPA 101. Exit devices shall not require more than 67 N to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.

.4 Panic Exit Devices: Listed and labelled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.

.5 Fire Exit Devices: Devices complying with NFPA 80 that are listed and labelled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.

.6 Removable Mullions: BHMA A156.3.

.7 Fire-Exit Removable Mullions: Provide removable mullions for use with fire exit devices complying with NFPA 80 that are listed and labelled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252. Mullions shall be used only with exit devices for which they have been tested.

.8 Dummy Push Bar: Non-functioning push bar matching functional push bar.
- .1 Operation: Movable.

.9 Outside Trim:
- .1 Material and finish to match locksets, unless otherwise indicated.
- .2 Heavy-duty commercial grade exterior trim based on style to match design for locksets and latchsets; unless otherwise indicated.

.10 Through Bolts: For exit devices and trim on metal doors, non-fire-rated wood doors, and fire-rated wood doors.

.11 Electronic Exit Bars: Non-latching electronic releasing device activated by an adjustable capacitance sensor, with no moving parts; listed and labelled as panic exit hardware. Fabricate bar from extruded aluminium, and provide door and frame transfer device and 4.9 m of cord to route wiring off the door frame.

.12 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- .1 DORMA Architectural Hardware; Member of The DORMA Group North America (DAH).
- .2 SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
- .3 Von Duprin; an Ingersoll-Rand Company (VD).
- .4 Or approved alternate.

2.12 LOCK CYLINDERS

.1 Standard Lock Cylinders: BHMA A156.5, Grade 1 .

.2 Cylinders: Manufacturer's standard tumbler type, constructed from brass or bronze, stainless steel, or nickel silver, and complying with the following:
- .1 Number of Pins: Seven.
- .2 Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
- .3 Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
- .4 Bored-Lock Type: Cylinders with tailpieces to suit locks.
  - .1 High-Security Grade: BHMA A156.5, Grade 1A, listed and labelled as complying with pick- and drill-resistant testing requirements in UL 437 (Suffix A).

.3 Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:

.1 Removable Cores: Core insert, removable by use of a special key; for use only with core manufacturer's cylinder and door hardware.

.4 Construction Keying: Comply with the following:
.1 Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.

.5 Manufacturer: Same manufacturer as for locks and latches.

2.13 KEYING

.1 Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference, and as follows:
.1 Existing Buildings: Master key or grand master key locks to Owner's existing system.
.2 New Buildings: Provide master key system.

.2 Keys: Nickel silver.
.1 Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
.1 Notation: *DO NOT DUPLICATE*.
.2 Quantity: In addition to one extra key blank for each lock, provide the following:
.1 Cylinder Change Keys: Three.
.2 Master Keys: Five.
.3 Grand Master Keys: Five.
.4 Great-Grand Master Keys: Five.

2.14 KEY CONTROL SYSTEM

.1 Key Control Cabinet: BHMA A156.5, Grade 1; metal cabinet with baked-enamel finish; containing key-holding hooks, labels, 2 sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers; with key capacity of 150percent of the number of locks.
.1 Wall-Mounted Cabinet: Cabinet with hinged-panel door equipped with key-holding panels and pin-tumbler cylinder door lock.

2.15 ELECTRIC STRIKES

.1 Standard: BHMA A156.31, Grade 1 .

.2 General: Use fail-secure electric strikes with fire-rated devices, unless otherwise noted.

.3 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
.1 Adams Rite Manufacturing Co. (ARM).
.2 Folger Adam Security Inc.; an ASSA ABLOY Group company (FAS).
.3 HES, Inc.; an ASSA ABLOY Group company (HES).
.4 Locknetics; an Ingersoll-Rand Company (LSE).
.5 Rutherford Controls Int'l. Corp. (RCI).
.6 Von Duprin; an Ingersoll-Rand Company (VD).
.7 Or approved alternate.

2.16 OPERATING TRIM

.1 Standard: BHMA A156.6.

.2 Materials: Fabricate from stainless steel, unless otherwise indicated.

.3 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
.1 Hager Companies (HAG).
.2 IVES Hardware; an Ingersoll-Rand Company (IVS).
.3 Or approved alternate.

2.17 CLOSERS

.1 Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with local accessibility regulations.
.1 Comply with the following maximum opening-force requirements:
.1 Interior, Non-Fire-Rated Hinged Doors: 22.2 N applied perpendicular to door.
.2 Sliding or Folding Doors: 22.2 N applied parallel to door at latch.
.3 Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

.2 Door Closers for Means of Egress Doors: Comply with NFPA 101. Door closers shall not require more than 133 N to set door in motion and not more than 67 N to open door to minimum required width.

.3 Hold-Open Closers/Detectors: Coordinate and interface integral smoke detector and closer device with fire alarm system.

.4 Flush Floor Plates: Provide finish cover plates for floor closers unless thresholds are indicated. Match door hardware finish, unless otherwise indicated.

.5 Recessed Floor Plates: Provide recessed floor plates with insert of floor finish material for floor closers unless thresholds are indicated. Provide extended closer spindle to accommodate thickness of floor finish.

.6 Power-Assist Closers: As specified in Division 08 Section *Automatic Door Operators* for access doors for people with disabilities or where listed in the door hardware sets.

.7 Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

.8 Surface Closers: BHMA A156.4 . Listed under Category C in BHMA's *Certified Product Directory.* Provide type of arm required for closer to be located on non-public side of door, unless otherwise indicated.
.1 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
.1 DORMA Architectural Hardware; Member of The DORMA Group North America (DAH).
.2 LCN Closers; an Ingersoll-Rand Company (LCN).
.3 Norton Door Controls; an ASSA ABLOY Group company (NDC).
.4 SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
.5 Yale Commercial Locks and Hardware; an ASSA ABLOY Group company (YAL).
.6 Or approved alternate.

.9 Concealed Closers: BHMA A156.4, Grade 1 . Listed under Category C in BHMA's *Certified Product Directory.*
.1 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
.1 DORMA Architectural Hardware; Member of The DORMA Group North America (DAH).
.2 LCN Closers; an Ingersoll-Rand Company (LCN).
.3 Norton Door Controls; an ASSA ABLOY Group company (NDC).
.4 SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).

.5 Or approved alternate.

.10 Closer Holder Release Devices: BHMA A156.15. Listed under Category C in BHMA's *Certified Product Directory.*
.1 Life-Safety Type: On release of hold open, door becomes self-closing. Automatic release is activated by smoke detection system or loss of power.
.2 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
.1 Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company (CR).
.2 DORMA Architectural Hardware; Member of The DORMA Group North America (DAH).
.3 LCN Closers; an Ingersoll-Rand Company (LCN).
.4 Norton Door Controls; an ASSA ABLOY Group company (NDC).
.5 SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
.6 Or approved alternate.

.11 Coordinators: BHMA A156.3.

2.18 PROTECTIVE TRIM UNITS

.1 Size: 38 mm less than door width on push side and 13 mm less than door width on pull side, by height specified in door hardware sets.

.2 Fasteners: Manufacturer's standard machine or self-tapping screws.

.3 Metal Protective Trim Units: BHMA A156.6; bevelled top and 2 sides; fabricated from the following material:
.1 Material: 1.3 mm thick stainless steel.
.2 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
.1 Hager Companies (HAG).
.2 IVES Hardware; an Ingersoll-Rand Company (IVS).
.3 Or approved alternate.

2.19 STOPS AND HOLDERS

.1 Stops and Bumpers: BHMA A156.16, Grade 1 .
.1 Provide floor stops for doors unless wall or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic. Where floor or wall stops are not appropriate, provide overhead holders.

.2 Mechanical Door Holders: BHMA A156.16, Grade 1 .

.3 Combination Floor and Wall Stops and Holders: BHMA A156.8, Grade 1 .

.4 Combination Overhead Stops and Holders: BHMA A156.8, Grade 1 .

.5 Electromagnetic Door Holders: BHMA A156.15. Listed under Category C in BHMA's *Certified Product Directory.*
.1 Coordinate with fire detectors and interface with fire alarm system for labelled fire door assemblies.

.6 Silencers for Wood Door Frames: BHMA A156.16, Grade 1; neoprene or rubber, minimum 16 by 19 mm; fabricated for drilled-in application to frame.

.7 Silencers for Metal Door Frames: BHMA A156.16, Grade 1; neoprene or rubber, minimum diameter 13 mm; fabricated for drilled-in application to frame.

.8 Manufacturers: Subject to compliance with requirements, provide products by one of the following:

.1 DORMA Architectural Hardware; Member of The DORMA Group North America (DAH).
.2 Glynn-Johnson; an Ingersoll-Rand Company (GJ).
.3 Hager Companies (HAG).
.4 IVES Hardware; an Ingersoll-Rand Company (IVS).
.5 SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
.6 Stanley Commercial Hardware; Div. of The Stanley Works (STH).
.7 Or approved alternate.

2.20 DOOR GASKETING

.1 Standard: BHMA A156.22. Listed under Category J in BHMA's *Certified Product Directory.*

.2 General: Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.
.1 Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
.2 Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
.3 Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

.3 Air Leakage: Not to exceed 0.000774 cu. m/s per m of crack length for gasketing other than for smoke control, as tested according to ASTM E 283.

.4 Smoke-Labelled Gasketing: Assemblies complying with NFPA 105 that are listed and labelled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke-control ratings indicated, based on testing according to UL 1784.
.1 Provide smoke-labelled gasketing on 20-minute-rated doors and on smoke-labelled doors.

.5 Fire-Labelled Gasketing: Assemblies complying with NFPA 80 that are listed and labelled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

.6 Sound-Rated Gasketing: Assemblies that are listed and labelled by a testing and inspecting agency, for sound ratings indicated, based on testing according to ASTM E 1408.

.7 Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

.8 Gasketing Materials: ASTM D 2000 and AAMA 701/702.

.9 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
.1 Hager Companies (HAG).
.2 National Guard Products (NGP).
.3 Pemko Manufacturing Co. (PEM).
.4 Zero International (ZRO).
.5 Or approved alternate.

2.21 THRESHOLDS

.1 Standard: BHMA A156.21. Listed under Category J in BHMA's *Certified Product Directory.*

.2 Accessibility Requirements: Where thresholds are indicated to comply with accessibility requirements, comply with local accessibility regulations

.1 Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 13 mm high.

.3 Thresholds for Means of Egress Doors: Comply with NFPA 101. Maximum 13 mm high.

.4 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
.1 Hager Companies (HAG).
.2 National Guard Products (NGP).
.3 Pemko Manufacturing Co. (PEM).
.4 Zero International (ZRO).
.5 Or approved alternate.

2.22 SLIDING DOOR HARDWARE

.1 Sliding Door Hardware: BHMA A156.14; consisting of complete sets including rails, hangers, supports, bumpers, floor guides, and accessories indicated.
.1 Manufacturers: Subject to compliance with requirements, .1 Manufacturers: Subject to compliance with requirements, provide products by one of the following offering products that may be incorporated into the Work include, but are not limited to, the following:
.1 Hager Companies.
.2 Stanley Commercial Hardware; Div. of The Stanley Works.
.3 Or approved alternate.

.2 Horizontal Sliding Door Hardware: Grade 1; rated for door weight, but not less than 205 kg.
.1 Material: Wrought steel.
.2 Rail: Box without mounting brackets.
.3 Rail Supports: Double sidewall style.
.1 Provide intermediate, end, and splice type track supports as required by rail configuration and door weight indicated.
.4 Hanger Configuration: Four-wheel truck hanger assembly with drop bolt.
.1 Wheel Assembly: Steel wheels with ball bearings.
.5 Accessories:
.1 Guide rail and guide rail brackets as required by rail configuration.
.2 Flush pull, minimum 100 by 140 by 19 mm, mortised into door.
.3 End guide and stop.
.4 Parallel door floor guides.
.5 Bumper shoe, minimum 1.5 mm thickness.

2.23 MISCELLANEOUS DOOR HARDWARE

.1 Boxed Power Supplies: Modular unit in NEMA ICS 6, Type 4 enclosure; filtered and regulated; voltage rating and type matching requirements of door hardware served; and listed and labelled for use with fire alarm systems.

.2 Monitor Strikes: Cast strike with toggle.

.3 Auxiliary Hardware: BHMA A156.16, Grade 1 .
.1 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
.1 Hager Companies (HAG).
.2 Stanley Commercial Hardware; Div. of The Stanley Works (STH).
.3 Or approved alternate.

2.24 FABRICATION

.1 Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Owner's Representative.
  .1 Manufacturer's identification is permitted on rim of lock cylinders only.

.2 Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.

.3 Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended, except aluminium fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
  .1 Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
  .2 Steel Machine or Wood Screws: For the following fire-rated applications:
    .1 Mortise hinges to doors.
    .2 Strike plates to frames.
    .3 Closers to doors and frames.
  .3 Steel Through Bolts: For the following fire-rated applications unless door blocking is provided:
    .1 Surface hinges to doors.
    .2 Closers to doors and frames.
    .3 Surface-mounted exit devices.
  .4 Spacers or Sex Bolts: For through bolting of hollow-metal doors.
  .5 Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, *Recommended Fasteners for Wood Doors*.

2.25 FINISHES

.1 Standard: BHMA A156.18, as indicated in door hardware sets.

.2 Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

.3 Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labelled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

.2 Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

.3 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

.1 Steel Doors and Frames: Comply with DHI A115 Series.
  .1 Surface-Applied Door Hardware: Drill and tap doors and frames according to ANSI A250.6.

.2 Wood Doors: Comply with DHI A115-W Series.

3.3 INSTALLATION

.1 Mounting Heights: Mount door hardware units at heights indicated as follows unless otherwise indicated or required to comply with governing regulations.
  .1 Standard Steel Doors *and Frames: DHI's Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames*.
  .2 Wood Doors: DHI WDHS.3, *Recommended Locations for Architectural Hardware for Wood Flush Doors*.

.2 Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
  .1 Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
  .2 Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

.3 Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

.4 Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings. Verify location with Owner's Representative.
  .1 Configuration: Provide the least number of power supplies required to adequately serve doors with electrified door hardware.

.5 Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 07 Section *Joint Sealants*.

3.4 FIELD QUALITY CONTROL

.1 Independent Architectural Hardware Consultant: Owner will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.
  .1 Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.5 ADJUSTING

.1 Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door

control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

.1 Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.

.2 Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.

.3 Door Closers: Unless otherwise required by authorities having jurisdiction, adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 75 mm from the latch, measured to the leading edge of the door.

.2 Occupancy Adjustment: Approximately six months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust, including adjusting operating forces, each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.6 CLEANING AND PROTECTION

.1 Clean adjacent surfaces soiled by door hardware installation.

.2 Clean operating items as necessary to restore proper function and finish.

.3 Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.7 HARDWARE GROUPS

.1 Refer to schedule on drawings.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

.1 Types of items described in this Section:
  .1 Low-energy door operators for swinging doors.

.2 Types of items you will not find described in this Section:
  .1 Power door operators for swinging doors.
  .2 Power-assist door operators for swinging doors.
  .3 Automatic entrances for sliding, swinging, and folding entrances packaged with automatic door operators.
  .4 Manual ICU/CCU entrance packages.

1.3 DEFINITIONS

.1 Double Egress Doors: A pair of doors that simultaneously swing with the two doors moving in opposite directions with no mullion between them.

.2 Double Swing Doors: A pair of doors that swing with the two doors moving in opposite directions with a mullion between them; each door functioning as a single swing door.

1.4 SUBMITTALS

.1 Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for automatic door operators, including activation and safety devices. Include operating characteristics, electrical characteristics, and furnished accessories.

.2 Shop Drawings: For automatic door operators. Include plans, elevations, sections, details, and attachments to other work.
  .1 Indicate required clearances, method of field assembly, components, and location and size of each field connection.
  .2 Include locations and elevations of entrances showing activation and safety devices.
  .3 Wiring Diagrams: For power, signal, and activation- and safety-device wiring.
  .4 Include plans, elevations, sections, details, and attachments to other work for guide rails.

.3 Product Certificates: For each operator for fire-rated door assemblies, signed by product manufacturer. Certify that operator is listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for use on types and sizes of labeled fire doors required.

.4 Field quality-control reports.

.5 Maintenance Data: For automatic door operators, including activation and safety devices, to include in maintenance manuals.

.6 Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

.1 Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation and maintenance of units required for this Project.
  .1 Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

.2 Source Limitations: Obtain automatic door operators, including activation and safety devices, from single source from single manufacturer.

.3 Electrical Components, Devices, and Accessories: Listed and labelled as defined in National Electrical Code of Canada by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

.4 Exit-Door Requirements: Comply with requirements of authorities having jurisdiction for doors with automatic door operators serving as a component of a required means of egress.

1.6 PROJECT CONDITIONS

.1 Field Measurements: Verify actual dimensions of door frames by field measurements before fabrication of exposed covers for automatic door operators.

1.7 COORDINATION

.1 Templates: Obtain and distribute, to the parties involved, templates for doors, frames, operators, and other work specified to be factory prepared and reinforced for installing automatic door operators. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing automatic door operators to comply with indicated requirements.

.2 Electrical System Roughing-in: Coordinate layout and installation of automatic door operators, including activation and safety devices, with connections to power supplies and to access-control system.

1.8 WARRANTY

.1 Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of automatic door operators that fail in materials or workmanship within specified warranty period.
  .1 Failures include, but are not limited to, the following:
    .1 Faulty or sporadic operation of automatic door operator, including activation and safety devices.
    .2 Deterioration of metals, metal finishes, and other materials beyond normal weathering or use.
  .2 Warranty Period: Two years from date of Substantial Completion.

1.9 MAINTENANCE SERVICE

.1 Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of automatic door operator Installer. Include planned and preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door operation. Provide parts and supplies the same as those used in the manufacture and installation of original equipment.
  .1 Perform maintenance, including emergency callback service, during normal working hours.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

.1 Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
  .1 Besam Automated Entrance Systems, Inc.; an ASSA ABLOY Group company.
  .2 DORMA Architectural Hardware.
  .3 DORMA Automatics.
  .4 Horton Automatics; a division of Overhead Door Corporation.
  .5 Stanley Access Technologies; Division of The Stanley Works.

2.2 MATERIALS

.1 Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with standards indicated below:
  .1 Sheet: ASTM B 209M.
  .2 Extrusions: ASTM B 221M.

.2 Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, stretcher-leveled standard of flatness, in manufacturer's standard thickness.

.3 Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

2.3 AUTOMATIC DOOR OPERATORS, GENERAL

.1 General: Provide operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; for long-term, maintenance-free operation under normal traffic load for type of occupancy indicated; and complying with UL 325. Coordinate operator mechanisms with door operation, hinges, and activation and safety devices.
  .1 Fire-Rated Doors: Provide door operators for fire-rated door assemblies that comply with NFPA 80 for fire-rated door components and are listed and labeled by a qualified testing agency.
  .2 Wind Load: Provide door operators on exterior doors that will open and close doors and maintain them in fully closed position when subjected to wind load as prescribed for locality in the National Building Code of Canada.

.2 Electromechanical Operating System: Self-contained unit powered by permanent-magnet dc motor; with closing speed controlled mechanically by gear train and dynamically by braking action of electric motor, connections for power and activation- and safety-device wiring, and manual operation including spring closing when power is off.

.3 Hinges: See Division 08 Section *Door Hardware* for type of hinge for each door that door operator shall accommodate.

.4 Cover for Surface-Mounted Operators: Fabricated from 3.2 mm thick extruded or formed aluminum ; continuous over full width of operator-controlled door opening; with enclosed end caps, provision for maintenance access, and fasteners concealed when door is in closed position.

.5 Brackets and Reinforcements: Manufacturer's standard, fabricated from aluminum with nonstaining, nonferrous shims for aligning system components.

.6 Fire-Door Package: Consisting of UL-listed latch mechanism, power-reset box, and caution signage for fire-rated doors. Latch mechanism shall allow door to swing free during automatic operation; when fire is detected, latch actuator shall cause exit hardware to latch when door closes. Provide latch actuators with fail-secure design.

2.4 LOW-ENERGY DOOR OPERATORS

.1 Standard: BHMA A156.19.

.2 Performance Requirements:
- .1 Opening Force if Power Fails: Not more than 67 N required to release a latch if provided, not more than 133 N required to manually set door in motion, and not more than 67 N required to fully open door.
- .2 Entrapment Protection: Not more than 67 N required to prevent stopped door from closing or opening.

.3 Configuration: Operator to control single swinging door unless otherwise noted .
- .1 Traffic Pattern: Two way.
- .2 Operator Mounting: Surface, unless otherwise noted.

.4 Operation: Power opening and power-assisted spring closing. Provide time delay for door to remain open before initiating closing cycle as required by BHMA A156.19. When not in automatic mode, door operator shall function as manual door closer, with or without electrical power.

.5 Operating System: Electromechanical.

.6 Microprocessor Control Unit: Solid-state controls.

.7 Features:
- .1 Adjustable opening and closing speed.
- .2 Adjustable opening and closing force.
- .3 Adjustable backcheck.
- .4 Adjustable hold-open time from zero to 30 seconds.
- .5 Adjustable time delay.
- .6 Adjustable acceleration.
- .7 Obstruction recycle.
- .8 On-off/hold-open switch to control electric power to operator; key operated.
- .9 .

.8 Exposed Finish: Finish exposed components with finish matching door and frame.

2.5 FABRICATION

.1 Factory fabricate automatic door operators to comply with indicated standards.

.2 Fabricate exterior components to drain water passing joints and condensation and moisture occurring or migrating within operator enclosure to the exterior.

.3 Form aluminum shapes before finishing.

.4 Use concealed fasteners to greatest extent possible. Where exposed fasteners are required, use countersunk Phillips flat-head machine screws, finished to match operator.

2.6 ACCESSORIES

.1 Signage: As required by cited BHMA standard for the type of operator.
.1 Application Process: Door manufacturer's standard process.
.2 Provide sign materials with instructions for field application when operators are installed.

2.7 GENERAL FINISH REQUIREMENTS

.1 Comply with NAAMM's *Metal Finishes Manual for Architectural and Metal Products* for recommendations for applying and designating finishes.

.2 Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

.3 Apply organic and anodic finishes to formed metal after fabrication unless otherwise indicated.

.4 Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES

.1 Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

.2 Colour Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

.3 Baked-Enamel or Powder-Coat Finish: AAMA 2603. Comply with coating manufacturer's written instructions for cleaning, conversion coating, application, and baking.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Examine conditions, with Installer present, for compliance with requirements for installation tolerances, door and frame preparation and reinforcements, and other conditions affecting performance of automatic door operators.

.2 Examine roughing-in for electrical systems to verify actual locations of power connections before automatic door operator installation.

.3 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

.1 General: Install complete automatic door operators according to manufacturer's written instructions, including activation and safety devices, control wiring, and remote power units if any; connection to the building's power supply; and signage.
.1 Do not install damaged components. Fit joints to produce hairline joints free of burrs and distortion.
.2 Install operators true in alignment with established lines and door geometry without warp or rack. Anchor securely in place.
.3 Low-Energy Door Operator Installation Standard: BHMA A156.19.

.2 Power Connection: See Division 26 Sections for connection to electrical power distribution system.

.3 Access-Control System: Connect operators to access-control system if specified and then in accordance with Division 28 Section *Access Control*.

.4 Signage: Apply on both sides of each door as required by cited BHMA standard for type of door operator and direction of pedestrian travel.

3.3 ADJUSTING

.1 Adjust automatic door operators to function smoothly, and lubricate as recommended by manufacturer; comply with requirements of applicable BHMA standards.
.1 Adjust operators on exterior doors for weather tight closure.

.2 After completing installation of exposed, factory-finished automatic door operators, inspect exposed finishes on doors and operators. Repair damaged finish to match original finish.

.3 Readjust automatic door operators after repeated operation of completed installation equivalent to three days' use by normal traffic (100 to 300 cycles).

.4 Occupancy Adjustment: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.4 DEMONSTRATION

.1 Engage a certified inspector to train Owner's maintenance personnel to adjust, operate, and maintain automatic door operators.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

.1 Types of items described in this Section:
- .1 Glass Tinting.
- .2 Reflective Glass Coating.
- .3 Low-E Glass Coating or Film.
- .4 Annealed Float Glass.
- .5 Heat Treated Float Glass.
- .6 Spandrel Glass.
- .7 Safety Glass.
- .8 Rated Glass.
- .9 Insulated glass units.

.2 Types of locations described in this Section where items products are installed:
- .1 Windows.
- .2 Doors.
- .3 Glazed curtain walls.
- .4 Glazed entrances.
- .5 Interior borrowed lites.
- .6 Storefront framing.

.3 Types of items and locations you will not find described in this Section:
- .1 Glass panels in railings.
- .2 All-glass entrances and storefronts.
- .3 Automatic entrances.
- .4 Revolving door entrances.
- .5 Structural-sealant-glazed curtain walls.
- .6 Decorative glass glazing.
- .7 Mirrors.
- .8 Security glazing resistant to ballistic attacks, blunt- and sharp-tool attacks, chemical threats, windborne debris and air blasts.

1.3 DEFINITIONS

.1 Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

.2 Glass Thicknesses: Indicated by thickness designations in millimetres according to ASTM C 1036.

.3 Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

.4 Deterioration of Coated Glass: Defects developed from normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to

manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

.5 Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

.6 Deterioration of Laminated Glass: Defects developed from normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1.4 PERFORMANCE REQUIREMENTS

.1 General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

.2 Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

.1 Glass Thicknesses: Select minimum glass thicknesses to comply with CAN/CGSB-12.20-M, according to the following requirements:

.1 Specified Design Wind Loads: Calculated as per the National Building Code of Canada for project location, type of building and adjacent site conditions, but in no case be less than 1.4 KPa.

.2 Specified Design Snow Loads: As per the National Building Code of Canada for project location, type of building and adjacent site conditions.

.3 Maximum Lateral Deflection: For the following types of glass supported on all 4 edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 25 mm, whichever is less.

.1 For monolithic-glass lites heat treated to resist wind loads.

.2 For insulating glass.

.3 For laminated-glass lites.

.4 Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.

.5 Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint colour indicated throughout Project.

.3 Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and night-time-sky heat loss.

.1 Temperature Change (Range): 67 deg C, ambient; 100 deg C, material surfaces.

1.5 SUBMITTALS

.1 Product Data: For each glass product and glazing material indicated.

.2 Samples: For the following products, in the form of 300 mm square Samples for glass.

.1 Each colour of tinted glass.

.2 Coated glass.
.3 Spandrel glass.
.4 Each colour of tinted and coated insulating glass unit.

.3 Product Test Reports: For each of the following types of glazing products:
.1 Tinted glass.
.2 Coated glass.
.3 Insulated glass units.

.4 Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

.1 Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

.2 Source Limitations for Glass Sputter-Coated with Solar-Control Low-E Coatings: Where solar-control low-e coatings of a primary glass manufacturer that has established a certified fabricator program is specified, obtain sputter-coated solar-control low-e-coated glass in fabricated units from a manufacturer that is certified by coated-glass manufacturer.

.3 Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.

.4 Safety Glazing Products: Comply with testing requirements in CAN/CGSB 12.1-M90 and, for wired glass, CAN/CGSB 12.11-M76.
.1 Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of manufacturer acceptable to authorities having jurisdiction.

.5 Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
.1 GANA Publications: GANA Laminated Division's *Laminated Glass Design Guide* and GANA's *Glazing Manual*.
.2 IGMA Publication for Insulating Glass: SIGMA TM-3000, *Glazing Guidelines for Sealed Insulating Glass Units*.

.6 Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the testing and inspecting agency:

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

.2 For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

1.8 PROJECT CONDITIONS

.1 Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
.1 Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 4.4 deg C.

1.9 WARRANTY

.1 Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form, made out to Owner and signed by coated-glass manufacturer agreeing to replace coated-glass units that deteriorate as defined in *Definitions* Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
.1 Warranty Period: Manufacturer’s standard or 10 years from date of Substantial Completion; whichever is greater.

.2 Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form, made out to Owner and signed by laminated-glass manufacturer agreeing to replace laminated-glass units that deteriorate as defined in *Definitions* Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
.1 Warranty Period: Manufacturer’s standard or five years from date of Substantial Completion; whichever is greater.

.3 Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to Owner and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in *Definitions* Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
.1 Warranty Period: Manufacturer’s standard or 10 years from date of Substantial Completion; whichever is greater.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS

.1 Glass Tinting:
.1 Refer to drawings to ascertain if and what type of glass tinting is required.

.2 Reflective Glass Coating:
.1 Refer to drawings to ascertain if and what type of reflective glass coating is required.

.3 Low-E Glass Coating or Film:
.1 Type: Pyrolytic or sputtered coating or low-e-coated film suspended in the interspace.

.4 Annealed Float Glass: to CAN/CGSB-12.3-M91.

.5 Heat-Treated Float Glass: to CAN/CGSB-12.1-M90.

.6 Spandrel Glass: Float glass complying with other requirements specified and with the following:
.1 Fallout Resistance: Provide spandrel units identical to those passing the fallout-resistance test for spandrel glass specified in ASTM C 1048.
.2 Factory apply manufacturer's standard opacifier of the following material to coated second surface of lites, with resulting products complying with Specification No. 89-1-6 in GANA Tempering Division's *Engineering Standards Manual*.
.1 Manufacturer's standard opacifier material.

.7 Safety Glass: to CAN/CGSB 12.1-M90, transparent. 6mm Thickness.
.1 Type 1: Laminated Glass.
.2 Type 2: Tempered Glass.

.8 Fire Rated Glass: to NFPA 80, NFPA 257, CAN/ULC-S104, and CAN/ULC-S106.
.1 Type 1: **5mm** thick fire-rated ceramic glazing material.
.1 Suitable locations: Transoms and Borrowed Lites.

.2 Type 2: **8mm** thick laminated fire-rated, and impact safety-rated ceramic glazing material.
.1 Suitable locations: Doors, Sidelites, Transoms, and Borrowed Lites.

.9 Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with CAN/CGSB-12.8-97 and with requirements specified in this Section.
.1 Fabricate using safety glass when located in doors and in lites located within 900 mm of the floor.
.2 Fabricate using heat-strengthened float glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 *Performance Requirements* Article.
.3 Overall Unit Thickness and Thickness of Each Lite: 25 and 6 mm.
.4 Sealing System: Dual seal, with primary and secondary sealants as follows:
.1 Manufacturer's standard sealants.
.5 Spacer Specifications: Manufacturer's standard spacer material and construction.
.6 Interspace Content: Argon, unless noted otherwise.
.7 Glass Tinting: Refer to drawings to ascertain if and what type of glass tinting is required.
.8 Reflective Glass Coating:
.1 For renovation projects, provide Low E coating or film if adjacent glazed units have similar coating; unless otherwise noted on drawings.
.2 For building extensions and new building projects, provide Low E coating or film, unless otherwise noted on drawings.

2.2 GLAZING GASKETS

.1 Dense Compression Gaskets: Moulded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
.1 Neoprene, ASTM C 864.
.2 EPDM, ASTM C 864.
.3 Silicone, ASTM C 1115.
.4 Thermoplastic polyolefin rubber, ASTM C 1115.
.5 Any material indicated above.

.2 Soft Compression Gaskets: Extruded or moulded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:
.1 Neoprene.
.2 EPDM.
.3 Silicone.
.4 Thermoplastic polyolefin rubber.
.5 Any material indicated above.

2.3 GLAZING TAPES

.1 Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and non-migrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
  .1 AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
  .2 AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

2.4 MISCELLANEOUS GLAZING MATERIALS

.1 General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

.2 Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

.3 Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

.4 Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

.5 Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

2.5 FABRICATION OF GLAZING UNITS

.1 Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

.2 Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.

.3 Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Examine framing glazing, with Installer present, for compliance with the following:
  .1 Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
  .2 Presence and functioning of weep system.
  .3 Minimum required face or edge clearances.
  .4 Effective sealing between joints of glass-framing members.

.2 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

.1 Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

.1 Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

.2 Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

.3 Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

.4 Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

.5 Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

.6 Provide spacers for glass lites where length plus width is larger than 1270 mm as follows:
- .1 Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
- .2 Provide 3-mm minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

.7 Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

.8 Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

.9 Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

.10 Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

.1 Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

.2 Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

.3 Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

.4 Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

.5 Do not remove release paper from tape until just before each glazing unit is installed.

.6 Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

3.5 GASKET GLAZING (DRY)

.1 Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

.2 Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints mitre cut and bonded together at corners.

.3 Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weather tight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

.4 Install gaskets so they protrude past face of glazing stops.

3.6 CLEANING AND PROTECTION

.1 Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

.2 Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.

.3 Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

.4 Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

3.7 SCHEDULE – GLASS PRODUCTS

.1 Install glass products as per drawings. In the absence of this information:
  .1 Install wired glass units when located in fire-rated assemblies.
  .2 Install insulated glass units when located in the exterior building envelope.
  .3 Install safety glass units in all other locations, unless otherwise indicated.

3.8 SCHEDULE – GLAZING METHOD

.1 Install glass products using the following glazing methods:
  .1 Use gasket glazing whenever possible.
  .2 Use tape glazing only when gasket glazing is not possible.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 Moisture testing of substrates.

.2 Surface preparation of substrates as required for acceptance of paint, including cleaning, small crack repair, patching, caulking, and making good surfaces and areas to limits defined under MPI Repainting Maintenance Manual requirements.

.3 Specific pre-treatments noted herein or specified in the MPI Repainting Maintenance Manual.

.4 Sealing/touch-up, spot priming, and/or full priming surfaces for repainting in accordance with MPI Repainting Maintenance Manual requirements.

.5 Provision of safe and adequate ventilation as required where toxic and/or volatile/flammable materials are being used over and above temporary ventilation supplied by others.

1.2 REFERENCES

.1 Maintenance Repainting Manual by the Master Painters Institute (MPI), including Identifiers, Evaluation, Systems, Preparation and Approved Product List.

.2 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings) of the Environmental Protection Agency (EPA).

.3 National Fire Code of Canada.

1.3 QUALITY ASSURANCE

.1 Contractor shall have a minimum of five years proven satisfactory experience. Provide a list of last three comparable jobs including, job name and location, specifying authority, and project manager.

.2 Qualified journeymen who have a "Tradesman Qualification Certificate of Proficiency" shall be engaged in repainting work. Apprentices may be employed provided they work under the direct supervision of a qualified journeyman in accordance with applicable trade regulations.

.3 Conform to latest MPI requirements for interior repainting work including cleaning, preparation and priming.

.4 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) shall be in accordance with the latest edition of the MPI Approved Product List and shall be from a single manufacturer for each system used.

.5 Paint materials such as linseed oil, shellac, turpentine, etc. shall be the highest quality product of an approved manufacturer listed in MPI Maintenance Repainting Manual and shall be compatible with other coating materials as required.

.6 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Owner’s Representative.

.7 Standard of Acceptance: When viewed using final lighting source surfaces shall indicate the following:

.1 Walls: No defects visible from a distance of 1000 mm at 90° to surface.

.2 Ceilings: No defects visible from floor at 45° to surface.

.3 Final coat to exhibit uniformity of colour and sheen across full surface area.

1.4 ENVIRONMENTAL PERFORMANCE REQUIREMENTS

.1 Provide paint products meeting MPI "Environmentally Friendly" E2 or E3 ratings based on VOC (EPA Method 24) content levels.

1.5 SCHEDULING OF WORK

.1 Submit work schedule for various stages of painting to Owner's Representative for approval. Submit schedule a minimum of two (2) working days in advance of proposed operations.

.2 Paint occupied facilities in accordance with approved schedule. Schedule operations to approval of Owner's Representative such that painted surfaces will have dried and cured sufficiently before occupants are affected.

.3 Obtain written authorization from Owner's Representative for changes in work schedule.

.4 Schedule repainting operations to prevent disruption by other trades if applicable and by occupants in and about the building.

1.6 SUBMITTALS

.1 Submit full range colour sample chips for review and selection. Indicate where colour availability is restricted.

.2 Submit product data and manufacturer's installation/application instructions for paints and coating products to be used.

.3 Submit WHMIS MSDS - Material Safety Data Sheets for paint and coating materials to be used.

.4 Upon completion, submit records of products used. List products in relation to finish system and include the following:

.1 Product name, type and use (i.e. materials and location).

.2 Manufacturer's product number.

.3 Colour code numbers.

.4 MPI Environmentally Friendly classification system rating.

.5 Manufacturer's Material Safety Data Sheets (MSDS).

.5 Submit duplicate 200 x 300 mm sample panels of each paint, stain, clear coating, with specified paint or coating in colours, gloss/sheen and textures required to MPI Painting Specification Manual standards submitted on the following substrate materials:

.1 3 mm plate steel for finishes over metal surfaces.

.2 13 mm birch plywood for finishes over wood surfaces.

.3 50 mm concrete block for finishes over concrete or concrete masonry surfaces.

.4 13 mm gypsum board for finishes over gypsum board and other smooth surfaces.

.6 When approved, samples shall become acceptable standard of quality for appropriate on-site surface with one of each sample retained on-site.

1.7 QUALITY CONTROL

.1 Provide a mock-up in accordance with requirements of Section 01 45 00 - Quality Control to Owner's Representative.

.2 Prepare and repaint mock-up designated interior room, surface or item to requirements specified herein, with specified paint or coating showing selected colours, gloss/sheen, textures and workmanship to MPI Maintenance Repainting Manual standards for review and approval.

.3 When approved, repainted room, surface and/or item shall become acceptable standard of finish quality and workmanship for similar on-site interior repainting work.

1.8 DELIVERY, HANDLING AND STORAGE

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

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

.3 Labels shall clearly indicate:

.1 Manufacturer's name and address.

.2 Type of paint or coating.

.3 Compliance with applicable standard.

.4 Colour number in accordance with established colour schedule.

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

.5 Observe manufacturer's recommendations for storage and handling.

.6 Store materials and equipment in a secure, dry, well-ventilated area with temperature range between 7°C to 30°C. Store materials and supplies away from heat generating devices and sensitive products above minimum temperature as recommended by manufacturer.

.7 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of Owner's Representative. After completion of operations, return areas to clean condition to approval of Owner's Representative.

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

.9 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.

.10 Fire Safety Requirements:

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

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

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

1.9 SITE REQUIREMENTS

.1 Heating, Ventilation and Lighting:

.1 Ventilate enclosed spaces.

.2 Perform no repainting work unless adequate and continuous ventilation and sufficient heating facilities are in place to maintain ambient air and substrate temperatures above 10°C for 24 hours before, during and after paint application and until paint has cured sufficiently.

.3 Where required, provide continuous ventilation for seven days after completion of application of paint.

.4 Provide temporary ventilating and heating equipment where permanent facilities are not available.

.5 Perform no painting work unless a minimum lighting level of 323 Lux is provided on surfaces to be painted. Adequate lighting facilities shall be provided by General Contractor.

.2 Temperature, Humidity and Substrate Moisture Content Levels:

.1 Unless specifically pre-approved by Owner's Representative and applied product manufacturer, perform no repainting work when:

.1 Ambient air and substrate temperatures are below 10°C.

.2 Substrate temperature is over 32°C unless paint is specifically formulated for application at high temperatures.

.3 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's prescribed limits.

.4 Relative humidity is above 85% or when dew point is less than 3°C variance between air/surface temperature.

.5 Rain or snow is forecast to occur before paint has thoroughly cured.

.6 It is foggy, misty, raining or snowing at site.

.2 Conduct moisture tests using a properly calibrated electronic Moisture Meter, except use a simple "cover patch test" on concrete floors to be repainted.

.3 Perform no repainting work when maximum moisture content of substrate exceeds:

.1 12% for concrete and masonry (clay and concrete brick/block).

.2 15% for wood.

.3 12% for plaster and gypsum board.

.4 Test painted concrete, masonry and plaster surfaces for alkalinity as required.

.3 Application Requirements:

.1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when ventilation conditions are such that airborne particles will not affect quality of finished surface.

.2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits noted herein.

.3 Apply paint when previous coat of paint is dry or adequately cured, unless otherwise pre-approved by the specific coating manufacturer.

.4 Apply paint finishes when conditions forecast for entire period of application fall within manufacturer's recommendations.

.5 Do not apply paint when:

.1 Temperature is expected to drop below 10°C before paint has thoroughly cured.

.2 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's limits.

.3 Surface to be painted is wet, damp or frosted.

.6 Provide and maintain cover when paint must be applied in damp or cold weather. Heat substrates and surrounding air to comply with temperature and humidity conditions specified by manufacturer. Protect until paint is dry or until weather conditions are suitable.

.7 Schedule repainting operations such that surfaces exposed to direct, intense sunlight are scheduled for completion during early morning.

.8 Remove paint from areas which have been exposed to freezing, excess humidity, rain, snow or condensation. Prepare surface again and repaint.

1.10 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Place materials defined as hazardous or toxic in designated containers.

.4 Ensure emptied containers are sealed and stored safely.

.5 Unused paint, coating materials must be disposed of at official hazardous material collections site as approved by Owner’s Representative.

.6 Paint, stain and wood preservative finishes and related materials (thinners, solvents, etc.) are hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.

.7 Materials that cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.

.8 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.

.9 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into the ground the following procedures shall be strictly adhered to:

.1 Retain cleaning water for water-based materials to allow sediments to be filtered out. In no case shall equipment be cleaned using free draining water.

.2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.

.3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.

.4 Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.

.10 Empty paint cans are to be dry prior to disposal or recycling (where available).

.11 Close and seal tightly partly used cans of materials including sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Paint materials listed in the latest edition of the MPI Approved Product List (APL) are acceptable for use on this project.

.2 Paint materials for repaint systems shall be products of a single manufacturer.

.3 Low odour products: whenever possible, select products exhibiting low odour characteristics. If two products are otherwise equivalent, select the product with the lowest odour. Only qualified products with E2 or E3 "Environmentally Friendly" rating are acceptable for use on this project.

.4 Paints, coatings, thinners, solvents, cleaners and other fluids used in repainting, shall:

.1 Be water-based, water soluble, water clean-up.

.2 Be non-flammable.

.3 Not contain methylene chloride, chlorinated hydrocarbons, toxic metal pigments.

.4 Be manufactured without compounds which contribute to ozone depletion in the upper atmosphere.

.5 Be manufactured without compounds which contribute to smog in the lower atmosphere.

.6 Be manufactured in a manner where matter generating a 'Biochemical Oxygen Demand' (BOD) in undiluted production plant effluent discharged to a natural watercourse or a sewage treatment facility lacking secondary treatment does not exceed 15 mg/L.

.7 Be manufactured in a manner where the total suspended solids (TSS) content in undiluted production plant effluent discharged to a natural watercourse or a sewage treatment facility lacking secondary treatment does not exceed 15 mg/L.

.5 Paints and coatings must be manufactured and transported in a manner that steps of processes, including disposal of waste products arising therefrom, will meet requirements of applicable governmental acts, by-laws and regulations including, for facilities located in Canada, Fisheries Act and Canadian Environmental Protection Act (CEPA).

.6 Paints and coatings must not be formulated or manufactured with formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavelant chromium or their compounds.

.7 Water-borne paints and stains, and water borne varnishes must meet a minimum "Environmentally Friendly" E2 rating.

2.2 COLOURS

.1 Owner’s Representative will provide Colour Schedule after Contract award.

.2 Selection of colours will be from manufacturers full range of colours.

.3 Where specific products are available in a restricted range of colours, selection will be based on the limited range.

.4 Second coat in a three coat repaint system to be tinted slightly lighter colour than top coat to show visible difference between coats.

2.3 MIXING AND TINTING

.1 Perform colour tinting operations prior to delivery of paint to site. On-site tinting of painting materials is allowed with Owner's Representative written permission.

.2 Paste, powder or catalyzed paint mixes shall be mixed in strict accordance with manufacturer's written instructions.

.3 Where thinner is used, addition shall not exceed paint manufacturer's recommendations. Do not use kerosene or such organic solvents to thin water-based paints.

.4 Thin paint for spraying according in strict accordance with paint manufacturer' instructions. If directions are not on container, obtain instructions in writing from manufacturer and provide copy of instructions to Owner's Representative.

.5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

2.4 GLOSS/SHEEN RATINGS

.1 Paint gloss shall be defined as the sheen rating of applied paint, in accordance with the following MPI gloss / sheen standard values:

Gloss Level Category	Units @ 60°	Units @ 85°
G1 - matte finish	0 to 5	maximum 10
G2 - velvet finish	0 to 10	10 to 35
G3 - eggshell finish	10 to 25	10 to 35
G4 - satin finish	20 to 35	minimum 35
G5 - semi-gloss finish	35 to 70	
G6 - gloss finish	70 to 85	
G7 - high gloss finish	> 85	

.2 Gloss level ratings of repainted surfaces shall be as specified herein.

2.5 INTERIOR PAINTING SYSTEMS

.1 The following paint formulas requires a two coat finish as indicated in the MPI Repainting Maintenance Manual.

.2 RIN 2.1 - Asphalt Surfaces: (zone/traffic marking on interior drive and parking areas, etc.).

.1 RIN 2.1B - Alkyd Zone/Traffic Marking.

.3 RIN 3.1 - Concrete Vertical Surfaces: (including soffits).

.1 RIN 3.1A - Latex G4 finish.

.4 RIN 3.2 - Concrete Horizontal Surfaces: (floors and stairs, etc.).

.1 RIN 3.2A - Latex Floor Enamel G4.

.5 RIN 4.1 - Clay Masonry Units: (pressed and extruded brick).

.1 RIN 4.1A - Latex G4 finish.

.6 RIN 4.2 - Concrete Masonry Units: (Concrete Block and Concrete Brick).

.1 RIN 4.2A - Latex G4 finish.

.7 RIN 5.1 - Structural Steel and Metal Fabrications.

.1 RIN 5.1K - 2 Component Epoxy finish.

.8 RIN 5.3 - Galvanized Metal: (High Contact/High Traffic Areas (Doors, Frames, Railings, Pipes, Handrails, etc.). Low Contact/Low traffic areas (Overhead Decking, Pipes, Ducts, etc.)

.1 RIN 5.3C - Alkyd G5 finish.

.9 RIN 6.2 - Dimension Lumber: (Columns, Beams, Exposed Joists, Underside of Decking, etc.)

.1 RIN 6.2A - Latex G4 (over latex primer).

.10 RIN 6.3 - Dressed Lumber: (Including Doors, Door and Window Frames, Mouldings, etc.)

.1 RIN 6.3A - Latex G5 finish.

.11 RIN 6.4 - Wood Panelling and Casework: (Partitions, Panels, Shelving, Millwork, etc.).

.1 RIN 6.4B – Latex G4 finish.

.12 RIN 6.5 - Wood Floors and Stairs: (Including Hardwood Flooring).

.1 RIN 6.5A - Alkyd Floor Enamel G4 (over primer).

.13 RIN 9.2 - Plaster and Gypsum Board: (gypsum wallboard, drywall, "sheet rock type material", etc.,

.1 RIN 9.2A - Latex G5 (over latex sealer) for walls.

.2 RIN 9.2A - Latex G1 (over latex sealer) for ceilings.

.14 RIN 10.1 - Canvas and Cotton Coverings:

.1 RIN 10.1B - Alkyd G5 finish.

PART 3 EXECUTION

3.1 GENERAL

.1 Perform preparation and operations for interior painting in accordance with MPI Maintenance Repainting Manual requirements except where otherwise specified.

.2 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.2 EXISTING CONDITIONS

.1 Prior to commencing work, thoroughly examine site conditions and existing interior substrates to be repainted. Report in writing to Owner’s Representative damages, defects, or unsatisfactory or unfavourable conditions or surfaces that will adversely affect this work.

.2 Conduct moisture testing of surfaces to be painted using a properly calibrated electronic moisture meter, except test concrete floors for moisture using a simple "cover patch test" and report findings to Owner's Representative. Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.

.3 Maximum moisture content as follows:

.1 Concrete: 12%.

.2 Clay and Concrete Block/Brick: 12%.

.3 Wood: 15%.

.4 No repainting work shall commence until such adverse conditions and defects have been corrected and surfaces and conditions are acceptable to the Painting Subcontractor and Inspection Agency. Commencement of work shall not be held to imply acceptance of surfaces except as qualified herein.

.5 Degree of surface deterioration (DSD) shall be assessed using MPI Identifiers and Assessment criteria indicated in the MPI Maintenance Repainting Manual. MPI DSD ratings and descriptions are as follows:

Condition	Description
DSD-0	Sound Surface (includes visual (aesthetic) defects that do not affect film's protective properties).
DSD-1	Slightly Deteriorated Surface (indicating fading; gloss reduction, slight surface contamination, minor pin holes scratches, etc.).
DSD-2	Moderately Deteriorated Surface (small areas of peeling, flaking, slight cracking, staining, etc.).
DSD-3	Severely Deteriorated Surface (heavy peeling, flaking, cracking, checking, scratches, scuffs, abrasion, small holes and gouges).
DSD-4	Substrate Damage (repair or replacement of surface required by others).

3.3 PROTECTION

.1 Protect existing surfaces and adjacent fixtures and furnishings from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore such surfaces as directed by Owner's Representative.

.2 Cover or mask windows and other ornamental hardware adjacent to areas being painted to prevent damage and to protect from paint drops and splatters. Use non-staining coverings.

.3 Protect items that are permanently attached such as Fire Labels on doors and frames.

.4 Protect factory finished products and equipment.

.5 Protect general public and building occupants in and about the building.

.6 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and surface mounted equipment, fittings and fastenings prior to undertaking re-painting operations. Items shall be securely stored and re-installed after painting is completed.

.7 Move and cover furniture and portable equipment as necessary to carry out repainting operations. Replace as painting operations progress.

.8 As repainting operations progress, place "WET PAINT" signs in occupied areas to approval of Owner's Representative.

3.4 CLEANING AND PREPARATION

.1 Clean and prepare interior surfaces to be repainted in accordance with MPI Maintenance Repainting Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:

.1 Remove dust, dirt, and surface debris by vacuuming, wiping with dry, clean cloths or compressed air.

.2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil and surface contaminants.

.3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.

.4 Allow surfaces to drain completely and to dry thoroughly. Allow sufficient drying time and test surfaces using an electronic moisture meter before commencing work.

.5 Use water-based cleaners in place of organic solvents where surfaces will be repainted using water based paints.

.6 Many water-based paints cannot be removed with water once dried. Minimize the use of kerosene or such organic solvents to clean up water-based paints.

.2 Where required, pressure wash exterior surfaces prior to repainting in accordance with MPI standards for type of surfaces and recommended pressures to ensure complete removal of loose paint, stains, dirt, and foreign matter. This work to be carried out by qualified tradesman experienced in pressure water cleaning. Use of spray equipment such as water hose cleaning will not be considered satisfactory unless specified herein. Allow sufficient drying time and test surfaces using an electronic moisture meter before commencing work.

.3 Clean metal surfaces to be repainted by removing rust, dirt, oil, grease and foreign substances in accordance with MPI requirements. Remove such contaminates from surfaces, pockets and corners to be repainted by brushing with clean brushes, blowing with clean dry compressed air, or brushing/vacuum cleaning as required.

.4 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before priming and between applications of remaining coats. Touch-up, spot prime, and apply primer, paint, or pre-treatment as soon as possible after cleaning and before deterioration occurs.

.5 Do not apply paint until prepared surfaces have been accepted by Owner's Representative.

.6 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.

3.5 APPLICATION

.1 Method of application to be as approved by Owner's Representative. Apply paint by brush, roller, air sprayer, airless sprayer. Conform to manufacturer's application instructions unless specified otherwise.

.2 Brush and Roller Application:

.1 Apply paint in a uniform layer using brush and/or roller of types suitable for application.

.2 Work paint into cracks, crevices and corners.

.3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.

.4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces shall be free of roller tracking and heavy.

.5 Remove runs, sags and brush marks from finished work and repaint.

.3 Spray Application:

.1 Provide and maintain equipment that is suitable for intended purpose, capable of properly atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.

.2 Keep paint ingredients properly mixed in containers during paint application by either continuous mechanical agitation or intermittent agitation frequently as necessary.

.3 Apply paint in a uniform layer, with overlapping at edges of spray pattern.

.4 Back roll spray applications and brush out runs and sags immediately.

.5 Use brushes to work paint into cracks, crevices and places which are not adequately painted by spray.

.4 Use dipping, sheepskins or daubers when no other method is practical in places of difficult access and when specifically authorized by Owner's Representative.

.5 Apply paint coats in a continuous manner and allow surfaces to dry and properly cure between coats for minimum time period as recommended by manufacturer. Minimum dry film thickness of coats shall not be less than that recommended by the manufacturer. Repaint thin spots or bare areas before next coat of paint is applied.

.6 Sand and dust between coats to remove visible defects.

.7 Repaint surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.

.8 Repaint top, bottom, and vertical edges of doors to be repainted.

.9 Repaint inside of cupboards and cabinets as specified for outside surfaces.

.10 Repaint closets and alcoves to match existing, unless otherwise scheduled or noted.

3.6 MECHANICAL / ELECTRICAL EQUIPMENT

.1 Unless otherwise noted, repainting shall also include exposed to view / previously painted mechanical and electrical equipment and components (panels, conduits, piping, hangers, ductwork, etc.).

.2 Touch up scratches and marks and repaint such mechanical and electrical equipment and components with colour, and sheen finish to match existing unless otherwise noted or scheduled.

.3 Do not paint over name plates or instruction labels.

.4 Leave unfinished exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish.

.5 Keep sprinkler heads free of paint.

.6 Do not paint interior transformers and substation equipment.

3.7 FIRE SEPARATIONS

.1 Contractor to stencil on both sides of fire rated partitions the fire rating for that assembly (i.e.: 1 HR FIRE SEPARATION).

.2 Stenciled fire ratings to be minimum 100 mm high RED letters, minimum 150 mm above finished ceilings, and minimum 2400 mm o.c. along partition.

3.8 FIELD QUALITY CONTROL

.1 Field inspection of exterior painting operations to be carried out by Owner's Representative.

.2 Advise Owner's Representative when each surface and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.

.3 Co-operate with Owner's Representative and provide access to areas of work.

3.9 CLEAN-UP

.1 Remove paint where spilled, splashed, splattered or sprayed as work progresses using means and materials that are not detrimental to affected surfaces.

.2 Keep work area free from an unnecessary accumulation of tools, equipment, surplus materials and debris.

.3 Remove combustible rubbish materials and empty paint cans each day and safely dispose of same in accordance with requirements of authorities having jurisdiction.

.4 Clean equipment and dispose of wash water used for water borne materials, solvents used for oil based materials as well as other cleaning and protective materials (e.g. rags, drop cloths, masking papers, etc.), paints, thinners, paint removers/strippers in accordance with the safety requirements of authorities having jurisdiction and as noted herein.

.5 Painting equipment shall be cleaned in leak-proof containers that will permit particulate matter to settle out and be collected. Sediment remaining from cleaning operations shall be recycled or disposed of in a manner acceptable to authorities having jurisdiction.

.6 Paint and coatings in excess of repainting requirements shall be recycled as noted herein.

3.10 RESTORATION

.1 Clean and re-install hardware items removed before undertaken painting operations.

.2 Remove protective coverings and warning signs as soon as practical after operations cease.

.3 Remove paint splashings on affected exposed surfaces. Remove smears and spatter immediately as operations progress, using compatible solvent.

.4 Protect freshly completed surfaces from paint droppings and dust to approval of Owner's Representative. Avoid scuffing newly applied paint.

.5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Owner's Representative.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

.1 Types of items described in this Section:
  .1 Non-load-bearing steel framing members for the following applications:
    .1 Interior framing systems (e.g., supports for partition walls, framed soffits, furring, etc.).
    .2 Interior suspension systems (e.g., supports for ceilings, suspended soffits, etc.).
  .2 Sheet steel security linear panel.

.2 Types of items you will not find described in this Section:
  .1 Wind-bearing steel stud framing.
  .2 Insulation.
  .3 Head-of-wall joint systems installed with non-load-bearing steel framing.
  .4 Non-load-bearing metal shaft-wall framing, gypsum panels, and other components of shaft-wall assemblies.

1.3 SUBMITTALS

.1 Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

.1 Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to CAN/ULC-S101 by an independent testing agency.

.2 STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

PART 2 - PRODUCTS

2.1 NON-LOAD-BEARING STEEL FRAMING, GENERAL

.1 Framing Members, General: Comply with ASTM C 754 for conditions indicated.
  .1 Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
  .2 Protective Coating: G60 Coating with equivalent corrosion resistance of ASTM A 653/A 653M, Z120, hot-dip galvanized, unless otherwise indicated.

2.2 SUSPENSION SYSTEM COMPONENTS

.1 Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 1.59 mm diameter wire, or double strand of 1.21 mm diameter wire.

.2 Hanger Attachments to Concrete:

.1 Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.

.2 Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.

.3 Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 4.12 mm diameter.

.4 Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 1.37 mm and minimum 12.7 mm wide flanges.

.5 Furring Channels (Furring Members):
.1 Cold-Rolled Channels: 1.37 mm bare-steel thickness, with minimum 12.7 mm wide flanges, 19.1 mm deep.
.2 Steel Studs: ASTM C 645.
.1 Minimum Base-Metal Thickness: 0.45 mm.
.2 Depth: As indicated on Drawings.
.3 Hat-Shaped, Rigid Furring Channels: ASTM C 645, 22.2 mm deep.
.1 Minimum Base Metal Thickness: 0.45 mm.
.4 Resilient Furring Channels: 12.7 mm deep members designed to reduce sound transmission.
.1 Configuration: Asymmetrical or hat shaped.

2.3 STEEL FRAMING FOR FRAMED ASSEMBLIES

.1 Steel Studs and Runners: ASTM C 645.
.1 Minimum Base-Metal Thickness: 0.45 mm.
.2 Depth: As indicated on Drawings.

.2 Slip-Type Head Joints: At underside of floor and roof decks and underside of structural framing, provide one of the following:
.1 Single Long-Leg Runner System: ASTM C 645 top runner with 50.8 mm deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 305 mm of the top of studs to provide lateral bracing.
.2 Double-Runner System: ASTM C 645 top runners, inside runner with 50.8 mm deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
.3 Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

.3 Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

.4 Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
.1 Minimum Base-Metal Thickness: 0.79 mm.

.5 Cold-Rolled Channel Bridging: 1.37 mm bare-steel thickness, with minimum 12.7 mm wide flanges.

.6 Hat-Shaped, Rigid Furring Channels: ASTM C 645.

.7 Resilient Furring Channels: 12.7 mm deep, steel sheet members designed to reduce sound transmission.

.8 Cold-Rolled Furring Channels: 1.37 mm bare-steel thickness, with minimum 12.7 mm wide flanges.

2.4 SHEET METAL SECURITY LINEAR PANEL

.1 Linear Panel: sheet metal of 1.99 mm minimum bare metal thickness, commercial quality consisting of one of the following:
.1 Zinc coated sheet steel to ASTM A 653/A 653M, with Z275 designation zinc coating;
.2 Aluminum-zinc alloy coated sheet steel to ASTM A 792/A 792M, grade 33 or 37 with AZ150 coating, regular spangle surface, not chemically treated for paint finish.

2.5 AUXILIARY MATERIALS

.1 General: Provide auxiliary materials that comply with referenced installation standards.
.1 Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

.2 Isolation Strip at Exterior Walls: Provide the following:
.1 Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 3.2 mm thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.
.1 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

.1 Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

.2 Coordination with Sprayed Fire-Resistive Materials, if material is used on this project:
.1 Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 600 mm o.c.
.2 After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

.1 Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.
.1 Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

.2 Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

.3 Install bracing at terminations in assemblies.

.4 Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING SUSPENSION SYSTEMS

.1 Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.

.2 Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

.3 Suspend hangers from building structure as follows:
- .1 Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
  - .1 Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
- .2 Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
  - .1 Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
- .3 Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
- .4 Do not connect or suspend steel framing from ducts, pipes, or conduit.

.4 Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

.5 Installation Tolerances: Install suspension systems that are level to within 3 mm in 3.6 m measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.5 INSTALLING FRAMED ASSEMBLIES

.1 Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

.2 Install studs so flanges within framing system point in same direction.

.3 Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
- .1 Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
- .2 Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
  - .1 Install two studs at each jamb, unless otherwise indicated.
  - .2 Frame around door openings intended for doors greater than 90 kg in weight using studs having minimum thickness of 0.79 mm
  - .3 Install cripple studs at head adjacent to each jamb stud, with a minimum 12.7 mm clearance from jamb stud to allow for installation of control joint in finished assembly.
  - .4 Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

.3 Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

.4 Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

.1 Firestop Track: Install to maintain continuity of fire-resistance-rated assembly indicated.

.5 Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

.6 Curved Partitions:

.1 Bend track to uniform curve and locate straight lengths so they are tangent to arcs.

.2 Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of not less than 2 studs at ends of arcs, place studs 150 mm o.c.

.4 Direct Furring:

.1 Screw to wood framing.

.2 Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 610 mm o.c.

.5 Installation Tolerance: Install each framing member so fastening surfaces vary not more than 3 mm from the plane formed by faces of adjacent framing.

3.6 SHEET METAL SECURITY LINEAR PANEL

.1 Install sheet metal security linear panels in locations indicated.

.2 Prepare sheet metal security linear panel with 9.5 mm holes for installation, plug welded to the room-exterior side of metal studs vertically or screw-fasten to the room-exterior side of wood studs; at 400 mm o.c. and horizontally at 300 mm o.c. maximum.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 Types of items described in this Section:
- .1 Interior gypsum board.
- .2 Tile backing panels.
- .3 Cementitious backer units (cement board).

.2 Types of items you will not find described in this Section:
- .1 Exterior gypsum board for ceilings and soffits.
- .2 Cement board as a substrate for exterior cement board stucco system.
- .3 Load-bearing steel framing that supports gypsum board.
- .4 Wood framing and furring that supports gypsum board.
- .5 Gypsum sheathing.
- .6 Insulation and vapour retarders installed in assemblies that incorporate gypsum board.
- .7 Fire Stop Systems for head-of-wall assemblies that incorporate gypsum board.
- .8 Non-structural framing and suspension systems that support gypsum board.
- .9 Metal shaft-wall framing, gypsum shaft liners, and other components of shaft-wall assemblies.
- .10 Gypsum base for veneer plaster and for other components of gypsum-veneer-plaster finishes.
- .11 Primers applied to gypsum board surfaces.

1.2 SUBMITTALS

.1 Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

.1 Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to CAN/ULC-S101 by an independent testing agency.

.2 STC -Rated Assemblies: For STC-rated assemblies provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

1.4 STORAGE AND HANDLING

.1 Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.5 PROJECT CONDITIONS

.1 Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

.2 Do not install interior products until installation areas are enclosed and conditioned.

.3 Do not install panels that are wet, those that are moisture damaged, and those that are mould damaged.
- .1 Indications that panels are wet or moisture damaged include, but are not limited to, discolouration, sagging, or irregular shape.

.2 Indications that panels are mould damaged include, but are not limited to, fuzzy or splotchy surface contamination and discolouration.

PART 2 - PRODUCTS

2.1 PANELS, GENERAL

.1 Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.2 INTERIOR GYPSUM BOARD (Also referred on drawings as **GYP BD**)

.1 General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.
.1 Regular Type.
.2 Type X.
.3 Flexible Type: Manufactured to bend to fit radii and to be more flexible than standard regular-type gypsum board of same thickness.
.4 Ceiling Type: Manufactured to have more sag resistance than regular-type gypsum board.
.5 Abuse-Resistant Type: Manufactured to produce greater resistance to surface indentation, through-penetration (impact resistance), and abrasion than standard, regular-type and Type X gypsum board.
.6 Moisture- and Mould-Resistant Type: With moisture- and mould-resistant core and surfaces, regular type and Type X gypsum board.

2.3 TILE BACKING PANELS (Also referred on drawings as **TILE BACKER**)

.1 Glass-Mat, Water-Resistant Backing Board: Any of the following:
.1 Complying with ASTM C 1178/C 1178M.
.1 Product: Subject to compliance with requirements, provide *DensShield Tile Guard* by G-P Gypsum; or approved alternate.
.2 Product: Subject to compliance with requirements, provide *GlasRoc Tile Backer Regular* by CertainTeed; or approved alternate.
.2 Complying with ASTM C1177/C 1177M.
.1 Product: Subject to compliance with requirements, provide *DensArmor Plus Interior Guard* by G-P Gypsum; or approved alternate.

2.4 CEMENTITIOUS BACKER UNITS (Also referred on drawings as **CBU** or **Cement Board**)

.1 Cementitious Backer Units: ANSI A118.9.
.1 Thickness: As indicated on Drawings.

2.5 TRIM ACCESSORIES

.1 Interior Trim: ASTM C 1047.
.1 Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
.2 Shapes:
.1 Corner bead.
.2 Bullnose bead.
.3 LC-Bead: J-shaped; exposed long flange receives joint compound.
.4 L-Bead: L-shaped; exposed long flange receives joint compound.
.5 U-Bead: J-shaped; exposed short flange does not receive joint compound.

.6 Expansion (control) joint.
.7 Curved-Edge Corner bead: With notched or flexible flanges.
.8 Other profiles as indicated or required.

2.6 JOINT TREATMENT MATERIALS

.1 General: Comply with ASTM C 475/C 475M.

.2 Joint Tape:
.1 Interior Gypsum Wallboard: Paper.
.2 Tile Backing Panels: As recommended by panel manufacturer.

.3 Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
.1 Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
.2 Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
.1 Use setting-type compound for installing paper-faced metal trim accessories.
.3 Fill Coat: For second coat, use setting-type, sandable topping compound.
.4 Finish Coat: For third coat, use setting-type, sandable topping compound.
.5 Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound or high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.

.4 Joint Compound for Tile Backing Panels:
.1 Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.

.5 Joint Compound for Cementitious Backer Units:
.1 Cementitious Backer Units: As recommended by backer unit manufacturer.

2.7 AUXILIARY MATERIALS

.1 General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

.2 Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

.3 Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
.1 Use screws complying with ASTM C 954 for fastening panels to steel members from 0.84 to 2.84 mm thick.
.2 For fastening cementitious backer units, use non-corrosive screws of type and size recommended by panel manufacturer.

.4 Acoustical Sealant: As specified in Division 07 Section *Joint Sealants*.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.

.2 Examine panels before installation. Reject panels that are wet, moisture damaged, and mould damaged.

.3 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

.1 Comply with ASTM C 840.

.2 Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

.3 Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1.5 mm of open space between panels. Do not force into place.

.4 Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

.5 Form control and expansion joints with space between edges of adjoining gypsum panels.

.6 Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
  .1 Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 0.7 sq. m in area.
  .2 Fit gypsum panels around ducts, pipes, and conduits.
  .3 Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 6.4 to 9.5 mm wide joints to install sealant.

.7 Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 6.4 to 12.7 mm wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

.8 Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

.9 Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members, or provide control joints to counteract wood shrinkage.

.10 STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

3.3 APPLYING INTERIOR GYPSUM BOARD

.1 Install interior gypsum board in the following locations:
  .1 Regular Type: Apply on vertical surfaces, unless otherwise indicated.
  .2 Type X: Apply where required for fire-resistance-rated assembly.

.3 Flexible Type: Apply in double layer at curved assemblies.
.4 Ceiling Type: Apply at ceiling and horizontal surfaces.
.5 Abuse-Resistant Type: Apply where indicated on Drawings.
.6 Moisture- and Mould-Resistant Type: Apply to inside of all exterior walls, in janitor's closets, in locker rooms, and in shower areas, provided the surface does not serve as a substrate for tile; and other locations indicated on Drawings.

.2 Single-Layer Application:
.1 On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
.2 On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
.1 Stagger abutting end joints not less than one framing member in alternate courses of panels.
.2 At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
.3 On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
.4 Fastening Methods: Apply gypsum panels to supports with steel drill screws.

.3 Multilayer Application:
.1 On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, 400 mm minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
.2 On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
.3 On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
.4 Fastening Methods: Fasten base layers and face layers separately to supports with screws.

.4 Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

.5 Curved Surfaces:
.1 Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 300-mm- long straight sections at ends of curves and tangent to them.
.2 For double-layer construction, fasten base layer to studs with screws 400 mm o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 300 mm o.c.

3.4 APPLYING TILE BACKING PANELS

.1 Install tile backing panels in the following locations:
.1 Regular type: As substrate for tile finishes, except as noted.
.1 Use Type X as substrate for tile finish where required for fire-resistance-rated assembly.

.2 Glass-Mat, Water-Resistant Backing Panel: Comply with manufacturer's written installation instructions. Install with 6.4 mm gap where panels abut other construction or penetrations.

.3 Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 APPLY CEMENTITIOUS BACKER UNITS

.1 Install cementitious backer units in the following locations:
  .1 Only at locations specifically indicated to receive cementitious backer units.

.2 Cementitious Backer Units: install to ANSI A108.11.

3.6 INSTALLING TRIM ACCESSORIES

.1 General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

.2 Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Engineer for visual effect.

.3 Interior Trim: Install in the following locations:
  .1 Corner bead: Use at outside corners.
  .2 Bullnose Bead: Use where indicated.
  .3 LC-Bead: Use at exposed panel edges.
  .4 Curved-Edge Corner bead: Use at curved openings.

3.7 FINISHING GYPSUM BOARD

.1 General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

.2 Prefill open joints and damaged surface areas.

.3 Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

.4 Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
  .1 Level 1: Ceiling plenum areas, concealed areas, and where indicated.
  .2 Level 2: Panels that are substrate for tile.
  .3 Level 3: Where indicated on Drawings.
  .4 Level 4: At panel surfaces that will be exposed to view, unless otherwise indicated.
    .1 Primer and its application to surfaces are specified in other Division 09 Sections.
  .5 Level 5: Where indicated on Drawings.
    .1 Primer and its application to surfaces are specified in other Division 09 Sections.

.5 Glass-Mat, Water-Resistant Backing Panels: Finish according to manufacturer's written instructions.

.6 Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.8 PROTECTION

.1 Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

.2 Remove and replace panels that are wet, moisture damaged, and mould damaged.

.1 Indications that panels are wet or moisture damaged include, but are not limited to, discolouration, sagging, or irregular shape.

.2 Indications that panels are mould damaged include, but are not limited to, fuzzy or splotchy surface contamination and discolouration.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 Types of items described in this Section:
- .1 Acoustical ceiling panels.
- .2 Exposed suspension systems for ceilings, having narrow and wide capped steel faces.

.2 Types of items you will not find described in this Section:
- .1 Exposed suspension systems having extra-wide faces.
- .2 Exposed face suspension systems of aluminum construction.
- .3 Clean room suspension systems.
- .4 Ceilings consisting of mineral-base acoustical tiles used with concealed suspension systems, stapling, or adhesive bonding.
- .5 Acoustical Metal Pan Ceilings.
- .6 Linear Metal Ceilings.
- .7 Suspended Decorative Grids.

.3 Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete at ceilings.

1.2 DEFINITIONS

.1 AC: Articulation Class.

.2 CAC: Ceiling Attenuation Class.

.3 LR: Light Reflectance coefficient.

.4 NRC: Noise Reduction Coefficient.

1.3 SUBMITTALS

.1 Product Data: For each type of product indicated.

.2 Samples for Initial Selection: For components with factory-applied colour finishes.

.3 Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
- .1 Acoustical Panel: Set of 150 mm square Samples of each type, colour, pattern, and texture.
- .2 Exposed Suspension System Members, Mouldings, and Trim: Set of 300 mm long Samples of each type, finish, and colour.

.4 Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical panel ceiling.

.5 Maintenance Data: For finishes to include in maintenance manuals.

1.4 QUALITY ASSURANCE

.1 Source Limitations:

.1 Acoustical Ceiling Panel: Obtain each type through one source from a single manufacturer.
.2 Suspension System: Obtain each type through one source from a single manufacturer.

.2 Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
.1 Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per CAN/ULC-S101 by ULC or another testing and inspecting agency acceptable to authorities having jurisdiction.
.1 Fire-Resistance Ratings: Indicated by design designations from ULC's *Fire Resistance Directory* or from the listings of another testing and inspecting agency.
.2 Identify materials with appropriate markings of applicable testing and inspecting agency.
.2 Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with CAN/ULC S102:
.1 Flame Spread Rating: 25 or less.
.2 Smoke-Developed Rating: 50 or less.

.3 Mock-ups: Build mock-ups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
.1 Approved mock-ups may become part of the completed Work if undisturbed at time of Substantial Completion.

.4 Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section *Project Management and Coordination*.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

.2 Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

.3 Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

.1 Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
.1 Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

1.7 COORDINATION

.1 Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.8 EXTRA MATERIALS

.1 Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
.1 Acoustical Ceiling Panels: Full-size panels equal to 2.0 percent of quantity installed.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANELS, GENERAL

.1 Recycled Content
.1 Provide acoustical panels with recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content constitutes a minimum of 25 percent by weight.

.2 Acoustical Panel Standard
.1 Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.

.3 Acoustical Panel Colours and Patterns
.1 Match appearance characteristics indicated for each product type.
.2 Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Owner's Representative from each manufacturer's full range that comply with requirements indicated for type, pattern, colour, light reflectance, acoustical performance, edge detail, and size.

.4 Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment
.1 For acoustical panels indicated, treat with manufacturer's standard antimicrobial formulation that inhibits fungus, mould, mildew, and gram-positive and gram-negative bacteria and showing no mould, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.2 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING

.1 General
.1 Provide panels complying with ASTM E 1264 for type, form, and pattern indicated and as outlined below.
.2 Fire Rating
.1 Required when installed in a fire rated assembly.
.3 Colour
.1 White, unless otherwise noted.
.4 Edge Detail
.1 Square edge, unless otherwise noted.
.5 Thickness
.1 15 mm unless otherwise indicated or required for fire rating.
.6 Modular Size
.1 610 x 610 and 610 x 1220 mm as implied by grid shown on drawings.
.7 Flame Spread Rating: 25 of less.
.8 Smoke Developed: 50 or less.

.2 Acoustical Panel **AP1**; if required (typical)
.1 Type and Form: Type III, mineral base with painted finish; Form 2, water felted.
.2 Pattern: CD (perforated small holes and fissured).
.3 Light Reflectance (LR): Not less than 0.80.
.4 Noise Reduction Coefficient (NRC): Range of 0.55 to 0.65
.5 Ceiling Attenuation Class (CAC): Not less than 35.
.6 Thickness: 15mm
.7 Colour: White

.8 Acceptable Products:
.1 "USG Radar Basic, Item No. 2110" (610 x 610) by USG CGC or approved alternate.
.2 "USG Radar Basic, Item No. 2310" (610 x 1220) by USG CGC or approved alternate.

.3 Acoustical Panel **AP2**; if required (high performance for open office environments)
.1 Type and Form: Type XII, glass-fibre base with membrane-faced overlay; Form 2, cloth.
.2 Pattern: E (lightly textured).
.3 Light Reflectance (LR): Not less than 0.90.
.4 Noise Reduction Coefficient (NRC): Not less than 0.95.
.5 Thickness: 25 mm

.4 Acoustical Panels **AP3, AP4, AP5**…; if required
.1 Refer to drawings.

2.3 METAL SUSPENSION SYSTEMS, GENERAL

.1 Recycled Content: Provide products made from steel sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

.2 Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

.3 Finishes and Colours, General: Comply with NAAMM's *Metal Finishes Manual for Architectural and Metal Products* for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
.1 High-Humidity Finish: Comply with ASTM C 635 requirements for *Coating Classification for Severe Environment Performance* where high-humidity finishes are indicated.

.4 Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, *Direct Hung*, unless otherwise indicated.
.1 Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to times that imposed by ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
.1 Type: any one of the following:
.1 Cast-in-place
.2 Postinstalled expansion
.3 Postinstalled bonded anchors.
.2 Corrosion Protection: any one of the following:
.1 Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.
.2 Stainless-steel components complying with ASTM F 593 and ASTM F 594, Group 1 Alloy 304 or 316 for bolts; Alloy 304 or 316 for anchor.
.3 Components fabricated from nickel-copper-alloy rods complying with ASTM B 164 for UNS No. N04400 alloy.
.2 Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.

.5 Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

.1 Material: any one of the following:
.1 Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
.2 Stainless-Steel Wire: ASTM A 580/A 580M, Type 304, nonmagnetic.
.3 Nickel-Copper-Alloy Wire: ASTM B 164, nickel-copper-alloy UNS No. N04400.

.6 Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

.7 Angle Hangers: Angles with legs not less than 22 mm wide; formed with 1 mm thick, galvanized steel sheet complying with ASTM A 653/A 653M, Z275 coating designation; with bolted connections and 8 mm diameter bolts.

2.4 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING

.1 Use wide-face suspension system unless otherwise indicated.
.1 Use narrow-face suspension system only when specifically indicated.

.2 Wide-Face, Capped, Double-Web, Hot-Dip Galvanized, Z180, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, hot-dip galvanized according to ASTM A 653/A 653M, Z180 coating designation, with prefinished, cold-rolled, 24 mm wide, aluminum caps on flanges.
.1 Fire Rating: required when installed in a fire rated assembly.
.2 Structural Classification: Intermediate-duty system.
.3 Face Design: Flat, flush.
.4 Cap Finish: Painted white, unless otherwise noted.

.3 Narrow-Face, Steel-Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than Z90 coating designation, with prefinished, cold-rolled, 15 mm wide metal caps on flanges.
.1 Fire Rating: required when installed in a fire rated assembly.
.2 Structural Classification: Intermediate-duty system.
.3 Face Design: Flat, flush.
.4 Cap Finish: Painted white, unless otherwise noted.

2.5 METAL EDGE MOLDINGS AND TRIM

.1 Roll-Formed, Sheet-Metal Edge Mouldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard mouldings; formed from sheet metal of same material, finish, and colour as that used for exposed flanges of suspension system runners.
.1 Provide manufacturer's standard edge mouldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners, unless otherwise indicated.
.2 For lay-in panels with reveal edge details, provide stepped edge moulding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
.3 For circular penetrations of ceiling, provide edge mouldings fabricated to diameter required to fit penetration exactly.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

.1 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

.1 Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

.1 General: Install acoustical panel ceilings to comply with ASTM C 63, per manufacturer's written instructions and CISCA's *Ceiling Systems Handbook*.
.1 Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.

.2 Suspend ceiling hangers from building's structural members and as follows:
.1 Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
.2 Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
.3 Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
.4 Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
.5 Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
.6 When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
.7 Do not attach hangers to steel roof deck. Attach hangers to structural members.
.8 Space hangers not more than 1200 mm o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 200 mm from ends of each member.
.9 Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

.3 Install edge mouldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
.1 Screw attach mouldings to substrate at intervals not more than 400 mm o.c. and not more than 75 mm from ends, levelling with ceiling suspension system to a tolerance of 3.2 mm in 3.6 m. Mitre corners accurately and connect securely.
.2 Do not use exposed fasteners, including pop rivets, on mouldings and trim.

.4 Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

.5 Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge mouldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
.1 Arrange directionally patterned acoustical panels as follows:
.1 Install panels with pattern running in one direction parallel to long axis of space.

.2 For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and mouldings.

.3 For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.

.4 For reveal-edged panels on suspension system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension system surfaces and panel faces flush with bottom face of runners.

.5 Paint cut edges of panel remaining exposed after installation; match colour of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

.6 Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 CLEANING

.1 Clean exposed surfaces of acoustical panel ceilings, including trim, edge mouldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touch-up of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 Types of items described in this Section:
- .1 Resilient Base
  - .1 Typical
  - .2 Contoured resilient base.
- .2 Resilient stair accessories
  - .1 One piece resilient stair tread and riser
- .3 Resilient moulding accessories.

.2 Types of items you will not find described in this Section:
- .1 Resilient sheet floor coverings.
- .2 Linoleum floor coverings.
- .3 Resilient floor tile.
- .4 Resilient floor coverings designed to control electrostatic discharge.
- .5 Resilient floor coverings for use in athletic-activity or support areas.

1.2 SUBMITTALS

.1 Product Data: For each type of product indicated.

.2 Samples for Initial Selection: For each type of product indicated.

.3 Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 300 mm long, of each resilient product colour, texture, and pattern required.

1.3 QUALITY ASSURANCE

.1 Mock-ups: Provide resilient products with mock-ups specified in other Sections.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 10 deg C or more than 32 deg C.

1.5 PROJECT CONDITIONS

.1 Maintain ambient temperatures within range recommended by manufacturer, but not less than 21 deg C or more than 35 deg C, in spaces to receive resilient products during the following time periods:
- .1 48 hours before installation.
- .2 During installation.
- .3 48 hours after installation.

.2 Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 13 deg C or more than 35 deg C.

.3 Install resilient products after other finishing operations, including painting, have been completed.

1.6 EXTRA MATERIALS

.1 Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  .1 Furnish not less than 3 linear m for every 150 linear m or fraction thereof, of each type, colour, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE - TYPICAL

.1 Refer to drawings to determine if resilient base is required and if so, the required locations.

.2 Resilient Base Standard: to ASTM F 1861.
  .1 Material Requirement: Type TS (rubber, vulcanized thermoset) or Type TP (rubber, thermoplastic).
  .2 Manufacturing Method: Group I (solid, homogeneous) or Group II (layered).
  .3 Style:
    .1 Cove (base with toe): unless otherwise indicated.
    .2 Straight (flat or toeless), at carpet flooring locations.
  .4 Minimum Thickness
    .1 3.2 mm.
  .5 Height
    .1 102 mm, unless otherwise indicated.
  .6 Lengths
    .1 Coils in manufacturer's standard length.
  .7 Outside Corners
    .1 Job formed or preformed.
  .8 Inside Corners
    .1 Job formed or preformed.
  .9 Colours and Patterns
    .1 As selected by Owner's Representative from full range of industry colours if not specifically indicated in the *Interior Finishes Legend*.

2.2 CONTOURED RESILIENT BASE

.1 Refer to drawings to determine if contoured resilient base is required and if so, the required locations.

.2 Contoured resilient base to replicated moulded wood base profiles, to ASTM F-1861, Type TP, Group 1 (solid) Standard.

.3 Colours and Profiles
  .1 As selected by Owner's Representative from full range of manufacturer’s colours and profiles if not specifically indicated in the *Interior Finishes Legend*.

2.3 RESILIENT STAIR ACCESSORIES

.1 Refer to drawings to determine if resilient stair accessories are required and if so, the required locations.

.2 Resilient Stair Treads: to ASTM F 2169.
  .1 Material
    .1 Type TS (rubber, vulcanized thermoset) or Type TP (rubber, thermoplastic); unless otherwise noted.

.2 Surface Design
  .1 Class 1, Smooth (flat): to be used only when specifically indicated
  .2 Class 2, Pattern: choose any one of the following patterns, unless otherwise noted on drawings.
    .1 Raised disc design
    .2 Raised-square design
    .3 Raised-chevron design
    .4 Raised-diamond design
    .5 Raised-rib design
.3 Nosing
  .1 Complete with contrasting colour, embedded abrasive strips, unless otherwise indicated.
  .2 Square profile, adjustable to cover angles between 60 and 90 degrees, unless otherwise indicated.
  .3 Height: as required to completely cover stair nosing.
.4 Riser
  .1 Integral with thread cover, full height of stair riser.
.5 Thickness
  .1 6 mm and tapered to back edge.
.6 Size
  .1 Lengths and depths to fit each stair tread in one piece or, for treads exceeding maximum lengths manufactured, in equal-length units.

.3 Stringers
  .1 Same thickness as risers; height and length after cutting to fit risers and treads and to cover stair stringers.
  .2 Produced by same manufacturer as treads and recommended by manufacturer for installation with treads.

.4 Colours and Patterns
  .1 As selected by Owner's Representative from full range of industry colours if not specifically indicated in the *Interior Finishes Legend*.

2.4 RESILIENT MOULDING ACCESSORY

.1 Description
  .1 Cap for cove carpet
  .2 Cap for cove resilient floor covering
  .3 Carpet edge for glue-down applications
  .4 Nosing for carpet
  .5 Nosing for resilient floor covering
  .6 Reducer strip for resilient floor covering
  .7 Joiner for tile and carpet
  .8 Transition strips.

.2 Material
  .1 Rubber.

.3 Profile and Dimensions
  .1 As required, absolute minimal height.

.4 Colours and Patterns
  .1 As selected by Owner's Representative from full range of industry colours if not specifically indicated in the *Interior Finishes Legend*.

2.5 INSTALLATION MATERIALS

.1 Trowelable Levelling and Patching Compounds
  .1 Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

.2 Adhesives
  .1 Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
  .2 Use adhesives that comply with the following limits for VOC content:
    .1 Cove Base Adhesives: Not more than 50 g/L.
    .2 Rubber Floor Adhesives: Not more than 60 g/L.

.3 Stair-Tread-Nose Filler
  .1 Two-part epoxy compound recommended by resilient tread manufacturer to fill nosing substrates that do not conform to tread contours.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

.2 Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

.3 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

.1 Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

.2 Concrete Substrates for Resilient Stair Treads and Accessories: Prepare according to ASTM F 710.
  .1 Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  .2 Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
  .3 Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.
  .4 Moisture Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

.3 Fill cracks, holes, and depressions in substrates with trowelable levelling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

.4 Do not install resilient products until they are same temperature as the space where they are to be installed.
  .1 Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

.5 Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT BASE INSTALLATION

.1 Comply with manufacturer's written instructions for installing resilient base.

.2 Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

.3 Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

.4 Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

.5 Do not stretch resilient base during installation.

.6 On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

.7 Preformed Corners: Install preformed corners before installing straight pieces.

.8 Job-Formed Corners:
- .1 Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discolouration (whitening) at bends.
- .2 Inside Corners: Use straight pieces of maximum lengths possible.

3.4 RESILIENT ACCESSORY INSTALLATION

.1 Comply with manufacturer's written instructions for installing resilient accessories.

.2 Resilient Stair Accessories:
- .1 Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
- .2 Tightly adhere to substrates throughout length of each piece.
- .3 For treads installed as separate, equal-length units, install to produce a flush joint between units.

.3 Resilient Moulding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet and resilient floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

.1 Comply with manufacturer's written instructions for cleaning and protection of resilient products.

.2 Perform the following operations immediately after completing resilient product installation:
- .1 Remove adhesive and other blemishes from exposed surfaces.
- .2 Sweep and vacuum surfaces thoroughly.
- .3 Damp-mop surfaces to remove marks and soil.

.3 Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

.4 Cover resilient products until Substantial Completion.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 Types of items described in this Section:
  .1 Vinyl sheet floor covering.
  .2 Rubber sheet floor covering.

.2 Types of items you will not find described in this Section:
  .1 Resilient base, reducer strips, and other accessories installed with resilient floor coverings.
  .2 Linoleum sheet floor coverings.
  .3 Resilient floor tile.
  .4 Resilient floor coverings designed to control electrostatic discharge.
  .5 Resilient floor coverings for use in athletic-activity or support areas.

1.2 SUBMITTALS

.1 Product Data: For each type of product indicated.

.2 Samples for Initial Selection: For each type of floor covering indicated.

.3 Samples for Verification: In manufacturer's standard size, but not less than 150-by-230 mm sections of each different colour and pattern of floor covering required.
  .1 For heat-welding bead, manufacturer's standard-size Samples, but not less than 230 mm long, of each colour required.

.4 Seam Samples: For seamless-installation technique indicated and for each floor covering product, colour, and pattern required; with seam running lengthwise and in center of 150-by-230 mm Sample applied to a rigid backing and prepared by Installer for this Project.

.5 Qualification Data: For qualified Installer.

.6 Maintenance Data: For each type of floor covering to include in maintenance manuals.

1.3 QUALITY ASSURANCE

.1 Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor covering installation and seaming method indicated.
  .1 Engage an installer who employs workers for this Project who are trained or certified by floor covering manufacturer for installation techniques required.

.2 Mock-ups: Build mock-ups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  .1 Build mock-ups for floor coverings including resilient base and accessories.
    .1 Size: Minimum 9.3 sq. m for each type, colour and pattern in locations directed by Owner's Representative.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Store floor coverings and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 10 deg C or more than 32 deg C. Store rolls upright.

1.5 PROJECT CONDITIONS

.1 Maintain ambient temperatures within range recommended by manufacturer, but not less than 21 deg C or more than 29 deg C, in spaces to receive floor coverings during the following time periods:
.1 48 hours before installation.
.2 During installation.
.3 48 hours after installation.

.2 Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 13 deg C or more than 35 deg C.

.3 Close spaces to traffic during floor covering installation.

.4 Close spaces to traffic for 48 hours after floor covering installation.

.5 Install floor coverings after other finishing operations, including painting, have been completed.

1.6 EXTRA MATERIALS

.1 Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

.2 Floor Covering
.1 Furnish quantity not less than 3 linear m for every 150 linear m or fraction thereof, in roll form and in full roll width for each colour, pattern, and type of floor covering installed.

PART 2 - PRODUCTS

2.1 VINYL SHEET FLOOR COVERING

.1 Refer to drawings for vinyl flooring type, colour, pattern, and finish.

.2 Sheet Width
.1 As standard with manufacturer.

.3 Seaming Method: any one of the following
.1 Heat welded.
.2 Chemically bonded.

2.2 RUBBER SHEET FLOOR COVERING

.1 Refer to drawings for rubber flooring type, colour, pattern, and finish.

.2 Sheet Width
.1 As standard with manufacturer.

.3 Seaming Method: any one of the following

.1 Heat welded.
.2 Chemically bonded.

2.3 INSTALLATION MATERIALS

.1 Trowelable Levelling and Patching Compounds
.1 Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

.2 Adhesives
.1 Water-resistant type recommended by manufacturer to suit floor covering and substrate conditions indicated.
.2 Use adhesives that have a VOC content of not more than 60 g/L.

.3 Seamless-Installation Accessories
.1 Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.
.1 Colour: Match floor covering.
.2 Chemical-Bonding Compound: Manufacturer's product for chemically bonding seams.
.1 VOC Content: Not more than 510 g/L.

.4 Integral-Flash-Cove-Base Accessories
.1 Cove Strip: 25 mm radius provided or approved by manufacturer.
.2 Cap Strip: Square metal, vinyl, or rubber cap provided or approved by manufacturer.
.3 Corners: Metal inside and outside corners and end stops provided or approved by manufacturer.

.5 Floor Polish
.1 Provide protective liquid floor polish products as recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

.2 Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor coverings.

.3 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

.1 Prepare substrates according to manufacturer's written instructions to ensure adhesion of floor coverings.

.2 Concrete Substrates: Prepare according to ASTM F 710.
.1 Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
.2 Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
.3 Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

.4 Moisture Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

.3 Fill cracks, holes, and depressions in substrates with trowelable levelling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

.4 Do not install floor coverings until they are same temperature as space where they are to be installed.
.1 Move floor coverings and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

.5 Sweep and vacuum clean substrates to be covered by floor coverings immediately before installation.

3.3 FLOOR COVERING INSTALLATION

.1 Comply with manufacturer's written instructions for installing floor coverings.

.2 Unroll floor coverings and allow them to stabilize before cutting and fitting.

.3 Lay out floor coverings as follows
.1 Maintain uniformity of floor covering direction.
.2 Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 152 mm away from parallel joints in floor covering substrates.
.3 Match edges of floor coverings for colour shading at seams.
.4 Avoid cross seams.

.4 Scribe and cut floor coverings to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, and door frames.

.5 Extend floor coverings into toe spaces, door reveals, closets, and similar openings.

.6 Maintain reference markers, holes, or openings that are in place or marked for future cutting by repeating on floor coverings as marked on substrates. Use chalk or other nonpermanent marking device.

.7 Install floor coverings on covers for telephone and electrical ducts and similar items in installation areas. Maintain overall continuity of colour and pattern between pieces of floor coverings installed on covers and adjoining floor covering. Tightly adhere floor covering edges to substrates that abut covers and to cover perimeters.

.8 Adhere floor coverings to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

.9 Seamless Installation
.1 Heat-Welded Seams: Comply with ASTM F 1516. Rout joints and use welding bead to permanently fuse sections into a seamless floor covering. Prepare, weld, and finish seams to produce surfaces flush with adjoining floor covering surfaces.
.2 Chemically-Bonded Seams: Bond seams with chemical-bonding compound to permanently fuse sections into a seamless floor covering. Prepare seams and apply compound to produce tightly-fitted seams without gaps, overlays, or excess bonding compound on floor covering surfaces.

.10 Integral-Flash-Cove Base
.1 Refer to drawings to determine if integral-flash cove base is required and if so, the locations required.

.2 Cove floor coverings 152 mm (unless otherwise indicated in *Interior Finishes Legend*) up vertical surfaces. Support floor coverings at horizontal and vertical junction by cove strip. Butt at top against cap strip.

.3 Install metal corners at inside and outside corners.

3.4 CLEANING AND PROTECTION

.1 Comply with manufacturer's written instructions for cleaning and protection of floor coverings.

.2 Perform the following operations immediately after completing floor covering installation:

.1 Remove adhesive and other blemishes from floor covering surfaces.

.2 Sweep and vacuum floor coverings thoroughly.

.3 Damp-mop floor coverings to remove marks and soil.

.3 Protect floor coverings from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

.4 Floor Polish: Remove soil, visible adhesive and surface blemishes from floor covering before applying liquid floor polish.

.1 Apply three coat(s) unless specifically not recommended by flooring manufacturer.

.5 Cover floor coverings until Substantial Completion.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 Types of items described in this Section:
  .1 Surface preparation and the application of paint systems on the following interior substrates:
    .1 Concrete.
    .2 Clay masonry.
    .3 Concrete masonry units (CMU).
    .4 Steel.
    .5 Galvanized metal.
    .6 Aluminum (not anodized or otherwise coated).
    .7 Wood.
    .8 Gypsum board.
    .9 Plaster.
    .10 Spray-textured ceilings.
    .11 Cotton or canvas insulation covering.

.2 Types of items you will not find described in this Section:
  .1 Wood stains and transparent finishes.
  .2 Shop priming of metal substrates with primers specified in this Section.
  .3 Shop priming carpentry with primers specified in this Section.
  .4 Factory finishing of steel doors and frames and of wood doors; where specified.
  .5 Gypsum board spackling.
  .6 Special-use coatings.
  .7 Intumescent painting.
  .8 Surface preparation and the application of paint systems on exterior substrates.
  .9 Surface preparation and the application of wood stains and transparent finishes on interior wood substrates.

.3 Scope of Work of this Contract
  .1 While drawings and schedules identify locations for some finishes, the scope of work entails painting all of the following interior surfaces:
    .1 All surfaces explicitly noted to be painted.
    .2 All surfaces scheduled to be covered with wall coverings.
    .3 All unfinished surfaces that are either exposed-to-view or semi-exposed-to-view and not otherwise scheduled to receive another type of finish, excluding finished hardwood; unless otherwise noted.
  .2 Specifically, do not paint any of the following surfaces:
    .1 Grating.
    .2 Concrete floors, unless specifically indicated.
    .3 Stainless steel.
    .4 Aluminum handrail and aluminum stair and ladder components.
    .5 PVC, rubber, copper, bronze or brass surfaces.

1.2 DEFINITIONS

.1 Concealed Surface: A surface that cannot be seen because the view from any angle is obstructed by an immovable object.

.2 Exposed and semi-exposed surface: Any surface that is not a concealed surface.

.3 Finish: a final surface treatment intended to enhance the appearance of a substrate or protect it from the adverse effects of its environmental, or both, and includes but is not limited to paint, stains, coatings, laminates, tiles, fabrics and carpets.
.1 Primer finish is not considered a finish.

.4 Unfinished Surface: A surface having no Finish.

1.3 SUBMITTALS

.1 Product Data: For each type of product indicated.

.2 Samples for Verification: For each type of paint system and in each colour and gloss of topcoat indicated.
.1 Submit Samples on rigid backing, 200 mm square.
.2 Step coats on Samples to show each coat required for system.
.3 Label each coat of each Sample.
.4 Label each Sample for location and application area.

.3 Product List: For each product indicated, include the following:
.1 Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.

.4 Sustainability Submittal:
.1 Product Data for paints, including printed statement of VOC content and chemical components.

1.4 QUALITY ASSURANCE

.1 MPI Standards:
.1 Products: Complying with MPI standards indicated and listed in *MPI Approved Products List*.
.2 Preparation and Workmanship: Comply with requirements in *MPI Architectural Painting Specification Manual* for products and paint systems indicated.

.2 Mock-ups: While paint colours may be specifically indicated in the documents, still proceed with mock-ups. Apply benchmark samples of each paint system indicated and each colour and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
.1 Owner's Representative will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
.1 Wall and Ceiling Surfaces: Provide samples of at least 9 sq. m.
.2 Other Items: Owner's Representative will designate items or areas required.
.2 Apply benchmark samples after permanent lighting and other environmental services have been activated.
.3 Final approval of colour selections will be based on benchmark samples.
.1 If preliminary colour selections are not approved, apply additional benchmark samples of additional colours selected by Owner's Representative at no added cost to Owner.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 7 deg C.
.1 Maintain containers in clean condition, free of foreign materials and residue.
.2 Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

.1 Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 10 and 35 deg C.

.2 Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 3 deg C above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

.1 Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
.1 Quantity: Furnish an additional 5 percent, but not less than 3.8 L of each material and colour applied.

PART 2 - PRODUCTS

2.1 PAINT, GENERAL

.1 Material Compatibility:
.1 Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
.2 For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

.2 VOC Content of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colourants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24); these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:
.1 Flat Paints, Coatings, and Primers: VOC content of not more than 50 g/L.
.2 Nonflat Paints, Coatings, and Primers: VOC content of not more than 150 g/L.
.3 Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
.4 Floor Coatings: VOC not more than 100 g/L.
.5 Shellacs, Clear: VOC not more than 730 g/L.
.6 Shellacs, Pigmented: VOC not more than 550 g/L.
.7 Flat Topcoat Paints: VOC content of not more than 50 g/L.
.8 Nonflat Topcoat Paints: VOC content of not more than 150 g/L.
.9 Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
.10 Floor Coatings: VOC not more than 100 g/L.
.11 Shellacs, Clear: VOC not more than 730 g/L.
.12 Shellacs, Pigmented: VOC not more than 550 g/L.
.13 Primers, Sealers, and Undercoaters: VOC content of not more than 200 g/L.
.14 Dry-Fog Coatings: VOC content of not more than 400 g/L.
.15 Zinc-Rich Industrial Maintenance Primers: VOC content of not more than 340 g/L.
.16 Pre-Treatment Wash Primers: VOC content of not more than 420 g/L.

.3 Chemical Components of Field-Applied Interior Paints and Coatings: Provide topcoat paints and anti-corrosive and anti-rust paints applied to ferrous metals that comply with the following chemical restrictions; these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:
.1 Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).

.2 Restricted Components: Paints and coatings shall not contain any of the following:
- .1 Acrolein.
- .2 Acrylonitrile.
- .3 Antimony.
- .4 Benzene.
- .5 Butyl benzyl phthalate.
- .6 Cadmium.
- .7 Di (2-ethylhexyl) phthalate.
- .8 Di-n-butyl phthalate.
- .9 Di-n-octyl phthalate.
- .10 1,2-dichlorobenzene.
- .11 Diethyl phthalate.
- .12 Dimethyl phthalate.
- .13 Ethylbenzene.
- .14 Formaldehyde.
- .15 Hexavalent chromium.
- .16 Isophorone.
- .17 Lead.
- .18 Mercury.
- .19 Methyl ethyl ketone.
- .20 Methyl isobutyl ketone.
- .21 Methylene chloride.
- .22 Naphthalene.
- .23 Toluene (methylbenzene).
- .24 1,1,1-trichloroethane.
- .25 Vinyl chloride.

.4 Colours: Refer to *Interior Finishes Legend*. When no colour is identified, then selected by Owner's Representative.
- .1 M&E equipment: Assume no colour coding required unless otherwise indicated in mechanical and electrical specification sections.
- .2 Where no colour is identified, Owner’s Representative shall chose up to a combination of 8 colours in each suite. Colours can be a combination of main and accent colours in each room.

.5 Gloss Levels: As determined by Owner's Representative.

2.2 BLOCK FILLERS

.1 Interior/Exterior Latex Block Filler: MPI #4.
- .1 VOC Content: E Range of E3.

2.3 PRIMERS/SEALERS

.1 Interior Latex Primer/Sealer: MPI #50.
- .1 VOC Content: E Range of E3.
- .2 Environmental Performance Rating: EPR 3.

.2 Interior Alkyd Primer/Sealer: MPI #45.
- .1 VOC Content: E Range of E2.

.3 Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint systems indicated.

2.4 METAL PRIMERS

.1 Alkyd Anticorrosive Metal Primer: MPI #79.
.1 VOC Content: E Range of E2.

.2 Quick-Drying Alkyd Metal Primer: MPI #76.
.1 VOC Content: E Range of E3.

.3 Rust-Inhibitive Primer (Water Based): MPI #107.
.1 VOC Content: E Range of E3.
.2 Environmental Performance Rating: EPR 3.

.4 Cementitious Galvanized-Metal Primer: MPI #26.
.1 VOC Content: E Range of E1.

.5 Waterborne Galvanized-Metal Primer: MPI #134.
.1 VOC Content: E Range of E3.
.2 Environmental Performance Rating: EPR 3.

.6 Vinyl Wash Primer: MPI #80.
.1 VOC Content: E Range of E3.

.7 Quick-Drying Primer for Aluminum: MPI #95.
.1 VOC Content: E Range of E3.

2.5 WOOD PRIMERS

.1 Interior Latex-Based Wood Primer: MPI #39.
.1 VOC Content: E Range of E3.
.2 Environmental Performance Rating: EPR 3.

2.6 LATEX PAINTS

.1 Interior Latex (Flat): MPI #53 (Gloss Level 1).
.1 VOC Content: E Range of E3.
.2 Environmental Performance Rating: EPR 2.5.

.2 Interior Latex (Low Sheen): MPI #44 (Gloss Level 2).
.1 VOC Content: E Range of E3.
.2 Environmental Performance Rating: EPR 3.

.3 Interior Latex (Eggshell): MPI #52 (Gloss Level 3).
.1 VOC Content: E Range of E3.
.2 Environmental Performance Rating: EPR 3.

.4 Interior Latex (Satin): MPI #43 (Gloss Level 4).
.1 VOC Content: E Range of E3.
.2 Environmental Performance Rating: EPR 3.5.

.5 Interior Latex (Semigloss): MPI #54 (Gloss Level 5).
.1 VOC Content: E Range of E3.
.2 Environmental Performance Rating: EPR 4.

.6 Interior Latex (Gloss): MPI #114 (Gloss Level 6, except minimum gloss of 65 units at 60 deg).
.1 VOC Content: E Range of E3.
.2 Environmental Performance Rating: EPR 4.

.7 Institutional Low-Odour/VOC Latex (Flat): MPI #143 (Gloss Level 1).
.1 VOC Content: E Range of E3.
.2 Environmental Performance Rating: EPR 5.5.

.8 Institutional Low-Odour/VOC Latex (Low Sheen): MPI #144 (Gloss Level 2).
.1 VOC Content: E Range of E3.
.2 Environmental Performance Rating: EPR 4.5.

.9 Institutional Low-Odour/VOC Latex (Eggshell): MPI #145 (Gloss Level 3).
.1 VOC Content: E Range of E3.
.2 Environmental Performance Rating: EPR 4.5.

.10 Institutional Low-Odour/VOC Latex (Semigloss): MPI #147 (Gloss Level 5).
.1 VOC Content: E Range of E3.
.2 Environmental Performance Rating: EPR 5.5.

.11 High-Performance Architectural Latex (Low Sheen): MPI #138 (Gloss Level 2).
.1 VOC Content: E Range of E3.
.2 Environmental Performance Rating: EPR 6.

.12 High-Performance Architectural Latex (Eggshell): MPI #139 (Gloss Level 3).
.1 VOC Content: E Range of E3.
.2 Environmental Performance Rating: EPR 6.

.13 High-Performance Architectural Latex (Satin): MPI #140 (Gloss Level 4).
.1 VOC Content: E Range of E3.
.2 Environmental Performance Rating: EPR 6.5.

.14 High-Performance Architectural Latex (Semigloss): MPI #141 (Gloss Level 5).
.1 VOC Content: E Range of E3.
.2 Environmental Performance Rating: EPR 7.

.15 Exterior Latex (Flat): MPI #10 (Gloss Level 1).
.1 VOC Content: E Range of E3.

.16 Exterior Latex (Semigloss): MPI #11 (Gloss Level 5).
.1 VOC Content: E Range of E3.

.17 Exterior Latex (Gloss): MPI #119 (Gloss Level 6, except minimum gloss of 65 units at 60 deg).
.1 VOC Content: E Range of E3.

2.7 ALKYD PAINTS

.1 Interior Alkyd (Flat): MPI #49 (Gloss Level 1).
.1 VOC Content: E Range of E3.

.2 Interior Alkyd (Eggshell): MPI #51 (Gloss Level 3).

.1 VOC Content: E Range of E2.

.3 Interior Alkyd (Semigloss): MPI #47 (Gloss Level 5).
.1 VOC Content: E Range of E2.
.2 Environmental Performance Rating: EPR 3.

.4 Interior Alkyd (Gloss): MPI #48 (Gloss Level 6).
.1 VOC Content: E Range of E2.

2.8 QUICK-DRYING ENAMELS

.1 Quick-Drying Enamel (Semigloss): MPI #81 (Gloss Level 5).
.1 VOC Content: E Range of E3.

.2 Quick-Drying Enamel (High Gloss): MPI #96 (Gloss Level 7).
.1 VOC Content: E Range of E3.

2.9 TEXTURED COATING

.1 Latex Stucco and Masonry Textured Coating: MPI #42.
.1 VOC Content: E Range of E3.

2.10 DRY FOG/FALL COATINGS

.1 Latex Dry Fog/Fall: MPI #118.
.1 VOC Content: E Range of E3.
.2 Environmental Performance Rating: EPR 3.

.2 Waterborne Dry Fall: MPI #133.
.1 VOC Content: E Range of E3.
.2 Environmental Performance Rating: EPR 3.

.3 Interior Alkyd Dry Fog/Fall: MPI #55.
.1 VOC Content: E Range of E3.

2.11 ALUMINUM PAINT

.1 Aluminum Paint: MPI #1.
.1 VOC Content: E Range of E3.

2.12 FLOOR COATINGS

.1 Interior Concrete Floor Stain: MPI #58.
.1 VOC Content: E Range of E3.
.2 Environmental Performance Rating: EPR 2.

.2 Interior/Exterior Clear Concrete Floor Sealer (Water Based): MPI #99.
.1 VOC Content: E Range of E3.

.3 Interior/Exterior Clear Concrete Floor Sealer (Solvent Based): MPI #104.
.1 VOC Content: E Range of E2.

.4 Interior/Exterior Latex Floor and Porch Paint (Low Gloss): MPI #60 (maximum Gloss Level 3).
.1 VOC Content: E Range of E3.
.2 Environmental Performance Rating: EPR 3.

.5 Exterior/Interior Alkyd Floor Enamel (Gloss): MPI #27 (Gloss Level 6).
.1 VOC Content: E Range of E2.
.2 Additives: Manufacturer's standard additive to increase skid resistance of painted surface.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

.2 Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
.1 Concrete: 12 percent.
.2 Masonry (Clay and CMU): 12 percent.
.3 Wood: 15 percent.
.4 Gypsum Board: 12 percent.
.5 Plaster: 12 percent.

.3 Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

.4 Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
.1 Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

.1 Comply with manufacturer's written instructions and recommendations in *MPI Architectural Painting Specification Manual* applicable to substrates indicated.

.2 Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
.1 After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
.2 Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

.3 Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
.1 Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

.4 Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

.5 Clay Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content of surfaces or alkalinity of mortar joints to be painted exceed that permitted in manufacturer's written instructions.

.6 Concrete Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

.7 Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

.8 Aluminum Substrates: Remove surface oxidation.

.9 Wood Substrates:
- .1 Scrape and clean knots, and apply coat of knot sealer before applying primer.
- .2 Sand surfaces that will be exposed to view, and dust off.
- .3 Prime edges, ends, faces, undersides, and backsides of wood.
- .4 After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

.10 Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

.11 Plaster Substrates: Do not begin paint application until plaster is fully cured and dry.

.12 Spray-Textured Ceiling Substrates: Do not begin paint application until surfaces are dry.

.13 Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

.1 Apply paints according to manufacturer's written instructions.
- .1 Use applicators and techniques suited for paint and substrate indicated.
- .2 Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
- .3 Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

.2 Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match colour of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

.3 If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, colour, and appearance.

.4 Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and colour breaks.

.5 Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:
- .1 Mechanical Work:
  - .1 Uninsulated metal piping.
  - .2 Uninsulated plastic piping.
  - .3 Pipe hangers and supports.
  - .4 Tanks that do not have factory-applied final finishes.

.5 Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
.6 Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
.7 Mechanical equipment that is indicated to have a factory-primed finish for field painting.

.2 Electrical Work:
.1 Galvanized and steel conduits.
.2 Electrical equipment that is indicated to have a factory-primed finish for field painting.

3.4 CLEANING AND PROTECTION

.1 At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

.2 After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

.3 Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Owner's Representative, and leave in an undamaged condition.

.4 At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 INTERIOR PAINTING SCHEDULE

.1 Propose paint system for any surfaces not listed. Propose paint system consisting of a minimum of a prime coat, intermediate coat, and topcoat.

.2 Concrete Substrates, Nontraffic Surfaces:
.1 High-Performance Architectural Latex System: MPI INT 3.1C.
.1 Prime Coat: Interior latex primer/sealer.
.2 Intermediate Coat: High-performance Architectural latex matching topcoat.
.3 Topcoat: High-performance Architectural latex.

.3 Concrete Substrates, Traffic Surfaces:
.1 Alkyd Floor Enamel System: MPI INT 3.2B.
.1 Prime Coat: Exterior/interior alkyd floor enamel.
.2 Intermediate Coat: Exterior/interior alkyd floor enamel.
.3 Topcoat: Exterior/interior alkyd floor enamel.

.4 Clay-Masonry Substrates:
.1 High-Performance Architectural Latex System: MPI INT 4.1L.
.1 Prime Coat: High-performance Architectural latex matching topcoat.
.2 Intermediate Coat: High-performance Architectural latex matching topcoat.
.3 Topcoat: High-performance Architectural latex .

.5 CMU Substrates:
.1 High-Performance Architectural Latex System: MPI INT 4.2D.
.1 Prime Coat: Interior/exterior latex block filler.
.2 Intermediate Coat: High-performance Architectural latex matching topcoat.
.3 Topcoat: High-performance Architectural latex .

.6 Steel Pipes filled with liquids, including but not limited to sprinkler pipes:
.1 Alkyd System: MPI INT 5.1E.

.1 Prime Coat: Alkyd anticorrosive metal primer.
.2 Intermediate Coat: Interior alkyd matching topcoat.
.3 Topcoat: Interior alkyd

.7 Galvanized Metal Pipes filled with liquids, including but not limited to sprinkler pipes:
.1 Alkyd System: MPI INT 5.3C.
.1 Prime Coat: Cementitious galvanized-metal primer.
.2 Intermediate Coat: Interior alkyd matching topcoat.
.3 Topcoat: Interior alkyd

.8 Steel Substrates:
.1 High-Performance Architectural Latex System: MPI INT 5.1R.
.1 Prime Coat: Alkyd anticorrosive metal primer.
.2 Intermediate Coat: High-performance Architectural latex matching topcoat.
.3 Topcoat: High-performance Architectural latex.

.9 Galvanized-Metal Substrates:
.1 High-Performance Architectural Latex System: MPI INT 5.3M.
.1 Prime Coat: Waterborne galvanized-metal primer.
.2 Intermediate Coat: High-performance Architectural latex matching topcoat.
.3 Topcoat: High-performance Architectural latex .

.10 Aluminum (Not Anodized or Otherwise Coated) Substrates:
.1 High-Performance Architectural Latex System: MPI INT 5.4F.
.1 Prime Coat: Quick-drying primer for aluminum.
.2 Intermediate Coat: High-performance Architectural latex matching topcoat.
.3 Topcoat: High-performance Architectural latex.

.11 Glue-Laminated Beam and Column Substrates:
.1 High-Performance Architectural Latex System: MPI INT 6.1N.
.1 Prime Coat: Interior latex-based wood primer.
.2 Intermediate Coat: High-performance Architectural latex matching topcoat.
.3 Topcoat: High-performance Architectural latex .

.12 Dressed Lumber Substrates: Including Architectural woodwork and doors.
.1 High-Performance Architectural Latex System: MPI INT 6.3A.
.1 Prime Coat: Interior latex-based wood primer.
.2 Intermediate Coat: High-performance Architectural latex matching topcoat.
.3 Topcoat: High-performance Architectural latex.

.13 Wood Panel Substrates: Including painted plywood, medium-density fiberboard, and hardboard.
.1 High-Performance Architectural Latex System: MPI INT 6.4S.
.1 Prime Coat: Interior latex-based wood primer.
.2 Intermediate Coat: High-performance Architectural latex matching topcoat.
.3 Topcoat: High-performance Architectural latex.

.14 Dimension Lumber Substrates, Nontraffic Surfaces: Including exposed joists and exposed beams.
.1 High-Performance Architectural Latex System: MPI INT 6.2B.
.1 Prime Coat: Interior alkyd primer/sealer.
.2 Intermediate Coat: High-performance Architectural latex matching topcoat.
.3 Topcoat: High-performance Architectural latex.

.15 Wood Substrates, Traffic Surfaces:
- .1 Latex Floor Paint System: MPI INT 6.5G.
  - .1 Prime Coat: Interior alkyd primer/sealer.
  - .2 Intermediate Coat: Interior/exterior latex floor and porch paint.
  - .3 Topcoat: Interior/exterior latex floor and porch paint.

.16 Gypsum Board Substrates:
- .1 High-Performance Architectural Latex System: MPI INT 9.2B.
  - .1 Prime Coat: Interior latex primer/sealer.
  - .2 Intermediate Coat: High-performance Architectural latex matching topcoat.
  - .3 Topcoat: High-performance Architectural latex.

.17 Plaster Substrates:
- .1 High-Performance Architectural Latex System: MPI INT 9.2B.
  - .1 Prime Coat: Interior latex primer/sealer.
  - .2 Intermediate Coat: High-performance Architectural latex matching topcoat.
  - .3 Topcoat: High-performance Architectural latex.

.18 Spray-Textured Ceiling Substrates:
- .1 Latex System: MPI INT 9.1E, spray applied.
  - .1 Prime Coat: Interior latex matching topcoat.
  - .2 Intermediate Coat: Interior latex matching topcoat.
  - .3 Topcoat: Interior latex.

.19 Cotton or Canvas Insulation-Covering Substrates: Including pipe and duct coverings.
- .1 Latex System: MPI INT 10.1A.
  - .1 Prime Coat: Interior latex matching topcoat.
  - .2 Intermediate Coat: Interior latex matching topcoat.
  - .3 Topcoat: Interior latex.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

.1 Types of items described in this Section:
  .1 Surface preparation and the application of wood finishes on the following substrates:
    .1 Interior substrates consisting of dressed lumber (finish carpentry).

.2 Types of items you will not find described in this Section:
  .1 Stains and transparent finishes applied to wood flooring.
  .2 Surface preparation and application of standard paint systems on exterior substrates.
  .3 Surface preparation and application of standard paint systems on interior substrates.
  .4 Factory-applied finishes over interior architectural millwork.

.3 Scope of Work of this Contract:
  .1 Apply stain on interior wood substrates indicated.
  .2 Apply a transparent finish on interior wood substrates indicated and other interior hardwood substrates not otherwise indicated to receive a finish.

1.3 SUBMITTALS

.1 Product Data: For each type of product indicated.

.2 Samples for Verification: For each type of finish system and in each colour and gloss of finish indicated.
  .1 Submit Samples on representative samples of actual wood substrates, 200 mm square.
  .2 Label each Sample for location and application area.

.3 Product List: For each product indicated, include the following:
  .1 Cross-reference to finish system and locations of application areas. Use same designations indicated on Drawings and in schedules.
  .2 Printout of MPI's current *MPI Approved Products List* for each product category specified in Part 2, with the product proposed for use highlighted.

1.4 QUALITY ASSURANCE

.1 MPI Standards:
  .1 Products: Complying with MPI standards indicated and listed in its *MPI Approved Products List*.
  .2 Preparation and Workmanship: Comply with requirements in *MPI Architectural Painting Specification Manual* for products and finish systems indicated.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 7 deg C.
  .1 Maintain containers in clean condition, free of foreign materials and residue.
  .2 Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

.1 Apply finishes only when temperature of surfaces to be finished and ambient air temperatures are between 10 and 35 deg C.

.2 Do not apply exterior finishes in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 3 deg C above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

.1 Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
  .1 Quantity: Furnish an additional 5 percent, but not less than 3.8 L of each material and colour applied.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

.1 Material Compatibility:
  .1 Provide materials for use within each finish system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  .2 For each coat in a finish system, provide products recommended in writing by manufacturers of topcoat for use in finish system and on substrate indicated.

2.2 WOOD FILLERS

.1 Wood Filler Paste: MPI #91.

2.3 STAINS

.1 Interior Wood Stain (Semitransparent): MPI #90.

2.4 POLYURETHANE FINISHES

.1 Moisture-Cured Clear Polyurethane (Flat): MPI #71, Gloss Level 1.

.2 Moisture-Cured Clear Polyurethane (Gloss): MPI #31.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
  .1 Maximum Moisture Content of Wood Substrates: 15 percent when measured with an electronic moisture meter.
  .2 Verify compatibility with and suitability of substrates, including compatibility with existing finishes.
  .3 Begin finish application only after unsatisfactory conditions have been corrected and surfaces are dry.
  .4 Beginning application of finish system constitutes Contractor's acceptance of substrate and conditions.

3.2 PREPARATION

.1 Comply with manufacturer's written instructions and recommendations in *MPI Architectural Painting Specification Manual* applicable to substrates indicated.

.2 Remove plates, machined surfaces, and similar items already in place that are not to be finished. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.
   .1 After completing finishing operations, reinstall items that were removed; use workers skilled in the trades involved. Remove surface-applied protection if any.

.3 Clean and prepare surfaces to be finished according to manufacturer's written instructions for each particular substrate condition and as specified.
   .1 Remove surface dirt, oil, or grease by washing with a detergent solution; rinse thoroughly with clean water and allow to dry. Remove grade stamps and pencil marks by sanding lightly. Remove loose wood fibres by brushing.
   .2 Remove mildew by scrubbing with a commercial wash formulated for mildew removal and as recommended by stain manufacturer.
   .3 Countersink steel nails, if used, and fill with putty tinted to final colour to eliminate rust leach stains.

.4 Apply wood filler paste to open-grain woods, as defined in *MPI Architectural Painting Specification Manual*, to produce smooth, glasslike finish.

3.3 APPLICATION

.1 Apply finishes according to manufacturer's written instructions.
   .1 Use applicators and techniques suited for finish and substrate indicated.
   .2 Finish surfaces behind movable equipment and furniture same as similar exposed surfaces.

.2 Apply finishes to produce surface films without cloudiness, holidays, lap marks, brush marks, runs, ropiness, or other surface imperfections.

3.4 FIELD QUALITY CONTROL

.1 Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when finishes are being applied:
   .1 Owner will engage the services of a qualified testing agency to sample finish materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
   .2 Testing agency will perform tests for compliance with product requirements.
   .3 Owner may direct Contractor to stop applying finishes if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying materials from Project site, pay for testing, and refinish surfaces finished with rejected materials. Contractor will be required to remove rejected materials from previously finished surfaces if, on refinishing with complying materials, the two finishes are incompatible.

3.5 CLEANING AND PROTECTION

.1 At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

.2 After completing finish application, clean spattered surfaces. Remove spattered materials by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

.3 Protect work of other trades against damage from finish application. Correct damage by cleaning, repairing, replacing, and refinishing, as approved by Departmental Representative, and leave in an undamaged condition.

.4 At completion of construction activities of other trades, touch up and restore damaged or defaced finished wood surfaces.

3.6 INTERIOR WOOD-FINISH-SYSTEM SCHEDULE

.1 Finish Carpentry Wood Substrates:
- .1 Moisture-Cured Clear Polyurethane Over Stain System: MPI INT 6.3Y.
  - .1 Stain Coat: Interior wood stain (semitransparent).
  - .2 Three Finish Coats: Moisture-cured clear polyurethane .
- .2 Moisture-Cured Clear Polyurethane System: MPI INT 6.3X.
  - .1 Three Finish Coats: Moisture-cured clear polyurethane.

3.7 SCHEDULE OF TRANSPARENT FINISH GLOSSES

.1 Confirm finish gloss levels with Departmental Representative prior to commencing work. Finish gloss levels listed below are tentative only.

.2 Specific glosses for specific surfaces may be indicated on drawings as per MPI guidelines, as follows:
- .1 **G1** / Level 1 – Traditional matte.
- .2 **G2** / Level 2 – High-side sheen, flat, velvet.
- .3 **G3** / Level 3 – Traditional eggshell.
- .4 **G4** / Level 4 – Satin.
- .5 **G5** / Level 5 – Traditional semi-gloss.
- .6 **G6** / Level 6 – Traditional gloss.
- .7 **G7** / Level 7 – High gloss.

3.8 SCHEDULE OF FINISH COLOURS

.1 See drawings for wood stain and transparent finish colours.
- .1 Confirm finish colours with Owner's Representative prior to commencing work. Finish colours listed are tentative only.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.3 Section 01 78 00 - Closeout Submittals.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)

.1 ANSI/NFPA 10, Portable Fire Extinguishers.

.2 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S508, Rating and Fire Testing of Fire Extinguishers and Class "D" Extinguishing Media.

1.3 SUBMITALS

.1 Submit manufacturer’s technical data for each type of fire extinguisher and safety blanket.

1.4 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with municipal regulations.

PART 2 PRODUCTS

2.1 MULTI-PURPOSE DRY CHEMICAL EXTINGUISHERS

.1 Stored pressure rechargeable type with hose and shut-off nozzle, ULC labelled for A, B and C class protection. Sizes 9 and 14 kg or as indicated on drawings.

2.2 EXTINGUISHER BRACKETS

.1 Type recommended by extinguisher manufacturer.

2.3 IDENTIFICATION

.1 Identify extinguishers in accordance with recommendations of ANSI/NFPA 10 and CAN/ULC-S508.

.2 Attach bilingual tag or label to extinguishers, indicating month and year of installation. Provide space for service dates.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install or mount extinguishers in cabinets or on brackets as indicated.

.2 Install fire safety blankets as indicated.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 74 21 - Construction / Demolition Waste Management and Disposal.

.3 Section 01 78 00 - Closeout Submittals.

1.2 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop drawings; submit drawings stamped and signed for approval by Owner.

.3 Shop drawings to show:

- .1 Mounting arrangements.
- .2 Operating and maintenance clearances.

.4 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.

.5 In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

.6 Closeout Submittals:

- .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
- .2 Operation and maintenance manual approved by, and final copies deposited with, Owner before final inspection.
- .3 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.

.4 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.

.5 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.

.6 Approvals:

.1 Submit 2 copies of draft Operation and Maintenance Manual to Owner for approval. Submission of individual data will not be accepted unless directed by Owner.

.2 Make changes as required and re-submit as directed by Owner.

.7 Additional data:

.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.8 Site records:

.1 Owner will provide one (1) set of reproducible mechanical drawings or AutoCAD files. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.

.2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.

.3 Use different colour for each service.

.4 Make available for reference purposes and inspection.

.9 As-built drawings:

.1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.

.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 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.

.10 Submit copies of as-built drawings for inclusion in final TAB report.

1.3 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

.2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.3 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.4 Mock ups: Complete mock-ups of all installations for each room for approval prior to completing installation. Contractor shall not proceed with any work until installation is acceptable to owner. Quality of installation will be paramount and only the highest quality installation will be acceptable. All required re-work shall be completed at the cost of the contractor until installation is deemed acceptable.

.5 Provide all materials and equipment and perform all labor required to install complete and operable mechanical systems as indicated on the drawings, as specified, and as required by code.

.6 Contract document drawings for mechanical work (HVAC, plumbing, fire protection, and controls) are diagrammatic and are intended to convey sizing, scope and general arrangement only.

.7 Install all mechanical equipment and appurtenances in accordance with manufacturers' recommendations, contract documents, and applicable codes and regulations.

.8 Provide vibration isolation for all mechanical equipment to prevent transmission of vibration to building structure. Provide vibration isolators for all piping supports connected to, and within 15m of, isolated equipment (except at base elbow supports and anchor points) throughout mechanical equipment rooms.

.9 Coordinate construction of all mechanical work with architectural, structural, civil, electrical work, etc., shown on other contract document drawings

.10 All tests shall be completed before any mechanical equipment or piping insulation is applied.

.11 Locate all temperature, pressure, and flow measuring devices in accessible locations with the straight section of pipe or duct up- and downstream as recommended by the manufacturer for good accuracy.

.12 Coordinate all equipment connections with manufacturers' certified drawings. Coordinate and provide all duct and piping transitions required for final equipment connections to furnished equipment. Field verify and coordinate all duct and piping dimensions before fabrication.

.13 Concrete housekeeping pads to suit mechanical equipment shall be sized and located by the mechanical contractor. Minimum concrete pad thickness shall be 150mm. Pad shall extend beyond the equipment a minimum of 150 mm on each side. Concrete housekeeping pads shall be provided by the general contractor. It shall be the responsibility of the mechanical contractor to coordinate the size and location of concrete housekeeping pads with the general contractor.

.14 When mechanical work (HVAC, plumbing, sheet metal, fire protection, controls, balancing etc.) is subcontracted, it shall be the mechanical contractor's responsibility to coordinate subcontractors and the associated contracts.

.15 The locations of all items shown on the drawings or called for in the specifications that are not definitely fixed by dimensions are approximate only. The exact locations necessary to secure the best conditions and results must be determined by the project site conditions. Do not scale drawings.

.16 All miscellaneous steel required to ensure proper installation and as shown in details for piping, ductwork, and equipment (unless otherwise noted) shall be furnished and installed by the mechanical contractor.

.17 All equipment, piping, ductwork, etc., shall be supported as detailed, specified, and required to provide a vibration-free installation.

.18 All ductwork, piping, and equipment supported from structural steel shall be coordinated with the general contractor.

.19 Locations and sizes of all floor, wall, and roof openings shall be coordinated with all other trades involved.

.20 Refer to typical details for ductwork, piping, and equipment installation.

.21 Install piping so all valves, strainers, unions, traps, flanges, and other appurtenances requiring access are accessible.

.22 All valves shall be installed so that the valve remains in service when equipment or piping on the equipment side of the valve is removed.

.23 Provide chainwheel operators for all valves in equipment rooms mounted greater than 2.1 m" above floor level; chain shall extend to 2.1m above floor level.

.24 Unions and/or flanges shall be installed at each piece of equipment, in bypasses, and in long piping runs (30 m or more) to permit disassembly for alteration and repairs.

.25 All piping work shall be coordinated with all trades involved. Offsets in piping around obstructions shall be provided at no additional cost to the owner.

.26 Coordinate diffuser, register, and grille locations with architectural reflected ceiling plans, lighting, and other ceiling items and make minor duct modifications to suit.

.27 All equipment provided by Div 21, 22, 23, 25 and shall be started up a factory trained and experienced journeyman or approved equal. All equipment shall have start up reports provided in an organized PDF with bookmarks.

1.4 MAINTENANCE

.1 Furnish spare parts in accordance with Section 01 78 00 - Closeout Submittals as follows:

.1 As recommended by Manufacturer.

.2 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 01 78 00 - Closeout Submittals.

.3 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 PRODUCTS

2.1 MATERIALS

.1 All materials used on this project shall be new and CSA approved unless noted otherwise.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install all work in keeping to trade and industry practice with all work completed and overseen by journeymen experienced in the relevant trade.

.2 All work to be completed to the requirement of manufacturers with direct involvement for manufacturer trained technicians to ensure the equipment is installed and commissioned properly.

.3 Plan and coordinate all work to maintain set project schedule.

.4 Coordinate all work with other trades to plan all installation prior to starting and fabrication work or installation works. Failure to do so and resulting interferences will require re-work at the contractor's expense.

.5 All ceiling mounted equipment requiring service access shall have locations planned to allow for ease of access from ceiling hatches/tiles. Any equipment not deemed easily accessible by owner/engineer will be required to be removed and reinstalled to allow proper access. This would include but not be limited to VAV boxes, reheat coils, valves, dampers, etc.

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 CLEANING

.1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

3.4 FIELD QUALITY CONTROL

.1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - SUBMITTALS.

.1 Perform tests as specified in other sections of this specification.

.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 as described in PART 1 - SUBMITTALS.

.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, as directed in PART 1 - QUALITY ASSURANCE.

3.5 DEMONSTRATION

.1 Owner will use equipment and systems for test purposes prior to acceptance. Contractor to 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 Owner may record these demonstrations on video tape for future reference.

3.6 PROTECTION

.1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Materials and installation for plumbing specialties and accessories.

1.2 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 35 29.06 – Health and Safety Requirements.

.3 Section 01 45 00 – Quality Control.

.4 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.5 Section 01 78 00 – Closeout Submittals.

.6 Section 01 91 13.13 – Commissioning (Cx) Requirements.

1.3 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM A126, Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
.2 ASTM B62, Specification for Composition Bronze or Ounce Metal Castings.

.2 American Water Works Association (AWWA)

.1 AWWA C700, Cold Water Meters-Displacement Type, Bronze Main Case.
.2 AWWA C701, Cold Water Meters-Turbine Type for Customer Service.
.3 AWWA C702, Cold Water Meters-Compound Type.

.3 American National Standards Institute (ANSI)

.1 ANSI Z358.1 Emergency eyewash and shower equipment.

.4 Canadian Standards Association (CSA)

.1 CSA-B64 Series, Backflow Preventers and Vacuum Breakers.
.2 CSA-B356, Water Pressure Reducing Valves for Domestic Water Supply Systems.

.5 Health Canada/Workplace Hazardous Materials Information Systems (WHMIS).

.1 Safety Data Sheets (SDS).

.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.

1.4 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 for fixtures and equipment.

.2 Indicate dimensions, construction details and materials for specified items.

.3 Submit WHMIS SDS in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOC's for adhesive and solvents during application and curing.

.3 Shop Drawings:

.1 Submit shop drawings to indicate materials, finishes, method of anchorage, number of anchors, dimensions, construction and assembly details and accessories.

.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 Section 01 78 00 – Closeout Submittals. Include:

.1 Description of plumbing specialties and accessories, giving manufacturer's name, type, model, year and capacity.

.2 Details of operation, servicing and maintenance.

.3 Recommended spare parts list.

1.5 QUALITY ASSURANCE

.1 Pre-Installation Meetings:

.1 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installations.

.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.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal, paper, plastic, polystyrene, corrugated cardboard packaging materials in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Divert unused metal materials from landfill to metal recycling facility as approved by Owner.

.5 Fold up metal and plastic banding flatten and place in designated area for recycling.

1.7 WARRANTY

.1 Provide a written guarantee, signed and issued in the name of the owner, against defective materials and workmanship for a period of one (1) year from the date of Substantial Completion.

PART 2 PRODUCTS

2.1 FLOOR DRAINS

.1 FD-1: general duty; cast iron body, round adjustable head, 125 mm, sediment basket nickel bronze strainer, integral seepage pan and clamping collar, trap primer connection.

.1 Acceptable Product: Zurn ZN-415-B5-P, Jay R. Smith, MIFAB, Blücher, Watts.

.2 FD-2: Funnel Floor Drain. Similar to FD-1

.1 Acceptable Product: Zurn Jay R. Smith, MIFAB, Blücher, Watts.

2.2 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.

.1 Acceptable Product: Zurn, Jay R. Smith, MIFAB, Blücher, Watts.

.2 Access covers:

.1 Wall access: face or wall type, or 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.

.1 Plugs: bronze with neoprene gasket.

.2 Cover for unfinished concrete floors: cast iron round, gasket, vandal-proof screws.

.3 Cover for tile and linoleum floors: polished nickel bronze with recessed cover for linoleum or tile infill, complete with vandal-proof locking screws.

2.3 WATER HAMMER ARRESTORS

.1 Stainless steel or copper construction, bellows or piston type: to PDI-WH201.

.2 Acceptable Product: Zurn, Jay R. Smith, MIFAB, Precision Plumbing Products, Watts.

2.4 BACK FLOW PREVENTERS

.1 To CSA-B64 Series.

.2 Application: as indicated;

.1 Bronze body construction.

.2 Internal pressure differential relief valve located in a zone between two positive seating check modules with captured springs and silicone seat discs.

.3 Seats and discs replaceable in both check modules and the relief valve.

.4 Assembly to include two resilient seated isolation valves, four resilient seated test cocks, protective wye strainer with 20 mesh screen, union end connections and an air gap drain fitting.

.5 Reduced pressure zone type backflow preventer.

.6 Acceptable Product: Watts Series LF909 complete with Watts Series air gap, Wilkins, Zurn.

.7 Backflows are to be housed inside an Emmerson Valvcheq Backflow Preventers Enclosure.

2.5 TRAP SEAL PRIMERS

.1 Trap guard:

.1 All elastomeric normally closed trap guard device utilizes a normally closed seal to prevent evaporation of the trap seal and to protect against sewer gases from backing up into habitable areas. It opens with fluid flow and allows liquid drainage to flow through into the building drain.

2.6 COMBINATION EMERGENCY DRENCH SHOWER/EYEWASH UNIT (BARRIER FREE)

.1 Equipment supplied by owner, installed and tested by contractor.

.2 Location: as indicated.

2.7 EMERGENCY EYEWASH AND COMBINATION EMERGENCY DRENCH SHOWER/EYEWASH THERMOSTATIC MIXING VALVE

.1 Equipment supplied by owner, installed and tested by contractor.

.2 Provide check stops on hot/cold water inlet to each valve.

.3 Location: as indicated.

.4 Contractor to provide 18 gauge recessed stainless steel enclosure. Dimension of enclosure to be 610 mm high x 578 mm wide x 165 mm deep.

2.8 COMBINATION EMERGENCY DRENCH SHOWER/EYEWASH UNIT FLOW SWITCH ALARM SYSTEM

.1 Equipment supplied by owner, installed and tested by contractor.

.2 Location: as indicated

.3 System to be fully grounded and electrically insulated from water piping for safety.

.4 Power supply: 120/1/60 with 0.5 amp current draw.

.5 All conduit to be PVC or liquid tight non metallic.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install in accordance with National Plumbing Code of Canada, and local authority having jurisdiction.

.2 Install in accordance with manufacturer's instructions and as specified.

3.3 CLEANOUTS

.1 In addition to those required by code, and as indicated, install at base of soil and waste stacks, and rainwater leaders.

.2 Bring cleanouts to wall or finished floor unless serviceable from below floor.

3.4 WATER HAMMER ARRESTORS

.1 Install on branch supplies to fixtures or group of fixtures where indicated.

3.5 BACK FLOW PREVENTORS

.1 Install in accordance with CSA-B64 Series, where indicated and elsewhere as required by code.

.1 Reduced pressure type where backflow would constitute a health hazard.

.2 Double check type where backflow would constitute a nuisance or be aesthetically objectionable or material which would not constitute a health hazard.

.2 Pipe discharge to terminate over nearest drain and or service sink.

3.6 Backflow Preventers Enclosures

.1 304 Stainless steel

.2 Double valve configurations.

.3 Generic locking mechanism.

.4 Preformed to allow easy installation of 50mm waste to bottom of enclosure.

.5 Stainless steel front panel with perspex window available.

Acceptable product: Emmerson ValvCheQ Backflow Preventer Enclosures or approved equal.

3.7 TRAP SEAL PRIMERS

.1 Install for floor drains and elsewhere, as indicated.

.2 Install on cold water supply to nearest frequently used plumbing fixture, in concealed space, to approval of Owner.

.3 Install Type K soft copper tubing to floor drain.

3.8 STRAINERS

.1 Install with sufficient room to remove basket.

3.9 START-UP AND COMMISSIONING

.1 General:

.1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: supplemented as specified herein.

.2 Timing: Start-up only after:

.1 Pressure tests have been completed.
.2 Disinfection procedures have been completed.
.3 Water treatment systems operational.

.3 Provide continuous supervision during start-up.

3.10 TESTING AND ADJUSTING

.1 General:

.1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: supplemented as specified herein.

.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, removeability 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.

.7 Access doors:

.1 Verify size and location relative to items to be accessed.

.8 Cleanouts:

.1 Verify covers are gas-tight, secure, yet readily removable.

.9 Water hammer arrestors:

.1 Verify proper installation of correct type of water hammer arrester.

.10 Tempered water assemblies:

.1 Verify operation of Hi/Lo tempered water assemblies at both high and low flow conditions.

.2 Verify proper discharge temperature setpoint for all tempered water assemblies including those serving emergency fixtures.

.11 Commissioning Reports:

.1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: supplemented as specified herein.

.12 Training:

.1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: supplemented as specified herein.

.2 Demonstrate full compliance with Design Criteria.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Thermal insulation for piping and piping accessories in commercial type applications.

1.2 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.3 Section 07 92 00 – Joint Sealing.

.4 Section 22 07 16 – Plumbing Equipment Insulation.

.5 Section 23 05 53.01 – Mechanical Identification.

1.3 REFERENCES

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

.1 ASHRAE Standard 90.1, Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings (Including all Addenda).

.2 American Society for Testing and Materials (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 Fibre-Hydraulic-Setting Thermal Insulating and Finishing Cement.

.5 ASTM C533 Standard specification for Calium Silicate Insulation Block and Pipe.

.6 ASTM C547 Standard Specification for Mineral Fibre 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 D1784, Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.

.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), c. 37.

.2 Canadian Environmental Protection Act, (CEPA), c. 33.

.3 Transportation of Dangerous Goods Act (TDGA), c. 34.

.5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets.

.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.

.8 National Energy Code for Buildings (NECB).

1.4 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 defined herein.

.2 TIAC ss:

.1 CRF: Commercial Rectangular Finish

.2 CPF: Commercial Piping Finish.

1.5 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.

.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Safety Data Sheets (SDS) in accordance with Section 01 33 00 - Submittal Procedures.

.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.

.2 Instructions: submit manufacturer's installation instructions to Owner.

1.6 QUALITY ASSURANCE

.1 Qualifications:

.1 Installer: certified in performing work of this Section, and have at least 5 years successful experience in this size and type of project, qualified to standards of TIAC.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.7 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, labeled 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 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition 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 approved by Owner.

.4 Dispose of unused adhesive material at official hazardous material collections site approved by Owner.

PART 2 PRODUCTS

2.1 FIRE AND SMOKE RATING

.1 In accordance with CAN/ULC-S102.

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.2 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 mean temperature when tested in accordance with ASTM C335.

.3 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 0.075 W/m °C @ 500° C.

.3 Design to permit periodic removal and re-installation.

.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-52Ma.

.3 Maximum "k" factor: to CAN/ULC-S702.

.5 TIAC Code A-6: Flexible unicellular tubular elastomer.

.1 Insulation: with vapour retarder jacket to ASTM C534.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Maximum "k" factor: 0.039 W/m – °C.

.4 To be certified by manufacturer to be free of potential stress corrosion cracking corrodants.

.5 Flame spread index less than 25, and smoke developed index less than 50.

.6 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.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Maximum "k" factor: to CAN/ULC-S702.

2.3 INSULATION SECUREMENT

.1 Tape: Self-adhesive, aluminum, plain reinforced, 50 mm wide minimum.

.2 Contact adhesive: Quick setting.

.3 Canvas adhesive: Washable.

.4 Tie wire: 1.5 mm diameter stainless steel.

.5 Bands: Stainless steel, 19 mm wide, 0.5 mm thick.

2.4 CEMENT

.1 Thermal insulating and finishing cement:

.1 Hydraulic setting or air drying on mineral wool, to ASTM C449/C449M.

2.5 VAPOUR RETARDER LAP ADHESIVE

.1 Water based, fire retardant type, compatible with insulation.

2.6 INDOOR VAPOUR RETARDER FINISH

.1 Vinyl emulsion type acrylic, compatible with insulation.

2.7 OUTDOOR VAPOUR RETARDER FINISH

.1 Vinyl emulsion type acrylic, compatible with insulation.

.2 Reinforcing fabric: Fibrous glass, untreated 305 g/m^2.

2.8 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. Confirm colour with Owner.
.3 Minimum service temperatures: -20° C.
.4 Maximum service temperature: 65° C.
.5 Moisture vapour transmission: 0.02 perm.
.6 Thickness: 0.55 mm.
.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: flame spread rating 25, smoke developed rating 50.
.2 Outdoor: UV rated material at least 0.5 mm thick.

.2 Canvas:

.1 220gm/m^2 cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.

.2 Lagging adhesive: Compatible with insulation.

.3 Aluminum:

.1 To ASTM B209.
.2 Thickness: 0.50 mm sheet.
.3 Finish: Embossed or corrugated.
.4 Joining: Longitudinal and circumferential slip joints with 50 mm 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 wide, 0.5 mm thick at 300 mm spacing.

.4 Stainless steel:

.1 Type: 304 or type 316.
.2 Thickness: 0.25 mm.
.3 Finish: Smooth.
.4 Joining: Longitudinal and circumferential slip joints with 50 mm 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 wide, 0.5 mm thick at 300 mm spacing.

2.9 WEATHERPROOF CAULKING FOR JACKETS INSTALLED OUTDOORS

.1 Caulking to: Section 07 92 00 - Joint Sealing.

PART 3 EXECUTION

3.1 MANUFACTURE'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 to be clean, dry, free from foreign material.

3.3 INSTALLATION

.1 Install in accordance with TIAC National Standards.

.2 Apply materials in accordance with manufacturer's instructions and this specification.

.3 Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm.

.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.

3.4 REMOVABLE, PRE-FABRICATED, INSULATION AND ENCLOSURES

.1 See Section 22 07 16 – Plumbing Equipment Insulation.

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 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified. Insulate vent pipes 3.0 m from roof penetration.

.2 TIAC Code: A-2.

.1 Insulation securements: 18 ga SS wire or 12 mm x 0.51 mm SS bands at 300 mm oc.
.2 Seals: lap seal adhesive, lagging adhesive.
.3 Installation: TIAC Code: 1501-H.

.3 TIAC Code: A-3.

.1 Securements: Tape at 300 mm oc.
.2 Seals: VR lap seal adhesive, VR lagging adhesive.
.3 Installation: TIAC Code: 1501-C.

.4 TIAC Code: A-6.

.1 Insulation securements: as per manufacturer's recommendation.
.2 Seals: lap seal adhesive, lagging adhesive.
.3 Installation: TIAC Code: 1501-CA.

.5 TIAC Code: C-2 with vapour retarder jacket.

.1 Insulation securements: 18 ga SS wire or 12 mm x 0.5 mm SS bands at 300 mm oc.
.2 Seals: lap seal adhesive, lagging adhesive.
.3 Installation: TIAC Code: 1501-C.

.6 Thickness of insulation to be as listed in following table.

.1 Run-outs to individual units and equipment not exceeding 4000 mm long.
.2 Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.

Application	**Temp °C**	**TIAC code**	**Pipe sizes (NPS) and insulation thickness (mm)**					
	Run out			***to 1***	***1 1/4 to 2***	***2 1/2 to 4***	***5 to 6***	***8 & over***
Domestic HWS		A-3	25	25	25	38	38	38
Domestic CWS		A-3	25	25	25	25	25	25
Vent Pipe Plumbing		A-3	25	25	25	25	25	25

.7 Finishes:

.1 Exposed indoors: PVC jacket.

.2 Exposed in mechanical rooms: PVC jacket.

.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 Aluminium, or SS jacket.

.6 Finish attachments: SS screws or bands, at 150 mm oc. Seals: wing or closed.

.7 Installation: To appropriate TIAC code CPF/1 through CPF/5.

3.7 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

Part 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 35 29.06 - Health and Safety Requirements.

.3 Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

.4 Section 01 78 00 - Closeout Submittals.

.5 Section 01 91 13 - Commissioning (CX) Requirements

.6 Section 21 05 01 - Common Work Results - Mechanical.

.7 Section 22 05 00 – Common Work Results for Plumbing.

.8 Section 22 07 16 – Plumbing Equipment Insulation.

.9 Section 22 07 19 – Plumbing Piping Insulation.

.10 Section 23 05 05 - Installation of Pipework.

.11 Section 23 05 23.01 - Valves - Bronze.

.12 Section 23 05 23.02 - Valves - Cast Iron

.13 Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

.14 Section 33 11 16.01 - Incoming Site Water Utility Distribution Piping.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)

.1 ANSI B16.1, Cast Iron Pipe Flanges and Flange Fittings, Class 25, 125, 250 and 800.

.2 Canadian Standard Association (CSA)

.1 CSA B137.5, Crosslinked Polyethylene (PEX) Tubing Systems for Pressure Applications.

.3 National Sanitation Foundation (NSF)

.1 NSF61 Potable Water Listing.

.4 Underwriters Listing 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.

.5 American Society for Testing and Materials International, (ASTM).

.1 ASTM A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.2 ASTM B88M, Standard Specification for Seamless Copper Water Tube (Metric).

.3 ASTM F876 Standard Specification for Crosslinked Polyethyline (PEX) Tubing.

.4 ASTM F877 Standard Specification for Crosslinked Polyethyline (PEX) Hot and Cold Water Distribution System.

.6 Department of Justice Canada (Jus).

.1 Canadian Environmental Protection Act (CEPA).

.7 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.1 Material Safety Data Sheets (MSDS).

.8 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).

.1 MSS-SP-67, Butterfly Valves.

.2 MSS-SP-70, Cast Iron Gate Valves, Flanged and Threaded Ends.

.3 MSS-SP-71, Cast Iron Swing Check Valves, Flanged and Threaded Ends.

.4 MSS-SP-80, Bronze Gate, Globe, Angle and Check Valves.

.5 MSS-SP-110 Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends

.9 National Research Council (NRC)/Institute for Research in Construction.

.1 NRCC, National Plumbing Code of Canada (NPC).

.10 Transport Canada (TC).

.1 Transportation of Dangerous Goods Act (TDGA).

1.3 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit product data for following: valves.

.3 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 02 62 00.01 - Hazardous Materials.

.4 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 HEALTH AND SAFETY

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Separate for reuse and recycling and place in designated containers Steel, Metal, Plastic waste in accordance with Waste Management Plan.

.4 Place materials defined as hazardous or toxic in designated containers.

.5 Handle and dispose of hazardous materials in accordance with CEPA , TDGA , Regional and Municipal regulations.

.6 Fold up metal banding, flatten and place in designated area for recycling.

1.6 WARRANTY

.1 Project warranty: Refer to Conditions of the Contract for project warranty provisions.

.2 Manufacturer's warranty: PEX-a manufacturer system warranty shall cover piping and fittings for a duration of 25 years from the date of installation. Piping system warranty shall apply to potable water distribution and water service systems constructed of pipe and fitting products sourced from the same manufacturer.

PART 2 PRODUCTS

2.1 GENERAL

.1 Performance requirements:

.1 PEX-a piping and fittings shall meet the following pressure and temperature ratings per ASTM F876:

.1 200 degrees F (93 degrees C) at 80 psi (551 kPa).

.2 180 degrees F (82 degrees C) at 100 psi (689 kPa).

.3 73 degrees F (23 degrees C) at 160 psi (1,102 kPa).

.2 PEX-a piping and fittings shall be tested for compliance by an independent third-party agency.

.3 Minimum bend radius (cold bending): Six times the outside diameter.

.4 Show compliance with ASTM E119 and ANSI/UL 263 through certification listings through UL.

.1 UL Design No. L557 1 hour wood frame floor/ceiling assemblies.

.2 UL Design No. K913 2 hour concrete floor/ceiling assemblies.

.3 UL Design No. U372 1 hour wood stud/gypsum wallboard wall assemblies.

.4 UL Design No. V444 1 hour steel stud/gypsum wallboard wall assemblies.

.5 PEX-a piping shall be tested to comply with the ASTM F2023 requirement for minimum chlorine resistance at the end use condition of 100% of the time at 140°F (60°C) at 80 psi (0.55 MPa) gauge pressure.

2.2 PIPING

.1 Domestic hot, cold and recirculation systems, within building.

.1 Above ground:

.1 PEX-a (Engel-method crosslinked polyethylene), ASTM F876 and F877 (CAN/CSA-B137.5), SDR 9, CTS, 1/2 inch (16mm) through 3 inch (75mm) nominal pipe size.

.2 Acceptable Material:

.1 Tubing Type: Uponor AQUAPEX tubing.

.3 PEX-a tubing shall be manufactured in accordance with ASTM F876, ASTM F877 and CAN/CSA-B137.5. The tube shall be listed to ASTM by an independent third party agency.

.4 PEX-a tubing shall have Standard Grade hydrostatic design and pressure ratings of 200 F (82 degrees C) at 80 psi (551 kPa), 180 degrees F (82 degrees C) at 100 psi (689 kPA), and 73.4 degrees F (23 degrees C) at 160 psi (1102 kPa). Temperature and pressure ratings shall be issued by the Plastic Pipe Institute (PPI), a division of the Society of the Plastic Industry (SPI).

.5 Minimum bend radius for cold bending of the PEX-a tubing shall not be less than 6 times the outside diameter. Bends with a radius less than stated shall require the use of a bend support as supplied by tube manufacturer.

.6 PEX-a tube dimensions shall be:

.1 ½" nominal inside diameter in accordance with ASTM F876 and ASTM F877 and/or,

.2 ¾" nominal inside diameter in accordance with ASTM F876 and ASTM F877 and/or,

.3 1" nominal inside diameter in accordance with ASTM F876 and ASTM F877 and/or,

.4 1 ¼" nominal inside diameter in accordance with ASTM F876 and ASTM F877 and/or,

.5 1 ½" nominal inside diameter in accordance with ASTM F876 and ASTM F877 and/or,

.6 2" nominal inside diameter in accordance with ASTM F876 and ASTM F877 and/or,

.7 3" nominal inside diameter in accordance with ASTM F876 and ASTM F877 as indicated on contract drawings.

.7 PEX shall be supported with manufacturer approved PEX-A pipe support and to reduce thermal expansion of piping. The support shall be a 23-gauge galvanized steel channel fitted to the pipe outside diameter. Supports shall be installed in accordance with the manufacture's instructions.

.2 Buried or embedded:

.1 UO to NPS 3: PEX Tubing to ASTM F876 and F877 and certified to NSF61 rated at 93° at 551kPa, 82°C at 690 kPa, 23°C at 1100 kPa, certified to be used for hot or cold water service.

.3 Stub-Out Terminations

.1 Where plastic piping (e.g., PEX) transitions to fixture connections, provide copper stub-out terminations to ensure durability and secure mounting.

.2 Stub-outs shall be Type L hard-drawn copper conforming to ASTM B88.

.3 Copper shall extend a minimum of 150 mm (6") beyond the wall or floor surface, unless otherwise indicated.

.4 Transitions from plastic piping to copper shall use approved mechanical, press, or crimp-type transition fittings listed for the materials in use.

.5 Copper stub-outs shall be securely fastened and protected from mechanical damage.

.6 Do not use plastic piping as a direct fixture connection in exposed or high-impact areas (e.g., under lavatories, at WC stops).

2.3 FITTINGS

.1 Transition points: as recommended by manufacturer.

.2 PEX fittings certified to CSA B137.5, ASTM F876 and ASTM F877, and certified to be used with PEX tubing.

.3 Third-party certified to NSF 14 and ASTM F1960 cold-expansion with PEX reinforcing ring and shall comply with ASTM F876 and ASTM F877, 1/2 inch through 3 inch nominal pipe size fittings manufactured from the following material types: engineered polymer (EP), brass, and lead-free (LF) brass

.4 Reinforcing cold-expansion rings shall be manufactured from the same source as PEX-a piping manufacturer

.5 Multiport tees and elbows: Multiple-outlet fitting complying with ASTM F877 (CAN/CSA B137.5); with ASTM F1960 inlets and outlets.

.6 Uponor manifolds: Multiple-outlet assembly with ASTM F1960 outlets.

.7 Type L copper branch manifold with lead-free brass valve outlets.

.8 Type L copper branch manifold without valves, with lead-free brass outlets.

.9 Acceptable Product. Uponor ProPEX

2.4 TRANSITION FITTINGS

.1 PEX-to-metal transition fittings:

.1 Manufacturers: Provide fittings from the same manufacturer of the piping.

.2 Third-party certified to NSF 14 and ASTM F1960 cold expansion with PEX reinforcing ring and shall comply with ASTM F876 and ASTM F877, 1/2 inch through 3 inch nominal pipe size fittings manufactured from the following material types:

.3 PEX-a to thread transition: One-piece Lead free (LF) brass fitting with male or female threaded adapter and ASTM F 1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.

.4 PEX-a to copper sweat transition: One-piece lead free (LF) brass fitting with sweat adapter and ASTM F 1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.

.5 PEX-a to copper press transition: One-piece lead free (LF) brass fitting with one ASME B16.51 copper press end and one ASTM F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.

.6 PEX-a to flange transition: Two-piece fitting with one steel flange conforming to ASME B 16.5 and one lead free (LF) brass adapter conforming to ASTM F1960.

.7 PEX-a to groove transition: One-piece lead free (LF) brass fitting with one CSA B242-05 groove end in either iron pipe size (IPS) or copper tube size (CTS) and one ASTM F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.

.8 PEX-a to water meter transition: Two-piece fitting with one NPSM union thread and one ASTM F 1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.

2.5 VALVES

.1 NPS 2 and under.

.1 PEX-to-PEX, lead-free (LF) full-port brass ball valves (1/2 inch (13 mm) through 2 inch (50 mm) nominal pipe size)

.1 Full-port ball valve: two-piece, ASTM F1960 cold-expansion ends, with PEX-a reinforcing cold-expansion ring.

.2 LF brass valve with a positive stop shoulder.

.3 In compliance with 250 CWP, ANSI/NSF 359, ANSI/NSF 372, ANSI/NSF 14/61, cNSF-us-pw_G lead free 0.25% lead maximum, ASTM F1960, ASTM F877 (CAN/CSA B137.5).

.4 Provide stem extension kits for insulated piping.

.2 PEX-to-NPSM, lead-free (LF) full-port brass water meter service valve

.1 3/4 inch PEX x 1 inch NPSM straight and elbow

.2 1 inch PEX x 1-1/4 inch NPSM straight and elbow

.3 Metal and polypropylene NPSM union nut

.4 In compliance with 250 CWP, ANSI/NSF 359, ANSI/NSF 14/61, cNSF-us-pw_G lead free 0.25% lead maximum, ASTM F1960, ASTM F877 (CAN/CSA B137.5).

.3 PEX-to-FNPT, lead-free (LF) full-port brass ball valves (1/2 inch (13mm) through 3 inch (75 mm) nominal pipe size).

.1 Full-port ball valve: two-piece, ASTM F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring by female NPT end.

.2 LF brass valve with a positive stop shoulder.

.3 In compliance with 250 CWP, ANSI/NSF 359, ANSI/NSF 372, ANSI/NSF 14/61, cNSF-us-pw_G lead free 0.25% lead maximum, ASTM F1960, ASTM F877 (CAN/CSA B137.5).

.4 PEX-to-MNPT, lead-free (LF) full-port ball valves (1/2 inch (13mm) through 2 inch (51mm) nominal pipe size).

.1 Full-port ball valve: two-piece, ASTM F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring by male NPT end.

.2 LF brass valve with a positive stop shoulder.

.3 In compliance with 250 CWP, ANSI/NSF 359, ANSI/NSF 372, ANSI/NSF 14/61, cNSF-us-pw_G lead free 0.25% lead maximum, ASTM F1960, ASTM F877 (CAN/CSA B137.5).

.5 PEX-to-copper press, lead-free (LF) full-port ball valves (1/2 inch (13mm) through 3 inch (75mm) nominal pipe size).

.1 Full-port ball valve: two-piece, ASTM F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring by copper press end.

.2 LF brass valve with a positive stop shoulder.

.3 In compliance with 250 CWP, ANSI/NSF 359, ANSI/NSF 372, ANSI/NSF 14/61, cNSF-us-pw_G lead free 0.25% lead maximum, ASTM F1960, ASTM F877 (CAN/CSA B137.5).

.6 PEX-to-pump flange, lead-free (LF) full-port ball valves (3/4 inch (19 mm) through 1-1/4 inch (32 mm) nominal pipe size).

.1 Full-port ball valve: two-piece, ASTM F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring by pump flange end.

.2 LF brass valve with a positive stop shoulder.

.3 In compliance with 250 CWP, ANSI/NSF 359, ANSI/NSF 372, ANSI/NSF 14/61, cNSF-us-pw_G lead free 0.25% lead maximum, ASTM F1960, ASTM F877 (CAN/CSA B137.5).

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install in accordance with Canadian Plumbing Code and local authority having jurisdiction.

.2 Install pipe work in accordance with Section 23 05 05 – Installation of Pipework and manufacturers' recommendations by certified journeyperson supplemented as specified herein.

.3 Assemble piping using fittings manufactured to ANSI standards.

.4 Install CWS piping below and away from HWS and HWR 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 Do not install in vertical shafts.

.7 Installation of plastic piping once insulated and at temperature shall be indistinguishable from rigid copper pipe. Pipe shall be straight, square and plumb.

.8 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.
- .3 White PEX shall not be installed outdoors where it is exposed to direct sunlight for more than one month; red or blue PEX shall not be installed outdoors where it is exposed to direct sunlight for more than six months.
- .4 Install support strapping as required by manufacturer to provide a code-compliant installation.
- .5 Install PEX piping free of kinks.
- .6 PEX piping penetrations through slabs shall be protected by PEX stand-up brackets or bend supports to prevent damage to piping.
- .7 Install PEX piping from the manifold as a home run. No joints shall be installed in the slab.
- .8 Insulation shall not be exposed to groundwater.
- .9 The piping system will be installed with the fewest number of underground joints as possible.
- .10 Backfill
  - .1 The piping system will be backfilled with clean sand material.
  - .2 Minimum vertical distance from the bottom of the tubing to the trench floor is 4 inches (100 mm).
  - .3 Minimum lateral distance from the side of the tubing to the trench wall is 6 inches (150 mm).
  - .4 Install a minimum of 12 inches (300 mm) of clean fill over the top of the piping.

.5 The balance of the trench can be backfilled with native soil void of stone greater than 2 inches (50m) in diameter.

3.2 MANUFACTURERS INSTRUCTIONS

.1 Comply with manufacturer's product data, including product technical bulletins, installation instructions and design drawings, including the following.

.2 Install PEX piping system in compliance with the manufacturers Systems Design and Installation Manual current edition, and the Installation Guide, current edition.

.3 PEX shall not be installed in areas within five feet of a UV light source, such as LED and fluorescent light fixtures or other UV-generating devices.

.4 White PEX shall not be installed outdoors where it is exposed to direct sunlight for more than one month; red or blue PEX shall not be installed outdoors where it is exposed to direct sunlight for more than six months.

.5 PEX piping shall be installed per ASTM E84 requirements for plenum applications.

.6 Install PEX-a Pipe Support and provide all required hangers and supporting strapping as required by manufacturer to provide a code compliant installation.

.7 Install PEX piping in straight runs free of sags and kinks and provide bend supports at all 1/2 inch and 3/4 inch drops.

.8 All PEX piping penetrations through wall plates shall be protected or shielded as required to prevent damage to piping.

.9 PEX tubing passing through metal studs shall use grommets or sleeves at the penetration.

.10 Install PEX piping from the multiport tee or manifold to each fixture as a home run.

.11 Install PEX-a Pipe Support, fixed anchor points, and hangers in compliance with the Uponor PEX Piping Systems Design and Installation Manual (PDIM), current edition, and the Uponor PEX Piping Systems Installation Guide, current edition, to minimize expansion and contraction.

.12 Install PEX piping at each fixture with out of the wall support bracket to secure piping and prevent excess movement when water stops or shut valves are operated.

.13 Install all PEX manifolds centered in access panels to permit servicing.

3.3 VALVES

.1 Isolate equipment, fixtures and branches with butterfly or ball valves.

.2 Balance recirculation system using lockshield globe valves. Mark settings and record on as-built drawings on completion.

3.4 HANGERS AND SUPPORTS

.1 Horizontal PEX-a piping: Install supports suitable for PEX-a piping in compliance the Uponor Piping Systems Installation Guide, current edition.

.2 Horizontal PEX-a piping with PEX-a Pipe Support: Install supports for PEX-a piping with horizontal support channel in accordance with manufacturer's recommendations and NPCC.

.3 Install clamps and fixed points per the Uponor PEX Piping Systems Design and Installation Manual (PDIM), current edition, and the Uponor PEX Piping Systems Installation Guide, current edition.

.4 Vertical PEX-a piping: Install supports suitable for PEX-a piping in compliance with local codes, the Uponor PEX Piping Systems Design and Installation Manual (PDIM), current edition, and the Uponor PEX Piping Systems Installation Guide, current edition:

.5 Support vertical in-wall piping every 5 feet (1.5 m).

.6 Support riser piping at the base of each floor and every 5 feet (1.5 m) vertically.

3.5 PRESSURE TESTS

.1 Conform to requirements of Section 21 05 01 - Common Work Results for Mechanical.

.2 Test pressure: greater of 1 ½ times maximum system operating pressure or 860 kPa.

3.6 FLUSHING AND CLEANING

.1 Flush entire system for 2 h. Ensure outlets flushed for 2 h. Let stand for 24 h, then draw one sample off longest run. Submit to testing laboratory for bacteriological testing to verify that system is clean to Provincial potable water guidelines.

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 DISINFECTION

.1 Flush out, disinfect and rinse system to requirements of authority having jurisdiction and approval of Owner.

.2 Coordinate with Section 33 11 16 – Site Water Utility Distribution Piping and Section 33 11 16.01 – Incoming Site Water Utility Distribution Piping.

.3 Upon completion, provide laboratory test reports on water quality to Owner.

3.9 START-UP

.1 Timing: Start up after:

.1 Pressure tests have been completed.
.2 Disinfection procedures have been completed.
.3 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 Bring HWS storage tank up to design temperature slowly.
.4 Monitor HWS and HWR piping systems for freedom of movement, pipe expansion as designed.
.5 Check control, limit, safety devices for normal and safe operation.

.4 Rectify start-up deficiencies.

3.10 PERFORMANCE VERIFICATION

.1 Timing:

.1 After pressure and leakage tests and disinfection 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 HWR 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 HWS and HWR 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 one outlet for 10 seconds, then shut off 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, verifying that no residuals remain as a result of flushing and/or cleaning.

.3 Reports:

.1 In accordance with Section 01 91 13.13 – Commissioning (CX) Requirements: using report forms as specified in Section 01 91 13.13 – Commissioning (CX) Requirements.

.2 Include certificate of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section includes:

.1 The installation of drainage waste and vent piping – corrosion resistant.

1.2 RELATED SECTIONS

.1 Section 01 33 00 – Submittals Procedures.

.2 Section 01 35 29.06 – Health and Safety Requirements.

.3 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.4 Section 01 78 00 – Closeout Submittals.

.5 Section 22 05 00 – Common Work Results for Plumbing.

.6 Section 23 05 15 – Common Installation Requirements for HVAC of Pipework

1.3 REFERENCES

.1 American Iron and Steel Institute (AISI)

.1 AISI 316L Stainless Steel.

.2 American Society for Testing and Materials (ASTM)

.1 ASTM B117, Standard Practice for Operating Salt Spray (FOG) Apparatus.

.2 ASTM D635, Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.

.3 ASTM D2843, Standard Test Method for Density of Smoke from the Burning or Decompositions of Plastics.

.4 ASTM3222, Standard Specification for Unmodified Poly (Vinylidene Fluoride) (PVDF) Molding Extrusion and Coating Materials.

.5 ASTM D4101, Standard Specification for Polypropylene Injection and Extrusion Materials.

.6 ASTM E-84, Standard Test for Surface Burning Characteristics of Building Materials.

.7 ASTM F1412, Standard Specification for Polyolefin Pipe and Fittings for Corrosive Waste Drainage Systems.

.8 ASTM F1673, Standard Specification for Polyvinylidene Fluoride (PVDF) Corrosion Waste Drainage System.

.3 Canadian Standards Association (CSA)

.1 CSA-B181.3, Polyolefin and Polyvinylidene fluoride (PVDF) Laboratory Drainage System.

.4 Underwriters Laboratories (UL):

.1 UL 94, Test for Flammability of Plastic Materials for Parts in Devices and Appliances.

.2 UL 723, Test for Surface Burning Characteristics of Building Materials.

1.4 DELIVERY STORAGE AND DISPOSAL

.1 Waste Management and Disposal:

.1 Separate and recycle waste materials in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.2 Collect and separate for disposal, paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

PART 2 PRODUCTS

2.1 CORROSIVE WASTE PIPING SYSTEMS

.1 General Requirements

.1 Provide complete systems of pipe, fittings, supports, and accessories designed for the conveyance of corrosive liquid waste.

.2 All materials shall be certified for chemical resistance as per manufacturer's chemical resistance guide.

.3 Use heat-fused joints for all connections unless noted otherwise. No solvent cement joints permitted.

.2 Non-Plenum Areas – FRPP Piping

.1 Piping: Orion BlueLine FRPP, or approved equal.

.2 Material: Flame-retardant polypropylene (FRPP), ASTM D4101 Type I, Grade 2, Class 1.

.3 Color: Blue for identification.

.4 Joining: Butt fusion using manufacturer-supplied equipment.

.5 Maximum flame spread and smoke development: Not plenum-rated; install only in non-plenum locations.

.6 Temperature rating: Minimum 0°C to 100°C (32°F to 212°F) intermittent service.

2.2 CORROSIVE WASTE PIPING SYSTEMS

.1 General:

.1 All corrosion resistant /acid resistant drainage piping (ARD), as indicated on drawings, shall discharge into a non-corrosive, acid-resistant waste system. All drainage and vent piping in this system to be constructed of corrosion-resistant materials described herein.

.2 Provide complete systems of pipe, fittings, supports, and accessories designed for the conveyance of corrosive liquid waste.

.3 All materials shall be certified for chemical resistance as per manufacturer's chemical resistance guide.

.4 Use heat-fused joints for all connections unless noted otherwise. No solvent cement joints permitted.

.2 **Non-Plenum Areas – FRPP Piping**

.1 Piping: Orion BlueLine FRPP, or approved equal.

.2 Material: Flame-retardant polypropylene (FRPP), ASTM D4101 Type I, Grade 2, Class 1.

.3 Color: Blue for identification.

.4 Joining: Butt fusion using manufacturer-supplied equipment.

.5 Maximum flame spread and smoke development: Not plenum-rated; install only in non-plenum locations.

.6 Temperature rating: Minimum 0°C to 100°C (32°F to 212°F) intermittent service.

.3 **Fittings and Accessories**

.1 Pipe fittings to match pipe material and joining method.

.2 Include cleanouts, couplings, transition fittings, expansion joints, and termination fittings as required.

.3 Transitions to metal or DWV piping to be made using manufacturer-approved mechanical transition couplings.

.4 **Hangers and Supports**

.1 Support piping using manufacturer-recommended spacing and hanger types for plastic piping.

.2 Use wide, non-abrasive supports to prevent deformation.

.3 Horizontal support spacing: per manufacturer, typically every 4' to 6' for FRPP, 3' to 4' for PVDF depending on diameter and temperature.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install in accordance with Canadian Plumbing Code and local authority having jurisdiction and by certified journeyperson.

.2 Install above ground piping parallel and close to walls and ceilings to conserve headroom and space, and to grade as indicated.

.3 All vent piping serving corrosion resistant drainage piping distribution system to be corrosion resistant up to and through the roof penetrations.

.4 Provide fire stopping at drainage piping wall and floor penetrations through fire separations.

.5 Install and test to manufacturer's recommendations.

3.2 INSTALLATION

.1 Install piping in accordance with the manufacturer's written installation guidelines and applicable plumbing/mechanical codes.

.2 Protect piping from exposure to direct UV unless specifically rated for such conditions.

.3 Confirm routing avoids contact with hot surfaces or incompatible materials.

.4 For PVDF piping, maintain required separation from non-plenum-rated materials.

.5 Ensure joints are clean, properly aligned, and fused using trained personnel and calibrated fusion equipment.

.6 Label piping with content and flow direction in accordance with ANSI/ASME A13.1.

3.3 3.2 FIELD QUALITY CONTROL

.1 Perform leak testing using manufacturer-recommended procedures (hydrostatic or air depending on project conditions).

.2 Inspect fusion joints visually and with manufacturer's recommended verification methods.

.3 Submit installation certification and testing records for inclusion in project closeout documents.
END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section includes:

.1 The supply and installation of plumbing fixtures and trim.

.2 Products installed but not supplied under this section as indicated elsewhere in the contract:

.1 Install rough-in for equipment supplied by others, complete with valves on hot and cold water supplies, waste and vent.

1.2 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.3 Section 01 35 29.06 – Health and Safety Requirements.

.4 Section 01 78 00 – Closeout Submittals.

1.3 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CAN/CSA-B45 Series, Plumbing Fixtures.
.2 CAN/CSA-B125, Plumbing Fittings.
.3 CAN/CSA-B651, Barrier-Free Design.

.2 Province of Newfoundland and Labrador Building Accessibility Regulations.

1.4 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data: submit WHMIS SDS – Safety Data Sheets.

.1 Submit shop drawings and product data in accordance with Section 01 33 00 – Submittal Procedures.

.1 Indicate, for all fixtures and trim:

.1 Dimensions, construction details, roughing-in dimensions.

.3 Closeout Submittals:

.1 Submit maintenance data in accordance with Section 01 78 00 – Closeout Submittals
.2 Include:

.1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.

.2 Details of operation, servicing maintenance.

.3 List of recommended spare parts.

1.5 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.

1.6 DELIVERY STORAGE AND DISPOSAL

.1 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Waste Management and Disposal.

.2 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.3 Fold up metal and plastic banding, flatten and place in designated area for recycling.

1.7 WARRANTY

.1 Provide a written guarantee, signed and issued in the name of the owner, against defective materials and workmanship for a period of one (1) year from the date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURED UNITS

.1 Fixtures: manufacture in accordance with CAN/CSA-B45 series.

.2 Trim, fittings: manufacture in accordance with CAN/CSA-B125.

.3 Exposed plumbing brass to be chrome plated.

.4 Number, locations: Architectural drawings to govern.

.5 Fixtures in any one location to be product of one manufacturer and of same type.

.6 Trim in any one location to be product of one manufacturer and of same type.

2.2 SINKS

.1 All sinks (S-1, S-2, S-3) and trim will be provided by owner.

.2 Contractor is to disassemble existing sinks and trim in existing location and to relocate and reinstall to new location.

.3 Contractor to supply new braded hoses, water stop valves and ARD traps.

2.3 FIXTURE PIPING

.1 Hot and cold water supplies to each fixture:

.1 Chrome plated flexible supply pipes each with screwdriver handwheel stop, reducers, escutcheon for exposed supplies.

.2 Waste:

.1 Corrosion/ARD P trap with cleanout on each fixture not having integral trap.

.2 Plastic in all exposed places.

PART 3 EXECUTION

3.1 ADJUSTING

.1 Do adjustments prior to pre-commissioning.

.2 Adjustments.

.1 Adjust water flow rate to design flow rates.

.2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.

.3 Checks.

.1 Aerators: operation, cleanliness.

.2 Vacuum breakers, backflow preventers: operation under all conditions.

.3 Wash fountains: operation of flow-actuating devices.

.4 Thermostatic controls.

.1 Verify temperature settings, operation of control, limit and safety controls.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 74 21 - Construction / Demolition Waste Management and Disposal.

.3 Section 01 78 00 - Closeout Submittals.

1.2 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop drawings; submit drawings stamped and signed for approval by Owner.

.3 Shop drawings to show:

- .1 Mounting arrangements.
- .2 Operating and maintenance clearances.

.4 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.

.5 In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

.6 Closeout Submittals:

- .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
- .2 Operation and maintenance manual approved by, and final copies deposited with, Owner before final inspection.
- .3 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.

.4 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.

.5 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.

.6 Approvals:

.1 Submit 2 copies of draft Operation and Maintenance Manual to Owner for approval. Submission of individual data will not be accepted unless directed by Owner.

.2 Make changes as required and re-submit as directed by Owner.

.7 Additional data:

.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.8 Site records:

.1 Owner will provide one (1) set of reproducible mechanical drawings or AutoCAD files. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.

.2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.

.3 Use different colour for each service.

.4 Make available for reference purposes and inspection.

.9 As-built drawings:

.1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.

.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 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.

.10 Submit copies of as-built drawings for inclusion in final TAB report.

1.3 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

.2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.3 Mock ups: Complete mock-ups of all installations for each room for approval prior to completing installation. Contractor shall not proceed with any work until installation is acceptable to owner. Quality of installation will be paramount and only the highest quality installation will be acceptable. All required re-work shall be completed at the cost of the contractor until installation is deemed acceptable.

.4 Provide all materials and equipment and perform all labor required to install complete and operable mechanical systems as indicated on the drawings, as specified, and as required by code.

.5 Contract document drawings for mechanical work (HVAC, plumbing, fire protection, and controls) are diagrammatic and are intended to convey sizing, scope and general arrangement only.

.6 Install all mechanical equipment and appurtenances in accordance with manufacturers' recommendations, contract documents, and applicable codes and regulations.

.7 Provide vibration isolation for all mechanical equipment to prevent transmission of vibration to building structure. Provide vibration isolators for all piping supports connected to, and within 15m of, isolated equipment (except at base elbow supports and anchor points) throughout mechanical equipment rooms. Unless otherwise noted isolators shall be type H1 Section 23 05 48 – Vibration and Seismic Controls for HVAC Piping and Equipment. Ceiling suspended fans and equipment shall have

.8 Coordinate construction of all mechanical work with architectural, structural, civil, electrical work, etc., shown on other contract document drawings

.9 All tests shall be completed before any mechanical equipment or piping insulation is applied.

.10 Locate all temperature, pressure, and flow measuring devices in accessible locations with the straight section of pipe or duct up- and downstream as recommended by the manufacturer for good accuracy.

.11 Coordinate all equipment connections with manufacturers' certified drawings. Coordinate and provide all duct and piping transitions required for final equipment connections to furnished equipment. Field verify and coordinate all duct and piping dimensions before fabrication.

.12 Concrete housekeeping pads to suit mechanical equipment shall be sized and located by the mechanical contractor. Minimum concrete pad thickness shall be 150mm. Pad shall extend beyond the equipment a minimum of 150 mm on each side. Concrete housekeeping pads shall be provided by the general contractor. It shall be the responsibility of the mechanical contractor to coordinate the size and location of concrete housekeeping pads with the general contractor.

.13 When mechanical work (HVAC, plumbing, sheet metal, fire protection, controls, balancing etc.) is subcontracted, it shall be the mechanical contractor's responsibility to coordinate subcontractors and the associated contracts.

.14 The locations of all items shown on the drawings or called for in the specifications that are not definitely fixed by dimensions are approximate only. The exact locations necessary to secure the

best conditions and results must be determined by the project site conditions. Do not scale drawings.

.15 All miscellaneous steel required to ensure proper installation and as shown in details for piping, ductwork, and equipment (unless otherwise noted) shall be furnished and installed by the mechanical contractor.

.16 All equipment, piping, ductwork, etc., shall be supported as detailed, specified, and required to provide a vibration-free installation.

.17 All ductwork, piping, and equipment supported from structural steel shall be coordinated with the general contractor.

.18 Locations and sizes of all floor, wall, and roof openings shall be coordinated with all other trades involved.

.19 Refer to typical details for ductwork, piping, and equipment installation.

.20 Install piping so all valves, strainers, unions, traps, flanges, and other appurtenances requiring access are accessible.

.21 All valves shall be installed so that the valve remains in service when equipment or piping on the equipment side of the valve is removed.

.22 Provide chainwheel operators for all valves in equipment rooms mounted greater than 2.1 m" above floor level; chain shall extend to 2.1m above floor level.

.23 Unions and/or flanges shall be installed at each piece of equipment, in bypasses, and in long piping runs (30 m or more) to permit disassembly for alteration and repairs.

.24 All piping work shall be coordinated with all trades involved. Offsets in piping around obstructions shall be provided at no additional cost to the owner.

.25 Certain items such as rises and drops in ductwork, access doors, volume dampers, etc., are indicated on the contract document drawings for clarity for a specific location requirement and shall not be interpreted as the extent of the requirements for these items.

.26 Coordinate diffuser, register, and grille locations with architectural reflected ceiling plans, lighting, and other ceiling items and make minor duct modifications to suit.

.27 Provide flexible connections in all ductwork systems (supply, return, and exhaust) connected to air handling units, fans, and other equipment that require vibration isolation. Flexible connections shall be provided at the point of connection to the equipment unless otherwise indicated.

.28 All ductwork shall be coordinated with all trades involved. Offsets in ducts, including divided ducts and transitions around obstructions, shall be provided at no additional cost to the owner.

.29 Provide access doors in ductwork to provide access for all smoke detectors, fire dampers, smoke dampers, volume dampers, humidifiers, coils, and other items located in the ductwork that require service and/or inspection.

.30 Smoke detectors shall be furnished and wired by the electrical contractor. The mechanical contractor shall be responsible for coordinating with the electrical contractor and in accordance with the manufacturer's printed instructions to ensure proper operation of smoke detectors

.31 Louver sizes, locations, and attachment details shall be coordinated with the general contractor. Refer to specification.

.32 All equipment provided by Div 21, 22, 23, 25 and shall be started up a factory trained and experienced journeyman or approved equal. All equipment shall have start up reports provided in an organized PDF with bookmarks.

1.4 MAINTENANCE

.1 Furnish spare parts in accordance with Section 01 78 00 - Closeout Submittals as follows:

.1 One casing joint gasket for each size pump.

.2 One head gasket set for each heat exchanger.

.3 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.

.1 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 01 78 00 - Closeout Submittals.

.2 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 PRODUCTS

2.1 MATERIALS

.1 All materials used on this project shall be new and CSA approved unless noted otherwise.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install all work in keeping to trade and industry practice with all work completed and overseen by journeymen experienced in the relevant trade.

.2 All work to be completed to the requirement of manufacturers with direct involvement for manufacturer trained technicians to ensure the equipment is installed and commissioned properly.

.3 Plan and coordinate all work to maintain set project schedule.

.4 Coordinate all work with other trades to plan all installation prior to starting and fabrication work or installation works. Failure to do so and resulting interferences will require re-work at the contractor's expense.

.5 All ceiling mounted equipment requiring service access shall have locations planned to allow for ease of access from ceiling hatches/tiles. Any equipment not deemed easily accessible by owner/engineer will be required to be removed and reinstalled to allow proper access. This would include but not be limited to VAV boxes, reheat coils, valves, dampers, etc.

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 CLEANING

.1 Clean interior and exterior of all systems including strainers. Protect open ends of ducts, diffusers, grilles and registers during construction to prevent ingress of dust and dirt into interior of ducts. If dust or dirt is detected prior to startup, vacuum interior of all ducts and air handling units. Prior to vacuuming use video camera to record condition of ductwork. Also use video camera to record condition of ducts after cleaning.

3.4 FIELD QUALITY CONTROL

.1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - SUBMITTALS.

.1 Submit tests as specified in other sections of this specification.

.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 as described in PART 1 - SUBMITTALS.

.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, as directed in PART 1 - QUALITY ASSURANCE.

3.5 DEMONSTRATION

.1 Owner will use equipment and systems for test purposes prior to acceptance. Contractor to 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 Owner may record these demonstrations on video tape for future reference.

3.6 PROTECTION

.1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Use of HVAC systems during construction.

1.2 RELATED SECTIONS

.1 Section 01 51 00 - Temporary Utilities.

1.3 USE OF SYSTEMS

.1 Use of new and/or existing permanent heating and/or ventilating systems for supplying temporary heat or ventilation is permitted only under the following conditions:

- .1 Entire system is complete, pressure tested, cleaned, flushed out.
- .2 Specified water treatment system has been commissioned, water treatment is being continuously monitored.
- .3 Building has been closed in, areas to be heated/ventilated are clean and will not thereafter be subjected to dust-producing processes.
- .4 There is no possibility of damage from any cause.
- .5 Supply ventilation systems are protected by 60 % filters, which shall be inspected daily, changed every week or more frequently as required.
- .6 Return systems have approved filters over all openings, inlets, outlets.
- .7 All systems will be:
  - .1 Operated as per manufacturer's recommendations or instructions.
  - .2 Operated by Contractor.
  - .3 Monitored continuously by Contractor.
- .8 Warranties and guarantees are not thereby relaxed.
- .9 Regular preventive and all other manufacturers recommended maintenance routines are performed by Contractor at his own expense and under supervision of Owner.
- .10 Refurbish entire system before static completion; clean internally and externally, restore to "as- new" condition, and replace filters in air systems.

.2 Filters specified in this section are over and above those specified in other sections of this project.

.3 Exhaust systems are not included in any approvals for temporary heating ventilation.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

PART 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 specified in Division 26. Control wiring 50V or less for systems specified in Division 21, 22, 23 and 25 is by Division 25.

1.2 RELATED SECTIONS:

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal

1.3 REFERENCES

.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 National Energy Code for Buildings (NECB).

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.1 Safety Data Sheets (SDS).

.4 National Electrical Manufacturers Association (NEMA).

1.4 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.

.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Safety Data Sheets (SDS) in accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop Drawings: Submit drawings stamped and signed for approval by Owner.

.3 Quality Control: in accordance with Section 01 45 00 - Quality Control.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Instructions: submit manufacturer's installation instructions.

.1 Owner will make available one (1) copy of systems supplier's installation instructions.

.4 Closeout Submittals

.1 Provide maintenance data for motors, drives and guards for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.5 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 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 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 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 PRODUCTS

2.1 GENERAL

.1 Motors to be premium efficiency, in accordance with local hydro company standards and the requirements of ASHRAE 90.1.

2.2 MOTORS

.1 Provide motors for mechanical equipment as specified.

.2 Motors 1/2 HP and larger: NEMA, Class B, 1.15 service factor, squirrel cage induction, premium efficiency, speed as indicated, continuous duty, enclosure as indicated, ball bearing, maximum temperature rise 40° C, 3 phase, 575 V, unless otherwise indicated, for inverted duty for variable frequency drives.

2.3 TEMPORARY MOTORS

.1 If delivery of specified motor will delay completion or commissioning work, install motor approved by Owner 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 specified.

.3 For motors under 10 HP: standard adjustable pitch drive sheaves, having plus or minus 10% range. Use mid-position of range for specified r/min.

.4 Correct size of sheave to be determined during commissioning.

.5 Minimum drive rating: 1.5 times nameplate rating on motor. Keep overhung loads within manufacturer's design requirements on prime mover shafts.

.6 Motor slide rail adjustment plates to allow for centre line adjustment.

.7 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 guards for unprotected drives.

.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 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.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Fasten securely in place.

.2 Make removable for servicing, easily returned into, and positively in position.

3.3 FIELD QUALITY CONTROL

.1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - SUBMITTALS.

.1 As specified in other sections of this specification.

.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 as described in PART 1 - SUBMITTALS.

.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, as directed in PART 1 - QUALITY ASSURANCE.

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

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 74 00 – Cleaning.

.2 Section 01 74 21 – Construction / Demolition Waste Management and Disposal

.3 Section 07 84 00 – Firestopping.

.4 Section 23 08 02 – Cleaning and Start-up of Mechanical Piping Systems.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal, paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Divert unused metal materials from landfill to metal recycling facility approved by Owner.

1.3 QUALITY ASSURANCE

.1 Installers to be certified to journeyperson.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 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.

.1 Unions are not required in installations using grooved mechanical couplings (The couplings shall serve as unions).

.3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.

.4 The flexible type grooved joint couplings may be used in lieu of a flexible connector at equipment connections for vibration attenuation and stress relief. Couplings shall be placed in close proximity to the source of the vibration, as per manufacturer’s recommendations.

3.2 CLEARANCES

.1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer.

.2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer or as indicated (whichever is greater) without interrupting operation of other system, equipment, components.

3.3 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. Discharge to be visible.

.4 Drain valves: NPS 3/4 gate or globe valves unless indicated otherwise, with hose end male thread, cap and chain.

3.4 AIR VENTS

.1 Install automatic air vents at 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.

3.5 DIELECTRIC WATERWAY FITTINGS AND COUPLINGS

.1 General: Compatible with system, to suit pressure rating of system.

.2 Locations: Where dissimilar metals are joined.

.3 NPS 2 and under: Isolating waterway fittings, unions or bronze valves.

.1 Waterway fittings shall be complete with thermoplastic liner.

.4 Over NPS 2: Isolating waterway fittings and flanges.

.1 Waterway fittings shall be complete with thermoplastic liner.

3.6 PIPEWORK INSTALLATION

.1 Installation by certified journeyperson.

.2 Screwed fittings jointed with Teflon tape or pipe dope as recommended by manufacturer.

.3 Grooved joint couplings and fittings shall be installed in accordance with the manufacturer's written installation instructions.

.1 Gaskets shall be verified as suitable for the intended service prior to installation. Gaskets shall be molded and produced by the coupling manufacturer.

.2 The grooved coupling manufacturer's factory trained representative shall provide on-site training for contractor's field personnel in the use of grooving tools, application of groove, and installation of grooved joint products. The manufacturer's representative shall periodically visit the jobsite and review installation. Contractor shall remove and replace any joints deemed improperly installed.

.4 Protect openings against entry of foreign material.

.5 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.

.6 Assemble piping using fittings manufactured to ANSI standards.

.7 Saddle type branch fittings may be used on mains if branch line is no larger than half the size of main.

.1 Hole saw (or drill) and ream main to maintain full inside diameter of branch line prior to welding saddle.

.8 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.

.9 Install concealed pipework to minimize furring space, maximize headroom, conserve space.

.10 Slope piping, except where indicated, in direction of flow for positive drainage and venting.

.11 Install, except where indicated, to permit separate thermal insulation of each pipe.

.12 Group piping wherever possible and as indicated.

.13 Ream pipes, remove scale and other foreign material before assembly.

.14 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.

.15 Provide for thermal expansion as indicated.

.16 Valves:

.1 Install in accessible locations.

.2 Remove interior parts before soldering.

.3 Install with stems above horizontal position unless otherwise indicated.

.4 Valves accessible for maintenance without removing adjacent piping.

.5 Install globe valves in bypass around control valves.

.6 Use ball or butterfly valves at branch take-offs for isolating purposes except where otherwise 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 ball valves for glycol service.

.10 Use chain operators on valves NPS 2-1/2 and larger where installed more than 2400 mm above floor in Mechanical Rooms.

.17 Check Valves:

.1 Install silent check valves on discharge of pumps and in vertical pipes with downward flow and elsewhere as indicated.

.2 Install swing check valves in horizontal lines on discharge of pumps and elsewhere as indicated.

3.7 SLEEVES

.1 General: Install where pipes pass through masonry, concrete structures, fire rated assemblies, and elsewhere as indicated.

.2 Material: Schedule 40 black steel pipe.

.3 Construction: Foundation walls and where sleeves extend above finished floors to have annular fins continuously welded on at mid-point.

.4 Sizes: 6 mm minimum clearance between sleeve and uninsulated pipe or between sleeve and insulation.

.5 Installation:

.1 Concrete, masonry walls, concrete floors on grade: Terminate flush with finished surface.

.2 Other floors: Terminate 25 mm above finished floor.

.3 Before installation, paint exposed exterior surfaces with heavy application of zinc-rich paint.

.6 Sealing:

.1 Foundation walls and below grade floors: Fire retardant, waterproof non-hardening mastic.

.2 Elsewhere: Provide space for firestopping. Maintain fire rating integrity.

.3 Sleeves installed for future use: Fill with lime plaster or other easily removable filler.

.4 Ensure no contact between copper pipe or tube and sleeve.

3.8 ESCUTCHEONS

.1 Install on pipes passing through walls, partitions, floors, and ceilings in finished areas.

.2 Construction: One piece type with set screws. Chrome or nickel plated brass or type 302 stainless steel.

.3 Sizes: Outside diameter to cover opening or sleeve. Inside diameter to fit around pipe or outside of insulation if so provided.

3.9 PREPARATION FOR FIRESTOPPING

.1 Material and installation within annular space between pipes, ducts, insulation and adjacent fire separation to Section 07 84 00 - Firestopping.

.2 Uninsulated unheated pipes not subject to movement: No special preparation.

.3 Uninsulated heated pipes subject to movement: Wrap with non-combustible smooth material to permit pipe movement without damaging firestopping material or installation, or install per manufacturer's recommendation as specified within the associated approval.

.4 Insulated pipes and ducts: Ensure integrity of insulation and vapour barriers.

3.10 FLUSHING OUT OF PIPING SYSTEMS

.1 In accordance with Section 23 08 02 - Cleaning and Start-up of Mechanical 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 sections of other Divisions.

.3 Preparatory to acceptance, clean and refurbish equipment and leave in operating condition, including replacement of filters in piping systems.

3.11 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK

.1 Advise Owner, 48 hours minimum prior to performance of pressure tests.

.2 Pipework: Test as specified in relevant sections of other sections or Divisions.

.3 Maintain specified test pressure without loss for four (4) hours minimum unless specified for longer period of time in relevant sections of other Divisions.

.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. Work to be carried out in off hours after 5 p.m., weekends or holidays.

.6 Pay costs for repairs or replacement, retesting, and making good. Owner to determine whether repair or replacement is appropriate.

.7 Insulate or conceal work only after approval and certification of tests by Owner.

3.12 EXISTING SYSTEMS

.1 Connect into existing piping systems at times approved by Owner. Work to be carried out off hours after 5 p.m., weekends or holidays.

.2 Request written approval ten (10) working days minimum, prior to commencement of work.

.3 Be responsible for damage to existing plant by this work.

.4 Ensure daily clean-up of existing areas.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Bronze – valves.

1.2 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures

.2 Section 01 35 29.06 – Health and Safety Requirements.

.3 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.4 Section 01 78 00 – Closeout Submittals.

.5 Section 23 05 15 - Common Installation Requirements for HVAC Pipework.

1.3 REFERENCES

.1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME)

.1 ANSI/ASME B1.20.1, Pipe Threads, General Purpose (Inch.)
.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.

.2 American Society for Testing and Materials (ASTM)

.1 ASTM A 276, Specification for Stainless Steel Bars and Shapes.
.2 ASTM A536, Specification for Ductile Iron Castings.
.3 ASTM B 16, Specification for Free-Cutting Brass Rod Bar and Shapes for Use in Screw Machines.
.4 ASTM B 62, Specification for Composition Bronze or Ounce Metal Castings.
.5 ASTM B 283, Specification for Copper and Copper Alloy Die Forgings (Hot Pressed)
.6 ASTM B 505/B505M, Specification for Copper-Base Alloy Continuous Castings.
.7 ASTM B584, Specification for Copper Alloy Sand Castings for General Applications.

.3 Canadian Standards Association (CSA)

.1 CSA B242, Groove and Solder Type Mechanical Pipe Couplings.

.4 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS).

.1 MSS SP-25, Standard Marking System for Valves, Fittings, Flanges and Unions.
.2 MSS SP-80, Bronze Gate, Globe, Angle and Check Valves.
.3 MSS SP-110, Ball Valves, Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

1.4 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data: submit WHMIS SDS – Safety Data Sheets.

.1 Submit shop drawings and product data in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit data for valves specified this section.

.3 Grooved joint couplings and fittings to be indicated on product submittals and to be specifically identified with the applicable style or series designation.

.3 Closeout Submittals

.1 Submit maintenance data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.

1.5 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.

.2 All grooved joint couplings, fittings, valves, and specialties to be the products of a single manufacturer. Grooving tools to be of the same manufacturer as the grooved components.

1.6 DELIVERY, STORAGE AND DISPOSAL

.1 Waste Management and Disposal

.1 Separate and recycle waste materials in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.2 Collect and separate for disposal, paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

1.7 MAINTENANCE

.1 Extra Materials

.1 Furnish following spare parts:

.1 Gaskets for flanges: one for every 10 flanged joints.

.2 Grooved couplings: IPS and copper-tube dimensioned, one for every 10 (ten) grooved joints.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Except for specialty valves, to be single manufacturer.

.2 All products to have Canadian registration numbers (CRN).

.3 End Connections

.1 Connection into adjacent piping/tubing:

.1 Steel pipe systems: Screwed ends to ANSI/ASME B1.20.1.

.2 Copper tube systems.

.1 Solder ends ANSI/ASME B16.18.

.2 Grooved ends to copper tube dimensions and CSA B242.

.3 Push-to-connect ends to ANSI/ASME B16.22 and manufacturer's standards.

.4 Lockshield Keys

.1 Where lockshield valves are specified, provide 10 keys of each size: malleable iron cadmium plated.

2.2 GATE VALVES

.1 Requirements common to all gate valves, unless specified otherwise:

.1 Standard specification: MSS SP-80.
.2 Bonnet: with hex. shoulders.
.3 Connections: with hex. shoulders.
.4 Inspection and pressure testing: to MSS SP-80. Tests to be hydrostatic.
.5 Packing: high grade non-asbestos packing.
.6 Handwheel: non-ferrous.
.7 Handwheel Nut: bronze to ASTM B62.
.8 Class 125, WP=860 kPa steam, 1.4 mPa WOG
.9 Class 150 WP=1.03 mPa steam, 2.07 mPa WOG.

.2 NPS 2 and under, non-rising stem, solid wedge disc, Class 125:

.1 Body: with long disc guides, screwed bonnet with stem retaining nut.
.2 Operator: Handwheel

.3 NPS 2 and under, non-rising stem, solid wedge disc, Class 150:

.1 Body: with long disc guides, screwed bonnet with stem retaining nut.
.2 Operator: Handwheel

.4 NPS 2 and under, rising stem, split wedge disc, Class 125:

.1 Body: with long disc guides, screwed bonnet.
.2 Disc: split wedge, bronze to ASTM B283, loosely secured to stem.
.3 Operator: Handwheel

.5 NPS 2 and under, rising stem, solid wedge disc, Class 125:

.1 Body: with long disc guides, screwed bonnet.

.2 Operator: Handwheel

.6 NPS 2 and under, rising stem, solid wedge disc, Class 150:

.1 Body: with long disc guides, screwed bonnet.

.2 Operator: Handwheel

2.3 GLOBE VALVES

.1 Requirements common to all globe valves, unless specified otherwise:

.1 Standard specification: MSS SP-80.

.2 Bonnet: union with hex. shoulders.

.3 Connections: screwed with hex. shoulders.

.4 Inspection and pressure testing: to MSS SP-80. Tests to be hydrostatic.

.5 Packing: non-asbestos.

.6 Handwheel: non-ferrous.

.7 Handwheel Nut: bronze to ASTM B62.

.8 Class 125, WP=860 kPa steam, 1.4 MPa WOG

.9 Class 150 WP=1.03 mPa steam, 2.07 MPa WOG.

.2 NPS 2 and under, composition disc, Class125:

.1 Body and bonnet: screwed bonnet.

.2 Disc and seat: renewable rotating PTFE disc regrindable bronze seat, loosely secured to bronze stem to ASTM B505.

.3 Operator: Handwheel.

.3 NPS 2 and under, composition disc, Class 150:

.1 Body and bonnet: union bonnet.

.2 Disc and seat: renewable rotating PTFE disc in easily removable disc holder, regrindable bronze seat, loosely secured to bronze stem to ASTM B505.

.3 Operator: Handwheel

.4 NPS 2 and under, plug disc, Class 150, screwed ends:

.1 Body and bonnet: union bonnet.

.2 Disc and seat ring: tapered plug type with disc stem ring of stainless steel to ASTM A276, loosely secured to stem.

.3 Operator: Handwheel

.5 Angle valve, NPS 2 and under, composition disc, Class 150:

.1 Body and bonnet: union bonnet.

.2 Disc and seat: renewable rotating PTFE disc in slip-on easily removable disc holder having integral guides, regrindable bronze seat, loosely secured to stem.

.3 Operator: Handwheel.

2.4 CHECK VALVES

.1 Requirements common to all check valves, unless specified otherwise:

.1 Standard specification: MSS SP-80.
.2 Connections: with hex agonal shoulders.
.3 Class 125, WP=860 kPa steam, 1.4 MPa WOG
.4 Class 150 WP=1.03 mPa steam, 2.07 MPa WOG
.5 Class 200 1.4 MPa CWP

.2 NPS 2 and under, swing type, bronze disc, Class 125:

.1 Body: Y-pattern with integral seat at 45°, screw-in cap with hex head.
.2 Disc and seat: renewable rotating disc, two-piece hinge disc construction; seat: regrindable.

.3 NPS 2 and under, swing type, bronze disc, Class 150:

.1 Body: Y-pattern with integral seat at 45°, screw-in cap with hex head.
.2 Disc and seat: renewable rotating disc, two-piece hinge disc construction; seat: regrindable.

.4 NPS 2 and under, swing type, composition disc, Class 200:

.1 Body: Y-pattern with integral seat at 45°, screw-in cap with hex. head.
.2 Disc: renewable rotating disc, of number 6 composition to suit service conditions, bronze two-piece hinge disc construction.

.5 NPS 2 and under, horizontal lift type, composition disc, Class150:

.1 Body: with integral seat, union bonnet ring with hex. shoulders, cap.
.2 Disc: renewable PTFE for steam, #6 composition rotating disc for water, oil or gas service in disc holder having guides top and bottom, of bronze to ASTM B62.

.6 NPS 2 and under, vertical lift type, bronze disc, Class 125:

.1 Disc: rotating disc having guides top and bottom, disc guides, retaining rings.

.7 NPS 2 and under, vertical or horizontal, lift type, 1380 kPa CWP.

.1 Disc: 301 stainless steel, center guided.

2.5 SILENT CHECK VALVES

.1 NPS 2 and under:

.1 Body: cast high tensile bronze to ASTM B62 with integral seat.
.2 Pressure rating: Class 125.
.3 Connections: screwed ends to ANSI B1.20.1 and with hex. shoulders.
.4 Disc and seat: renewable rotating disc.
.5 Stainless steel spring, heavy duty.
.6 Seat: regrindable.

2.6 BALL VALVES

.1 NPS 2 and under:

.1 Body and cap: cast high tensile bronze to ASTM B16 or ASTM B62.

.2 Pressure rating: Class 125, 860 MPa steam.

.3 Connections: Screwed ends to ANSI B1.20.1 and with hex. shoulders. Push-to-connect, Pressfit ends.

.4 Stem: tamperproof ball drive.

.5 Stem packing nut: external to body.

.6 Ball and seat: replaceable stainless steel or hard chrome, plated brass solid ball and teflon seats.

.7 Stem seal: TFE, EPDM, Nitrile, Fluoroelastomer with with external packing nut.

.8 Operator: removable lever handle with extension for insulated pipe.

.9 Cap and drain for drain service.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install rising stem valves in upright position with stem above horizontal.

.2 Remove internal parts before soldering.

.3 Adjoining tube, couplings, and fittings with grooved joint valves shall be copper-tube dimensioned. Flaring tube or fitting ends to accommodate IPS sized valves is not permitted.

.4 Install valves with unions at each piece of equipment arranged to allow servicing, maintenance, and equipment removal.

.1 Unions are not required in installations using grooved mechanical couplings. The couplings shall serve as unions.

3.2 COMMISSIONING

.1 As part of commissioning activities, develop schedule of valves and record thereon identifier, location, service, purchase order number and date, manufacturer, identification data specified above.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section includes:

.1 Concrete housekeeping pads, hangers and supports for mechanical piping, ducting and equipment.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal

.3 Section 03 30 00 - Cast-in-Place Concrete.

.4 Section 05 12 23 - Structural Steel for Buildings.

.5 Section 05 50 00 - Metal Fabrications.

1.3 REFERENCES

.1 American National Standards Institute/ American Society of Mechanical Engineers (ANSI/ASME)

.1 ANSI/ASME B31.1, Power Piping, (SI Edition).

.2 American Society for Testing and Materials (ASTM)

.1 ASTM A125, Specification for Steel Springs, Helical, Heat-Treated.
.2 ASTM A307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
.3 ASTM A563, Specification for Carbon and Alloy Steel Nuts.

.3 Factory Mutual (FM)

.4 Health Canada / Workplace Hazardous Materials Information System (WHMIS).

.1 Safety Data Sheets (SDS).

.5 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)

.1 MSS SP-58, Pipe Hangers and Supports - Materials, Design and Manufacture.
.2 ANSI/MSS SP-69, Pipe Hangers and Supports - Selection and Application.
.3 MSS SP-89, Pipe Hangers and Supports - Fabrication and Installation Practices.

.6 Underwriter's Laboratories of Canada (ULC)

1.4 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 MSS SP58 or ASME B31.1.

.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 all 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 to be in accordance with MSS SP58.

.2 Performance Requirements

.1 Design supports, platforms, catwalks, hangers, to withstand seismic events for location as per the National Building Code

1.5 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop drawings: submit drawings stamped and signed for approval by Owner.

.3 Submit shop drawings and product data for following items:

.1 Bases, hangers and supports.

.2 Connections to equipment and structure.

.3 Structural assemblies.

.4 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Instructions: submit manufacturer's installation instructions.

.1 Owner will make available one (1) copy of systems supplier's installation instructions.

.5 Closeout Submittals:

.1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals

1.6 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.

1.7 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 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 PRODUCTS

2.1 GENERAL

.1 Fabricate hangers, supports and sway braces in accordance with ANSI B31.1 and MSS SP-58 and SP-89.

.2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

2.2 PIPE HANGERS

.1 Finishes:

.1 Pipe hangers and supports: galvanized painted with zinc-rich paint after manufacture.

.2 Use electro-plating galvanizing process or hot dipped galvanizing process.

.3 Ensure steel hangers in contact with copper piping are copper plated or epoxy coated.

.2 Upper attachment structural: Suspension from lower flange of I-Beam.

.1 Cold piping NPS 2 maximum: malleable iron C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip.

.1 Rod: 9 mm UL listed, 13 mm FM approved.

.2 Cold piping 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, FM approved where required to MSS-SP58 and MSS-SP69.

.3 Upper attachment structural: Suspension from upper flange of I-Beam.

.1 Cold piping NPS 2 maximum: Ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, UL listed FM approved where required to MSS SP69.

.2 Cold piping NPS 2 1/2 or greater, all hot piping: Malleable iron top-of-beam jaw-clamp with hooked rod, spring washer, plain washer and nut UL listed, FM approved where required.

.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 FM approved where required to MSS SP-69.

.5 Shop and field-fabricated assemblies.

.1 Trapeze hanger assemblies: MSS SP-89.

.2 Steel brackets: MSS SP-89.

.3 Sway braces for seismic restraint systems: to MSS SP-89.

.6 Hanger rods: threaded rod material to MSS SP-58.

.1 Ensure that hanger rods are subject to tensile loading only.

.2 Provide linkages where lateral or axial movement of pipework is anticipated.

.3 Do not use 22 mm or 28 mm rod.

.7 Pipe attachments: material to MSS SP-58.

.1 Attachments for steel piping: carbon steel galvanized.

.2 Attachments for copper piping: copper plated black steel.

.3 Use insulation saddles for hot pipework.

.4 Oversize pipe hangers and supports for insulated pipes.

.8 Adjustable clevis: material to MSS SP-69, UL listed FM approved, where required clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.

.1 Ensure "U" has hole in bottom for rivetting to insulation shields.

.9 Yoke style pipe roll: carbon steel yoke, rod and nuts with cast iron roll, to MSS SP-69.

.10 U-bolts: carbon steel to MSS SP-69 with 2 nuts at each end to ASTM A563.

.1 Finishes for steel pipework: galvanized.

.2 Finishes for copper, glass, brass or aluminum pipework: black with formed portion plastic coated or epoxy coated.

.11 Pipe rollers: cast iron roll and roll stand with carbon steel rod to MSS SP-69.

2.3 RISER CLAMPS

.1 Steel or cast iron pipe: galvanized black carbon steel to MSS SP-58, type 42, UL listed FM approved where required.

.2 Copper pipe: carbon steel copper plated to MSS SP-58, type 42.

.3 Bolts: to ASTM A307.

.4 Nuts: to ASTM A563.

2.4 INSULATION PROTECTION SHIELDS

.1 Insulated cold piping:

.1 64 kg/m^3 density insulation plus insulation protection shield to: MSS SP-69, galvanized sheet carbon steel. Length designed for maximum 3.0 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 SP-69.

2.5 EQUIPMENT SUPPORTS

.1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel meeting requirements of Section 05 12 23 - Structural Steel for Buildings. Submit calculations with shop drawings.

2.6 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

.1 Provide templates to ensure accurate location of anchor bolts.

2.7 OTHER EQUIPMENT SUPPORTS

.1 From structural grade steel meeting requirements of Section 05 12 23 - Structural Steel for Buildings.

.2 Submit structural calculations with shop drawings.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.3 HANGER SPACING

.1 Plumbing piping: most stringent requirements of Canadian Plumbing Code

.2 Fire protection: to applicable fire code.

.3 Gas and fuel oil piping: up to NPS 1/2: every 1.8 m.

.4 Copper piping: up to NPS 1/2: every 1.5 m.

.5 Hydronic, steam, condensate, rigid, and flexible joint roll groove pipe: in accordance with table below, but not less than one hanger at joints.

Maximum Pipe Size: NPS	Maximum Spacing: Steel	Maximum Spacing: Copper
up to 1-1/4	2.1 m	1.8 m
1-1/2	2.7 m	2.4 m
2	3.0 m	2.7 m
2-1/2	3.6 m	3.0 m
3	3.6 m	3.0 m
3-1/2	3.9 m	3.3 m
4	4.2 m	3.6 m
5	4.8 m	
6	5.1 m	
8	5.7 m	
10	6.6 m	
12	6.9 m	

.6 Within 300 mm of each elbow.

.7 Pipework greater than NPS 12: to MSS SP69.

.8 Plastic Piping shall be supported to ensure plumb and square installation to satisfaction of engineer.

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, comprised of angel iron or c-channel.

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.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Materials and requirements for the identification of piping systems, duct work, valves and controllers, including the installation and location of identification systems.

.2 Sustainable requirements for construction and verification.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal

.3 Section 09 91 23 - Interior Painting.

1.3 REFERENCES

.1 Canadian Gas Association (CGA)

.1 CSA/CGA B149.1, Natural Gas and Propane Installation Code.

.2 CSAZ7396.1 Medical Gas pipeline Systems – Part 1: Pipelines for medical gases and vacuum.

.2 Canadian General Standards Board (CGSB)

.1 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 Standpipe and Hose Systems.

1.4 SUBMITTALS

.1 Product Data:

.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.

1.5 QUALITY ASSURANCE

.1 Quality assurance submittals: submit following in accordance with Section 01 33 00 – Submittal Procedures.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 – Health and Safety Requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 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 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.2 Dispose of unused paint coating material at official hazardous material collections site approved by Owner.

.3 Do not dispose of unused paint coating material into sewer system, into streams, lakes, onto ground or in locations where it will pose health or environmental hazard.

PART 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 to be 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 or white anodized aluminum, 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.

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.

2.4 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, to 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 All other pipes: Pressure sensitive plastic-coated cloth or vinyl with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100%RH and continuous operating temperature of 150°C and intermittent temperature of 200°C.

.7 Colours and Legends:

.1 Where not listed, obtain direction from Owner.

.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
** Add design temperature		
++ Add design temperature and pressure		
Raw water	Green	RAW WATER
Hot water heating supply	Yellow	HEATING SUPPLY
Hot water heating return	Yellow	HEATING RETURN
Domestic hot water supply	Green	DOM. HW SUPPLY
Dom. HWS recirculation	Green	DOM. HW CIRC
Domestic cold water supply	Green	DOM. CWS
Contaminated lab waste	Yellow	CONT. LAB WASTE
Acid waste	Yellow	ACID WASTE (add source)
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
Conduit for low voltage control wiring	To Section 25 05 54 – EMCS: Identification	

2.5 IDENTIFICATION DUCTWORK SYSTEMS

.1 50 mm high stencilled letters and directional arrows 150 mm long x 50 mm high.

.2 Colours: Black, or co-ordinated with base colour to ensure strong contrast.

.3 Identify system: e.g. Supply AHU-1, Exhaust F-7.

2.6 VALVES, CONTROLLERS

.1 Brass tags 12 mm diameter with 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.

2.7 CONTROLS COMPONENTS IDENTIFICATION

.1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in section 25 05 54 – EMCS: Identification. If no EMCS included in project, identification as per this section.

.2 Inscriptions to include function and (where appropriate) fail-safe position, component ID name.

2.8 LANGUAGE

.1 Identification to be in English.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 TIMING

.1 Provide identification only after all painting specified in Section 09 91 23 - Interior Painting has been completed.

3.3 INSTALLATION

.1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.

.2 Provide ULC and/or CSA registration plates as required by respective agency.

3.4 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 in any way.

3.5 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, dampers, etc. Where this is not possible, place identification as close as possible, preferably on upstream side.

.9 Identification to be easily and accurately readable from usual operating areas and from access points.

.1 Position of identification to be approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

3.6 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 Owner. Provide one copy (reduced in size if required) in each operating and maintenance manual.

.3 Number valves in each system consecutively.

3.7 CLEANING

.1 Proceed in accordance with Section 01 74 00 – Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, rubbish, tools and equipment.

END OF SECTION

PART 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 QUALIFICATIONS OF TAB PERSONNEL

.1 Submit names of personnel certified to NEBB or SMACNA to perform TAB to Owner within 90 days of award of contract.

.2 Provide documentation confirming qualifications, successful experience. TAB contractor shall have a minimum of 5 (five) years experience to NEBB or SMACNA.

.3 TAB: performed in accordance with the requirements of standard under which TAB Firm's qualifications are approved:

.1 National Environmental Balancing Bureau (NEBB) TABES, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems.

.2 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 the 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 (NEBB, or SMACNA), requirements and recommendations contained in these procedures and requirements are mandatory.

1.3 PURPOSE OF TAB

.1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads.

.2 Adjust and regulate equipment and systems so as to meet specified performance requirements and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.

.3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.

1.4 EXCEPTIONS

.1 TAB of systems and equipment regulated by codes, standards to be to satisfaction of authority having jurisdiction.

1.5 CO-ORDINATION

.1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule so as to ensure completion before acceptance of project.

.2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

1.6 PRE-TAB REVIEW

.1 Review contract documents before project construction is started and confirm in writing to Owner adequacy of provisions for TAB and other aspects of design and installation pertinent to success of TAB.

.2 Review specified standards and report to Owner in writing all 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 other Divisions.

1.8 OPERATION OF SYSTEMS DURING TAB

.1 Operate systems for length of time required for TAB and as required by Owner for verification of TAB reports.

1.9 START OF TAB

.1 Notify Owner seven (7) working days prior to start of TAB.

.2 Start TAB when building is essentially completed, including:

- .1 Installation of ceilings, doors, windows, other construction affecting TAB.
- .2 Application of weatherstripping, sealing, caulking.
- .3 All pressure, leakage, other tests specified elsewhere in other Divisions.
- .4 All provisions for TAB installed and operational.

.3 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.

1.10 APPLICATION TOLERANCES

.1 Do TAB to following tolerances of design values:

- .1 Laboratory HVAC systems: plus 10%, minus 0%.
- .2 Other HVAC systems: plus 5%, minus 5%.
- .3 Hydronic systems: plus or minus 10 %.
- .4 Refrigeration systems: plus or minus 10%.

1.11 ACCURACY TOLERANCES

.1 Measured values to be accurate to within plus or minus 2 % of actual values.

1.12 INSTRUMENTS

.1 Prior to TAB, submit to Owner list of instruments to be used together with serial numbers.

.2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.

.3 Calibrate within 3 (three) months of TAB. Provide certificate of calibration to Owner.

1.13 SUBMITTALS

.1 Submit, prior to commencement of TAB:

.2 Proposed methodology and procedures for performing TAB if different from referenced standard.

1.14 PRELIMINARY TAB REPORT

.1 Submit for checking and approval of Owner, prior to submission of formal TAB report, sample of rough TAB sheets. Include:

.1 Details of instruments used.
.2 Details of TAB procedures employed.
.3 Calculations procedures.
.4 Summaries.

1.15 TAB REPORT

.1 Format to be in accordance with referenced standard.

.2 TAB report to show results in SI units and to include:

.1 Project record drawings.
.2 System schematics.

.3 Submit 3 (three) copies of TAB Report to Owner for verification and approval, in English in D-ring binders, complete with index tabs.

1.16 VERIFICATION

.1 Reported results subject to verification by Owner.

.2 Provide manpower and instrumentation to verify up to 30% of reported results.

.3 Number and location of verified results to be at discretion of Owner.

.4 Bear costs to repeat TAB as required to satisfaction of Owner.

1.17 SETTINGS

.1 After TAB is completed to satisfaction of Owner, 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. Markings not to be eradicated or covered in any way.

1.18 COMPLETION OF TAB

.1 TAB to be considered complete when final TAB Report received and approved by Owner.

1.19 AIR SYSTEMS

.1 Standard: TAB to be to most stringent of this section or TAB standards of or NEBB.

.2 Do TAB of systems, equipment, components, controls specified in other Divisions.

.3 Qualifications: personnel performing TAB to be qualified to standards of NEBB.

.4 Quality assurance: Perform TAB under direction of supervisor qualified to standards of NEBB.

.5 Measurements: to include, but not limited to, following as appropriate for systems, equipment, components, controls: air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, dewpoint), duct cross-sectional area, RPM, electrical power, voltage, noise, vibration, amperage and volts for each stage of electrical heating coils.

.6 Locations of equipment measurements: To include, but not be limited to, following as appropriate:

.1 Inlet and outlet of dampers, filter, coil, humidifier, fan, other equipment causing changes in conditions.

.2 At controllers, controlled device.

.7 Locations of systems measurements to include, but not be limited to, following as appropriate: Main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

1.20 HYDRONIC SYSTEMS

.1 Definitions: for purposes of this section, to include low pressure hot water heating, chilled water, condenser water, glycol systems.

.2 Standard: TAB to be to most stringent of TAB standards of NEBB.

.3 Do TAB of systems, equipment, components, controls specified in other Divisions.

.4 Qualifications: personnel performing TAB to be qualified to standards of NEBB.

.5 Quality assurance: perform TAB under direction of supervisor qualified to standards of NEBB.

.6 Measurements: to include, but not limited to, following as appropriate for systems, equipment, components, controls: flow rate, static pressure, pressure drop (or loss), temperature, specific gravity, density, RPM, electrical power, voltage, noise, vibration.

.7 Locations of equipment measurement: to include, but not be limited to, following as appropriate:

.1 Inlet and outlet of heat exchangers (primary and secondary sides), boiler, chiller, coil, humidifier, cooling tower, condenser, pump, PRV, control valve, other equipment causing changes in conditions.

.2 At controllers, controlled device.

.8 Locations of systems measurements to include, but not be limited to, following as appropriate: supply and return of primary and secondary loops (main, main branch, branch, sub-branch) of all hydronic systems, inlet connection of make-up water.

1.21 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: THIS IS REQUIRED

.1 Set system airflows as specified

.2 Measure airflow velocities with sash in operating position

.3 Zone pressure differences:

.1 Adjust HVAC systems, equipment, controls to establish specified air pressure differentials, with all systems in all possible combinations of normal operating modes.

.4 Existing Fans to be relocated-

.1 measure airflow and amps voltage before moving and after relocations.

.5 Smoke management systems:

.1 Test for proper operation of all smoke and fire dampers, sensors, detectors, installed as component parts of air systems specified in other Divisions.

1.22 POST- OCCUPANCY TAB

.1 Measure DBT, WBT (or %RH), air velocity, air flow patterns, NC levels, in occupied zone of areas designated by Owner.

.2 Participate in systems checks twice during Warranty Period - #1 approximately three (3) months after acceptance and #2 within three (3) months of termination of Warranty Period.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Materials and methods for pressure testing ducts over 5 m in length, forming part of a supply, return or exhaust ductwork system directly or indirectly connected to air handling equipment.

1.2 RELATED SECTIONS:

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 35 29.06 - Health and Safety Requirements.

.3 Section 01 45 00 - Quality Control.

.4 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.5 Section 01 78 00 - Closeout Submittals.

.6 Section 01 91 13.13 - Commissioning (Cx) Requirements.

1.3 REFERENCES

.1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Safety Data Sheets (SDS).

.2 Sheet Metal and Air Conditioning Contractor's National Association (SMACNA)

.1 SMACNA HVAC Air Duct Leakage Test Manual.

1.4 SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties. Include pressure test information and results as follows:

.1 Submit proposed report form and test report format to Owner for approval at least three (3) months before proposed date of first series of tests. Do not start tests until approval received in writing from Owner.

.2 Prepare report of results and submit to Owner within two (2) working days of completion of tests. Include:

.1 Schematic of entire system.

.2 Schematic of section under test showing test site.

.3 Required and achieved static pressures.

.4 Orifice differential pressure at test sites.

.5 Permissible and actual leakage flow rate (L/s) for test sites.

.6 Witnessed certification of results.

.3 Include test reports in final TAB report.

.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 Manufacturer's field reports specified.

1.5 QUALITY ASSURANCE

.1 Pre-Installation Meetings:

.1 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installations.

.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.

PART 2 PRODUCTS

2.1 TEST INSTRUMENTS

.1 Test apparatus to include:

.1 Fan capable of producing required static pressure.

.2 Duct section with calibrated orifice plate mounted and accurately located pressure taps.

.3 Flow measuring instrument compatible with the orifice plate.

.4 Calibration curves for orifice plates used.

.5 Flexible duct for connecting to ductwork under test.

.6 Smoke bombs for visual inspections.

.2 Test apparatus: accurate to within +/- 3 % of flow rate and pressure.

.3 Submit details of test instruments to be used to Owner at least three (3) months before anticipated start date.

.4 Test instruments: calibrated and certificate of calibration deposited with Owner no more than 28 days before start of tests.

.5 Re-calibrated every six (6) months thereafter.

2.2 EQUIPMENT LEAKAGE TOLERANCES

.1 Equipment and system components such as VAV boxes, duct heating leakage: 2%.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 TEST PROCEDURES

.1 Maximum lengths of ducts to be tested consistent with capacity of test equipment.

.2 Section of duct to be tested to include:

.1 Fittings, branch ducts, tap-ins.

.3 Repeat tests until specified pressures are attained. Bear costs for repairs and repetition to tests.

.4 Base partial system leakage calculations on SMACNA HVAC Air Duct Leakage Test Manual.

.5 Seal leaks that can be heard or felt, regardless of their contribution to total leakage.

3.3 SITE TOLERANCES

.1 System leakage tolerances specified are stated as percentage of total flow rate handled by system. Pro-rate specified system leakage tolerances. Leakage for sections of duct systems: not to exceed total allowable leakage.

.2 Leakage tests on following systems not to exceed specified leakage rates.

.1 Small duct systems up to 250 Pa: leakage 2 %.
.2 VAV box and duct on downstream side of VAV box: leakage 2 %.
.3 Large low pressure duct systems up to 500 Pa: leakage 2 %.
.4 HP duct systems up to 1000 Pa pressure classification, including upstream side of VAV boxes: leakage 1%.

.3 Evaluation of test results to use surface area of duct and pressure in duct as basic parameters.

3.4 TESTING

.1 Test ducts before installation of insulation or other forms of concealment.

.2 Test after seals have cured.

.3 Test when ambient temperature will not affect effectiveness of seals, and gaskets.

.4 Flexible connections to VAV boxes.

3.5 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services.

.1 Have manufacturer of products, supplied under this Section, review Work involved in the handling, installation/application, protection and cleaning, of its products and submit written reports, in acceptable format, to verify compliance of Work with Contract.

.2 Manufacturer's Field Services: 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, or other Work, on which the 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 the Work, after cleaning is carried out.

.4 Obtain reports, within three (3) days of review, and submit, immediately, to Owner.

.2 Performance Verification:

.1 Owner to witness tests and to verify reported results.

.2 To be certified by same TAB agency approved by Owner to undertake TAB on this project.

3.6 CLEANING

.1 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 74 21 - Construction/Demolition Waste Management and Disposal

.3 Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment

.4 Section 23 05 53.01 – Mechanical Identification.

1.2 REFERENCES

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

.1 ANSI/ASHRAE/IESNA 90.1, SI; Energy Standard for Buildings Except Low-Rise Residential Buildings.

.2 American Society for Testing and Materials International, (ASTM)

.1 ASTM B209M, Specification for Aluminum and Aluminum Alloy Sheet and Plate (Metric).

.2 ASTM C335, Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.

.3 ASTM C411, 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, Specification for Mineral Fiber Pipe Insulation.

.6 ASTM C553, Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

.7 ASTM C612, Specification for Mineral Fiber Block and Board Thermal Insulation.

.8 ASTM C795, Specification for Thermal Insulation for Use with Austenitic Stainless Steel.

.9 ASTM C921, Standard Practice for Determining Properties of Jacketing Materials 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.

.4 Thermal Insulation Association of Canada (TIAC): National Insulation Standards.

.5 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC-S102, Surface Burning Characteristics of Building Materials and Assemblies.

.6 National Energy Code of Canada for Buildings (NECB)

1.3 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" - will mean "not concealed" as defined herein.

.3 Insulation systems - insulation material, fasteners, jackets, and other accessories.

.2 TIAC Codes:

.1 CRD: Commercial Round Ductwork,

.2 CRF: Commercial Rectangular Finish.

1.4 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit for approval manufacturer's catalogue literature related to installation, fabrication for duct jointing recommendations.

1.5 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 typewritten label beneath sample indicating service.

1.6 MANUFACTURERS' INSTRUCTIONS

.1 Submit manufacturer's installation instructions in accordance with Section 01 33 00 - Submittal Procedures.

.2 Installation instructions to include procedures used and installation standards achieved.

1.7 QUALIFICATIONS

.1 Installer: certified in performing work of this section, and have at least 5 years successful experience in this size and type of project, qualified to standards of TIAC.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.2 Protect from weather and construction traffic.

.3 Protect against damage from any source.

.4 Store at temperatures and conditions recommended by manufacturer.

1.9 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 21 – Construction / Demolition Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal, paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Divert unused metal materials from landfill to metal recycling facility approved by Owner.

.5 Divert unused adhesive material from landfill to official hazardous material collections site approved by Owner.

.6 Do no dispose of unused adhesive materials into sewer systems, into lakes, streams, onto ground or in other locations where it will pose health or environmental hazard.

PART 2 PRODUCTS

2.1 FIRE AND SMOKE RATING

.1 In accordance with CAN/ULC-S102:

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.2 INSULATION

.1 Mineral fibre: as specified includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) not to exceed specified values 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-52Ma (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-52Ma (as scheduled in PART 3 of this section).

.1 Mineral fibre: to ASTM C553.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Maximum "k" factor: to ASTM C553.

2.3 JACKETS

.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.

.3 Aluminum:

.1 To ASTM B209 with moisture barrier as scheduled in PART 3 of this section.

.2 Thickness: 0.40 mm sheet.

.3 Finish: Stucco embossed or corrugated.

.4 Jacket banding and mechanical seals: 12 mm wide, 0.5 mm thick stainless steel.

.4 Stainless steel:

.1 Type: 304 or 316 where additional corrosion protection is required.

.2 Thickness: 0.25 mm sheet.

.3 Finish: Corrugated or stucco embossed.

.4 Jacket banding and mechanical seals: 12mm wide, 0.5 mm thick stainless steel.

2.4 ACCESSORIES

.1 Vapour retarder lap adhesive:

.1 Water based, fire retardant type, compatible with insulation.

.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

.8 Canvas adhesive: washable.

.9 Tie wire: 1.5 mm stainless steel.

.10 Banding: 12 mm wide, 0.5 mm thick stainless steel.

.11 Facing: 25 mm galvanized steel hexagonal wire mesh stitched on one face of insulation.

.12 Fasteners: 4 mm diameter pins with 35 mm diameter or square clips, length to suit thickness of insulation.

PART 3 EXECUTION

3.1 PRE-INSTALLATION REQUIREMENTS

.1 Pressure testing of ductwork systems complete, witnessed and certified.

.2 Surfaces clean, dry, free from foreign material.

3.2 INSTALLATION

.1 Install in accordance with TIAC National Standards.

.2 Apply materials in accordance with manufacturer's instructions and as indicated.

.3 Use two layers with staggered joints when required nominal thickness exceeds 75 mm.

.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.

.1 Hangers, supports to be outside vapour retarder jacket.

.5 Supports, Hangers in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment

.1 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.

.6 Fasteners: At 300 mm oc in horizontal and vertical directions, minimum two rows each side.

3.3 DUCTWORK INSULATION SCHEDULE

.1 Insulation types and thicknesses: Conform to following Table:

.2

	TIAC Code	Vapour Retarder	Thickness (mm)
Rectangular cold and dual temperature supply air ducts (exposed)	C-1	yes	50
Round cold and dual temperature supply air ducts (concealed)	C-2	yes	50
Rectangular warm air ducts (exposed)	C-1	no	25
Round warm air ducts (exposed)	C-1	no	25
Rectangular cold and dual temperature supply air ducts (concealed)	C-2	Yes	25
Round cold and dual temperature supply air ducts (exposed)	C-1	yes	50
Rectangular warm air ducts (concealed)	C-2	No	25
Round warm air ducts (concealed)	C-2	No	25
Supply, return and exhaust ducts exposed in space being served			none
Outside air ducts to mixing plenum	C-1	yes	50
Mixing plenums	C-1	yes	25
Exhaust duct between dampers and louvers	C-1	no	50
Rectangular ducts outside	C-1	special	50
Round ducts outside	C-1	special	50
Acoustically lined ducts	See Section 23 33 53- Duct Liners		

.3 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.

.4 Finishes: Conform to following table:

	TIAC Code Rectangular	Round
Indoor, concealed	None	none
Indoor, exposed within mechanical room	CRF/1	CRD/2
Indoor, exposed elsewhere	CRF/2	CRD/3
Outdoor, exposed to precipitation	CRF/3	CRD/4
Outdoor, elsewhere	CRF/4	CRD/5

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Thermal insulation for piping and piping accessories in commercial type applications.

1.2 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal

.3 Section 07 92 00 – Joint Sealing.

.4 Section 23 07 16 – HVAC Equipment Insulation.

.5 Section 23 05 53.01 – Mechanical Identification.

1.3 REFERENCES

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

.1 ASHRAE Standard 90.1, Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings (Including all Addenda).

.2 American Society for Testing and Materials (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 Fibre-Hydraulic-Setting Thermal Insulating and Finishing Cement.

.5 ASTM C533 Standard specification for Calium Silicate Insulation Block and Pipe.

.6 ASTM C547 Standard Specification for Mineral Fibre 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 D1784, Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.

.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), c. 37.

.2 Canadian Environmental Protection Act, (CEPA), c. 33.

.3 Transportation of Dangerous Goods Act (TDGA), c. 34.

.5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets.

.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.

.8 National Energy Code of Canada for Buildings (NECB).

1.4 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 defined herein.

.2 TIAC ss:

.1 CRF: Commercial Rectangular Finish

.2 CPF: Commercial Piping Finish.

1.5 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.

.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Safety Data Sheets (SDS) in accordance with Section 01 33 00 - Submittal Procedures.

.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.

.2 Instructions: submit manufacturer's installation instructions to Owner.

1.6 QUALITY ASSURANCE

.1 Qualifications:

.1 Installer: certified in performing work of this Section, and have at least 5 years successful experience in this size and type of project, qualified to standards of TIAC.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.7 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, labeled 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 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition 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 approved by Owner.

.4 Dispose of unused adhesive material at official hazardous material collections site approved by Owner.

PART 2 PRODUCTS

2.1 FIRE AND SMOKE RATING

.1 In accordance with CAN/ULC-S102.

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.2 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 mean temperature when tested in accordance with ASTM C335.

.3 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 0.075 W/m °C @ 500 °C.

.3 Design to permit periodic removal and re-installation.

.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-52Ma.

.3 Maximum "k" factor: to CAN/ULC-S702.

.5 TIAC Code A-6: Flexible unicellular tubular elastomer.

.1 Insulation: with vapour retarder jacket to ASTM C534.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Maximum "k" factor: 0.039 W/m – °C.

.4 To be certified by manufacturer to be free of potential stress corrosion cracking corrodants

.5 Flame spread index less than 25, and smoke developed index less than 50.

.6 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 ASTM C547.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Maximum "k" factor: to CAN/ULC-S702.

2.3 INSULATION SECUREMENT

.1 Tape: Self-adhesive, aluminum, plain reinforced, 50 mm wide minimum.

.2 Contact adhesive: Quick setting.

.3 Canvas adhesive: Washable.

.4 Tie wire: 1.5 mm diameter stainless steel.

.5 Bands: Stainless steel, 19 mm wide, 0.5 mm thick.

2.4 CEMENT

.1 Thermal insulating and finishing cement:

.1 Hydraulic setting or air drying on mineral wool, to ASTM C449/C449M.

2.5 VAPOUR RETARDER LAP ADHESIVE

.1 Water based, fire retardant type, compatible with insulation.

2.6 INDOOR VAPOUR RETARDER FINISH

.1 Vinyl emulsion type acrylic, compatible with insulation.

2.7 OUTDOOR VAPOUR RETARDER FINISH

.1 Vinyl emulsion type acrylic, compatible with insulation.

.2 Reinforcing fabric: Fibrous glass, untreated 305 g/m^2.

2.8 JACKETS

.1 Polyvinyl Chloride (PVC):

.1 One-piece moulded type and sheet to ASTM D1784 with pre-formed shapes as required.
.2 Colours: to match adjacent finish paint. Confirm colour with Owner.
.3 Minimum service temperatures: -20°C.
.4 Maximum service temperature: 65°C.
.5 Moisture vapour transmission: 0.02 perm.
.6 Thickness: 0.55 mm.
.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: flame spread rating 25, smoke developed rating 50.
.2 Outdoor: UV rated material at least 0.5 mm thick.

.2 Canvas:

.1 220gm/m^2 cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
.2 Lagging adhesive: Compatible with insulation.

.3 Aluminum:

.1 To ASTM B209.

.2 Thickness: 0.50 mm sheet.

.3 Finish: Embossed or corrugated.

.4 Joining: Longitudinal and circumferential slip joints with 50 mm 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 wide, 0.5 mm thick at 300 mm spacing.

.4 Stainless steel:

.1 Type: 304 or type 316.

.2 Thickness: 0.25 mm.

.3 Finish: Smooth.

.4 Joining: Longitudinal and circumferential slip joints with 50 mm 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 wide, 0.5 mm thick at 300 mm spacing.

2.9 WEATHERPROOF CAULKING FOR JACKETS INSTALLED OUTDOORS

.1 Caulking to: Section 07 92 00 - Joint Sealing.

PART 3 EXECUTION

3.1 MANUFACTURER'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 to be 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 this specification.

.3 Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm.

.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.

3.4 REMOVABLE, PRE-FABRICATED, INSULATION AND ENCLOSURES

.1 See Section 23 07 16 – HVAC Equipment Insulation.

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 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified. Insulate vent pipes 3.0 m from roof penetration.

.2 TIAC Code: A-2.

.1 Insulation securements: 18 ga SS wire or 12 mm x 0.51 mm SS bands at 300 mm oc.
.2 Seals: lap seal adhesive, lagging adhesive.
.3 Installation: TIAC Code: 1501-H.

.3 TIAC Code: A-3.

.1 Securements: Tape at 300 mm oc.
.2 Seals: VR lap seal adhesive, VR lagging adhesive.
.3 Installation: TIAC Code: 1501-C.

.4 TIAC Code: A-6.

.1 Insulation securements: as per manufacturer's recommendation.
.2 Seals: lap seal adhesive, lagging adhesive.
.3 Installation: TIAC Code: 1501-CA.

.5 TIAC Code: C-2 with vapour retarder jacket.

.1 Insulation securements: 18 ga SS wire or 12 mm x 0.5 mm SS bands at 300 mm oc.
.2 Seals: lap seal adhesive, lagging adhesive.
.3 Installation: TIAC Code: 1501-C.

.6 Thickness of insulation to be as listed in following table.

.1 Run-outs to individual units and equipment not exceeding 4000 mm long.
.2 Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.

Application	**Temp °C**	**TIAC code**	**Pipe sizes (NPS) and insulation thickness (mm)**					
	Run out			***to 1***	***1 1/4 to 2***	***2 1/2 to 4***	***5 to 6***	***8 & over***

Application	**Temp °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***
Hot Water Heating	60 - 94	A-3	25	38	38	38	38	38
Hot Water Heating	up to 59	A-3	25	25	25	25	38	38
Domestic HWS		A-3	25	25	25	38	38	38
Domestic CWS		A-3	25	25	25	25	25	25

.7 Finishes:

.1 Exposed indoors: PVC jacket.

.2 Exposed in mechanical rooms: PVC jacket.

.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 Aluminium, or SS jacket.

.6 Finish attachments: SS screws or bands, at 150 mm oc. Seals: wing or closed.

.7 Installation: To appropriate TIAC code CPF/1 through CPF/5.

3.7 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

Part 1 GENERAL

1.1 SUMMARY

.1 This Section specifies requirements for commissioning of the laboratory ventilation and related control systems serving the small lab space, including but not limited to:

- .1 Critical airflow control valves (e.g., Antec-type laboratory airflow control valves).
- .2 Room pressure sensors and associated control logic.
- .3 Rooftop makeup air unit (MAU) with integral DX cooling and electric heating.
- .4 Exhaust fans
- .5 Associated control panels, field devices, safeties, alarms, and interfaces to the Building Automation System (EMCS).

.2 Commissioning work includes:

- .1 Review of submittals for commissioning implications.
- .2 Pre-functional inspections and start-up verification.
- .3 Functional performance testing (FPT) of individual components and integrated systems.
- .4 Verification of room pressurization performance.
- .5 Trend logging and performance verification under typical operating conditions.
- .6 Training of Owner's operations staff.
- .7 Commissioning documentation and closeout.

.3 General: Where there may be conflicts in the specifications or drawings with the responsibilities of the contractor(s) outlined here, the more stringent shall apply.

1.2 RELATED SECTIONS

.1 Section 23 05 93 – Testing, Adjusting and Balancing for HVAC.

.2 Section 23 09 00 – Instrumentation and Control for HVAC.

.3 Section 23 73 13 – Rooftop Makeup Air Units.

.4 Section 25 05 00 – Integrated Automation.

.5 Section 26 05 00 – Common Work Results for Electrical.

1.3 REFERENCES

.1 ASHRAE Guideline 0 – The Commissioning Process.

.2 ASHRAE Guideline 1.1 – HVAC&R Technical Requirements for the Commissioning

Process.

.3 Manufacturer's installation, start-up, and commissioning instructions for critical airflow control valves, room pressure sensors, and rooftop makeup air units.

1.4 DEFINITIONS

.1 Commissioning Authority (CxA): Party designated by Owner to witness the commissioning process.

.2 Contractor: Party reasonable to execute, manage, oversee and generate forms and checklists and to document the commissioning process and deliver a operational system(s) for the owner.

.3 Consultant: Responsible to review results of commissioning and provide opinion to owner on whether commissioning has been completed.

.4 Pre-Functional Checklist (PFC): Documented verification that equipment is installed correctly and ready for operation. Prepared by contractor and submitted to CxA and Consultant for review.

.5 Functional Performance Test (FPT): Test to verify the installed system performs in accordance with the design intent and sequences of operation. Prepared by contractor and submitted to CxA and Consultant for review.

1.5 COMMISSIONING RESPONSIBILITIES

.1 Owner / CxA:

.1 Prepare overall Commissioning Plan.
.2 Coordinate commissioning activities and schedule.
.3 Witness key functional performance tests.
.4 Review and accept commissioning documentation.

.2 Mechanical Contractor:

.1 Provide labour, tools, and temporary materials required for commissioning.
.2 Complete pre-functional checklists for mechanical equipment.
.3 Prepare and implement programming in accordance with approved sequences for programmed devices supplied under Division 23.
.4 Coordinate with Controls Contractor, Integrator, TAB Contractor, and Electrical Contractor.
.5 Execute functional performance tests under direction of CxA.

.3 Controls Contractor

.1 Prepare and implement EMCS and local controller programming in accordance with approved sequences.
.2 Provide point-to-point checks, I/O checkout, and assistance with functional

performance tests.

.3 Set up trend logs as specified in this Section.

.4 Provide as-implemented control logic and point lists.

.4 Integrator:

.1 Prepare and implement EMCS EBI programming in accordance with approved sequences.

.2 Provide point discovery, I/O checkout in coordination with controls contractor, and assistance with functional performance tests.

.3 Set up trend logs as specified in this Section.

.4 Provide as-implemented control logic and point lists.

.5 TAB Contractor:

.1 Perform air balancing of MAU and terminal devices, including critical control valves.

.2 Provide TAB report indicating final airflows and room pressurization results.

.3 Assist during FPT where airflow measurements are required.

.6 Electrical Contractor:

.1 a. Verify power supply to equipment and controls.

.2 b. Verify proper operation of disconnects, starters, VFDs, and interlocks.

1.6 SUBMITTALS

.1 Commissioning Plan including scope, responsibilities, schedule, and test procedures.

.2 Pre-Functional Checklists for each control device including but not limited to critical control valves, room pressure sensors, VFD’s, controllers, and MAU.

.3 Functional Performance Test procedures including test steps, expected results, and acceptance criteria.

.4 Test reports including completed and signed FPT forms, trend data summaries, and deficiency logs.

.5 O&M and training materials including as-built control drawings, point lists, and sequences of operation.

1.7 QUALITY ASSURANCE

.1 Commissioning activities shall be performed under the supervision of a CxA experienced in laboratory ventilation and room pressure control systems.

.2 Testing of controls shall be carried out by factory-trained technicians for the supplied control system and critical control valves.

.3 Measurement instruments shall be calibrated within the last 12 months; provide

calibration certificates on request.

1.8 Coordination

.1 .1 Coordinate commissioning schedule with construction activities, TAB, and Owner's occupancy schedule.

.2 .2 Do not schedule FPT until:

- .1 Equipment installation is complete.
- .2 Preliminary TAB balancing is complete.
- .3 EMCS programming is complete and debugged to a functional level.

Part 2 PRODUCTS

2.1 General

.1 .1 Provide test equipment and temporary instrumentation required to execute commissioning tests, including but not limited to:

- .1 Portable airflow measurement devices.
- .2 Differential pressure manometers capable of reading to ±0.1 Pa (or as appropriate).
- .3 Temperature and humidity measurement devices appropriate to the range.

2.2 Trend Points

.1 Configure EMCS trend logs for the following points:

- .1 MAU supply air flow and temperature.
- .2 Outdoor air temperature.
- .3 Each critical control valve – commanded flow, measured flow, valve position.
- .4 Each room pressure sensor – measured differential pressure (Pa).
- .5 Lab room temperature (and humidity if applicable).
- .6 Key unit statuses and alarms including: MAU supply fan status, cooling call, electric heat stages, freezestat, filter differential pressure alarm, high/low temperature alarms, and loss of pressure alarm.
- .7 Points as requested by engineer.

.2 Trend interval: not more than 1 minute during functional performance testing and not more than 5 minutes for extended monitoring.

Part 3 EXECUTION

3.1 General Sequence of Commissioning

.1 Pre-Functional Phase:

- .1 Visual inspection of installation against drawings and manufacturer instructions.
- .2 Verification of labeling and identification of all valves, sensors, controllers, and panels.

  Power-on and start-up checks for MAU, including safeties.
- .3 I/O point-to-point verification for all EMCS and local controller points.

.2 TAB and Setup:

- .1 Balance MAU airflow to design supply airflow.
- .2 Balance exhaust / return systems as applicable.
- .3 Set up critical control valves to design minimum and maximum flows and room pressure offsets.

.3 Functional Performance Testing:

- .1 Execute FPTs for each subsystem (valves, sensors, MAU) and then integrated room-level tests.
- .2 Record results on approved forms and via EMCS trending.

3.2 Critical Control Valves (Lab Air Valves)

.1 Verify each valve is installed in the correct location and orientation, with adequate straight duct length upstream/downstream as per manufacturer's requirements.

.2 Verify communication and addressing of each valve controller with EMCS.

.3 Confirm electrical power, control wiring, and labeling are complete.

.4 Verify analog/digital inputs and outputs including flow sensor, actuator feedback, and valve position.

.5 Confirm design setpoints (minimum and maximum flow, room offset, fail positions) are entered.

.6 Command valve to minimum, typical, and maximum design flows; verify actual measured airflow is within ±10% of setpoint (or project criteria).

.7 Simulate loss of control / power and verify fail-safe position as specified.

.8 Verify response time between setpoint changes meets manufacturer or design limits.

.9 Verify alarms for valve fault, out-of-range flow, and communication failure are generated

at EMCS.

3.3 Room Pressure Sensors

.1 Verify each room pressure sensor is installed at correct location and height with tubing routed to appropriate reference space (e.g., corridor).

.2 Verify sensor power, addressing, and communication with EMCS.

.3 Verify sensor engineering units (Pa or in. w.g.) and ranges are per design.

.4 With doors open and spaces at neutral condition, perform sensor zeroing according to manufacturer instructions and verify readings are within ±0.2 Pa of zero.

.5 With doors closed and system operating at design offsets, verify room pressure meets design setpoint (e.g., –5 Pa relative to corridor) within ±1 Pa.

.6 Open and close the lab door several times; verify control system re-establishes room pressure within 30 seconds (or project criteria).

.7 Simulate airflow failure and verify room pressure alarm is generated when pressure departs from allowable range and is annunciated at EMCS.

3.4 Rooftop Makeup Air Unit (MAU)

.1 Confirm installation per manufacturer requirements, including clearances, access, drain pans, and filters.

.2 Verify filters installed and clean; record initial filter pressure drop.

.3 Verify electric heater, DX coil, and condensate drainage are complete and correct.

.4 Verify correct rotation and operation of supply fan and any exhaust/relief fans.

.5 Confirm operation of freezestat / low temperature protection.

.6 Verify high temperature limit for electric heat operates correctly and trips/resets as specified.

.7 Verify unit shuts down or goes to safe mode on smoke alarm, fire alarm, or emergency stop signal as per design.

.8 In heating mode, step supply air temperature setpoint and verify electric heat stages modulate to maintain setpoint within specified deadband.

.9 In cooling mode (when ambient conditions or simulated load permit), verify DX cooling stages modulate to maintain supply air temperature setpoint.

.10 Verify safeties and lockouts for DX system generate alarms at EMCS.

.11 Verify unit responds correctly to occupied/unoccupied modes including setback temperatures and fan operation.

3.5 Variable Frequency Drives (VFDs)

.1 1 The Contractor shall perform functional testing of each Variable Frequency Drive (VFD) associated with HVAC fans and pumps under this Section. As a minimum, testing shall verify:

.1 Proper installation, nameplate data, and wiring, including power, ground, and control interlocks.

.2 Correct motor rotation and ability to start/stop the motor from both local and EMCS commands, where applicable.

.3 Speed control via the specified control signal (e.g., 0–10 VDC or 4–20 mA) over the full operating range, confirming that commanded speed and actual speed/Hz correspond within acceptable tolerance.

.4 Operation at minimum and maximum design speeds without nuisance trips, excessive vibration, or abnormal noise.

.5 Correct response to safety and interlock signals (e.g., freezestat trip, fire alarm shutdown, process interlocks) including proper restart logic where specified.

.2 VFD alarm and fault functions shall be verified, including but not limited to overcurrent, overvoltage, undervoltage, ground fault, and over-temperature. For each condition simulated or induced per manufacturer guidance, the test shall confirm that:

.1 The drive trips or limits operation as intended.

.2 The fault is clearly indicated on the drive keypad and at the EMCS, with appropriate alarm text.

.3 The required manual or automatic reset sequence is correctly implemented per the sequences of operation.

.3 Where VFDs are integrated with the EMCS, trend logs shall be configured during testing to record minimum: drive run status, output frequency, command signal, and any trip/fault status at intervals suitable to capture dynamic behaviour during tests. Trend data shall be included with the commissioning report to demonstrate stable operation, correct tracking of setpoints, and absence of recurring trips.

3.6 Room-Level Integrated Tests

.1 With all systems in normal occupied mode, verify each lab room maintains design supply and exhaust flows, room pressure offset, and room temperature setpoint under typical load conditions.

.2 Perform door operation tests while monitoring room pressure and airflow; verify setpoint is recovered within specified time and alarms are generated if room pressure remains outside allowable range longer than specified.

.3 Simulate failure of room pressure sensor and communication failure to a critical control valve; verify fail-safe positions and alarms as per sequences of operation.

.4 Simulate MAU shutdown; verify lab valves and controls behave per design sequences and appropriate alarms are generated.

3.7 Trend Logging and Performance Verification

.1 After successful FPT, maintain trend logs for a minimum of 7 consecutive days of normal operation for representative conditions (occupied/unoccupied periods).

.2 Analyze trends to confirm:

.1 Lab rooms maintain pressure within design range for at least 95% of occupied time.

.2 Room temperatures remain within setpoint ± allowable deadband for at least 95% of occupied time.

.3 MAU supply air temperature is stable and within setpoint range.

.4 No recurring alarms related to pressure, temperature, or airflow.

.3 Provide summary report including plots, findings, and recommended corrective actions (if any).

3.8 Deficiencies and Corrective Actions

.1 Record all deficiencies identified during commissioning, including description, responsible party, and target completion date.

.2 Re-test affected systems after corrective action is completed until acceptance criteria are met.

3.9 Training

.1 Provide structured training for Owner's operations staff, minimum 2 hours, covering:

.1 Overview of lab ventilation and pressurization strategy.

.2 Operation of MAU, critical control valves, and room pressure sensors.

.3 EMCS graphics, setpoints, alarms, and trend retrieval.

.4 Routine maintenance requirements and recommended checks.

.2 Provide training agenda and sign-in sheet as part of commissioning closeout documentation.

3.10 Seasonal Deferred Testing

.1 Where outdoor conditions or building occupancy do not permit complete verification of all operating modes at Substantial Performance (e.g., DX cooling during winter conditions, economizer operation, or peak summer load operation), the Contractor shall perform seasonal deferred testing at the first appropriate season following Substantial Performance, or as directed by the Owner. Seasonal testing shall include all remaining functional performance tests, trend logs, and fine-tuning of setpoints required to

demonstrate that systems perform in accordance with the design intent and sequences of operation under representative seasonal conditions. The Contractor shall coordinate seasonal testing with the Owner and provide a proposed test plan and schedule a minimum of two (2) weeks in advance, and submit updated test reports and deficiency corrections upon completion. Any deficiencies identified during seasonal testing shall be corrected by the Contractor at no additional cost to the Owner.

3.11 Coordination Between Controls and Division 23 Equipment

.1 The Mechanical (Division 23) Contractor and Controls Contractor (Division 25) shall jointly coordinate all control interfaces, field devices, and sequences of operation associated with Division 23 equipment.

.2 Prior to start-up and commissioning, the Mechanical and Controls Contractors shall jointly review each equipment schedule and sequence of operation, confirm all control points and terminations, and resolve any discrepancies between mechanical drawings, control diagrams, and EMCS point lists. All interlocks (e.g., unit enable, proof of flow, fire alarm shutdown, freeze protection, VFD run feedback) shall be clearly identified, wired, and verified by a documented point-to-point check before functional testing.

.3 During functional performance testing, both the Mechanical Contractor and Controls Contractor shall be present as required to operate field equipment, adjust setpoints, and modify EMCS programming to achieve the specified performance. Any changes to control logic or setpoints required to meet design intent shall be recorded and incorporated into the final “as-implemented” sequences of operation, control drawings, and point lists submitted at project closeout.

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 91 13.13 – Commissioning (Cx) Requirements: supplemented as specified herein.

.2 Section 22 05 15 – Plumbing Specialities and Accessories.

.3 Section 23 05 93 – Testing, Adjusting and Balancing for HVAC.

.4 Section 23 08 02 – Cleaning and Start-up of Mechanical Piping Systems.

.5 Section 23 11 13 – Facility Fuel-Oil Piping.

.6 Section 22 11 18 – Domestic Water Piping Copper.

.7 Section 23 21 13.02 – Hydronic Systems: Steel.

.8 Section 23 23 00 – Copper Tubing and Fittings Refrigerant.

1.2 REFERENCES

1.3 CLEANING AND START-UP OF MECHANICAL PIPING SYSTEMS

.1 In accordance with Section 23 08 02 - Cleaning and Start-up of Mechanical Piping Systems.

1.4 HYDRONIC SYSTEMS - PERFORMANCE VERIFICATION (PV)

.1 Perform hydronic systems performance verification after cleaning is completed and system is in full operation.

.2 When systems are operational, perform following tests:

.1 Conduct full scale tests at maximum design flow rates, temperatures and pressures for continuous consecutive period of two (2) working days to demonstrate compliance with design criteria.

.2 Verify performance of hydronic system circulating pumps as specified in relevant technical sections, recording system pressures, temperatures, fluctuations by simulating maximum design conditions and varying.

.1 Pump operation.

.2 Boiler and/or chiller operation.

.3 Pressure bypass open/closed.

.4 Control pressure failure.

.5 Maximum heating demand.

.6 Maximum cooling demand.

.7 Boiler and/or chiller failure.

.8 Cooling tower (and/or industrial fluid cooler) fan failure.

.9 Outdoor reset. Re-check heat exchanger output supply temperature at 100% and 50% reset, maximum water temperature.

1.5 HYDRONIC SYSTEM CAPACITY TEST

.1 Timing: After:

.1 TAB has been completed

.2 Verification of operating, limit, safety controls.

.3 Verification of primary and secondary pump flow rates.

.4 Verification of accuracy of temperature and pressure sensors and gauges.

.2 Calculate system capacity at test conditions.

.3 Using manufacturer's published data and calculated capacity at test conditions, extrapolate system capacity at design conditions.

.4 When capacity test is completed, return controls and equipment status to normal operating conditions.

.5 Submit sample of system water to approved testing agency to determine if chemical treatment is correct. Include cost.

.6 Heating system capacity test:

.1 Perform capacity test when ambient temperature is within 10% of design conditions. Simulate design conditions by:

.1 Increasing OA flow rates through heating coils (in this case, monitor heating coil discharge temperatures at all times to ensure that coils are not subjected to freezing conditions) or

.2 Reducing space temperature by turning off heating system for sufficient period of time before starting testing.

.2 Test procedures:

.1 Open fully heat exchanger, heating coil and radiation control valves.

.2 With boilers on full firing and hot water heating supply temperature stabilized, record flow rates and supply and return temperatures simultaneously.

.3 Conduct flue gas analysis test on boilers at full load and at low fire conditions.

.7 Chilled water system capacity test:

.1 Perform capacity test when ambient temperature is within 10% of design conditions. Simulate design conditions by:

.1 Adding heat from building heating system or

.2 Raising space temperature by turning off cooling and air systems for sufficient period of time before starting testing and pre-heating building to summer design space temperature (occupied) or above. Set OAD and RAD for minimum outside

air if OAT is near outside design temperature or to maximum recirculation if RAT is greater that OAT. RAT to be at least 23^{0}C.

.2 Test procedures:

.1 Open fully cooling coil control valves.

.2 Set thermostats on associated AHU's for maximum cooling.

.3 Set AHU's for design maximum air flow rates.

.4 Set load or demand limiters on chillers to 100%

.5 After system has stabilized, record chilled water, condenser water, etc., flow rates and supply and return temperatures simultaneously.

1.6 SANITARY AND STORM DRAINAGE SYSTEMS

.1 Buried systems: Perform tests prior to back-filling. Perform hydraulic tests to verify grades and freedom from obstructions.

.2 Ensure that traps are fully and permanently primed.

.3 Ensure that fixtures are properly anchored, connected to system.

.4 Operate flush valves, tank and operate each fixture to verify drainage and no leakage.

.5 Cleanouts: Refer to Section 22 05 15 - Plumbing Specialities and Accessories.

.6 Roof drains:

.1 Refer to Section 22 05 15 - Plumbing Specialities and Accessories.

.2 Remove caps as required.

1.7 REPORTS

.1 In accordance with Section 01 91 13.13 –Commissioning (Cx) Requirements: supplemented as specified herein.

1.8 TRAINING

.1 In accordance with Section 01 91 13.13 –Commissioning (Cx) Requirements: supplemented as specified in relevant specification sections

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes.

.1 Materials and installation for steel piping, valves and fittings for hydronic systems in building services piping.

1.2 RELATED SECTIONS.

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 35 29.06- Health and Safety Requirements.

.3 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.4 Section 01 78 00 - Closeout Submittals.

.5 Section 21 05 01 - Common Work Results -Mechanical.

.6 Section 23 05 00 – Common Work Results for Plumbing.

.7 Section 23 05 15 - Common Installation Requirements for HVAC Pipework.

.8 Section 23 05 17 - Pipe Welding.

.9 Section 23 05 23.01 - Valves - Bronze.

.10 Section 23 05 23.02 - Valves - Cast Iron

.11 Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

.12 Section 23 07 13 – Duct Insulation.

.13 Section 23 10 16 – HVAC Equipment Insulation.

.14 Section 23 07 19 – HVAC Piping Insulation.

.15 Section 23 08 01 - Performance Verification of Mechanical Piping.

.16 Section 23 08 02 - Cleaning and Start-up of Mechanical Piping Systems.

1.3 REFERENCES

.1 American Society of Mechanical Engineers (ASME).

.1 ASME B16.1, Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.

.2 ASME B16.3, Malleable Iron Threaded Fittings: Classes 150 and 300.

.3 ASME B16.5, Pipe Flanges and Flanged Fittings: NPS through NPS 24 Metric/Inch Standard.

.4 ASME B16.9, Factory-Made Wrought Buttwelding Fittings.

.5 ASME B18.2.1, Square Hex, Heavy Hex and Askew Head Bolts and Hex, Heavy Hex, Hex Flange. Loded Head and Lag Screws (Inch Series).

.6 ASME B18.2.2, Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series).

.2 American Society for Testing and Materials International, (ASTM).

.1 ASTM A47/A47M, Standard Specification for Ferritic Malleable Iron Castings.

.2 ASTM A53/A53M, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.

.3 ASTM A536, Standard Specification for Ductile Iron Castings.

.4 ASTM B61, Standard Specification for Steam or Valve Bronze Castings.

.5 ASTM B62, Standard Specification for Composition Bronze or Ounce Metal Castings.

.6 ASTM E202, Standard Test Method for Analysis of Ethylene Glycols and Propylene Glycols.

.3 American Water Works Association (AWWA).

.1 AWWA C111, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

.4 Canadian Standards Association (CSA International).

.1 CSA B242, Groove and Shoulder Type Mechanical Pipe Couplings.

.2 CAN/CSA W48, Filler Metals and Allied Materials for Metal Arc Welding.

.5 Manufacturer's Standardization of the Valve and Fittings Industry (MSS).

.1 MSS-SP-67, Butterfly Valves.

.2 MSS-SP-70, Cast Iron Gate Valves, Flanged and Threaded Ends.

.3 MSS-SP-71, Cast Iron Swing Check Valves Flanged and Threaded Ends.

.4 MSS-SP-80, Bronze Gate, Globe, Angle and Check Valves.

.5 MSS-SP-85, Cast Iron Globe and Angle Valves, Flanged and Threaded Ends.

.6 Province of Newfoundland and Labrador Boiler, Pressure Vessel and Compressed Gas Regulations.

1.4 SUBMITTALS

.1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.

.2 Closeout Submittals.

.1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals, and include the following:

.1 Special servicing requirements.

.3 Grooved joint couplings and fittings to be indicated on product submittals and to be specifically identified with the applicable style or series designation.

.4 Grooved products manufacturer to supply on site tools and products for installation training.

.5 All grooved products to be of one manufacturer.

.6 Groove products to have current CRN numbers.

1.5 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.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal.

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal, paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Fold up metal and plastic banding, flatten and place in designated area for recycling.

1.7 MAINTENANCE

.1 Extra Materials.

.1 Provide following spare parts:

.1 Valve seats: one for every ten valves, each size. Minimum one.

.2 Discs: one for every ten valves, each size. Minimum one.

.3 Stem packing: one for every ten valves, each size. Minimum one.

.4 Valve handles: two of each size.

.5 Gaskets for flanges: one for every ten flanges.

PART 2 PRODUCTS

2.1 PIPE

.1 Steel pipe: to ASTM A53/A53M, Grade B as follows:

.1 To NPS 6: schedule 40.

.2 NPS 8 and 10: schedule 40.

.3 NPS 12 and over, 10 mm wall thickness.

2.2 PIPE JOINTS

.1 NPS 2 and under: screwed fittings with PTFE tape or lead-free pipe dope.

.2 NPS 2-1/2 and over: welding fittings and flanges to CAN/CSA W48.

.3 Roll grooved: rigid coupling to CSA B242.

.4 Flexible couplings to CSA B242 to be used where noted on drawings and on elbows utilized on expansion joints.

.5 Flanges: plain ASME, B16.1, raised face, slip-on or weld neck to ASME B16.5.

.6 Orifice flanges: slip-on raised face, 2100 kPa.

.7 Flange gaskets: to AWWA C111

.8 Pipe thread: taper.

.9 Bolts and nuts: to ASME B18.2.1 and ASME B18.2.2.

.10 Roll grooved coupling gaskets: NPS 2 to 8, type EHP, EPDM high performance, -40°C to +120°C for continuous operation, NPS 10 and above type EPDM, -30°C to +110°C for continuous acceptable on hot hater, glycol water, chilled water and condenser water.

2.3 FITTINGS

.1 Screwed fittings: malleable iron, to ASME B16.3, Class 150.

.2 Pipe flanges and flanged fittings:

.1 Cast iron: to ASME B16.1, Class 125.
.2 Steel: to ASME B16.5.

.3 Butt-welding fittings: steel, to ASME B16.9.

.4 Unions: malleable iron, to ASTM A47/A47M and ASME B16.3.

.5 Fittings for roll grooved piping: malleable iron to ASTM A47/A47M, ductile iron to ASTM A536.

2.4 VALVES

.1 Connections:

.1 NPS2 and smaller: screwed ends.
.2 NPS2.1/2 and larger: Flanged or grooved ends.

.2 Gate valves: to MSS-SP-70 and MSS-SP-80 Application: Isolating equipment, control valves, pipelines:

.1 NPS 2 and under:

.1 Mechanical Rooms: Class 125 rising stem, solid wedge disc, as specified Section 23 05 23.01 – Valves – Bronze.

.2 Elsewhere: Class 125, non- rising stem, solid wedge disc, as specified Section 23 05 23.01 – Valves – Bronze.

.2 NPS 21/2 and over:

.1 Mechanical Rooms: rising stem, solid wedge disc, lead free bronze trim, as specified Section 23 05 23.02 – Valves – Cast Iron.

.2 Elsewhere: Non- rising stem, solid wedge disc, lead free bronze trim, as specified Section 23 05 23.02 – Valves – Cast Iron.

.3 Butterfly valves: to MSS-SP-67 Application: Isolating cells or section of multiple component equipment (eg. multi-section coils, multi-cell cooling towers).

.1 NPS 2 1/2 and over: Lug type or Grooved ends: as specified Section 23 05 17 – Pipe Welding.

.4 Globe valves: to MSS-SP-80 and 85 Application: Throttling, flow control, emergency bypass.

.1 NPS 2 and under:

.1 Mechanical Rooms: with plug disc, as specified Section 23 05 23.01 – Valves – Bronze.

.2 Elsewhere: Globe, with composition disc, as specified Section 23 05 23.01 – Valves - Bronze.

.2 NPS 2 1/2 and over:

.1 With composition bronze disc, bronze trim, as specified Section 23 05 23.02 – Valves – Cast Iron.

.5 Balancing, for TAB:

.1 Sizes: Calibrated balancing valves, as specified this section.

.2 NPS 2 and under:

.1 copper alloy body threaded and, 2.1 MPa rating, globe style, self sealing measuring ports for temperature or pressure probes, locking tamper proof setting.

.2 Mechanical Rooms and Elsewhere: Globe, with plug disc as specified Section 23 05 23.01 - Valves – Bronze.

.3 In lieu of standard malleable iron or copper fittings the Contractor may install the following component system:

.1 Union port fitting with air vent and pressure/temperature port.

.2 Balancing valve, strainer with drain valve, ball valve combination may also be used.

.3 NPS 2 ½ and over:

.1 Ductile iron body, flanged or grooved connections, 1700 kPa rating minimum, globe style, self sealing measurement parts for temperature or pressure probes, locking tamper proof setting.

.6 Drain valves: Gate, Class 125 non-rising stem, solid wedge disc, as specified Section 23 05 23.01 – Valves - Bronze.

.7 Bypass valves on gate and globe valves NPS 8 and larger: NPS ¾ as specified Section 23 05 23.01 – Valves - Bronze.

.8 Swing check valves: to MSS-SP-71.

.1 NPS 2 and under:

.1 Class 125 swing, with composition disc, as specified Section 23 05 23.01 – Valves - Bronze.

.2 NPS 2 1/2 and over:

.1 Flanged or grooved ends: as specified Section 23 05 23.02 – Valves – Cast Iron.

.9 Silent check valves:

.1 NPS 2 and under:

.1 As specified Section 23 05 23.01 – Valves – Bronze.

.2 NPS 2 1/2 and over:

.1 Flanged or grooved or wafer style ends: as specified Section 23 05 23.02 – Valves – Cast Iron.

.10 Ball valves:

.1 NPS 2 and under: as specified Section 23 05 23.01 – Valves - Bronze.

PART 3 EXECUTION

3.1 PIPING INSTALLATION

.1 Install pipework in accordance with Section 23 05 15 - Common Installation Requirements for HVAC Pipework by certified journeyperson and authority having jurisdiction.

3.2 CIRCUIT BALANCING VALVES

.1 Install flow measuring stations and flow balancing valves as indicated.

3.3 CLEANING, FLUSHING AND START-UP

.1 In accordance with Section 23 08 02 – Cleaning and Start-up of Mechanical Piping Systems.

3.4 TESTING

.1 Test system in accordance with Section 21 05 01 – Common Work Results - Mechanical. Minimum 1.5 times working pressure or 1000 kPa.

3.5 BALANCING

.1 Balance water systems to within plus or minus 5 % of design output.

.2 Refer to Section 23 05 93 – Testing, Adjusting and Balancing for HVAC, for applicable procedures.

3.6 PERFORMANCE VERIFICATION

.1 In accordance with Section 23 08 01 – Performance Verification of Mechanical Systems.

.2 Provide copies of test reports for Commissioning Manuals.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section includes:

.1 Materials and installation of low-pressure metallic ductwork, joints and accessories.

1.2 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 35 29.06 – Health and Safety Requirements

.3 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.4 Section 01 91 13.13 – Commissioning (Cx) Requirements.

.5 Section 07 84 00 – Firestopping

.6 Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment.

.7 Section 23 05 94 – Pressure Testing of Ducted Air Systems.

.8 Section 23 40 00 – HVAC Air Filtration

1.3 REFERENCES

.1 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).

.2 American Society for Testing and Materials International, (ASTM).

.1 ASTM A 480/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 A 653/A653M, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

.3 Department of Justice Canada (Jus).

.1 Canadian Environmental Protection Act (CEPA).

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.1 Safety Data Sheets (SDS).

.5 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.

.6 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, 1st Edition.

.7 Transport Canada (TC).

.1 Transportation of Dangerous Goods Act (TDGA).

1.4 SUBMITTALS

.1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data: submit WHMIS SDS - Safety Data for the following:

.1 Sealants.

.2 Tape.

.3 Proprietary Joints.

1.5 QUALITY ASSURANCE

.1 Certification of Ratings:

.1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.2 During construction meet or exceed the requirements of SMACNA IAQ Guideline for Occupied Buildings under Construction.

.3 Installers to be certified to journeyperson level in sheet metal work.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Protect on site stored or installed absorptive material from moisture damage.

.2 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal, paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Separate for reuse and recycling and place in designated containers steel, metal, plastic waste in accordance with Waste Management Plan.

.5 Place materials defined as hazardous or toxic in designated containers.

.6 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.

.7 Fold up metal and plastic banding, flatten and place in designated area for recycling.

PART 2 PRODUCTS

2.1 SEAL CLASSIFICATION

.1 Classification as follows:

Maximum Pressure Pa	SMACNA Seal Class
> 1000	A
750	B
500	C
250	C
125	C

.2 Seal classification:

.1 Class A: longitudinal seams, transverse joints, duct wall penetrations and connections made airtight with sealant and tape.

.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 tape or combination thereof. Longitudinal seams unsealed.

2.2 SEALANT

.1 Sealant: oil resistant, polymer type flame resistant duct sealant. Temperature range of minus 30°C to plus 93°C.

2.3 TAPE

.1 Tape: polyvinyl treated, open weave fiberglass tape, 50 mm wide.

2.4 DUCT LEAKAGE

.1 In accordance with SMACNA HVAC Duct Leakage Test Manual.

2.5 FITTINGS

.1 Fabrication: to SMACNA.

.2 Radiused elbows:

.1 Rectangular: Centreline radius: 1.5 times width of duct.

.2 Round: smooth radius or five piece. Centreline radius: 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 45^0 entry on branch.

.2 Round main and branch: enter main duct at 45^0 with conical connection.

.3 Provide volume control damper in branch duct near connection to main duct.

.4 Main duct branches: with volume control damper.

.5 Transitions:

.1 Diverging: 20^0 maximum included angle.

.2 Converging: 30^0 maximum included angle.

.6 Offsets:

.1 Full short radiused elbows as indicated.

.7 Obstruction deflectors: maintain full cross-sectional area. Maximum included angles: as for transitions.

2.6 FIRESTOPPING

.1 Retaining angles around duct, on both sides of fire separation in accordance with Section 07 84 00 – Firestopping.

.2 Firestopping material and installation must not distort duct.

2.7 GALVANIZED STEEL

.1 Lock forming quality: to ASTM A653, G90 zinc coating.

.2 Thickness, fabrication and reinforcement: to SMACNA.

.3 Joints: to SMACNA or 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 316.

.2 Finish: No 4. finish on exposed side of duct in finished area's, No. 3 finish or lower where concealed.

.3 Thickness, fabrication and reinforcement: to SMACNA.

.4 Joints: to SMACNA and be continuous inert gas welded.

2.9 HANGERS AND SUPPORTS

.1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct. Maximum size duct supported by strap hanger: 500 mm.

.2 Hanger configuration: to SMACNA.

.3 Hangers: galvanized steel angle with black steel rods to ASHRAE or SMACNA following table:

Duct Size (mm)	Angle Size (mm)	Rod Size (mm)
up to 750	25x25x3	6
751 to 1050	40x40x3	6
1051 to 1500	40x40x3	10
1501 to 2100	50x50x3	10
2101 to 2400	50x50x5	10
2401 and over	50 x 50 x 6	10

.4 Upper hanger attachments:

.1 For concrete: manufactured concrete inserts.

.2 For steel joist: manufactured joist clamp steel plate washer.

.3 For steel beams: manufactured beam clamps:

PART 3 EXECUTION

3.1 GENERAL

.1 Do work in accordance with NFPA 90A, NFPA 90B, and SMACNA.

.2 Do not break continuity of insulation vapour barrier with hangers or rods. Insulate strap hangers 100 mm beyond insulated duct.

.3 Support risers in accordance with SMACNA.

.4 Install breakaway joints in ductwork on sides of fire separation. Do not place fire stopping material in expansion space between damper sleeve and fire partition.

.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.

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 or as follows:

Duct Size (mm)	Spacing (mm)
to 1500	3000
1501 and over	2500

3.3 SEALING AND TAPING

.1 Apply sealant to outside of joint to manufacturer's recommendations.

.2 Bed tape in sealant and recoat with minimum of one coat of sealant to manufacturers recommendations. Sealant and tape to be applied to full perimeter of duct.

3.4 LEAKAGE TESTS/COMMISSIONING

.1 Refer to Section 23 05 94 - Pressure Testing of Ducted Air Systems.

.2 In accordance with SMACNA HVAC Duct Leakage Test Manual.

.3 Do leakage tests in sections.

.4 Make trial leakage tests as instructed to demonstrate workmanship.

.5 Install no additional ductwork until trial test has been passed.

.6 Test section minimum of 30 m long with not less then three branch takeoffs and two 90º elbows.

.7 Complete test before insulation or concealment.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Materials and installation for duct accessories including flexible connections, access doors, vanes and collars.

1.2 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 35 29.06 – Health and Safety Requirements.

.3 Section 01 45 00 – Quality Control.

.4 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.5 Section 01 78 00 – Closeout Submittals.

1.3 REFERENCES

.1 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.1 Safety Data Sheets (SDS).

.2 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).

.1 SMACNA – HVAC Duct Construction Standards – Metal and Flexible.

1.4 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and data sheet. Indicate the following:

.1 Flexible connections

.2 Duct access doors.

.3 Turning vanes.

.4 Instrument test ports.

.2 Submit WHMIS SDS in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOC's for adhesive and solvents during application and curing.

.3 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.

.1 Certification of ratings: catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

.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 Manufacturer's Field Reports: manufacturer's field reports specified.

.7 Closeout Submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.

1.5 QUALITY ASSURANCE

.1 Pre-Installation Meetings:

.1 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installations.

.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.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, and corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan (WMP).

.4 Separate for reuse and recycling and place in designated containers steel, metal, and plastic waste in accordance with Waste Management Plan (WMP).

.5 Divert unused metal materials from landfill to metal recycling facility as approved by Owner.

PART 2 PRODUCTS

2.1 GENERAL

.1 Manufacture in accordance with SMACNA - HVAC Duct Construction Standards.

2.2 FLEXIBLE CONNECTIONS

.1 Frame: galvanized sheet metal frame 0.66 mm thick with fabric clenched by means of double locked seams.

.2 Material:

.1 Fire resistant, self extinguishing, neoprene coated glass fabric, temperature rated at minus 40^0C to plus 90^0C, density of 1.3 kg/m^2.

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 Hold open devices.
.2 300 x 300 mm glass viewing panels.
.3 Up to 300 x 300 mm: two sash locks complete with safety chain.
.4 301 to 450 mm: four sash locks complete with safety chain.
.5 451 to 1000 mm: piano hinge and minimum two sash locks.
.6 Doors over 1000 mm: piano hinge and two handles operable from both sides.
.1 Hold open devices.
.2 300 X 300 mm glass viewing panels.

.5 Equal to Ductmate.

2.4 TURNING VANES

.1 Factory or shop fabricated double thickness with trailing edge, to recommendations of SMACNA and as indicated.

2.5 INSTRUMENT TEST PORTS

.1 1.6 mm 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.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 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 Size:
  - .1 600 x 600 mm for person size entry.
  - .2 450 x 450 mm for servicing entry.
  - .3 300 x 300 mm for viewing.
  - .4 As indicated.
- .2 Locations:
  - .1 Fire and smoke dampers.
  - .2 Control dampers.
  - .3 Devices requiring maintenance.
  - .4 Required by code.
  - .5 Reheat coils.
  - .6 Elsewhere as indicated.

.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 Owner.

.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 and as indicated.

3.3 FIELD QUALITY CONTROL

.1 Manufacturer’s Field Services:

.1 Have manufacturer’s representative of products, supplied under this Section, review Work involved in the handling, installation/application, protection and cleaning, of its products and submit written reports, in acceptable format, to verify compliance of Work with Contract.

.2 Manufacturer’s Field Services: 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, or other Work, on which the 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 the Work, after cleaning is carried out.

.4 Obtain reports, within three (3) working days of review, and submit, immediately, to Owner.

3.4 CLEANING

.1 Perform cleaning operations as specified in Section 01 74 00 – Cleaning and in accordance with Manufacturer’s recommendations.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Balancing dampers for mechanical forced air ventilation and air conditioning systems.

1.2 RELATED SECTIONS:

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 35 29.06 – Health and Safety Requirements.

.3 Section 01 45 00 – Quality Control.

.4 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.5 Section 01 78 00 – Closeout Submittals.

1.3 REFERENCES

.1 Sheet Metal and Air Conditioning National Association (SMACNA)

.1 SMACNA HVAC Duct Construction Standards, Metal and Flexible.

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Safety Data Sheets (SDS).

1.4 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, and limitations.

.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Safety Data Sheets (SDS) in accordance with Section 01 33 00 – Submittal Procedures.

.2 Indicate the following:

.1 Specifications.

.2 Quality assurance submittals: submit following in accordance with Section 01 33 00 – Submittal Procedures.

.1 Certificates: Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Instructions: Submit manufacturer's installation instructions.

1.5 QUALITY ASSURANCE

.1 Health and Safety Requirements:

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 – Health and Safety Requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 61 00 – Common Product Requirements.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

PART 2 PRODUCTS

2.1 GENERAL

.1 Manufacture to SMACNA standards.

2.2 SINGLE BLADE DAMPERS

.1 Fabricate from same material as duct, 0.8 mm up to 450 mm wide, 1.6 mm maximum up to 1200 mm wide, 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: 100 mm.

.4 Bearings: pin in bronze bushings or 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: 2 % at 500 Pa.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install where indicated.

.2 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.

.3 For supply, return and exhaust systems, locate balancing dampers in each branch duct.

.4 Runouts to registers and diffusers: located as close as possible to main ducts.

.5 All dampers to be vibration free.

.6 Ensure damper operators are observable and accessible.

3.3 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

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Fans, motors, accessories, and hardware for commercial use.

1.2 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures

.2 Section 01 35 29.06 – Health and Safety Requirements.

.3 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.4 Section 01 78 00 – Closeout Submittals

.5 Section 23 05 13 – Common Motor Requirements for HVAC Equipment.

.6 Section 23 05 48 – Vibration and Seismic Control for HVAC Piping and Equipment.

.7 Section 23 33 00 – Air Duct Accessories.

1.3 REFERENCES

.1 American National Standards Institute/Air Movement and Control Association (ANSI/AMCA)

.1 ANSI/AMCA Standard 99, Standards Handbook.
.2 ANSI/AMCA Standard 300, Reverberant Room Method for Sound Testing of Fans.
.3 ANSI/AMCA Standard 301, Methods for Calculating Fan Sound Ratings from Laboratory Test Data.

.2 American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME)

.1 ANSI/AMCA 210, Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.

.3 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

.1 AHSRAE 51, Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Safety Data Sheets (SDS).

.5 National Electrical Manufacturers Association (NEMA)

.1 NEMA MG 1 Motors and Generators
.2 NEMA ICS 7.1 Safety Standard for Construction and Guide for Selection, Installation and Operation of Adjustable Drive Systems.

.6 The Master Painters Institute (MPI)

.1 Architectural Painting Specification Manual, MPI #18, Primer, Zinc Rich, Organic.

1.4 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.

.2 Capacity: flow rate, total static pressure, bhp W, efficiency, revolutions per minute, power, model, size, sound power data and as indicated on schedule.

.3 Fans: statically and dynamically balanced, constructed in conformity with AMCA 99.

.4 Sound ratings: comply with AMCA 301, tested to AMCA 300. Supply unit with AMCA certified sound rating seal.

.5 Performance ratings: based on tests performed in accordance with ANSI/AMCA 210. Supply unit with AMCA certified rating seal, except for propeller fans smaller than 300 mm diameter.

1.5 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, and limitations.

.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Safety Data Sheets (SDS) in accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop Drawings:

.1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

.3 Provide:

.1 Fan performance curves showing point of operation, BHP kW and efficiency.

.2 Sound rating data at point of operation.

.3 Dimensional data.

.4 Installation procedures.

.4 Indicate:

.1 Motors, sheaves, bearings, shaft details

.2 Minimum performance achievable with variable speed controllers and variable inlet vanes as appropriate.

.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.

.2 Instructions: submit manufacturer's installation instructions.

.6 Closeout Submittals:

.1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.6 QUALITY ASSURANCE

.1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.7 MAINTENANCE

.1 Extra Materials:

.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

.1 Spare parts to include:

.1 Matched sets of belts.

.2 Furnish list of individual manufacturer's recommended spare parts for equipment, include:

.1 Bearings and seals.

.2 Belts

.3 Addresses of suppliers.

.4 List of specialized tools necessary for adjusting, repairing or replacing.

1.8 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 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 PRODUCTS

2.1 FANS GENERAL

.1 Capacity: flow rate, static pressure, bhp, efficiency, revolutions per minute, power, model, size, sound power data and as indicated on schedule.

.2 Fans: statically and dynamically balanced, constructed in conformity with AMCA 99.

.3 Sound ratings: comply with AMCA 301, tested to AMCA 300. Unit shall bear AMCA certified sound rating seal.

.4 Performance ratings: based on tests performed in accordance with ANSI/AMCA 210, and ANSI/ASHRAE 51. Unit shall bear AMCA certified rating seal, except for propeller fans smaller than 300 mm diameter.

.5 Motors:

.1 Open drip proof outside of air stream, TEFC when in air stream, explosion proof as indicated in accordance with NEMA MG1.

.2 In accordance with Section 23 05 13 – Common Motor Requirements for HVAC Equipment supplemented as specified herein.

.3 For use with variable speed controllers where specified.

.4 Sizes as specified.

.5 Two speed with two windings and speeds of approximately 1200 or 900 r/min low and 1800 r/min high as indicated.

.6 Two speeds with split winding, constant horsepower or constant or variable torque as specified and speeds as indicated.

.6 Accessories and hardware: matched sets of V-belt drives, adjustable slide rail motor bases, belt guards, coupling guards, fan inlet and/or outlet safety screens as indicated and as specified in Section 23 05 13 – Common Motor Requirements for HVAC Equipment, inlet or outlet dampers and vanes and as indicated.

.7 Factory primed before assembly in colour standard to manufacturer.

.8 Scroll casing drains: as indicated.

.9 Finish on fume hood exhaust fans: heresite coated

.10 Bearing lubrication systems plus extension lubrication tubes where bearings are not easily accessible.

.11 Vibration isolation: to Section 23 05 48 - Vibration and Seismic Control for HVAC Piping and Equipment.

.12 Flexible connections: to Section 23 33 00 – Air Duct Accessories.

2.2 CENTRIFUGAL FANS

.1 Fan wheels:

.1 Welded steel or aluminum construction.

.2 Maximum operating speed of centrifugal fans not more than 40 % of first critical speed.

.3 Air foil or backward inclined blades, as indicated.

.2 Bearings: air handling quality, heavy duty, split pillow-block, flange mounted grease lubricated ball or roller self aligning type with oil retaining, dust excluding seals and a certified minimum rated life to ABMA L10 of 100,000 hours. Shaft seals on laboratory fume hood and biological safety cabinet exhaust fans:

.1 Single disc or stuffing box seals.

.3 Housings:

.1 Volute with inlet cones: fabricated steel for wheels 300 mm or greater, cast iron, or steel, for smaller wheels, braced, and with welded supports.

.2 For horizontally and vertically split housings provide flanges on each section for bolting together, with gaskets of non-oxidizing non-flammable material.

.3 Provide bolted latched airtight access doors with handles.

.4 Spark resistant construction Type B minimum where indicated.

.4 Variable volume control devices:

.1 Mounted by fan manufacturer.

.2 Adjustable inlet vanes: operated from a centre mechanism linked to each damper vane. Support each vane at ends in bronze bearings. On DWDI fans interconnect vanes to operate in unison. Provide locking devices for manual operation.

.3 Variable Speed Drives: to NEMA ICS 7.1.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 FAN INSTALLATION

.1 Install fans as indicated, complete with resilient mountings specified in Section 23 05 48 - Vibration and Seismic Control for HVAC and Piping Equipment, flexible electrical leads and flexible connections in accordance with Section 23 33 00 – Air Duct Accessories.

.2 Provide sheaves and belts required for final air balance.

.3 Bearings and extension tubes to be easily accessible.

.4 Access doors and access panels to be easily accessible.

.5 Install fans as indicated, with resilient mountings and flexible electrical leads.

.6 Pipe housing drain to nearest drain.

.7 Install fans in accordance with manufacturers instructions.

3.3 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.

3.4 COMMISSIONING

.1 Commissioning in accordance with Section 01 91 13.13 – Commissioning (Cx) Requirements.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section includes:

.1 Supply, return and exhaust grilles and registers, diffusers and linear grilles, for commercial and residential use.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.3 Section 01 78 00 - Closeout Submittals.

1.3 REFERENCES

.1 American Society of Heating Refrigerating and Air-Conditioning Engineers (ASHRAE).

.1 ASHRAE 70, Method of Testing for Rating the Performance of Air Outlets and Inlets.

1.4 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.

1.5 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, and limitations.

.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Safety Data Sheets (SDS) in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate following:

.1 Capacity

.2 Throw and terminal velocity

.3 Noise criteria

.4 Pressure drop

.5 Neck velocity

.2 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Instructions: submit manufacturer's installation instructions.

1.6 QUALITY ASSURANCE

.1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.7 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 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 PRODUCTS

2.1 GENERAL

.1 To meet capacity, pressure drop, terminal velocity, throw, noise level, neck velocity.

.2 Frames:

.1 Full perimeter gaskets.

.2 Plaster frames where set into plaster or gypsum board.

.3 Concealed fasteners.

.3 Concealed manual volume control damper operators as indicated.

.4 Colour: standard or as directed by Owner.

2.2 MANUFACTURED UNITS

.1 Grilles, registers and diffusers of same generic type to be product of one manufacturer.

2.3 SUPPLY GRILLES AND REGISTERS

.1 See Schedule.

2.4 RETURN AND EXHAUST GRILLES AND REGISTERS

.1 See Schedule.

2.5 DIFFUSERS

.1 See Schedule.

2.6 LINEAR GRILLES

.1 See Schedule.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install in accordance with manufacturers instructions.

.2 Install with flat head stainless steel or cadmium plated screws in countersunk holes where fastenings are visible.

.3 Bolt grilles, registers and diffusers, in place, in gymnasium and similar game rooms.

.4 Provide concealed safety chain on each grille, register and diffuser in gymnasium and similar game rooms and elsewhere.

3.3 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

PART 1 GENERAL

1.1 SUMMARY

.1 Rooftop mounted, self contained, single zone, 100% VAV make-up air unit. Unit shall consist of an insulated metal cabinet, an electric heating coil, and packaged DX cooling. Direct-drive supply air fan shall discharge supply air downwards as shown on contract drawings.

1.2 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 35 29.06 – Health and Safety Requirements

.3 Section 01 45 00 – Quality Control

.4 Section 01 74 21 – Construction/Demolition Waste Management and Disposal

.5 Section 01 78 00 – Closeout Submittals.

.6 Section 01 91 13.13 – Commissioning (Cx) Requirements.

.7 Section 23 08 02 – Cleaning and Startup of Mechanical Piping Systems

1.3 REFERENCES

.1 American National Standards Institute (ANSI)/Air Conditioning and Refrigeration Institute (ARI)

.1 ANSI/ARI 210/240, Unitary Air-Conditioning and Air-Source Heat Pump Equipment.
.2 ARI 270, Sound Rating of Outdoor Unitary Equipment.

.2 ANSI/UL 1995 B, Standard for Heating and Cooling Equipment.

.3 Canadian Standards Association (CSA)

.1 CSA B52, Mechanical Refrigeration Code.
.2 CSA C22.1, Canadian Electrical Code.

.4 Health Canada / Workplace Hazardous Materials Information System (WHMIS)]

.1 Safety Data Sheets (SDS)

.5 National Roofing Contractors Association (NRCA)

.6 National Fire Protection Association (NFPA)

.1 NFPA 90A, Installation of Air Conditioning and Ventilating Systems.

.7 American Bearing Manufacturer's Association (ABMA)

.1 ANSI/ABMA 9 Load Ratings and Fatigue Life for Ball Bearings
.2 ANSI/ABMA 11 Load Ratings and Fatigue Life for Roller Bearings.

.8 Air Movement and Control Association (AMCA)

.1 AMCA 300 Reverberaut Room Method for Sound Testing of Fans.

.9 National Electrical Manufacturer's Association (NEMA)

.1 NEMA MG1 Motors and Generators

.2 NEMA ICS 7-1 Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable Speed Drive Systems.

.10 Provincial Boiler, Pressure Vessel and Compressed Gas Regulations.

1.4 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 for packaged rooftop HVAC units.

.3 Submit WHMIS SDS in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOC's for adhesive and solvents during application and curing.

.4 Shop Drawings:

.1 Submit shop drawings to indicate project layout and dimensions; indicate:

.1 Equipment, piping, and connections, together with valves, strainers, control assemblies, thermostatic controls, auxiliaries and hardware, and recommended ancillaries which are mounted, wired and piped ready for final connection to building system, its size and recommended bypass connections.

.2 Piping, valves, fittings shipped loose showing final location in assembly.

.3 Control equipment shipped loose, showing final location in assembly.

.4 Complete internal panel pneumatic tube piping and wiring and external panel pneumatic tube piping and wiring, both as schematics and as actually assembled.

.5 Dimensions, internal and external construction details, recommended method of installation with proposed structural steel support, mounting curb details, sizes and location of mounting bolt holes; include mass distribution drawings showing point loads.

.6 Detailed composite wiring diagrams for control systems showing factory installed wiring and equipment on packaged equipment or required for controlling devices of ancillaries, accessories, controllers.

.7 Pump and fan performance curves.

.8 Details of vibration isolation.

.9 Estimate of sound levels to be expected across individual octave bands in dB referred to A rating.

.10 Type of refrigerant used.

.5 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.

.6 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.7 Instructions: submit manufacturer's installation instructions.

.8 Manufacturer's Field Reports: manufacturer's field reports specified.

.9 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals include data as follows:

.1 Indicate: brief description of unit, indexed, with details of function, operation, control, and service for components.

.2 Provide for units, manufacturer's name, type, year, number of units, and capacity.

1.5 QUALITY ASSURANCE

.1 Pre-Installation Meetings:

.1 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installations.

.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.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal, paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan (WMP).

.4 Separate for reuse and recycling and place in designated containers steel, metal, plastic waste in accordance with Waste Management Plan (WMP).

.5 Handle and dispose of hazardous materials in accordance with Canadian Environmental Protection Act (CEPA), Transportation of Dangerous Goods Act (TDGA), Regional and Municipal, regulations.

.6 Divert unused metal materials from landfill to metal recycling facility as approved by Owner.

1.7 WARRANTY

.1 Contractor hereby warrants that packaged rooftop HVAC refrigeration compressors will function and operate in accordance with GC 31.1, but for 5 Years.

PART 2 PRODUCTS

2.1 GENERAL

.1 Provide a factory-assembled, roof-mounted, self-contained, single-zone, 100% outdoor air make-up air unit with electric heating and packaged DX cooling, certified and labeled for use in Canada.

.2 Basis-of-Design Intent: Features and performance in this Section establish the minimum standard of quality and functionality. Other manufacturers may be submitted provided all requirements herein are met without reducing performance, accessibility, serviceability, safety, or durability.

.3 Unit shall include: insulated double-wall cabinet; outdoor-air weatherhood with integral washable intake screen; low-leak motorized outdoor-air damper; filter section; direct-drive supply fan with factory VFD; packaged DX cooling section; electric heat section; factory electrical/control center; and all integral safeties.

.4 Provide a prefabricated roof curb, minimum height 450 mm, compatible with the unit base and roofing requirements.

.5 Safety Listings/Standards: Unit shall be listed to UL/CSA 60335-2-40 (A2L equipment), and conform to CSA B52, CSA C22.1 (CEC), and NFPA 90A.

.6 Refrigerant: R-454B (A2L) unless otherwise indicated on the Drawings/Schedule. Provide all A2L safety features required by UL/CSA 60335-2-40 and CSA B52, including any refrigerant detection/mitigation when charge thresholds require it.

.7 Cooling/heating capacities, airflow, and external static pressure: as scheduled on Drawings.

2.2 CABINET

.1 Construction: Double-wall, galvanized steel panels with thermal/acoustic insulation throughout, including base pan. Minimum insulation thickness 25 mm.

.2 Coatings: Exterior cabinet surfaces to have a high-performance polyester coating meeting ASTM B117, 5,000-hour salt-spray resistance

.3 Base: Heavy-gauge perimeter base rail suitable for forklift and crane lifting; provide lifting points.

.4 Access: Hinged, gasketed access doors/panels to all serviceable components; provide tool-less latches where feasible.

.5 Drainage: Cooling-coil drain pan, positively sloped to drain connection; corrosion-resistant construction.

2.3 FANS

.1 Supply Fan: Direct-drive backward-curved plenum fan (or equal) dynamically balanced, mounted on heavy-gauge rails with neoprene vibration isolators.

.2 Motor and Drive: Premium-efficiency motor controlled by factory-mounted VFD capable of continuous speed modulation to maintain scheduled airflow/pressure.

.3 Performance: Meet scheduled airflow and external static pressure at the specified sound criteria. Provide fan curve demonstrating stable operation across the control range

2.4 AIR FILTERS

.1 Configuration: Two-stage filtration arranged in a V-bank immediately downstream of the outdoor-air intake.

.2 Ratings: Primary 2 in. MERV 8 disposable pleated filters plus secondary 4 in. MERV 14 disposable pleated filters.

.3 Access & Monitoring: Side-access filter racks with gasketing and hold-downs. Provide a differential pressure switch or transmitter with filter-dirty alarm point to BAS/controller.

.4 Install new air filters at substantial. Turn over complete set of spare filters to owner.

2.5 Electric Heaters

.1 High grade Open-coil **nickel-chromium alloy** elements with galvanized or stainless support frames, suitable for make-up-air duty.

.2 Controls:

.1 Panel board with modulating SCR controller for supply-air temperature regulation; minimum 0–100% modulation range.

.2 Indicating light centre.

.3 Remote thermostats as indicated.

.4 Fuseblocks (one per step unless otherwise specified).

.5 Built-in control transformer.

.6 Thermal cut outs: manual reset disc types, one per circuit, one linear bulb type automatic reset.

.7 Built-in un-fused disconnect switch.

.8 Elements control: accessible with protection against no air flow, short and grounds, and of self checking type.

.9 High limit temperature control: de-energize heating elements to protect against over heating.

.10 Supply fan: start before electric elements are energized and continue operating until temperature reaches minimum setting. Include switch for continuous fan operation.

.11 Unit-mounted, weatherproof service disconnect for the heater section.

.12 Ground-fault and short-circuit protection sized per CEC.

.13 Conform to Canadian Electrical Code CSA C22.1.

2.6 PACKAGED DX COOLING

.1 Hermetic scroll-type compressors mounted on neoprene vibration isolation, crankcase heater.

.2 Direct-drive condensing fans.

.3 ElectroFin coated evaporator and condensing coils ASTM-B-117 10,000 hr salt spray.

.4 Copper tube, aluminum fin coil assembly

.5 Refrigerant: R-454b.

.6 Electrical system shall have operating controls, oil and refrigerant pressure protection, motor overload protection, weatherproof electrical wiring with weatherproof, rain tight disconnect.

.7 Include refrigerant piping with, sight glass, filter drier and valves.

.8 Electrofin Coil Coating - Airstream and condensing coil

2.7 CONTROLS

.1 Provide factory-mounted, factory-programmed microprocessor controller as part of the packaged outdoor HVAC unit. Controller shall:

.1 Control supply-air temperature to the setpoint shown on the unit schedule.

.2 Coordinate operation of supply fan, electric preheat/reheat, and DX cooling.

.3 Include economizer/free-cooling logic where provided by the unit.-

.4 Provide adjustable cooling lockout (factory set ≈ 24°C outdoor air) and adjustable heating lockout (factory set ≈ 18°C outdoor air).

.5 Monitor unit safeties including refrigerant leak detection (A2L), dirty filter, fan status, coil frost protection (if provided), and high/low refrigerant pressure, and annunciate alarms.

.6 Include 7-day scheduling and occupied/unoccupied setpoints

.7 Controls to include

.1 Heating Inlet Air Sensor

.2 Cooling Inlet Air Sensor

.3 Dirty Filter Switch

.4 Inlet Damper End Switch

.5 Freeze Protection (Supply Air Low Limit)

.6 Airflow Proving Monitoring Contact

.8 Provide BACnet IP/Modbus Monitoring and Control communication for integration with the Building Management System (BMS).

.1 Unit shall permit Supply Fan Control, and temperature setpoint adjustments via bacnet BMS Control.

.2 All alarms, unit status, etc.

.2 Provide smoke detector for 100% outdoor air packaged unit in the location and configuration recommended by the unit manufacturer and in accordance with NFPA and local code.

2.8 Refrigerant Safety:

.1 Unit shall include factory A2L refrigerant leak detection and mitigation features as provided by the manufacturer, including alarm annunciation through the unit controller and to BMS.

2.9 CAPACITY

.1 Capacity: see schedule.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install as per manufacturers' instructions on roof curbs provided by manufacturer.

.2 Manufacturer's representative to certify installation, supervise start-up and commission unit.

.3 Run drain line from cooling coil condensate drain pan to discharge over roof.

3.3 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:

.1 Manufacturers shall provide direct assistance in setup and control and control integration with all trades.

.2 Have manufacturer's representative 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.

.3 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.

.4 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.

.2 Obtain reports within three (3) working days of review and submit immediately to Owner.

.3 Verify accessibility, serviceability of components including motorized dampers, filters coils, fans, motors, operators, humidifiers, sensors, electrical disconnects.

.4 Verify accessibility, cleanability, drainage of drain pans for coils, humidifiers.

.5 Performance Verification:

.1 Have manufacturer's authorized representative perform start-up, check unit safeties (including A2L leak detection where provided), verify supply-air temperature control, Supply Fan Speed control by BMS and and verify communication to BMS.

.2 Provide operator training and copies of controller setpoints.

.3 Rooftop Air Handling Units:

.1 Check for smooth, vibrationless correct rotation of supply fan impeller.

.2 Measure supply fan capacity.

.3 Adjust impeller speed as necessary and repeat measurement of fan capacity.

.4 Measure pressure drop for each component of air handling unit.

.5 Set outside air and return air dampers for the % of outside air required by design and repeat measurements of fan capacity.

.6 Measure DBT, WBT of SA,

.7 Measure air cooled condenser discharge DBT.

.8 Measure flow rates (minimum and maximum) of SA

.9 Simulate maximum cooling load and measure refrigerant hot gas and suction temperatures and pressures.

.10 Simulate maximum heating load and:

.1 Simulate minimum heating load and repeat measurements.

.11 Measure radiated and discharge sound power levels under maximum heating demand and under maximum cooling demand with compressors running.

.12 Verify operating control strategies, including:

.1 Freeze protection.

.2 Economizer cycle operation, temperature of change-over.

.3 Alarms.

.4 Voltage drop across thermostat wiring.

.5 Operation of remote panel including pilot lights, failure modes.

.13 Set zone mixing dampers for full heating and repeat measurements.

.4 Verify accessibility, serviceability of components including motorized dampers, filters, coils, fans, motors, operators, humidifiers, sensors, electrical disconnects.

.5 Verify accessibility, clean ability, drainage of drain pans for coils, humidifiers.

.6 Commissioning Reports:

.1 In accordance with Section 01 91 13.13 - Commissioning (Cx) Requirements: reports supplemented as specified herein. Include:

.1 Report forms as specified Section 01 91 13.13 - Commissioning (Cx) Requirements: Report Forms and Schematics.

3.4 DEMONSTRATION

.1 Training: in accordance with Section 01 91 13.13 - Commissioning (Cx) Requirements: Training of O&M Personnel, supplemented as specified.

3.5 CLEANING

.1 Perform cleaning operations as specified in Section 01 74 00 – Cleaning and in accordance with manufacturer's recommendations.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 General requirements for Venturi Valve controls and room pressure monitoring and controls.

1.2 RELATED SECTIONS

.1 The contractor is to ensure that all related work is co-ordinated among all specification sections, as well as between other Divisions, and that the tender price includes all related work. The referenced sections below are for guidance only and are not necessarily a complete list of related sections.

.2 Section 01 33 00 – Submittal Procedures.

.3 Section 01 35 29.06 – Health and Safety Requirements.

.4 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.5 Section 01 91 13 – General Commissioning (Cx) Requirements.

.6 Section 09 91 23 - Interior Painting.

.7 Section 25 01 11 - EMCS: Start-up, Verification and Commissioning.

.8 Section 25 01 12 - EMCS: Training.

.9 Section 25 05 02 - EMCS: Submittals and Review Process.

.10 Section 25 05 03 - EMCS: Project Record Documents.

.11 Section 25 05 54 - EMCS: Identification.

.12 Section 25 05 60 - EMCS: Field Installation.

.13 Section 25 08 20 - EMCS: Warranty and Maintenance.

.14 Section 25 10 01 - EMCS: Local Area Network (LAN).

.15 Section 25 10 02 - EMCS: Operator Work Station (OWS).

.16 Section 25 30 01 - EMCS: Building Controllers

.17 Section 25 30 02 - EMCS: Field Control Devices.

.18 Section 25 90 01 - EMCS: Site Requirements, Applications and Systems Sequences of Operation.

1.3 REFERENCES

.1 American National Standards Institute (ANSI)

.1 ANSI/ISA 5.5, Graphic Symbols for Process Displays.

.2 American National Standards Institute (ANSI)/ Institute of Electrical and Electronics Engineers (IEEE).

.1 ANSI/IEEE 260.1, American National Standard Letter Symbols Units of Measurement (SI Units, Customary Inch-Pound Units, and Certain Other Units).

.3 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).

.1 ASHRAE STD 135, BACNET - Data Communication Protocol for Building Automation and Control Network.

.4 Canadian Standards Association (CSA International).

.1 CAN/CSA-Z234.1, Canadian Metric Practice Guide.

.5 Consumer Electronics Association (CEA).

.1 CEA-709.1-B, Control Network Protocol Specification.

.6 Department of Justice Canada (Jus).

.1 Canadian Environmental Assessment Act (CEAA).
.2 Canadian Environmental Protection Act (CEPA).

.7 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.1 Material Safety Data Sheets (MSDS).

.8 Transport Canada (TC).

.1 Transportation of Dangerous Goods Act (TDGA).

.9 National Electrical Manufacturers Association (NEMA)

1.4 ACRONYMS, ABBREVIATIONS AND DEFINITIONS

.1 Acronyms used in EMCS.

.1 AEL - Average Effectiveness Level
.2 AI - Analog Input
.3 AO - Analog Output
.4 BACnet - Building Automation and Control Network
.5 BC(s) - Building Controller(s)
.6 BECC - Building Environmental Control Centre
.7 CAB - Canadian Automated Building (CAB) Protocol
.8 CAD - Computer Aided Design
.9 CDL - Control Description Logic
.10 CDS - Control Design Schematic
.11 COSV - Change of State or Value
.12 CPU - Central Processing Unit
.13 DI - Digital Input
.14 DO - Digital Output
.15 DP - Differential Pressure
.16 ECU - Equipment Control Unit
.17 EMCS - Energy Monitoring and Control System
.18 HVAC - Heating, Ventilation, Air Conditioning
.19 IDE - Interface Device Equipment
.20 I/O - Input/Output

.21 ISA - Industry Standard Architecture
.22 LAN - Local Area Network
.23 LCU - Local Control Unit
.24 MCU - Master Control Unit
.25 NC - Normally Closed
.26 NO - Normally Open
.27 OS - Operating System
.28 O&M - Operation and Maintenance
.29 OWS - Operator Work Station
.30 PC - Personal Computer
.31 PCI - Peripheral Control Interface
.32 PCMCIA - Personal Computer Micro-Card Interface Adapter
.33 PID - Proportional, Integral and Derivative.
.34 RAM - Random Access Memory
.35 ROM - Read Only Memory
.36 SP - Static Pressure
.37 TCU - Terminal Control Unit
.38 USB - Universal Serial Bus
.39 UPS - Uninterruptible Power Supply
.40 VV – Venturi Valve
.41 WAN- Wide Area Network

1.5 DEFINITIONS

.1 Point: may be logical or physical.

.1 Logical points: values calculated by system such as setpoints, totals, counts, derived corrections and may include, but not limited to result of and statements in CDL's.

.2 Physical points: inputs or outputs which have hardware wired to controllers which are measuring physical properties, or providing status conditions of contacts or relays which provide interaction which related equipment (stop, start) and value or damper actuators.

.2 Point Name: composed of two parts, point identifier and point expansion.

.1 Point identifier: comprised of three descriptors, "area" descriptor, "system" descriptor and "point" descriptor, for which database to provide 25 character field for each point identifier. "System" is system that point is located on.

.1 Area descriptor: building or part of building where point is located.
.2 System descriptor: system that point is located on.
.3 Point descriptor: physical logical point description. For point identifier "area", "system" and "point" will be shortforms or acronyms. Database must provide 25 character field for each point identifier.

.2 Point expansion: comprised of three fields, one for each descriptor. Expanded form of shortform or acronym used in "area", "system", and "point" descriptors is placed into appropriate point expansion field. Database must provide 32 character field for each point expansion.

.3 Bilingual systems to include additional point identifier expansion fields of equal capacity for each point name for second language.

.1 System to support use of numbers and readable characters including blanks, periods or underscores to enhance user readability for each of the above strings.

.3 Point Object Type: points fall into following object types:

.1 AI (analog input)
.2 AO (analog output)
.3 DI (digital input)
.4 DO (digital output)
.5 Pulse inputs

.4 Symbols and engineering unit abbreviations utilized in displays: to ANSI/ISA S5.5.

.1 Printouts: to ANSI/IEEE 260.1.
.2 Refer also to Section 25 05 54 - EMCS: Identification.
.3

1.6 SYSTEM DESCRIPTION

.1 Refer to control schematics, sequences of operation and related Divisions of specifications for system architecture.

.2 Work covered by sections referred to above consists of fully operational pressure monitoring and venturi valve system including, but not limited to, following:

.1 Venturi Valve Controllers.
.2 Room pressure transducers.
.3 Wall mounted display for each room
.4 Data communications equipment necessary for a complete system
.5 Field control devices.
.6 Software/Hardware complete with full documentation.
.7 All associated controls wiring in conduit
.8 Complete operating and maintenance manuals.
.9 Training of personnel.
.10 Acceptance tests, technical support during commissioning, full documentation.
.11 Wiring interface co-ordination of equipment supplied by others.
.12 Miscellaneous work as specified in these sections and as indicated.

.3 Design Requirements:

.1 Design and provide conduit and wiring linking elements of system.
.2 Supply sufficient programmable controllers of types to meet project requirements. Quantity and points contents as reviewed prior to installation.
.3 Location of controllers as reviewed by Owner's Representative prior to installation.
.4 Provide utility and emergency power to all portions of the system.

.4 Language Operating Requirements:

.1 Provide English interface to system through operator selectable access codes.

.2 Use non-linguistic symbols for displays on graphic terminals wherever possible. Other information to be in English.

.5 Include, in English:

.1 Input and output commands and messages from operator-initiated functions and field related changes and alarms as defined in CDL's or assigned limits (i.e. commands relating to day-to-day operating functions and not related to system modifications, additions, or logic re-definements).

.6 The network design to be a fully distributed network, with each primary system having its own locally mounted dedicated controller. Any failure in the network shall **not** in any way affect the control of these primary systems. Connecting hardware points from one system to more than one controller is not acceptable. Any points associated with a system are to be connected to one dedicated controller. Each dedicated controller to have a locally mounted control and display device to allow the operator to view and adjust any point on the controller. This network shall be separate from other device networks and shall connect separately to the Div 25 supervisory controller.

.7 All control wiring associated with the communication network as well as all control wiring and conduit associated at 50 volts or less. Wire and conduit above 50 volts by Electrical Division.

.8 BACnet compliance: full compliance to the BACnet standard (ANSA/ASHRAE) 135, BACnet – A Data communication Protocol for Building Automation and Control Networks is mandatory. Down to the field device level, the system must meet BACnet standards for system architecture and administration, and use open communication protocols and user friendly programming and graphics.

.9 The Room Pressure control system for this facility to be accessible by designated personnel via the WAN for monitoring and programming purposes via BACnet interface to the building EMCS. This vendor shall provide all the required hardware, software, gateways, etc. needed to permit connection to the EMCS. This shall include all hardware, software, programming, start-up and commissioning required.

.10 Control setpoints including airflows shall be accessible fand writable from the Eastern Health EBI Interface.

1.7 SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Provide complete submittals for all critical control products including but not limited to:

.1 Product data sheets and catalog cuts for all valves, actuators, controllers, sensors, and accessories.

.2 Valve and device schedules indicating tag, location, size, Cv, pressure rating, close-off

pressure, fail position, and service.

.3 Control system configuration and network diagrams showing all panels, controllers, I/O modules, and communication links.

.4 Job specific wiring diagrams and point-to-point I/O lists identifying all connected devices, control points and interface to EMCS system.

.5 Sequence of operation and factory configuration descriptions for each critical control application.

.3 Submit for review:

.1 Equipment list and systems manufacturers within ten (10) working days after award of contract.

.4 Quality Control:

.1 Provide equipment and material from manufacturer's regular production, CSA certified, manufactured to standard quoted plus additional specified requirements.

.2 Where CSA certified equipment is not available submit such equipment to inspection authorities for special inspection and approval before delivery to site.

.3 Submit proof of compliance to specified standards with shop drawings and product data. Label or listing of specified organization is acceptable evidence.

.4 In lieu of such evidence, submit certificate from testing organization, approved by third party Engineer registered in Canada, certifying that item was tested in accordance with their test methods and that item conforms to their standard/code.

.5 For materials whose compliance with organizational standards/codes/ specifications is not regulated by organization using its own listing or label as proof of compliance, furnish certificate stating that material complies with applicable referenced standard or specification.

.6 Permits and fees: in accordance with general conditions of contract.

.7 Existing devices intended for re-use: submit test report.

1.8 QUALITY ASSURANCE

.1 Have local office for at least 5 years staffed by factory trained personnel capable of installing and providing instruction, routine maintenance and emergency service on systems.

.2 Provide record of successful previous installations submitting tender showing experience with similar installations utilizing computer-based systems.

.3 Have access to local supplies of essential parts and provide 7 year guarantee of availability of spare parts after obsolescence.

.4 Ensure factory qualified supervisory personnel continuously direct and monitor work and attend site meetings.

.5 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.6 Be able to provide factory trained personnel on site within two (2) working days notice or provide

instructions on maintenance and emergency service on system.

.7 BACnet devices to bear BACnet testing laboratories BTL mark and listed on BACnet manufacturers association web site.

1.9 DELIVERY, STORAGE AND HANDLING

.1 Material Delivery Schedule: provide Owner's Representative with "Materials Delivery Schedule" within 2 weeks after award of contract.

.2 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Separate for reuse and recycling and place in designated containers Steel, Metal, Plastic waste in accordance with Waste Management Plan.

.5 Place materials defined as hazardous or toxic in designated containers.

.6 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional, Municipal, and Provincial regulations.

.7 Label location of salvaged material's storage areas and provide barriers and security devices.

.8 Ensure emptied containers are sealed and stored safely.

.9 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative Owner's Representative.

.10 Fold up metal and plastic banding, flatten and place in designated area for recycling

PART 2 PRODUCTS

2.1 VENTURI AIR CONTROL VALVES

.1 General

.1 The airflow control device shall be a venturi shaped anemometer using differential pressure to measure airflow.

.2 Performance Requirements:

.1 The Venturi FX assembly shall respond within one second of a change in duct static pressure irrespective of the magnitude of pressure and/or flow change or quantity of airflow controllers on a manifold system.

.2 The airflow control device shall maintain a controlled accuracy within plus or minus five percent of signal over an airflow turndown range of no less than ten to one.

.3 No minimum duct diameter entrance shall be required to ensure accuracy.

.3 Construction:

.1 Non-Corrosive: The airflow control device for non-corrosive airstreams, such as supply, and general exhaust, shall be 14-gauge aluminum (valve body). The airflow measuring probes shall be constructed of 316 stainless steel. The damper shall be constructed with two 24-gauge galvanized steel plates and a Teflon gasket, mounted on a zinc plated steel shaft. . Supply valves shall be insulated with ¾ inch flexible closed-cell polyethylene insulation with a flame spread index not exceeding 25 and a smoke-developed index not exceeding 50 when tested according to ASTM 84.

.2 Actuation:

.1 For electrically actuated VAV operation with low-speed electric actuator shall be used to modulate the airflow over the range of the specific valve size.

.2 A UL or CSA listed electronic actuator shall be factory mounted to the valve. The actuator shall have sufficient torque to modulate the airflow against the maximum duct static pressure (within product specifications). Loss of main power shall cause the valve to maintain its last airflow position. This position shall be maintained until power is restored.

.3 Certification:

.1 Each airflow control device shall be factory calibrated to the job specific airflows as detailed on the plans and specifications using NIST traceable air stations and instrumentation having a combined accuracy of no more than plus or minus one percent of signal over the entire range of measurement. Airflow control devices shall be further calibrated and their accuracy verified to plus or minus five percent of signal at a minimum of 48 different airflows across the full operating range of the device.

.2 The calibration laboratory shall measure volumetric flow rate with the following calibration accuracy, in accordance with the scope of

.3 accreditation to ISO/IEC 17025:

.1 30 standard cubic feet per minute to 100 standard cubic feet per minute shall have 4.0 percent expanded uncertainty.

.2 100 standard cubic feet per minute to 250 standard cubic feet per minute shall have 2.5 percent expanded uncertainty.

.3 250 standard cubic feet per minute to 4200 standard cubic feet per minute shall have 1.4 percent expanded uncertainty.

.4 Each airflow control device shall be marked with device-specific factory calibration data. At a minimum, it should include the tag number, serial number, model number, characterization information (for electronic devices), and quality control inspection numbers. All information
shall be stored by the manufacturer for use with as-built documentation.

2.2 VENTURI VALVE CONTROLLER

.1 General

.1 Programable controller with UL 94 ABS housing for venturi valve control and monitoring with BACnet ms/tp interface

.2 2 Binary Inputs

.3 4 Analog Inputs

.4 2 Binary Outputs

.5 4 Analog Outputs

.6 Adjustable communication speed

.7 Remote mount option with panel

2.3 ROOM PRESSURE MONITOR

.1 General

.1 The Touchscreen Room Pressure Monitor shall be an electronic device utilizing a flow-through style sensor, furnished and installed to measure differential room pressure between adjacent spaces and display the information on a digital interface mounted outside the critical space.

.2 Construction:

.1 Digital Display Unit:

.1 The device shall be wall mounted in close proximity immediately outside the space being monitored.

.2 Each monitor shall have a 4.3 inch thin-film-transistor (TFT), dimmable, full-color touch-screen display with a 480 x 800 resolution.

.3 The display shall include additional light emitting diode (LED) status indication light bars on the sides of the device to ensure room status conditions are visible across a 180 degree viewing angle. Room status indication lights that are only visible from the face or across viewing angles of less than 180 degrees shall not be acceptable.

.4 The device must utilize a password-protected menu format to permit access for programming or set-point changes. Different levels of secure access shall be available using different passwords.

.2 Room Pressure Sensor:

.1 The PMT Touchscreen Room Pressure Monitor will have the capability to connect with up to three room pressure sensors.

.2 The device shall be mounted in the ceiling above the door separating the spaces for which differential room pressure is being measured.

.3 The sensor shall include cover plates on both sides of the ceiling for protection from drafts and/or cleaning solvents. The sensor cover plate shall be secured with security fasteners to prevent tampering.

.4 The sensor shall maintain an accuracy of plus or minus three percent of reading. Sensors with accuracy rated as a percentage of full scale shall not be acceptable.

.5 The sensor shall be capable of monitoring pressure from -0.1 to +0.1 inches water gauge.

.6 The device must utilize digital sensor technology. Flutter strips, ball-in-tube monitors or similar approaches that do not display actual quantitative differential room pressure information are not acceptable.

.7 Sensor drift shall be less than 0.0004 inches water gage (0.1 Pascal) per year. Sensors with yearly drift specified as a percentage of their full scale range shall not be acceptable.

.8 The sensor element shall be constructed in such a way that it is protected from the effects of dust or lint. Sensors with elements exposed to the airstream are not acceptable.

.3 Alarm:

.1 The monitor shall include the ability for both audible and visual alarming during a user defined event, including low pressure, high pressure, emergency condition, and door status.

.2 The alarm shall incorporate a user defined delay between time when the alarm set-point is met and when the alarm initiates.

.3 The monitor shall include a mute button which, when depressed during an alarm event, shall disable the audio alarm for a user defined length of time.

.4 Door Switches:

.1 Magnetic door switches shall be utilized to prevent nuisance alarms during room cleaning, patient transfer, or other situations requiring door(s) to be kept open for extended periods of time.

.2 The door switches shall be wired directly to the room pressure monitor, and the alarm delay duration shall be field adjustable through the service menu on the monitor display interface.

.5 Building Management System Interface:

.1 The room pressure monitor shall interface with the building management system (BMS) to allow remote monitoring of room parameters and permit settings adjustments over the building network. Adjustable parameters shall include airflow, offset, valve actuator voltage, room mode, and setpoints.

.2 The BMS shall use either analog inputs, digital inputs, or utilize BACnet network protocol to view and modify points or status of the room being measured. The use of BACnet protocol shall be native to the device and shall not require the use of an external gateway.

.3 The monitor shall include the ability to change MAC address, device instance, and baud rate (9600, 19200, 38400, 76800) for proper interfacing to BACnet network.

.4 The manufacturer shall be a member of BACnet international and the monitor shall be BTL listed.

2.4 ACCEPTABLE SYSTEMS, MANUFACTURERS

.1 Antec or approved equal.

.2 Proposed system to have communication capability utilizing BACnet Protocol.

.3 Panel to be NEMA rated to suit environmental requirements.

.4 Panels to have hinged doors equipped with standard keyed-alike cabinet locks, keyed to same key.

.5 Wiring within panels to be contained within properly sized rigid PVC slotted wall wire duct. All wiring within the wire duct to be concealed with a non-slip cover.

.6 Terminations for the connection of power wiring, communication wiring and field mounted devices to be at properly identified terminal blocks mounted within the control panel.

.7 All control panels to be provided with an internally mounted 120 volt duplex power receptacle.

.8 All control panels to be identified with permanently mounted Lamecoid tags to identify the control panel and the systems served by the control panel. Submit schedule of labels with shop drawing submission.

.9 Provide low voltage transformers in panels or elsewhere as required.

.10 Provide adaptors between metric and imperial components.

.11 Provisional alternates shall ensure prior to bidding that they can meet all performance aspects of the specification including but not limited to;

.1 All EMCS/BAS communication and read write capability

.2 Identify to the Owner any special service or access requirements that are different in any way to the specified products.

.3 Carry all additional costs that may arise from the use of this product over the existing.

.4 Have local trained support available for timely response to questions or product issues.

.5 Meet the requirements for local monitoring with an equivalent (as assessed by the engineer) to the PMT touch screen and the MVM monitors specified.

.6 Provide Owners Representative with a product demonstration prior to shop drawing submittals.

.12 Alternate products shall undertake a bench test with a supply and exhaust valve to demonstrate operation and communication

.13 Specified and alternates manufacturers shall provide a minimum 2 day training course on the operation and maintenance and troubleshooting of the room pressure control systems. System Manuals as well as programming tools are to be made available upon request.

PART 3 EXECUTION

3.1 MANUFACTURER'S RECOMMENDATIONS

.1 Installation to be to manufacturer's recommendations. Provide printed copies of recommendations with shop drawings or product data.

3.2 INSTALLATION

.1 The factory authorized technician shall complete all final terminations and set-up as well as programming of this system. This includes the display unit, the control board (if applicable), transformer, room pressure sensor(s), nylon tubing for sensor(s), all options and accessories including door switches, monitors, airflow control devices and network wires.

.2 Cable/wire Requirements:

.1 All cables/wires shall be provided and shall meet the requirements set by the manufacturer with all wiring installed in EMT conduit

.3 Start-up shall include verifying proper installation, testing and calibrating pressure sensor(s), setting all parameters and alarm set points, configuring and testing remote station (if applicable)

and verifying network communication (if applicable). Start up shall be completed by a factory trained and qualified technician. A record of all check shall be provided to the engineer for records.

.4 The Test and Balance (TAB) contractor shall be responsible for final verification of room pressure measurement and venturi valve flows.

.5 The manufacturer or the manufacturer's representative shall provide a minimum of eight hours of owner training to facilities personnel or other parties as required

3.3 Sequence

.1 Refer to Section 25 90 01 – EMCS: Site Requirements, Applications and Systems Sequence of Operation. Critical control programming to be setup by factory trained critical control vendor and coordinated with Honeywell.

3.4 Warranty

.1 The warranty shall commence upon substantial completion and extend for a period of 60 months for all airflow devices and 36 months for all control system components from substantial completion.

3.5 Commissioning

.1 Provide the services of a factory-trained and qualified manufacturer's technical representative for each major equipment item. The equipment supplier/Contractor shall be responsible to inspect the installation; develop and submit all required start-up forms, installation checklists, and functional performance verification checklists for review and approval by the Owner (and Commissioning Authority, where applicable); and perform start-up, set-up, and functional commissioning of the equipment. The manufacturer's representative shall adjust, program, and verify all operating parameters to achieve proper performance in accordance with the Contract Documents, and shall coordinate all commissioning activities with the General Contractor, other equipment suppliers, affected trades, and the controls contractor to ensure complete and proper integration with associated systems and the building automation system. Under the direction of the General Contractor, the equipment supplier/Contractor shall provide all labour, supervision, documentation, and repeat visits as required to deliver a fully operational, integrated, and successfully commissioned system

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes.

.1 Methods and procedures for start-up, verification and commissioning, for building Energy Monitoring and Control System (EMCS) and includes:

.1 Start-up testing and verification of systems

.2 Check-out demonstration or proper operation of components.

.3 On-site operational tests

1.2 RELATED SECTIONS

.1 The contractor is to ensure that all related work is co-ordinated among all specification sections, as well as between all Divisions, and that the tender price includes all related work. The referenced sections below are for guidance only and are not necessarily a complete list of related sections.

.2 Section 01 33 00 - Submittal Procedures.

.3 Section 01 78 00 - Closeout Submittals.

.4 Section 01 79 00.13 – Demonstration and Training for Building Commissioning.

.5 Section 01 91 13.13 - Commissioning (Cx) Requirements.

.6 Section 25 05 01 - EMCS: General Requirements.

1.3 DEFINITIONS

.1 For additional acronyms and definitions refer to Section 25 05 01 - EMCS: General Requirements.

.2 AEL (Average Effectiveness Level): ratio between total test period less any system downtime accumulated within that period and test period.

.3 Downtime: results whenever EMCS is unable to fulfill required functions due to malfunction of equipment defined under responsibility of EMCS contractor. Downtime is measured by duration, in time, between time that Contractor is notified of failure and time system is restored to proper operating condition. Downtime not to include following:

.1 Outage of main power supply in excess of back-up power sources, provided that:

.1 Automatic initiation of back-up was accomplished.

.2 Automatic shut-down and re-start of components was as specified.

.2 Failure of communications link, provided that:

.1 Controller automatically and correctly operated in stand-alone mode.

.2 Failure was not due to failure of any specified EMCS equipment.

.3 Functional failure resulting from individual sensor inputs or output devices, provided that:

.1 System recorded said fault.

.2 Equipment defaulted to fail-safe mode.

.3 AEL of total of all input sensors and output devices is at least 99 % during test period.

1.4 DESIGN REQUIREMENTS

.1 Confirm with Owner that Design Criteria and Design Intents are still applicable.

.2 Commissioning personnel to be fully aware of and qualified to interpret Design Criteria and Design Intents.

1.5 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Final Report: submit report to Owner.

.1 Include measurements, final settings and certified test results.

.2 Bear signature of commissioning technician and supervisor

.3 Report format to be approved by Owner before commissioning is started.

.4 Revise "as-built" documentation, commissioning reports to reflect changes, adjustments and modifications to EMCS as set during commissioning and submit to Owner in accordance with Section 01 78 00 - Closeout Submittals.

.5 Recommend additional changes and/or modifications deemed advisable in order to improve performance, environmental conditions or energy consumption.

1.6 CLOSEOUT SUBMITTALS

.1 Provide documentation, O&M Manuals, and training materials of O&M personnel for review by Owner before interim acceptance in accordance with Section 01 78 00 - Closeout Submittals and Section 25 05 03 – EMCS: Project Record Documents.

1.7 COMMISSIONING

.1 Do commissioning in accordance with Section 01 91 13.13 – General Commissioning (Cx) Requirements.

.2 Carry out commissioning under direction of Owner and in presence of Owner and Commissioning Co-ordinator.

.3 Inform, and obtain approval from, Owner in writing at least 14 days prior to commissioning or each test. Indicate:

.1 Location and part of system to be tested or commissioned.

.2 Testing/commissioning procedures, anticipated results.

.3 Names of testing/commissioning personnel.

.4 Correct deficiencies, re-test in presence of Owner until satisfactory performance is obtained.

.5 Acceptance of tests will not relieve Contractor from responsibility for ensuring that complete systems meet every requirement of Contract.

.6 Load system with project software. Install software for access to EMCS via dial up modem at Owner's designated site and at Transportation and Works Office in St. John's for use during commissioning and for their use afterwards. Where high speed internet is available, use web browser software, compatible with Windows Vista with access via Internet Explorer (latest edition).

.7 Perform tests as required.

1.8 COMPLETION OF COMMISSIONING

.1 Commissioning to be considered as satisfactorily completed when objectives of commissioning have been achieved and reviewed by Owner and Commissioning Co-ordinator.

1.9 ISSUANCE OF FINAL CERTIFICATE OF COMPLETION

.1 Final Certificate of Completion will not be issued until receipt of written approval indicating successful completion of specified commissioning activities including receipt of commissioning documentation.

PART 2 PRODUCTS

2.1 EQUIPMENT

.1 Provide sufficient instrumentation to verify and commission the installed system. Provide two-way radios.

.2 Instrumentation accuracy tolerances: higher order of magnitude than equipment or system being tested.

.3 Independent testing laboratory to certify test equipment as accurate to within approved tolerances no more than 2 months prior to tests.

.4 Locations to be approved, readily accessible and readable.

.5 Application: to conform to normal industry standards.

PART 3 EXECUTION

3.1 PROCEDURES

.1 Test each system independently and then in unison with other related systems.

.2 Commission each system using procedures prescribed by the Commissioning Co-ordinator and/or Owner.

.3 Commission integrated systems using procedures prescribed by Commissioning Co-ordinator and/or Owner.

.4 Debug system software.

.5 Optimize operation and performance of systems by fine-tuning PID values and modifying CDLs as required.

.6 Test full scale emergency evacuation and life safety procedures including operation and integrity of smoke management systems under normal and emergency power conditions as applicable.

3.2 FIELD QUALITY CONTROL

.1 Pre-Installation Testing.

.1 General: consists of field tests of equipment just prior to installation.

.2 Testing may be on site or at Contractor's premises as approved by Owner.

.3 Configure major components to be tested in same architecture as designed system. Include all required network and control components.

.4 Equip each Building Controller with sensor and controlled device of each type (AI, AO, DI, DO).

.5 Additional instruments to include:

.1 DP transmitters.

.2 VAV supply duct SP transmitters.

.3 DP switches used for dirty filter indication and fan status.

.6 In addition to test equipment, provide inclined manometer, digital micro-manometer, milli-amp meter, source of air pressure infinitely adjustable between 0 and 500 Pa, to hold steady at any setting and with direct output to milli-amp meter at source.

.7 After setting, test zero and span in 10 % increments through entire range while both increasing and decreasing pressure.

.8 Owner to mark instruments tracking within 0.5 % in both directions as "approved for installation".

.9 Transmitters above 0.5 % error will be rejected.

.10 DP switches to open and close within 2% of setpoint.

.2 Completion Testing.

.1 General: test after installation of each part of system and after completion of mechanical and electrical hook-ups, to verify correct installation and functioning.

.2 Include following activities:

.1 Test and calibrate field hardware including stand-alone capability of each controller.

.2 Verify each A-to-D convertor.

.3 Test and calibrate each AI using calibrated digital instruments.

.4 Test each DI to ensure proper settings and switching contacts.

.5 Test each DO to ensure proper operation and lag time.

.6 Test each AO to ensure proper operation of controlled devices. Verify tight closure and signals.

.7 Test operating software.

.8 Test application software and provide samples of logs and commands.

.9 Verify each CDL including energy optimization programs.

.10 Debug software.

.11 Blow out flow measuring and static pressure stations with high pressure air at 700 kPa.

.12 Provide point verification list in table format including point identifier, point identifier expansion, point type and address, low and high limits and Engineering units. This document will be used in final startup testing.

.3 Final Startup Testing: Upon satisfactory completion of tests, perform point-by-point test of entire system under direction of Owner and Commissioning Co-ordinator and provide:

.1 2 technical personnel capable of re-calibrating field hardware and modifying software.

.2 Detailed daily schedule showing items to be tested and personnel available.

.3 Owner's acceptance signature to be on executive and applications programs.

.4 Commissioning to commence during final startup testing.

.5 O&M personnel to assist in commissioning procedures as part of training.

.6 Commissioning to be supervised by qualified supervisory personnel and Owner.

.7 Commission systems considered as life safety systems before affected parts of the facility are occupied.

.8 Operate systems as long as necessary to commission entire project.

.9 Monitor progress and keep detailed records of activities and results.

.4 Final Operational Testing: to demonstrate that EMCS functions in accordance with contract requirements.

.1 Prior to beginning of 30 day test demonstrate that operating parameters (setpoints, alarm limits, operating control software, sequences of operation, trends, graphics and CDL's) have been implemented to ensure proper operation and operator notification in event of off-normal operation.

.1 Repetitive alarm conditions to be resolved to minimize reporting of nuisance conditions.

.2 Test to last at least 30 consecutive 24 hour days.

.3 Tests to include:

.1 Demonstration of correct operation of monitored and controlled points.

.2 Operation and capabilities of sequences, reports, special control algorithms, diagnostics, software.

.4 System will be accepted when:

.1 EMCS equipment operates to meet overall performance requirements. Downtime as defined in this Section must not exceed allowable time calculated for this site.

.2 Requirements of Contract have been met.

.5 In event of failure to attain specified AEL during test period, extend test period on day-to-day basis until specified AEL is attained for test period.

.6 Correct defects when they occur and before resuming tests.

.5 Commissioning Co-ordinator and/or Owner to verify reported results.

3.3 ADJUSTING

.1 Final adjusting: upon completion of commissioning as reviewed by Owner set and lock devices in final position and permanently mark settings.

3.4 DEMONSTRATION

.1 Demonstrate to Commissioning Manager and/or Owner operation of systems including sequence of operations in regular and emergency modes, under normal and emergency conditions, start-up, shut-down interlocks and lock-outs in accordance with Section 01 91 13.13 –Commissioning (Cx) Requirements.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes.

.1 Requirements and procedures for training program, instructors and training materials, for building Energy Monitoring and Control System (EMCS) Work.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 25 05 01 - EMCS: General Requirements.

1.3 DEFINITIONS

.1 CDL - Control Description Logic.

.2 For additional acronyms and definitions refer to Section 25 05 01 - EMCS: General Requirements

1.4 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures and supplemented and modified by requirements of this Section.

.2 Submit training proposal complete with hour-by-hour schedule including brief overview of content of each segment to Owner 30 days prior to anticipated date of beginning of training.

.1 List name of trainer, and type of visual and audio aids to be used.

.2 Show co-ordinated interface with other EMCS mechanical and electrical training programs.

.3 Submit reports within one week after completion of Phase 1 and Phase 2 training program that training has been satisfactorily completed.

1.5 QUALITY ASSURANCE

.1 Provide competent instructors thoroughly familiar with aspects of EMCS installed in facility.

.2 Owner reserves right to approve instructors.

1.6 INSTRUCTIONS

.1 Provide instruction to designated personnel in adjustment, operation, maintenance and pertinent safety requirements of EMCS installed.

.2 Training to be project-specific.

1.7 TIME FOR INSTRUCTION

.1 Number of days of instruction to be as specified in this section (1 day = 7 hours including two 15 minute breaks and excluding lunch time).

1.8 TRAINING MATERIALS

.1 Provide equipment, visual and audio aids, and materials for classroom training.

.2 Supply manual for each trainee, describing in detail data included in each training program.

.1 Review contents of manual in detail to explain aspects of operation and maintenance (O&M).

1.9 TRAINING PROGRAM

.1 To be in 2 phases over 6 month period.

.2 Phase 1: 2 day program to begin before 30 day test period at time mutually agreeable to Contractor, Owner and Commissioning Co-ordinator.

.1 Train O&M personnel in functional operations and procedures to be employed for system operation.

.2 Supplement with on-the-job training during 30 day test period.

.3 Include overview of system architecture, communications, operation of computer and peripherals, report generation.

.4 Include detailed training on operator interface functions for control of mechanical systems, CDL's for each system, and elementary preventive maintenance.

.5 Introduction to Direct Digital Controls and BACnet protocol.

.6 Identification of Control Components.

.7 Review of DDC Network Diagram for building.

.8 Review of shop drawings for building.

.9 Detailed discussion of sequences of operation

.10 Walk through of mechanical systems.

.3 Phase 2: 5 day program to begin 8 weeks after acceptance for operators, equipment maintenance personnel and programmers.

.1 Provide multiple instructors on pre-arranged schedule. Include at least

.1 Operator training: provide operating personnel, maintenance personnel and programmers with condensed version of Phase 1 training.

.2 Equipment maintenance training: provide personnel with 2 days training within a 5 day period in maintenance of EMCS components, maintenance and calibration of sensors and controls.

.3 Programmers: provide personnel with 2 days training within a 5 day period in following subjects in approximate percentages of total course shown:

- .1 Software and architecture: 10%
- .2 Application programs: 15%
- .3 Controller programming: 50%
- .4 Trouble shooting and debugging:10%
- .5 Colour graphic generation: 15%
- .6 Display and interpret summaries
- .7 Command points
- .8 Modify points and point groups
- .9 Define trend logs
- .10 Schedule and print reports

1.10 ADDITIONAL TRAINING

.1 List courses offered by name, duration and approximate cost per person per week. Note courses recommended for training supervisory personnel.

1.11 MONITORING OF TRAINING

.1 Owner to monitor training program and may modify schedule and content.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 General requirements for building Energy Monitoring and Control System (EMCS) that are common to NMS EMCS Sections.

1.2 RELATED SECTIONS

.1 The contractor is to ensure that all related work is co-ordinated among all specification sections, as well as between other Divisions, and that the tender price includes all related work. The referenced sections below are for guidance only and are not necessarily a complete list of related sections.

.2 Section 01 33 00 – Submittal Procedures.

.3 Section 01 35 29.06 – Health and Safety Requirements.

.4 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.5 Section 01 91 13.13 – Commissioning (Cx) Requirements.

.6 Section 09 91 23 - Interior Painting.

.7 Section 25 01 11 - EMCS: Start-up, Verification and Commissioning.

.8 Section 25 01 12 - EMCS: Training.

.9 Section 25 05 02 - EMCS: Submittals and Review Process.

.10 Section 25 05 03 - EMCS: Project Record Documents.

.11 Section 25 05 54 - EMCS: Identification.

.12 Section 25 05 60 - EMCS: Field Installation.

.13 Section 25 08 20 - EMCS: Warranty and Maintenance.

.14 Section 25 10 01 - EMCS: Local Area Network (LAN).

.15 Section 25 10 02 - EMCS: Operator Work Station (OWS).

.16 Section 25 30 01 - EMCS: Building Controllers

.17 Section 25 30 02 - EMCS: Field Control Devices.

.18 Section 25 90 01 - EMCS: Site Requirements, Applications and Systems Sequences of Operation.

1.3 REFERENCES

.1 American National Standards Institute (ANSI)

.1 ANSI/ISA 5.5, Graphic Symbols for Process Displays.

.2 American National Standards Institute (ANSI)/ Institute of Electrical and Electronics Engineers (IEEE).

.1 ANSI/IEEE 260.1, American National Standard Letter Symbols Units of Measurement (SI Units, Customary Inch-Pound Units, and Certain Other Units).

.3 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).

.1 ASHRAE STD 135, BACNET - Data Communication Protocol for Building Automation and Control Network.

.4 Canadian Standards Association (CSA International).

.1 CAN/CSA-Z234.1, Canadian Metric Practice Guide.

.5 Consumer Electronics Association (CEA).

.1 CEA-709.1-B, Control Network Protocol Specification.

.6 Department of Justice Canada (Jus).

.1 Canadian Environmental Assessment Act (CEAA).
.2 Canadian Environmental Protection Act (CEPA).

.7 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.1 Safety Data Sheets (SDS).

.8 Transport Canada (TC).

.1 Transportation of Dangerous Goods Act (TDGA).

.9 National Electrical Manufacturers Association (NEMA)

1.4 ACRONYMS, ABBREVIATIONS AND DEFINITIONS

.1 Acronyms used in EMCS.

.1 AEL - Average Effectiveness Level

.2 AI - Analog Input
.3 AO - Analog Output
.4 BACnet - Building Automation and Control Network
.5 BC(s) - Building Controller(s)
.6 BECC - Building Environmental Control Centre
.7 CAB - Canadian Automated Building (CAB) Protocol
.8 CAD - Computer Aided Design
.9 CDL - Control Description Logic
.10 CDS - Control Design Schematic
.11 COSV - Change of State or Value
.12 CPU - Central Processing Unit
.13 DI - Digital Input
.14 DO - Digital Output
.15 DP - Differential Pressure
.16 ECU - Equipment Control Unit
.17 EMCS - Energy Monitoring and Control System
.18 HVAC - Heating, Ventilation, Air Conditioning
.19 IDE - Interface Device Equipment
.20 I/O - Input/Output
.21 ISA - Industry Standard Architecture
.22 LAN - Local Area Network
.23 LCU - Local Control Unit
.24 MCU - Master Control Unit
.25 NC - Normally Closed
.26 NO - Normally Open
.27 OS - Operating System
.28 O&M - Operation and Maintenance
.29 OWS - Operator Work Station
.30 PC - Personal Computer
.31 PCI - Peripheral Control Interface
.32 PCMCIA - Personal Computer Micro-Card Interface Adapter
.33 PID - Proportional, Integral and Derivative.
.34 RAM - Random Access Memory
.35 ROM - Read Only Memory
.36 SP - Static Pressure
.37 TCU - Terminal Control Unit
.38 USB - Universal Serial Bus
.39 UPS - Uninterruptible Power Supply
.40 WAN- Wide Area Network

1.5 DEFINITIONS

.1 Point: may be logical or physical.

.1 Logical points: values calculated by system such as setpoints, totals, counts, derived corrections and may include, but not limited to result of and statements in CDL's.

.2 Physical points: inputs or outputs which have hardware wired to controllers which are measuring physical properties, or providing status conditions of contacts or relays which provide interaction which related equipment (stop, start) and value or damper actuators.

.2 Point Name: composed of two parts, point identifier and point expansion.

.1 Point identifier: comprised of three descriptors, "area" descriptor, "system" descriptor and "point" descriptor, for which database to provide 25 character field for each point identifier. "System" is system that point is located on.

.1 Area descriptor: building or part of building where point is located.

.2 System descriptor: system that point is located on.

.3 Point descriptor: physical logical point description. For point identifier "area", "system" and "point" will be shortforms or acronyms. Database must provide 25 character field for each point identifier.

.2 Point expansion: comprised of three fields, one for each descriptor. Expanded form of shortform or acronym used in "area", "system", and "point" descriptors is placed into appropriate point expansion field. Database must provide 32 character field for each point expansion.

.3 Bilingual systems to include additional point identifier expansion fields of equal capacity for each point name for second language.

.1 System to support use of numbers and readable characters including blanks, periods or underscores to enhance user readability for each of the above strings.

.3 Point Object Type: points fall into following object types:

.1 AI (analog input)

.2 AO (analog output)

.3 DI (digital input)

.4 DO (digital output)

.5 Pulse inputs

.4 Symbols and engineering unit abbreviations utilized in displays: to ANSI/ISA S5.5.

.1 Printouts: to ANSI/IEEE 260.1.

.2 Refer also to Section 25 05 54 - EMCS: Identification.

1.6 SYSTEM DESCRIPTION

.1 Refer to control schematics, sequences of operation and related Divisions of specifications for system architecture.

.2 Work covered by sections referred to above consists of fully operational EMCS, including, but not

limited to, following:

.1 Building Controllers.
.2 Control devices as listed in I/O point summaries and/or shown on the control drawings.
.3 OWS
.4 Data communications equipment necessary to affect EMCS data transmission system.
.5 Field control devices.
.6 Software/Hardware complete with full documentation.
.7 Complete operating and maintenance manuals.
.8 Training of personnel.
.9 Acceptance tests, technical support during commissioning, full documentation.
.10 Wiring interface co-ordination of equipment supplied by others.
.11 Miscellaneous work as specified in these sections and as indicated.

.3 Design Requirements:

.1 Design and provide conduit and wiring linking elements of system.
.2 Supply sufficient programmable controllers of types to meet project requirements. Quantity and points contents as reviewed prior to installation.
.3 Location of controllers as reviewed by Owner prior to installation.
.4 Provide utility and emergency power to EMCS.
.5 Metric references: in accordance with CAN/CSA Z234.1.

.4 Language Operating Requirements:

.1 Provide English interface to system through operator selectable access codes.
.2 Use non-linguistic symbols for displays on graphic terminals wherever possible. Other information to be in English.
.3 Operating system executive: provide primary hardware-to-software interface specified as part of hardware purchase with associated documentation to be in English.
.4 System manager software: include in English system definition point database, additions, deletions or modifications, control loop statements, use of high level programming languages, report generator utility and other OS utilities used for maintaining optimal operating efficiency.

.5 Include, in English:

.1 Input and output commands and messages from operator-initiated functions and field related changes and alarms as defined in CDL's or assigned limits (i.e. commands relating to day-to-day operating functions and not related to system modifications, additions, or logic re-definements).
.2 Graphic "display" functions, point commands to turn systems on or off, manually override automatic control of specified hardware points. To be in English at specified OWS. Point name expansions in English.
.3 Reporting function such as trend log, trend graphics, alarm report logs, energy report logs, maintenance generated logs.

.6 The network design to be a fully distributed network, with each primary system having its own

locally mounted dedicated controller. Any failure in the network shall **not** in any way affect the control of these primary systems. Connecting hardware points from one system to more than one controller is not acceptable. Any points associated with a system are to be connected to one dedicated controller. Each dedicated controller to have a locally mounted control and display device to allow the operator to view and adjust any point on the controller.

.7 All wiring associated with the EMCS communication network as well as all control wiring and conduit associated with the EMCS at 50 volts or less. Wire and conduit above 50 volts by Electrical Division.

.8 BACnet compliance: full compliance to the BACnet standard (ANSA/ASHRAE) 135, BACnet – A Data communication Protocol for Building Automation and Control Networks is mandatory. Down to the field device level, the EMCS system must meet BACnet standards for system architecture and administration, and use open communication protocols and user friendly programming and graphics. Install the EMCS installed to communicate at the supervisory layer to the WAN using the BACnet TCP/IP protocol implemented on Ethernet.

.9 The EMCS system for this facility to be accessible by designated personnel via the WAN for monitoring and programming purposes. The EMCS contractor to provide all the required hardware, software, gateways, etc. needed to permit connection of the EMCS to the WAN. This shall include all hardware, software, programming, start-up and commissioning required. The contractor to supply and install all the required hardware and software on the WAN file server to allow for this remote operation monitoring and programming to take place. The contractor to supply and install all the required hardware and software on the operator workstation(s) located in the Owner's facilities management department. In addition, a remote dial in access directly to the system shall be provided.

1.7 SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures and 25 05 02 - EMCS: Submittals and Review Process.

.2 Submit for review:

.1 Equipment list and systems manufacturers within ten (10) working days after award of contract.

.3 Quality Control:

.1 Provide equipment and material from manufacturer's regular production, CSA certified, manufactured to standard quoted plus additional specified requirements.

.2 Where CSA certified equipment is not available submit such equipment to inspection authorities for special inspection and approval before delivery to site.

.3 Submit proof of compliance to specified standards with shop drawings and product data in accordance with Section 25 05 02 – EMCS: Submittals and Review Process. Label or listing of specified organization is acceptable evidence.

.4 In lieu of such evidence, submit certificate from testing organization, approved by third party Engineer registered in Canada, certifying that item was tested in accordance with their test methods and that item conforms to their standard/code.

.5 For materials whose compliance with organizational standards/codes/ specifications is not

regulated by organization using its own listing or label as proof of compliance, furnish certificate stating that material complies with applicable referenced standard or specification.

.6 Permits and fees: in accordance with general conditions of contract.

.7 Existing devices intended for re-use: submit test report.

1.8 QUALITY ASSURANCE

.1 Have local office for at least 5 years staffed by factory trained personnel capable of installing and providing instruction, routine maintenance and emergency service on systems.

.2 Provide record of successful previous installations submitting tender showing experience with similar installations utilizing computer-based systems.

.3 Have access to local supplies of essential parts and provide 7 year guarantee of availability of spare parts after obsolescence.

.4 Ensure factory qualified supervisory personnel continuously direct and monitor work and attend site meetings.

.5 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.6 Be able to provide factory trained personnel on site within two (2) working days notice or provide instructions on maintenance and emergency service on system.

.7 BACnet devices to bear BACnet testing laboratories BTL mark and listed on BACnet manufacturers association web site.

1.9 DELIVERY, STORAGE AND HANDLING

.1 Material Delivery Schedule: provide Owner with “Materials Delivery Schedule” within 2 weeks after award of contract.

.2 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Separate for reuse and recycling and place in designated containers Steel, Metal, Plastic waste in accordance with Waste Management Plan.

.5 Place materials defined as hazardous or toxic in designated containers.

.6 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional, Municipal, and Provincial regulations.

.7 Label location of salvaged material's storage areas and provide barriers and security

devices.

.8 Ensure emptied containers are sealed and stored safely.

.9 Divert unused metal materials from landfill to metal recycling facility as approved by Owner.

.10 Fold up metal and plastic banding, flatten and place in designated area for recycling

1.10 EXISTING CONDITIONS - CONTROL COMPONENTS

.1 Utilize existing control wiring and piping as indicated.

.2 Re-use field control devices that are usable in their original configuration provided that they conform to applicable codes, standards and specifications.

.1 Do not modify original design of existing devices without written permission from Owner.

.2 Provide for new, properly designed device where re-usability of components is uncertain.

.3 Inspect and test existing devices intended for re-use within 30 days of award of contract, and prior to installation of new devices.

.1 Furnish test report to Owner within 40 days of award of contract listing each component to be re-used and indicating whether it is in good order or requires repair by Owner.

.2 Failure to produce test report will constitute acceptance of existing devices by owner.

.4 Non-functioning items:

.1 Provide with report specification sheets or written functional requirements to support findings.

.2 Owner will repair or replace existing items judged defective yet deemed necessary for EMCS.

.5 Submit written request for permission to disconnect controls and to obtain equipment downtime before proceeding with Work.

.6 Assume responsibility for existing controls to be incorporated into EMCS after written receipt of approval from Owner.

.1 Be responsible for items repaired or replaced by Owner.

.2 Be responsible for repair costs due to negligence or abuse of equipment repaired or replaced by Owner.

.3 Responsibility for existing devices terminates upon final acceptance of EMCS or applicable portions of EMCS as approved by Owner.

.7 Remove existing controls not re-used or not required. Place in approved storage for disposition as directed

PART 2 PRODUCTS

2.1 ACCEPTABLE SYSTEMS, MANUFACTURERS

.1 Honeywell,

.2 Proposed system to have communication capability utilizing BACnet Protocol.

.3 Panel to be NEMA rated to suit environmental requirements.

.4 Panels to have hinged doors equipped with standard keyed-alike cabinet locks, keyed to same key.

.5 Wiring within panels to be contained within properly sized rigid PVC slotted wall wire duct. All wiring within the wire duct to be concealed with a non-slip cover.

.6 Terminations for the connection of power wiring, communication wiring and field mounted devices to be at properly identified terminal blocks mounted within the control panel.

.7 All control panels to be provided with an internally mounted 120 volt duplex power receptacle.

.8 All control panels to be identified with permanently mounted Lamecoid tags to identify the control panel and the systems served by the control panel. Submit schedule of labels with shop drawing submission.

.9 Provide low voltage transformers in panels or elsewhere as required.

.10 Provide adaptors between metric and imperial components.

PART 3 EXECUTION

3.1 MANUFACTURER'S RECOMMENDATIONS

.1 Installation to be to manufacturer's recommendations. Provide printed copies of recommendations with shop drawings or product data.

3.2 PAINTING

.1 Painting to be in accordance with NEMA, supplemented as follows:

.2 Clean and touch up marred or scratched surfaces of factory finished equipment to match original finish.

.3 Restore to new condition, finished surfaces which have been damaged too extensively to be primed and touched up to make good.

.4 Clean and prime exposed hangers, racks, fastenings, and other support components.

.5 Paint all unfinished equipment installed indoors to NEMA.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes.

.1 Methods and procedures for shop drawings submittals, preliminary and detailed review process include review meetings for building Energy Monitoring and Control System (EMCS).

1.2 RELATED SECTIONS

.1 The contractor is to ensure that all related work is co-ordinated among all specification sections as well as between all Divisions, and that the tender price includes all related work. The referenced sections below are for guidance only and are not necessarily a complete list of related sections.

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 25 01 11 - EMCS: Start-up, Verification and Commissioning.

.3 Section 25 05 01 - EMCS: General Requirements.

1.3 DEFINITIONS

.1 Acronyms and definitions: refer to Section 25 05 01 - EMCS: General Requirements.

1.4 DESIGN REQUIREMENTS

.1 Preliminary Design Review: to contain following contractor and systems information.

.1 Location of local office.
.2 Description and location of installing and servicing technical staff.
.3 Location and qualifications of programming design and programming support staff.
.4 List of spare parts.
.5 Location of spare parts stock.
.6 Names of sub-contractors and site-specific key personnel.
.7 Sketch of site-specific system architecture.
.8 Specification sheets for each item including memory provided, programming language, speed, type of data transmission.
.9 Descriptive brochures.
.10 Sample CDL and graphics (systems schematics).
.11 Response time for each type of command and report.
.12 Item-by-item statement of compliance.
.13 Proof of demonstrated ability of system to communicate utilizing BACnet protocol.

1.5 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures and coordinate with

requirements in this Section.

.2 Submit preliminary design document within 30 working days after contract award for review by Owner.

.3 Shop Drawings to consist of 3 hard copies and 1 soft copy of design documents, shop drawings, product data and software.

.4 Hard copy to be completely indexed and coordinated package to assure compliance with contract requirements and arranged in same sequence as specification and cross-referenced to specification section and paragraph number.

.5 Soft copy to be in AutoCAD - latest version and Microsoft Word latest version format, or PDF structured using menu format for easy loading and retrieval on OWS.

.6 Submittals shall consist of:

.1 Data sheets of all products.
.2 Wiring and piping interconnection diagrams including panel and device power, and sources.
.3 List of materials of all proposed devices and equipment.
.4 Software documentation:
.5 Sequence of operation, in text form.
.6 Application programs.
.7 Point Schedules
.8 Controls schematics and system diagrams.
.9 Project installation schedule.
.10 Names of subtrades working for EMCS contractor.
.11 Mounting support details for components installed in airflow, waterflow and steam systems.

.7 Submit shop drawings in a package which contains the various schedules and drawings which completely describe the control system installed. At a minimum the shop drawing package to contain the following items described in Section 1.4.8 to 1.4.28 as follows:

.8 Network drawing showing the network connection of all network control units, programmable control units, terminal control units and operator workstations to indicate the location of each of these elements.

.9 Schematic control diagram for each system being controlled. Where there are typical systems a drawing to be provided for each system. This drawing to be on a AB size sheet (11 x 17) and shall include a title block which includes as a minimum the drawing title, drawing number, project title, contractor's name, contractor's address, contractor's phone and fax numbers, contractor's project number and a section to provide a record for revision information.

.10 The schematic control diagram to include a bill of materials which provides a list of all part numbers and descriptions for the control components on the drawing list to include field equipment as well as panel mounted components.

.11 The schematic control diagram to include a complete wiring diagram for all electrical connections, including motor starters, heating coils, coiling coils etc.

.12 The schematic control diagram to include a layout of the control panels for each system. This layout to show the mounting of all panel equipment, including transformers, power supplies, controllers, transducers, sensors, relays, contactors and any other panel mounted equipment.

.13 The contractor to include with the shop drawing submittal drawings, showing all wiring details for the connections of sensors, transducers, relays and contactors these details to show terminal numbers and be referenced to the appropriate schedules and drawings.

.14 The contractor to supply with the shop drawing package a complete point schedule to show every point connected to the system. This schedule to be in tabular format and provide the point identification, point type, wire tag, termination details reference, referenced drawings, device mounting location and device code numbers.

.15 The point schedule to provide at a minimum the following information on the software attributes of the point:

.1 Tag name – ex. EPT-1
.2 Point type – ex. AO-3
.3 System name – ex. A/C-1
.4 Object name – H-VLV.
.5 Expanded ID- Heating control valve
.6 Units of measurement - %.

.16 The point schedule to provide at a minimum the following information on the digital controller to which the point is connected:

.1 Controller type – ex. Unitary controller
.2 Controller address ex. 256.
.3 Cable destination – the termination at the controller, ex. AO-1.
.4 Terminal numbers – the termination at the controller.

.17 The point schedule to provide at minimum the following information on the control panel:

.1 Panel identification
.2 Panel location
.3 Reference drawing

.18 The point schedule to provide at a minimum the following information on any intermediate device which may be associated with the point:

.1 Type of wiring or tubing used
.2 Device part number
.3 Location of the device.
.4 Reference details.

.19 The point schedule to provide at a minimum the following information on any field device which

may be associated with the point;

.1 Type of wiring or tubing used

.2 Device part number

.3 Location of the devices

.4 Reference details

.20 The contractor to supply with the shop drawing package a complete room schedule, to show the equipment associated with the room controls. Schedule to be in tabular format and provide the room number and location, terminal unit number, part numbers for the terminal unit controller, sensors and actuators. Included on this schedule terminal unit type, size, minimum flow and maximum flow.

.21 Sequence of operation for each system controlled. Sequence to be in complete conformance with the sequence of operations included with this specification. Any changes require the approval of the Owner in writing. Sequence to include all modes of operation including fail safe, emergency and fire modes.

.22 Valve schedule including design flow, CV, size, type, actuator, pressure drop and maximum shut off pressure differential for each control valve.

.23 Damper schedule including design air flow, size, type actuator and torque requirements for each control damper.

.24 Provide one permanent, not fading, as built copy of each control drawing, enclosed by an aluminium frame with glass cover, or sealed by plastic laminate in rigid metal bound frame. To be installed at each respective control panel location.

.25 Catalogue cut sheets of all equipment used. This includes, but is not limited to DDC panels, peripherals, sensors, actuators, dampers, control air system components, etc.

.26 Range and scale information for all transmitters and sensors. This sheet to clearly indicate one device and any applicable options. Where more than one device to be used is on a single sheet, submit two sheets, individually marked.

.27 Hardware data sheets for all operator workstations, local access panels, and portable operator terminals.

.28 Software manuals for all applications programs to be provided as a part of the operator workstations, portable operator terminals, programming devices, and so forth for

1.6 PRELIMINARY SHOP DRAWING REVIEW

.1 Submit preliminary shop drawings within 30 working days of award of contract and include following:

.1 Specification sheets for each item. To include manufacturer's descriptive literature, manufacturer's installation recommendations, specifications, drawings, diagrams, performance and characteristic curves, catalogue cuts, manufacturer's name, trade name, catalogue or model number, nameplate data, size, layout, dimensions, capacity, other

data to establish compliance.

.2 Detailed system architecture showing all points associated with each controller including, signal levels, pressures where new EMCS ties into existing control equipment.

.3 Spare point capacity of each controller by number and type.

.4 Controller locations.

.5 Auxiliary control cabinet locations.

.6 Single line diagrams showing cable routings, conduit sizes, spare conduit capacity between control centre, field controllers and systems being controlled.

.7 Valves: complete schedule listing including following information: designation, service, manufacturer, model, point ID, design flow rate, design pressure drop, required Cv, Valve size, actual Cv, spring range, pilot range, required torque, actual torque and close off pressure (required and actual).

.8 Dampers: sketches showing module assembly, interconnecting hardware, operator locations, operator spring range, pilot range, required torque, actual torque.

.9 Flow measuring stations: complete schedule listing designation, service, point ID, manufacturer, model, size, velocity at design flow rate, manufacturer, model and range of velocity transmitter.

.10 Compressor schematic and sizing data.

1.7 DETAIL SHOP DRAWING REVIEW

.1 Submit detailed shop drawings within 60 working days after award of contract and before start of installation and include following:

.1 Corrected and updated versions (hard copy only) of submissions made during preliminary review.

.2 Wiring diagrams.

.3 Piping diagrams and hook-ups.

.4 Interface wiring diagrams showing termination connections and signal levels for equipment to be supplied by others.

.5 Shop drawings for each input/output point, sensors, transmitters, showing information associated with each particular point including:

.1 Sensing element type and location.

.2 Transmitter type and range.

.3 Associated field wiring schematics, schedules and terminations.

.4 Pneumatic schematics and schedules.

.5 Complete Point Name Lists.

.6 Setpoints, curves or graphs and alarm limits (high and low, 3 types critical, cautionary and maintenance), signal range.

.7 Software and programming details associated with each point.

.8 Manufacturer's recommended installation instructions and procedures.

.9 Input and output signal levels or pressures where new systems ties into existing control equipment.

.6 Control schematics, narrative description, CDL's fully showing and describing automatic

and manual procedure required to achieve proper operation of project, including under complete failure of EMCS.

.7 Graphic system schematic displays of air and water systems with point identifiers and textual description of system, and typical floor plans as specified.

.8 Complete system CDL's including companion English language explanations on same sheet but with different font and italics. CDL's to contain specified energy optimization programs.

.9 Listing of and example of specified reports.

.10 Listing of time of day schedules.

.11 Mark up to-scale construction drawing to detail control room showing location of equipment and operator work space.

.12 Type and size of memory with statement of spare memory capacity.

.13 Full description of software programs provided.

.14 Sample of "Operating Instructions Manual" to be used for training purposes.

.15 Outline of proposed start-up and verification procedures. Refer to Section 25 01 11 – EMCS: Start-up, Verification and Commissioning.

1.8 QUALITY ASSURANCE

.1 Preliminary Design Review Meeting: Convene meeting within 45 working days of award of contract to:

.1 Undertake functional review of preliminary design documents, resolve inconsistencies.

.2 Resolve conflicts between contract document requirements and actual items (e.g.: points list inconsistencies).

.3 Review interface requirements of materials supplied by others.

.4 Review "Sequence of Operations".

.2 Contractor's factory trained programmer to attend meeting.

.3 Owner retains right to revise sequence or subsequent CDL prior to software finalization without cost to Owner.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes.

.1 Requirements and procedures for final control diagrams and operation and maintenance (O&M) manual, for building Energy Monitoring and Control System (EMCS) Work.

1.2 RELATED SECTIONS

.1 Section 01 78 00 - Closeout Submittals.

.2 Section 25 01 11 - EMCS: Start-up, Verification and Commissioning.

.3 Section 25 05 01 - EMCS: General Requirements.

.4 Section 25 05 02 - EMCS: Submittals and Review Process.

1.3 DEFINITIONS

.1 BECC - Building Environmental Control Centre.

.2 OWS - Operator Work Station.

.3 For additional acryonyms and definitions refer to Section 25 05 01 - EMCS: General Requirements

1.4 SUBMITTALS

.1 Submittals in accordance with Section 01 78 00 - Closeout Procedures, supplemented and modified by requirements of this Section.

.2 Submit Record Documents, As-built drawings, Operation and Maintenance Manual to Owner in English.

.3 Provide soft copies and hard copies in hard-back, 50 mm 3 ring, D-ring binders.

.1 Binders to be 2/3 maximum full.
.2 Provide index to full volume in each binder.
.3 Identify contents of each manual on cover and spine.
.4 Provide Table of Contents in each manual.
.5 Assemble each manual to conform to Table of Contents with tab sheets placed before instructions covering subject.

1.5 AS-BUILTS

.1 Provide 1 copy of detailed shop drawings generated in Section 25 05 02 - EMCS: Submittals and Review Process and include:

.1 Changes to contract documents as well as addenda and contract extras.

.2 Changes to interface wiring.

.3 Routing of conduit, wiring and control air lines associated with EMCS installation.

.4 Locations of obscure devices to be indicated on drawings.

.5 Listing of alarm messages.

.6 Documentation of all final sequences as programmed

.7 Panel/circuit breaker number for sources of normal/emergency power.

.8 Names, addresses, telephone numbers of each sub-contractor having installed equipment, local representative for each item of equipment, each system.

.9 Test procedures and reports: provide records of start-up procedures, test procedures, checkout tests and final commissioning reports as specified in Section 25 01 11 - EMCS: Start-up, Verification and Commissioning.

.10 Basic system design and full documentation on system configuration.

.2 Submit for final review by Owner.

.3 Provide before acceptance 4 hard and 1 soft copy incorporating changes made during final review.

1.6 O&M MANUALS

.1 Custom design O&M Manuals (both hard and soft copy) to contain material pertinent to this project only, and to provide full and complete coverage of subjects referred to in this Section.

.2 Provide 2 complete sets of hard and soft copies prior to system or equipment tests.

.3 Include complete coverage in concise language, readily understood by operating personnel using common terminology of functional and operational requirements of system. Do not presume knowledge of computers, electronics or in-depth control theory.

.4 Functional description to include:

.1 Functional description of theory of operation.

.2 Design philosophy.

.3 Specific functions of design philosophy and system.

.4 Full details of data communications, including data types and formats, data processing and disposition data link components, interfaces and operator tests or self-test of data link integrity.

.5 Explicit description of hardware and software functions, interfaces and requirements for components in functions and operating modes.

.6 Description of person-machine interactions required to supplement system description, known or established constraints on system operation, operating procedures currently implemented or planned for implementation in automatic mode.

.5 System operation to include:

.1 Complete step-by-step procedures for operation of system including required actions at each OWS.

.2 Operation of computer peripherals, input and output formats.

.3 Emergency, alarm and failure recovery.

.4 Step-by-step instructions for start-up, back-up equipment operation, execution of systems functions and operating modes, including key strokes for each command so that operator need only refer to these pages for keystroke entries required to call up display or to input command.

.6 Software to include:

.1 Documentation of theory, design, interface requirements, functions, including test and verification procedures.

.2 Detailed descriptions of program requirements and capabilities.

.3 Data necessary to permit modification, relocation, reprogramming and to permit new and existing software modules to respond to changing system functional requirements without disrupting normal operation.

.4 Software modules, fully annotated source code listings, error free object code files ready for loading via peripheral device

.5 Complete program cross reference plus linking requirements, data exchange requirements, necessary subroutine lists, data file requirements, other information necessary for proper loading, integration, interfacing, program execution.

.6 Software for each Controller and single section referencing Controller common parameters and functions.

.7 Maintenance: document maintenance procedures including inspection, periodic preventive maintenance, fault diagnosis, repair or replacement of defective components, including calibration, maintenance, repair of sensors, transmitters, transducers, controller and interface firmware, plus diagnostics and repair/replacement of system hardware.

.8 System configuration document:

.1 Provisions and procedures for planning, implementing and recording hardware and software modifications required during operating lifetime of system.

.2 Information to ensure co-ordination of hardware and software changes, data link or message format/content changes, sensor or control changes in event that system modifications are required.

.9 Programmer control panel documentation: provide where panels are independently interfaced with BECC, including interfacing schematics, signal identification, timing diagrams, fully commented source listing of applicable driver/handler.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes.

.1 Requirements and procedures for identification of devices, sensors, wiring, tubing, conduit and equipment, for building Energy Monitoring and Control System (EMCS) Work and nameplates, materials, colours and lettering sizes.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 25 05 01 - EMCS: General Requirements.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International).

.1 CSA C22.1, The Canadian Electrical Code, Part I, Safety Standard for Electrical Installations.

1.4 DEFINITIONS

.1 For acronyms and definitions refer to Section 25 05 01 - EMCS: General Requirements.

1.5 SYSTEM DESCRIPTION

.1 Language Operating Requirements: provide identification for control items in English.

1.6 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures and Section 25 05 02 – EMCS: Submittals and Review Process supplemented and modified by requirements of this Section.

.2 Submit to Owner for approval samples of nameplates, identification tags and list of proposed wording.

PART 2 PRODUCTS

2.1 NAMEPLATES FOR PANELS

.1 Identify by plastic laminate, 3 mm thick melamine, matt white finish, black core, square corners, lettering accurately aligned and engraved into core, mechanically attached with self-tapping screws.

.2 Sizes: 25 x 67 mm minimum.

.3 Lettering: minimum 7 mm high, black.

.4 Inscriptions: machine engraved to identify function.

2.2 NAMEPLATES FOR FIELD DEVICES

.1 Identify by plastic encased cards attached by plastic tie.

.2 Sizes: 50 x 100 mm minimum.

.3 Lettering: minimum 5 mm high produced from laser printer in black.

.4 Data to include: point name and point address, make, model number.

.5 Companion cabinet: identify interior components using plastic enclosed cards with point name and point address.

2.3 NAMEPLATES FOR ROOM SENSORS

.1 Identify by stick-on labels using point identifier.

.2 Location: as directed by Owner.

.3 Letter size: to suit, clearly legible.

2.4 WARNING SIGNS

.1 Equipment including motors, starters under remote automatic control: supply and install orange coloured signs warning of automatic starting under control of EMCS.

.2 Sign to read: "Caution: This equipment is under automatic remote control of EMCS" as reviewed by Owner.

2.5 WIRING

.1 Supply and install numbered tape markings on wiring at panels, junction boxes, splitters, cabinets and outlet boxes.

.2 Colour coding: to CSA C22.1. Use colour coded wiring in communications cables, matched throughout system.

.3 Power wiring: identify circuit breaker panel/circuit breaker number inside each EMCS panel.

2.6 PNEUMATIC TUBING

.1 Numbered tape markings on tubing to provide uninterrupted tracing capability.

2.7 CONDUIT

.1 Colour code EMCS conduit.

.2 Pre-paint box covers and conduit fittings.

.3 Coding: use fluorescent orange paint and confirm colour with Owner during "Preliminary Design Review".

PART 3 EXECUTION

3.1 NAMEPLATES AND LABELS

.1 Ensure that manufacturer's nameplates, CSA labels and identification nameplates are visible and legible at all times.

3.2 EXISTING PANELS

.1 Correct existing nameplates and legends to reflect changes made during work.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 11 00 – Summary of Work.

.2 Section 01 73 00 – Execution Requirements.

.3 Section 07 84 00 – Firestopping.

.4 Section 21 05 01 – Common Work Results for Mechanical.

.5 Section 21 07 19 – Thermal Insulation of Piping.

.6 Section 22 13 16.13 – Sanitary Waste and Vent Piping – Cast Iron and Copper.

.7 Section 23 05 15 - Common Installation Requirements for HVAC Pipework.

.8 Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment.

.9 Section 23 07 13 – Duct Insulation.

.10 Section 23 21 13.02 – Hydronic Systems: Steel.

.11 Section 23 23 00 – Copper Tubing and Fittings Refrigerant.

.12 Section 25 05 01 – EMCS: General Requirements.

.13 Section 26 05 00 – Common Work Results-Electrical.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)

.1 ANSI/ASME B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

.2 ANSI C2, National Electrical Safety Code.

.3 ANSI/NFPA 70, National Electrical Code.

.2 Canadian Standards Association (CSA)

.1 CSA C22.1, Canadian Electrical Code, Part 1.

.2 CAN/CSA C22.3 No.1, Overhead Systems.

.3 CSA C22.3 No. 7, Underground Systems.

1.3 SYSTEM DESCRIPTION

.1 Electrical:

.1 Provide power wiring from emergency power panels where emergency power is provided to EMCS field panels. If no emergency power provided, install UPS Device. Circuits to be for exclusive use of EMCS equipment. Panel breakers to be identified on panel legends tagged and locks applied to breaker switches.

.2 Hard wiring between field control devices and EMCS field panels.

.3 Communication wiring between EMCS field panels and OWS's including main control centre BECC.

.4 Modify existing starters to provide for EMCS as indicated in I/O Summaries and as indicated.

.5 Refer to wiring diagrams included as part of flow diagrams. Trace existing control wiring installation and provide updated wiring schematics including additions and/or deletions to control circuits for approval by Owner before commencing work.

.6 All control wiring 50 V and less for equipment supplied by Division 25 will be the responsibility of Division 25- Integrated Automation Contractor. Conduit and wire associated with this is the responsibility of Division 25.

.2 Pneumatic:

.1 Pneumatic tubing, valves and fittings for field control devices.

.3 Mechanical:

.1 Pipe taps required for EMCS equipment will be supplied and installed by Mechanical Division.

.2 Wells and control valves shall be supplied by EMCS Contractor and installed by Mechanical.

.3 Installation of air flow stations, dampers, and other devices requiring sheet metal trades to be mounted by Mechanical. Costs to be carried by designated trade.

.4 VAV Terminal Units.

.1 Air flow probe for VAV boxes to be supplied and installed under Mechanical Division. Air flow dp sensor, actuator and associated VAV controls to be supplied and installed by EMCS contractor. Tubing from air probe to dp sensor as well as installation and adjustment of air flow sensors and actuators to be the responsibility of EMCS contractor. Coordinate air flow adjustments with balancing trade.

.5 Structural:

.1 Special steelwork as required for installation of work.

1.4 PERSONNEL QUALIFICATIONS

.1 Qualified factory trained supervisory personnel to:

.1 Continuously direct and monitor all work.

.2 Attend site meetings.

1.5 EXISTING CONDITIONS

.1 Cutting and Patching: refer to Section 01 73 00 – Execution Requirements supplemented as specified herein.

.2 Repair all surfaces damaged during execution of work.

.3 Turn over to Owner existing materials removed from work not identified for re-use.

PART 2 PRODUCTS

2.1 PIPING

.1 Domestic H&CWS: refer to Section 22 11 18-Domestic Water Piping Copper and Section 22 11 18.01 – Domestic Water Piping Plastic.

.2 Sanitary, storm water: refer to Section 22 13 16.13 – Sanitary Waste and Vent Piping – Cast Iron and Copper, and Section 22 13 16.16 – Sanitary Waste and Vent Piping – Plastic.

.3 Hot water heating, chilled water: refer to Section 23 21 13.02 – Hydronic Systems: Steel and Section 23 20 12 Pressure Piping – Plastic.

.4 Condenser water: refer to Section 23 21 13 02– Hydronic Systems: Steel.

.5 Refrigeration: refer to Section 23 23 00 - Refrigerant Piping.

.6 Sleeves, escutcheons: refer to Section 23 05 15 - Common Installation Requirements for HVAC Pipework.

.7 Hangers and supports: refer to Section 23 05 29– Hangers and Supports for HVAC Piping and Equipment.

.8 Insulation: refer to Section 21 07 19 – Thermal Insulation for Piping and 23 07 13 – Thermal Insulation for Ducting.

2.2 SPECIAL SUPPORTS

.1 Structural grade steel, primed and painted after construction and before installation.

2.3 PIPING FOR PNEUMATIC CONTROL SYSTEMS

.1 Copper:

.1 Tubing: Type L Hard Drawn

.1 Fittings: wrought copper solder type to ANSI/ASME B16.22, and 95.5 antimonial tin solder. At instruments use compression fittings.

.2 At panels and junction boxes where there is a transition from plastic to copper use bulkhead fittings.

.2 Plastic:

.1 Flame retardant, black PVC with minimum burst strength 1.3 MPa at 23□C installed in conduit.

.2 Fittings: compression or barbed type as required.

2.4 WIRING

.1 As per requirements of Electrical Divisions.

.2 For 50V and above copper conductor with chemically cross-linked thermosetting polyethylene insulation rated RW90 and 600V. Colour code to CSA 22.1.

.3 For wiring under 50 volts use FT6 rated wiring where wiring is not run in conduit. All other cases use FT4 wiring.

.4 Sizes:

.1 120V Power supply: to match or exceed breaker, size #12 minimum.

.2 Wiring for safeties/interlocks for starters, motor control centres, to be stranded, #14 minimum.

.3 Field wiring to digital device: #18AWG or 20AWG stranded twisted pair.

.4 Analog input and output: shielded #18 minimum solid copper or #20 minimum stranded twisted pair. Wiring must be continuous without joints.

.5 More than 4 conductors: #22 minimum solid copper.

.5 Terminations:

.1 Terminate wires with screw terminal type connectors suitable for wire size, and number of terminations.

2.5 CONDUIT

.1 As per requirements of Electrical Division.

.2 Electrical metallic tubing to CSA C22.2 No. 03. Flexible and liquid tight flexible metal conduit to CSA C22.2 No.56. Rigid steel threaded conduit to CSA C22.2 No. 45.

.3 Junction and pull boxes: welded steel.

.1 Surface mounting cast FS: screw-on flat covers.

.2 Flush mounting: covers with 25 mm minimum extension all round.

.4 Cabinets: sheet steel, for surface mounting, with hinged door, latch lock, 2 keys, complete with perforated metal mounting backboard. Panels to be keyed alike for similar functions and or entire contract as approved.

.5 Outlet boxes: 100 mm minimum, square.

.6 Conduit boxes, fittings:

.1 Bushings and connectors: with nylon insulated throats.

.2 With push pennies to prevent entry of foreign materials.

.7 Fittings for rigid conduit:

.1 Couplings and fittings: threaded type steel.

.2 Double locknuts and insulated bushings: use on sheet metal boxes.

.3 Use factory "ells" where 90 degree bends required for 25 mm and larger conduits.

.8 Fittings for thin wall conduit:

.1 Connectors and couplings: steel, set screw type.

2.6 WIRING DEVICES, COVER PLATES

.1 Conform to CSA.

.2 Receptacles:

.1 Duplex: CSA type 5-15R.

.2 Single: CSA type 5-15R.

.3 Cover plates and blank plates: finish to match other plates in area.

2.7 SUPPORTS FOR CONDUIT, FASTENINGS, EQUIPMENT

.1 Solid masonry, tile and plastic surfaces: lead anchors or nylon shields.

.1 Hollow masonry walls, suspended drywall ceilings: toggle bolts.

.2 Exposed conduits or cables:

.1 50 mm diameter and smaller: one-hole steel straps.

.2 Larger than 50 mm diameter: two-hole steel straps.

.3 Suspended support systems:

.1 Individual cable or conduit runs: support with 6 mm diameter threaded rods and support clips.

.2 Two or more suspended cables or conduits: support channels supported by 6 mm diameter threaded rod hangers.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install equipment, components so that manufacturer's and CSA labels are visible and legible after commissioning is complete.

3.2 PIPING

.1 Domestic H&CWS: refer to Section 22 11 18 –Domestic Water Piping Copper.

.2 Sanitary, storm water: refer to 22 13 16.13 – Sanitary Waste and Vent Piping – Cast Iron and Copper.

.3 Hot water heating, chilled water: refer to Section 23 21 13.02 – Hydronic Systems: Steel.

.4 Condenser water: refer to Section 23 21 13.02 – Hydronic Systems: Steel.

.5 Refrigeration: refer to Section 23 23 00 - Copper Tubing and Fittings Refrigerant.

.6 Insulation: refer to Section 21 07 19 – Thermal Insulation for Piping and 23 07 13 – Thermal Insulation for Ducting.

3.3 MECHANICAL PIPING

.1 Install piping in accordance with Section 23 05 15 - Common Installation Requirements for HVAC Pipework.

3.4 SUPPORTS

.1 Install special supports as required and as indicated.

3.5 PNEUMATIC CONTROL SYSTEMS

.1 General:

.1 Install tubing in accessible concealed locations, straight, parallel and close to building structure with required grades for drainage and venting.

.2 Install drip legs and drains at low points.

.3 Tubing to be free from surface damage.

.4 Tubing NOT to pass through or touch unheated ducts or enclosures.

.5 Do not cover pneumatic tubing with insulation.

.6 Test tubing, check joints after connection to system.

.2 Copper tubing:

.1 Not to come into contact with dissimilar metal. Use non-metallic stand-offs on air handling systems.

.2 Install dielectric couplings where dissimilar metals are connected.

.3 Plastic tubing:

.1 Inaccessible locations: install plastic tubing in conduit.
.2 Inside panels: install in tube trays or racks, or clip individually to back of panel.
.3 Multiple tube bundles: install in tube trays, conduit or armoured flexible cable.

3.6 ELECTRICAL GENERAL

.1 Do complete installation in accordance with requirements of:

.1 Electrical Divisions, this specification.

.2 CSA 22.1 Canadian Electrical Code, latest edition.

.3 ANSI/NFPA 70.

.4 ANSI C2.

.2 Fully enclose or properly guard electrical wiring, terminal blocks, high voltage (above 50 V) contacts and mark to prevent accidental injury.

.3 Do underground installation to CAN/CSA C22.3 No.7, except where otherwise specified.

.4 Conform to manufacturer's recommendations for storage, handling and installation.

.5 Check factory connections and joints. Tighten where necessary to ensure continuity.

.6 Install electrical equipment between 1000 and 2000 mm above finished floor wherever possible and adjacent to related equipment.

.7 Protect exposed live equipment such as panel, mains, outlet wiring during construction for personnel safety.

.8 Shield and mark live parts "LIVE 120 VOLTS" or other appropriate voltage.

.9 Install conduits, and sleeves prior to pouring of concrete.

.10 Holes through exterior wall and roofs: flash and make weatherproof.

.11 Make necessary arrangements for cutting of chases, drilling holes and other structural work required to install electrical conduit, cable, pull boxes, outlet boxes.

.12 Install cables, conduits and fittings which are to be embedded or plastered over, neatly and closely to building structure to minimize furring.

3.7 CONDUIT SYSTEM

.1 Communication wiring shall be installed in conduit. Provide complete conduit system to link Building Controllers to BECC. Conduit sizes to suit wiring requirements and to allow for future expansion capabilities specified for systems. Maximum conduit fills not to exceed 40%. Design drawings do not show conduit layout.

.2 Install conduits parallel or perpendicular to building lines, to conserve headroom and to minimize interference.

.3 Do not run exposed conduits in normally occupied spaces unless otherwise indicated or unless impossible to do otherwise. Obtain approval from Owner before starting such work. Provide complete conduit system to link field panels and devices with main control centre. Conduit size to match conductors plus future expansion capabilities as specified.

.4 Locate conduits at least 150 mm from parallel steam or hot water pipes and at least 50 mm at crossovers.

.5 Bend conduit so that diameter is reduced by less than 1/10th original diameter.

.6 Field thread on rigid conduit to be of sufficient length to draw conduits up tight.

.7 Limit conduit length between pull boxes to less than 30 m.

.8 Use conduit outlet boxes for conduit up to 32 mm diameter and pull boxes for larger sizes.

.9 Fastenings and supports for conduits, cables, and equipment:

.1 Provide metal brackets, frames, hangers, clamps and related types of support structures as indicated and as required to support cable and conduit runs.

.2 Provide adequate support for raceways and cables, sloped vertically to equipment.

.3 Use supports or equipment installed by other trades for conduit, cable and raceway supports only after written approval from Owner.

.10 Install polypropylene fish cord in empty conduits for future use.

.11 Where conduits become blocked, remove and replace blocked sections.

.12 Pass conduits through structural members only after receipt of Owner's written approval.

.13 Conduits may be run in flanged portion of structural steel.

.14 Group conduits wherever possible on suspended or surface channels.

.15 Pull boxes:

.1 Install in inconspicuous but accessible locations.

.2 Support boxes independently of connecting conduits.

.3 Fill boxes with paper or foam to prevent entry of construction material.

.4 Provide correct size of openings. Reducing washers not permitted.

.5 Mark location of pull boxes on record drawings.

.6 Identify AC power junction boxes, by panel and circuit breaker.

.16 Install terminal blocks or strips indicated in cabinets to Electrical Division.

.17 Install bonding conductor for 120 volt and above in conduit.

3.8 WIRING

.1 Install multiple wiring in ducts simultaneously.

.2 Do not pull spliced wiring inside conduits or ducts.

.3 Use CSA certified lubricants of type compatible with insulation to reduce pulling tension.

.4 Tests: use only qualified personnel. Demonstrate that:

.1 Circuits are continuous, free from shorts, unspecified grounds.

.2 Resistance to ground of all circuits is greater than 50 Megohms.

.5 Provide Owner with test results showing locations, circuits, results of tests.

.6 Remove insulation carefully from ends of conductors and install to manufacturer's recommendations. Accommodate all strands in lugs. Where insulation is stripped in excess, neatly tape so that only lug remains exposed.

.7 Wiring in main junction boxes and pull boxes to terminate on terminal blocks only, clearly and permanently identified. Junctions or splices not permitted for sensing or control signal covering wiring.

.8 Do not allow wiring to come into direct physical contact with compression screw.

.9 Install ALL strands of conductor in lugs of components. Strip insulation only to extent necessary for installation.

3.9 WIRING DEVICES, COVER PLATES

.1 Receptacles:

.1 Install vertically in gang type outlet box when more than one receptacle is required in one location.

.2 Cover plates:

.1 Install suitable common cover plate where wiring devices are grouped.

.2 Use flush type cover plates only on flush type outlet boxes.

3.10 STARTERS, CONTROL DEVICES

.1 Install and make control connections as indicated. Power connections above 50V by Electrical Division.

.2 Install correct over-current devices.

.3 Identify each control wire, terminal for external connections with permanent number marking identical to diagram.

.4 Performance Verification:

.1 Operate switches and controls to verify functioning.

.2 Perform start and stop sequences of contactors and relays.

.3 Check that interlock sequences, with other separate related starters, equipment and auxiliary control devices, operate as specified.

3.11 GROUNDING

.1 Install complete, permanent, continuous grounding system for equipment, including conductors, connectors and accessories.

.2 Install separate grounding conductors in conduit within building.

.3 Install ground wire in all PVC ducts and in tunnel conduit systems.

.4 Tests: perform ground continuity and resistance tests, using approved method appropriate to site conditions.

3.12 TESTS

.1 General:

.1 Perform following tests in addition to tests specified Section 25 08 20 - EMCS: Warranty and Maintenance.

.2 Give 14 days written notice of intention to test.

.3 Conduct in presence of Owner and authority having jurisdiction.

.4 Conceal work only after tests satisfactorily completed.

.5 Report results of tests to Owner in writing.

.6 Preliminary tests:

.1 Conduct as directed to verify compliance with specified requirements.

.2 Make needed changes, adjustments, replacements.

.3 Insulation resistance tests:

.1 Megger all circuits, feeders, equipment for 120 - 600V with 1000V instrument. Resistance to ground to be more than required by Code before energizing.

.2 Test insulation between conductors and ground, efficiency of grounding system to satisfaction of Owner and authority having jurisdiction.

3.13 IDENTIFICATION

.1 Refer to Section 25 05 54- EMCS: Identification.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes.

.1 Requirements and procedures for warranty and activities during warranty period and service contracts, for building Energy Monitoring and Control System (EMCS).

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 78 00 - Closeout Submittals.

.3 Section 25 05 01 - EMCS: General Requirements.

1.3 REFERENCES

.1 Canada Labour Code (R.S., c. L-2)/Part I - Industrial Relations.

.2 Canadian Standards Association (CSA)

.1 CSA Z204 – Guidelines for Managing Indoor Quality in Buildings

1.4 DEFINITIONS

.1 OWS - Operator Work Station.

.2 For additional acronyms and definitions refer to Section 25 05 01 - EMCS: General Requirements.

1.5 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit detailed preventative maintenance schedule for system components to Owner.

.3 Submit detailed inspection reports Owner.

.4 Submit dated, maintenance task lists to Owner and include the following sensor and output point detail, as proof of system verification:

.1 Point name and location.
.2 Device type and range.
.3 Measured value.
.4 System displayed value.
.5 Calibration detail
.6 Indication if adjustment required,
.7 Other action taken or recommended.

.5 Submit network analysis report showing results with detailed recommendations to correct problems found.

.6 Records and logs: in accordance with Section 01 78 00 - Closeout Submittals.

.1 Maintain records and logs of each maintenance task on site.

.2 Organize cumulative records for each major component and for entire EMCS chronologically.

.3 Submit records to Owner, after inspection indicating that planned and systematic maintenance have been accomplished.

.7 Revise and submit to Owner in accordance with Section 01 78 00 - Closeout Submittals "As-built drawings" documentation and commissioning reports to reflect changes, adjustments and modifications to EMCS made during warranty period.

1.6 MAINTENANCE SERVICE DURING WARRANTY PERIOD

.1 Provide services, materials, and equipment to maintain EMCS for warranty period of one year after date of substantial completion. Provide detailed preventative maintenance schedule for system components as described in Submittal article.

.2 Emergency Service Calls:

.1 Initiate service calls when EMCS is not functioning correctly.

.2 Qualified control personnel to be available during warranty period to provide service to "CRITICAL" components whenever required at no extra cost.

.3 Furnish Owner with telephone number where service personnel may be reached at any time.

.4 Service personnel to be on site ready to service EMCS after receiving request for service.

.5 Perform work continuously until EMCS restored to reliable operating condition.

.3 Operation: foregoing and other servicing to provide proper sequencing of equipment and satisfactory operation of EMCS based on original design conditions and as recommended by manufacturer.

.4 Work requests: record each service call request, when received separately on approved form and include:

.1 Serial number identifying component involved.

.2 Location, date and time call received.

.3 Nature of trouble.

.4 Names of personnel assigned.

.5 Instructions of work to be done.

.6 Amount and nature of materials used.

.7 Time and date work started.

.8 Time and date of completion.

.5 Provide system modifications in writing.

.1 No system modification, including operating parameters and control settings, to be made without prior written approval of Owner.

1.7 SERVICE CONTRACTS

.1 Provide in-depth technical expertise and assistance to Owner and Commissioning Manager in preparation and implementation of service contracts and in-house preventive maintenance procedures. Service contracts duration is for the warranty period.

.2 Service Contracts to include:

.1 Annual verification of field points for operation and calibration.
.2 4 visits per year.
.3 2 responses to emergency calls during day, per year.
.4 2 responses to emergency calls during silent hours, per year.
.5 Silent hours defined as 1630 h – 0800 h and on weekends and statutory holidays.
.6 Complete inventory of installed system.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

.1 Perform as minimum (3) three minor inspections and one major inspection (more often if required by manufacturer) per year. Provide detailed written report to Owner as described in Submittal article.

.2 Perform inspections during regular working hours, 0800 to 1630 h, Monday through Friday, excluding statutory holidays.

.3 Following inspections are minimum requirements and should not be interpreted to mean satisfactory performance:

.1 Perform calibrations using test equipment having traceable, certifiable accuracy at minimum 50% greater than accuracy of system displaying or logging value.
.2 Check and calibrate random sample of 10% field input/output devices in accordance with Canada Labour Code - Part I and CSA Z204.
.3 Provide dated, maintenance task lists, as proof of execution of complete system verification.

.4 Minor inspections to include, but not limited to:

.1 Perform visual, operational checks to BC's, peripheral equipment, interface equipment and other panels.
.2 Check equipment cooling fans as required.
.3 Visually check for mechanical faults, air leaks and proper pressure settings on pneumatic components.

.4 Review system performance with Operations Supervisor and/or Owner to discuss suggested or required changes.

.5 Major inspections to include, but not limited to:

.1 Minor inspection.

.2 Clean OWS(s) peripheral equipment, BC(s), interface and other panels, micro-processor interior and exterior surfaces.

.3 Check signal, voltage and system isolation of BC(s), peripherals, interface and other panels.

.4 Verify calibration/accuracy of each input and output device and recalibrate or replace as required (as per 3.1. 3.2).

.5 Provide mechanical adjustments, and necessary maintenance on printers.

.6 Run system software diagnostics as required.

.7 Install software and firmware enhancements to ensure components are operating at most current revision for maximum capability and reliability.

.1 Perform network analysis and provide report as described in Submittal article.

.6 Rectify deficiencies revealed by maintenance inspections and environmental checks.

.7 Continue system debugging and optimization.

.8 Testing/verification of occupancy and seasonal-sensitive systems to take place during four (4) consecutive seasons, after facility has been accepted, taken over and fully occupied.

.1 Test weather-sensitive systems twice: first at near winter design conditions and secondly under near summer design conditions.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 System requirements for Local Area Network (LAN) for Building Energy Monitoring and Control System (EMCS).

1.2 RELATED SECTIONS

.1 Section 25 05 01 – EMCS: General Requirements.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International).

.1 CSA T529, Telecommunications Cabling Systems in Commercial Buildings (Adopted ANSI/TIA/EIA-568-A with modifications.

.2 CSA T530, Commercial Building Standard for Telecommunications Pathways and Spaces (Adopted ANSI/TIA/EIA – 569-A with modifications.

.2 Institute of Electrical and Electronics Engineers (IEEE)/Standard for Information Technology – Telecommunications and information exchange between systems – Local and metropolitan area networks – Specific requirements.

.1 IEEE Std 802.3TM, Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications.

.3 Telecommunications Industries Association (TIA)/Electronic Industries Alliance (EIA).

.1 TIA/EIA-568, Commercial Building Telecommunications Cabling Standards Set, Part 1 General Requirements, Part 2 Balanced Twisted- Pair Cabling Components, Part 3 Optical Fiber Cabling Components Standard.

.2 TIA/EIA-569-A, Commercial Building Standard for Telecommunications Pathways and Spaces.

.4 Treasury Board Information Technology Standard (TBITS).

.1 TBITS 6.9, Profile for the Telecommunications Wiring System in Government Owned and Leased Buildings-Technical Specifications.

1.4 DEFINITIONS

.1 Acronyms and definitions: refer to Section 25 05 01 – EMCS: General Requirements.

1.5 SYSTEM DESCRIPTION

.1 Data communication network to link Operator Workstations and Master Control Units (MCU) in accordance with CSA T529, TIA/EIA-568, CSA T530 and TIA/EIA-569-A.

.1 Provide reliable and secure connectivity of adequate performance between different sections segments of network.

.2 Allow for future expansion of network, with selection of networking technology and communication protocols.

.2 Data communication network to included, but not limited to:

.1 EMCS-LAN.

.2 Modems.

.3 Network interface cards.

.4 Network management hardware and software.

.5 Network components necessary for complete network.

1.6 DESIGN REQUIREMENTS

.1 EMCS Local Area Network (EMCS-LAN).

.1 High Speed, high performance, local area network over MS/TP with MCUs and OWSs communicate with each other directly on peer to peer basis in accordance with IEEE 802.3/Ethernet Standard.

.2 EMCS-LAN to be: BACnet Protocol

.3 Each EMCS-LAN to be capable of supporting at least 50 devices.

.4 Support of combination of MCUs and OWSs directly connected to EMCS-LAN.

.5 High speed data transfer rates for alarm reporting, quick report generation from multiple controllers, upload/download information between network devices. Bit rate to be 10 Megabits per second minimum.

.6 Detection and accommodation of single or multiple failures of either OWSs, MCUs or network media. Operational equipment to continue to perform designated functions effectively in event of single or multiple failures.

.7 Commonly available, multiple sourced, networking components and protocols to allow system to co-exist with other networking applications including office automation.

.2 Dynamic Data Access.

.1 LAN to provide capabilities for OWSs, either network resident or connected remotely to access point status and application report data or execute control functions for other devices via LAN.

.2 Access to data to be based upon logical identification of building equipment.

.3 Network Medium.

.1 Network medium: twisted cable, shielded twisted cable, or fibre optic cable compatible with network protocol to be used within buildings. Fibre optic cable to be used between buildings.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes materials and installation for building automation controllers including:

.1 Master Control Unit (MCU).

.2 Local Control Unit (LCU)

.3 Equipment Control Unit (ECU).

.4 Terminal Control Unit (TCU).

1.2 RELATED SECTIONS

.1 Section 25 05 01 - EMCS: General Requirements.

.2 Section 25 05 02 - EMCS: Submittals and Review Process.

.3 Section 25 05 03 - EMCS: Project Records Documents.

.4 Section 25 30 02 - EMCS: Field Control Devices.

.5 Section 25 90 01 – EMCS: Site Requirements, Applications and Systems Sequences of Operation.

1.3 REFERENCES

.1 American Society of Heating, Refrigeration, and Air-Conditioning Engineers, Inc. (ASHRAE).

.1 ASHRAE, Applications Handbook, SI Edition.

.2 ASHRAE Standard 135 – BAC net – A Data Communications Protocol for Building Automation and Control Networks.

.3 ASHRAE Standard 135.1 Method of Test Conformance to BAC net.

.2 Canadian Standards Association (CSA)

.1 C22.2 No.205, Signal Equipment.

.3 Institute of Electrical and Electronics Engineers (IEEE)

.1 IEEE C37.90.1, Surge Withstand Capabilities Test for Protective Relays and Relays Systems.

1.4 DEFINITIONS

.1 Acronyms used in this section include: see Section 25 05 01 - EMCS: General Requirements.

1.5 SYSTEM DESCRIPTION

.1 General: Network of controllers comprising of MCU('s), LCU('s), ECU('s) or TCU('s) to be provided as indicated in System Architecture Diagram to support building systems and associated sequence(s) of operations as detailed in these specifications.

.1 Provide sufficient controllers to meet intents and requirements of this section.

.2 Controllers quantity, and point contents to be approved by Owner at time of preliminary design review.

.2 Controllers: stand-alone intelligent Control Units:

.1 Incorporate programmable microprocessor, non-volatile program memory, RAM, power supplies, as required to perform specified functions.

.2 Incorporate communication interface ports for communication LANs to exchange information with other Controllers.

.3 Capable of interfacing with operator interface device.

.4 Execute its logic and control using primary inputs and outputs connected directly to its onboard input/output field terminations or slave devices, and without need with other controller. Secondary input used for reset such as outdoor air temperature may be located in other Controller(s).

1.6 DESIGN REQUIREMENTS

.1 To include:

.1 Scanning of AI and DI connected inputs for detection of change of value and processing the detection of alarm conditions.

.2 Perform On-Off digital control of connected points, including the resulting required states generated through programmable logic output.

.3 Perform Analog control using programmable logic, (including PID) with adjustable dead bands and deviation alarms.

.4 Control of systems as described in sequence of operations.

.5 Execution of optimization routines as listed in this section.

.2 Total spare capacity for MCUs and LCUs: at least 25% of each point type distributed throughout the MCUs and LCUs.

.3 Field Termination and Interface Devices.

.1 To conform to CSA C22.2 No. 205.

.2 Electronically interface sensors and control devices to processor unit.

.3 Include, but not be limited to, following:

.1 Programmed firmware or logic circuits to meet functional and technical requirements.

.2 Power supplies for operation of logic devices and associated field equipment.

.3 Lockable wall cabinet.

.4 Required communications equipment and wiring.

.5 Leave controlled system in "fail-safe" mode in event of loss of communication

with, or failure of, processor unit.

.6 Input/Output interface to accept as minimum AI, AO, DI, DO functions as specified.

.7 Wiring terminations: use conveniently located screw type or spade lug terminals.

.4 AI interface equipment to:

.1 Convert analog signals to digital format with 12 bit analog-to-digital resolution.

.2 Provide for following input signal types and ranges:

.1 4 - 20 mA;

.2 0-10V DC

.3 10 K ohm.

.3 Meet IEEE C37.90.1 surge withstand capability.

.4 Have common mode signal rejection greater than 60 dB to 60 Hz.

.5 Where required, dropping resistors to be certified precision devices which complement accuracy of sensor and transmitter range specified.

.5 AO interface equipment:

.1 Convert digital data from controller processor to acceptable analog output signals using 12 bit digital-to-analog resolution.

.2 Provide for following output signal types and ranges:

.1 4 - 20 mA.

.2 0 - 10 V DC.

.3 Meet IEEE C37.90.1 surge withstand capability.

.6 DI interface equipment:

.1 Able to reliably detect contact change of sensed field contact and transmit condition to controller.

.2 Meet IEEE C37.90.1 surge withstand capability.

.3 Accept pulsed inputs up to 2 kHz.

.7 DO interface equipment:

.1 Respond to controller processor output, switch respective outputs. Each DO hardware to be capable of switching up to 0.5 amps at 24 V AC.

.2 Switch up to 5 amps at 220 V AC using optional interface relay.

.4 Controller's and associated hardware and software: operate in conditions of 0°C to 44°C and 20 % to 90 % non-condensing RH.

.5 Controllers (MCU, LCU): mount in wall mounted cabinet with hinged, keyed-alike locked door.

.1 Provide for conduit entrance from top, bottom or sides of panel.

.2 ECUs to be mounted in equipment enclosures or separate enclosures.

.3 Mounting details as approved by Owner for ceiling mounting.

.6 Cabinets to provide protection from water dripping from above, while allowing sufficient airflow to prevent internal overheating.

.7 Provide surge and low voltage protection for interconnecting wiring connections.

1.7 SUBMITTALS

.1 Make Submittals in accordance with Section 01 33 00 – Submittal Procedures and Section 25 05 02 – EMCS: Submittals and Review Process.

.1 Submit product data sheets for each product item proposed for this project.

1.8 MAINTENANCE PROCEDURES

.1 Provided manufacturers recommended maintenance procedures for insertion in Section 25 05 03 – EMCS: Project Record Documents.

PART 2 PRODUCTS

2.1 MASTER CONTROL UNIT (MCU)

.1 Primary function of MCU is to provide co-ordination and supervision of subordinate devices. Supervisory role shall include coordination of subordinate devices in the execution of optimization routines such as demand limiting or enthalpy control.

.2 Include high speed communication LAN Port for Peer to Peer communications with OWS(s) and other MCU level devices. Include support for Open System Protocols, BACnet.

.3 MCU shall have local I/O capacity as follows;

.1 To have at least 16 I/O points of which minimum to be 2AO, 6AI, 4DI, 4DO.

.2 LCU's to be added to support system functions as indicated in I/O Summary List.

.4 Central Processor Unit (CPU)

.1 Processor to consist of at minimum a 16 bit microprocessor capable of supporting software to meet specified requirements.

.2 CPU idle time to be more than 30 % when system configured to maximum input and output with worst case program use.

.3 Minimum addressable memory to be at manufacturer's discretion but to support at least all performance and technical specifications. Memory to include:

.1 Non-volatile EEPROM to contain operating system, executive, application, sub-routine, other configurations definition software. Tape media not acceptable.

.2 Battery backed (72 hr minimum capacity) RAM (to reduce the need to reload operating data in event of power failure) RAM to contain CDLs, application parameters, operating data or software that is required to be modifiable from operational standpoint such as schedules, setpoints, alarm limits, PID constants and CDL and hence modifiable on-line through operator panel or remote operator's interface. RAM to be downline loadable from OWS, CAB-Gateway, or locally installed floppy disk.

.4 Include uninterruptible clock accurate to plus or minus 5 secs/month, capable of deriving month/day/hour/minute/second, with rechargeable batteries for minimum 72 hr operation in event of power failure.

.5 Local Operator Terminal (OT)

.1 OT to:

.1 Have integral access/display panel where immediate access to OWS is not available.

.2 Support operator's terminal for local command entry, instantaneous and historical data display, programs additions and modifications.

.3 Simultaneously display minimum of 16 points with full English identification to allow operator to view single screen dynamic displays depicting entire mechanical systems.

.2 Functions to include, but not be limited to, following:

.1 Start and stop points.

.2 Modify setpoints.

.3 Modify PID loop setpoints.

.4 Override PID control.

.5 Change time/date.

.6 Add/modify/start/stop weekly scheduling.

.7 Add/modify setpoint weekly scheduling.

.8 Enter temporary override schedules.

.9 Define holiday schedules.

.10 View analog limits.

.11 Enter/modify analog warning limits.

.12 Enter/modify analog alarm limits.

.13 Enter/modify analog differentials.

.3 OT to provide access to real and calculated points in controller to which it is connected or to any other controller in network. This capability not to be restricted to subset of predefined "global points" but to provide totally open exchange of data between OT and any other controller in network.

.4 Operator access to OTs to the same as OWS user password. Password changes to automatically be downloaded to controllers on network.

.5 OT to provide prompting to eliminate need for user to remember command format or point names. Prompting to be consistent with user's password clearance and types of points displayed to eliminate possibility of operator error.

.6 Identity of real or calculated points to be consistent with network devices. Use same point identifier as at OWS's for access of points at OT to eliminate cross-reference or look-up tables.

2.2 LOCAL CONTROL UNIT (LCU)

.1 Provide multiple control functions for typical built-up and package HVAC, hydronic and electrical systems.

.2 Minimum of 16 I/O points of which minimum be 4 AOs, 4 AIs, 4 DIs, 4 DOs.

.3 Points of one Building System to be connected to one controller as listed in I/O Summary designations.

.4 Microprocessor capable of supporting necessary software and hardware to meet specified

requirements. As per MCU requirements (section 2.3.4) above with the following additions:

.1 Include as minimum 2 interface ports for connection to local computer terminal.

.2 Design so that shorts, opens or grounds on any input or output will not interfere with other input or output signals.

.3 Physically separate line voltage (50V and over) circuits from DC logic circuits to permit maintenance on either circuit with minimum hazards to technician and equipment.

.4 Include power supplies for operation of LCU and associated field equipment.

.5 In event of loss of communications with, or failure of, MCU, LCU to continue to perform control. Controllers that use defaults or fail to open or close positions not acceptable.

.6 Provide conveniently located screw type or spade lug terminals for field wiring.

.7 LCU to have 25 % spare input and 25 % output point capacity without addition of cards, terminals, etc.

2.3 TERMINAL/EQUIPMENT CONTROL UNIT (TCU/ECU)

.1 Microprocessor capable of supporting necessary software and hardware to meet TCU/ECU functional specifications.

.1 The TCU definition to be consistent with those defined in ASHRAE HVAC Applications Handbook.

.2 Controller to communicate directly with EMCS through EMCS LAN and provide access from EMCS OWS for setting occupied and unoccupied space temperature setpoints, flow setpoints, and associated alarm values, permit reading of sensor values, field control values (% open) and transmit alarm conditions to EMCS OWS.

.3 VAV Terminal Controller

.1 Microprocessor based controller with integral flow transducer, including software routines to execute PID algorithms, calculate airflow for integral flow transducer and measure temperatures as per I/O Summary required inputs. Sequence of operation to ASHRAE HVAC Applications Handbook.

.2 Controller to support point definition; in accordance with section 25 05 01 – EMCS: General Requirements.

.3 Controller to operate independent of network in case of communication failure.

.4 Controller to include damper actuator and terminations for input and output sensors and devices.

2.4 SOFTWARE

.1 General:

.1 Include as minimum: operating system executive, communications, application programs, operator interface, and systems sequence of operation - CDL's.

.2 To include "firmware" or instructions which are programmed into ROM, EPROM, EEPROM or other non-volatile memory.

.3 Include initial programming of all Controllers, for entire system.

.2 Program and data storage:

.1 Store executive programs and site configuration data in ROM, EEPROM or other non-volatile memory.

.2 Maintain CDL and operating data such as setpoints, operating constants, alarm limits in battery-backed RAM or EEPROM for display and modification by operator.

.3 Programming languages:

.1 Control Description Logic software to be programmed using English like or graphical, high level, general control language.

Structure software in modular fashion to permit simple restructuring of program modules if future software additions or modifications are required. GO TO constructs not allowed.

.4 Operator terminal interface:

.1 MCU to perform operating and control functions specified Section 25 10 02 - EMCS: Operator Work Stations (OWS), including:

.1 Multi-level password access protection to allow user/manager to limit workstation control.

.2 Alarm management: processing and messages.

.3 Operator commands.

.4 Reports.

.5 Displays.

.6 Point identification.

.5 Pseudo or calculated points:

.1 Software to have access to any value or status in controller or other networked controller so as to define and calculate pseudo point from other values/status of controller. When current pseudo point value is derived, normal alarm checks must be performed or value used to totalize.

.2 Inputs and outputs for any process to be able to include data from controllers to permit development of network-wide control strategies. Processes also to permit operator to use results of one process as input to any number of other processes (eg. cascading).

.6 Control Description Logic (CDL):

.1 Capable of generating on-line project-specific control loop algorithms (CDLs). CDLs to be software based, programmed into RAM or EEPROM and backed up to OWS. Owner must have access to these algorithms for modification or to be able to create new ones and to integrate these into CDLs on BC(s) from OWS.

.2 Write CDL in high level language that allows algorithms and interlocking programs to be written simply and clearly. Use parameters entered into system (eg. setpoints) to determine operation of algorithm. Operator to be able to alter operating parameters on-line from OWS or BC(s) and to tune control loops.

.3 Perform changes to CDL on-line.

.4 Control logic to have access to values or status of all points available to controller including global or common values, allowing cascading or inter-locking control.

.5 Energy optimization routines such as enthalpy control, supply temperature reset, etc. to be LCU or MCU resident functions and form part of CDL.

.6 MCU to be able to perform following pre-tested control algorithms:

.1 Two position control.

.2 Proportional Integral and Derivative (PID) control.

.3 Automatic control loop tuning.

.7 Control software to provide the ability to define the time between successive starts for each piece of equipment to reduce cycling of motors.

.8 Provide protection against excessive electrical-demand situations during start-up periods by automatically introducing time delays between successive start commands to heavy electrical loads.

.9 Power Fail Restart: Upon detection of power failure system to verify availability of emergency power as determined by emergency power transfer switches and analyze controlled equipment to determine its appropriate status under emergency power conditions and start or stop equipment as defined by I/O Summary. Upon resumption of normal power as determined by emergency power transfer switches, MCU to analyze status of controlled equipment, compare with normal occupancy scheduling, turn equipment on or off as necessary to resume normal operation.

.7 Event and Alarm management: The system to use a management by exception concept for Alarm Reporting. This is a system wide requirement. This approach will ensure that only principal alarms are reported to OWS. Events which occur as a direct result of the primary event to be suppressed by the system and only events which fail to occur to be reported. Such event sequence to be identified in I/O Summary and sequence of operation. Examples of above are, operational temperature alarms limits which are exceeded when main air handler is stopped, or General Fire condition shuts air handlers down, only Fire alarm status shall be reported. The exception is, when an air handler which is supposed to stop or start fails to do so under the event condition.

.8 Energy management programs: The following programs shall include specific summarizing reports, to include the date stamp indicating sensor details which activated and or terminated the feature.

.1 MCU in coordination with subordinate LCU, TCU, ECU to provide for the following energy management routines:

.1 Time of day scheduling.

.2 Calendar based scheduling.

.3 Holiday scheduling.

.4 Temporary schedule overrides.

.5 Optimal start stop.

.6 Night setback control.

.7 Enthalpy (economizer) switchover.

.8 Peak demand limiting.

.9 Temperature compensated load rolling.

.10 Fan speed/flow rate control.

.11 Cold deck reset.

.12 Hot deck reset.

.13 Hot water reset.

.14 Chilled water reset.

.15 Condenser water reset.

.16 Chiller sequencing.

.17 Night purge.

.2 Programs to be executed automatically without need for operator intervention and be flexible enough to allow customization.

.3 Apply programs to equipment and systems as specified or requested by the Owner.

.9 Function/Event Totalization: features to provide predefined reports which show daily, weekly, and monthly accumulating totals and which include high rate (time stamped) and low rate (time stamped) and accumulation to date for month.

.1 MCUs to accumulate and store automatically run-time for binary input and output points.

.2 MCU to automatically sample, calculate and store consumption totals on daily, weekly or monthly basis for user-selected analog or binary pulse input-type points.

.3 MCU to automatically count events (number of times pump is cycled off and on) daily, weekly or monthly basis.

.4 Totalization routine to have sampling resolution of 1 min or less for analog inputs.

.5 Totalization to provide calculations and storage of accumulations up to 99,999.9 units (eg. kWH, litres, tonnes, etc.).

.6 Store event totalization records with minimum of 9,999,999 events before reset.

.7 User to be able to define warning limit and generate user-specified messages when limit reached.

2.5 LEVELS OF ADDRESS

.1 Upon operator's request, EMCS to present status of any single 'point', 'system' or point group, entire 'area', or entire network on printer or OWS as selected by operator.

.1 Display analog values digitally to 1 place of decimals with negative sign as required.

.2 Update displayed analog values and status when new values received.

.3 Flag points in alarm by blinking, reverse video, different colour, bracketed or other means to differentiate from points not in alarm.

.4 Updates to be change-of-value (COV)-driven or if polled not exceeding 2 second intervals.

2.6 POINT NAME SUPPORT

.1 Controllers (MCU, LCU) to support point naming convention as defined in Section 25 05 01 – EMCS: General Requirements.

PART 3 EXECUTION

3.1 LOCATION

.1 Location of Controllers to be approved by Owner.

3.2 INSTALLATION

.1 Install Controllers in secure enclosures as indicated.

.2 Provide necessary power from local 120 V branch circuit panel for equipment.

.3 Install tamper locks on breakers of circuit breaker panel.

.4 Use Uninterruptible Power Supply (UPS) and emergency power when equipment must operate in an emergency and co-ordinating mode.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 25 05 02 - EMCS: Submittals and Review Process.

.2 Section 25 05 03 - EMCS: Project Records Documents.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)

.1 ANSI C12.7, Requirements for Watthour Meter Sockets.
.2 ANSI/IEEE C57.13, Requirements for Instrument Transformers.

.2 Canadian Standards Association (CSA)

.1 CSA Type 1 Enclosure
.2 CSA Type 4X Enclosures
.3 CSA Type 12 Enclosures

1.3 SUBMITTALS

.1 Submit shop drawings and manufacturer's installation instructions in accordance with Section 25 05 02 - EMCS: Submittals and Review Process.

.2 Include:

.1 Information as specified for each device.
.2 Manufacturer's detailed installation instructions.

.3 Pre-Installation Tests

.1 Submit samples at random from equipment shipped, as requested by Owner, for testing before installation. Replace devices not meeting specified performance and accuracy.

.4 Manufacturer's Instructions

.1 Submit manufacturer's installation instructions for specified equipment and devices.

1.4 CLOSEOUT SUBMITTALS

.1 Submit operating and maintenance data for inclusion in operation and maintenance manual in accordance with Section 25 05 03 - EMCS: Project Records Documents.

PART 2 PRODUCTS

2.1 GENERAL

.1 Control devices of each category to be of same type and manufacturer.

.2 External trim materials to be corrosion resistant. Internal parts to be assembled in watertight, shockproof, vibration-proof, heat resistant assembly.

.3 Operating conditions: 0 - 32 °C with 10 - 90 % RH (non-condensing) unless otherwise specified.

.4 Terminations: use standard conduit box with slot screwdriver compression connector block unless otherwise specified.

.5 Transmitters to be unaffected by external transmitters (eg. walkie talkies).

.6 Account for hysteresis, relaxation time, maximum and minimum limits in applications of sensors and controls.

.7 Outdoor installations: use weatherproof construction in CSA 4X enclosures.

.8 Devices to be installed in user occupied space must not exceed Noise Criteria (NC) of 35. Noise generated by any device must not be detectable above space ambient conditions.

2.2 TEMPERATURE SENSORS

.1 General: to be resistance or thermocouple type to following requirements:

.1 Thermisters 10 K ohm, $\pm$ 0.2^{o} C accuracy, less than 0.1^{o} C drift over 10 year span. Power supply 5 V dc, 10-35 Vdc, 24 Vac.

.2 RTD's: 1000 ohm at 0 °C (plus or minus 0.2 ohms) platinum element with strain minimizing construction, 3 integral anchored leadwires. Coefficient of resistivity: 0.00385 ohms/ohm□C.

.3 Immersion wells: NPS 3/4, stainless steel spring loaded construction, with heat transfer compound compatible with sensor. Insertion length 100 mm as indicated.

.2 Sensors:

.1 Room type: wall mounting, in slotted type covers, LCD display ^{o}C or ^{o}F, with guard as indicated. Dual set point momentary push button, override switch.

.2 General purpose duct type: suitable for insertion into ducts at any angle, insertion length 460 mm.

.3 Averaging duct type: continuous filament with minimum immersion length 6000 mm. Bend probe at field installation time to 100 mm radius at any point along probe without degradation of performance.

.4 Outside air type: complete with probe length 100 - 150 mm long, non-corroding shield to minimize solar and wind effects, threaded fitting for mating to 13 mm conduit, weatherproof construction in CSA 4X enclosure.

.5 Immersion type: spring loaded probe, NPT ½ fitting insertion to suit pipe size.

2.3 TEMPERATURE TRANSMITTERS

.1 Requirements:

.1 Input circuit: to accept 3-lead, 100 ohm at 0 deg C, platinum resistance detector type sensors.

.2 Power supply: 575 ohms at 24 V DC into load of 575 ohms. Power supply effect less than 0.01 deg C per volt change.

.3 Output signal: 4 - 20 mA into 500 ohm maximum load.

.4 Input and output short circuit and open circuit protection.

.5 Output variation: less than 0.2 % of full scale for supply voltage variation of plus or minus 10 %.

.6 Combined non-linearity, repeatability, hysteresis effects: not to exceed plus or minus 0.5 % of full scale output.

.7 Maximum current to 100 ohm RTD sensor: not to exceed 22.5 mA.

.8 Integral zero and span adjustments.

.9 Temperature effects: not to exceed plus or minus 1.0 % of full scale/ 50 °C.

.10 Long term output drift: not to exceed 0.25 % of full scale/ 6 months.

.11 Transmitter ranges: Select narrowest range to suit application from following:

.1 Minus 50 °C to plus 50 °C, plus or minus 0.5 °C.

.2 0 to 100 °C, plus or minus 0.5 °C.

.3 0 to 50 °C, plus or minus 0.25 °C.

.4 0 to 25 °C, plus or minus 0.1 °C.

.5 10 to 35 °C, plus or minus 0.25°C.

2.4 PRESSURE/CURRENT (P/I) TRANSMITTERS

.1 Requirements:

.1 Range: as indicated in I/O summaries.

.1 Pressure sensing elements: bourdon tube, bellows or diaphragm type.

.2 Internal materials: suitable for continuous contact with industrial standard instrument air, compressed air, water, steam, as applicable.

.2 Output signal: 4 - 20 mA, 0-5V, 0-10V.

.3 Output variations: ± 1 % full scale for supply voltage variations of plus or minus 10 %.

.4 Combined non-linearity, repeatability, and hysteresis effects: not to exceed plus or minus 1% of full scale output over entire range.

.5 Integral zero and span adjustment.

.6 Temperature effects: not to exceed plus or minus 1.5 % full scale/ 50 °C.

.7 Over-pressure input protection to at least twice rated input pressure.

.8 Output short circuit and open circuit protection.

.9 Pressure ranges: see I/O Summaries.

.10 Accuracy: plus or minus 1 % of full scale.

.11 LCD Display.

2.5 DIFFERENTIAL PRESSURE (KPA) TRANSMITTERS

.1 Requirements:

.1 Internal materials: suitable for continuous contact with industrial standard instrument air, compressed air, water, steam, as applicable.

.2 Output signal: 4 - 20 mA, 0-5V, 0-10V.

.3 Output variations: ± 1 % full scale for supply voltage variations of plus or minus 10 %.

.4 Combined non-linearity, repeatability, and hysteresis effects: not to exceed plus or minus 1 % of full scale output over entire range.

.5 Integral zero and span adjustment.

.6 Temperature effects: not to exceed plus or minus 1.5 % full scale/ 50 °C.

.7 Over-pressure input protection to at least twice rated input pressure.

.8 Output short circuit and open circuit protection.

.9 The unit to have a NPT connections. The enclosure shall be an integral part of the unit.

.10 LCD Display.

2.6 DIFFERENTIAL PRESSURE (PA) TRANSMITTERS

.1 Requirements:

.1 Output signal: 4 - 20 mA in 400 ohms, 0-5V into 5K ohms minimum, 0-10 V into 10K ohms minimum.

.2 Output variations: ± 1% full scale for supply voltage variations of plus or minus 10%.

.3 Integral zero and span adjustment.

.4 Temperature effects: not to exceed plus or minus 3% full scale/ 50 °C.

.5 Output short circuit and open circuit protection.

.6 The unit to have a NPT ½ conduit connection. The enclosure shall be an integral part of the unit.

.7 Pressure ranges: see I/O Summaries.

.8 LCD Display.

2.7 FAN SYSTEM STATIC PRESSURE SENSORS

.1 As per 2.10

2.8 FAN SYSTEM STATIC PRESSURE TRANSMITTERS

.1 Requirements:

.1 Output signal: 4 - 20 mA in 400 ohms, 0-5V into 5K ohms minimum, 0-10 V into 10K ohms minimum.

.2 Output variations: ± 1% full scale for supply voltage variations of plus or minus 10%.

.3 Integral zero and span adjustment.

.4 Temperature effects: not to exceed plus or minus 3% full scale/ 50 °C.

.5 Output short circuit and open circuit protection.

.6 The unit to have a NPT ½ conduit connection. The enclosure shall be an integral part of the unit.

.7 Pressure ranges: see I/O Summaries.

.8 LCD Display.

2.9 DUCT SYSTEM VELOCITY PRESSURE SENSORS

.1 Requirements:

.1 Multipoint static and total pressure sensing element with self-averaging manifold with integral air equalizer and straightener section.

.2 Maximum pressure loss: 37 Pa at 1000 m/s.

.3 Accuracy: plus or minus 1 % of actual duct velocity.

2.10 FAN SYSTEM VELOCITY PRESSURE TRANSMITTERS

.1 Requirements:

.1 Output signal: 4 - 20 mA linear into 500 ohm maximum load.

.2 Calibrated span: not to exceed 25 % of duct velocity pressure at maximum flow.

.3 Accuracy: 0.4 % of span.

.4 Repeatability: within 0.1 % of output.

.5 Linearity: within 0.5 % of span.

.6 Deadband or hysteresis: 0.1 % of span.

.7 External exposed zero and span adjustment.

.8 The unit to have a NPT ½ conduit connection. The enclosure shall be an integral part of the unit.

2.11 PRESSURE AND DIFFERENTIAL PRESSURE SENSORS AND SWITCHES

.1 Requirements:

.1 Range: as indicated in I/O summaries.

.1 Pressure sensing elements: bourdon tube, bellows or diaphragm type.

.2 Adjustable setpoint and differential.

.3 Switch: snap action type, rated at 120V, 15 amps AC or 24 V DC.

.4 Sensor assembly: to operate automatically and reset automatically when conditions return to normal. Over-pressure input protection to at least twice rated input pressure.

.5 Accuracy: within 2% repetitive switching.

.6 Provide sensor pressure and accuracy ratings:

.1 Chilled and condenser water: 860 kPa.

.2 Hot water: 860 kPa.

.3 Low pressure steam, compressed air: 1050 kPa. Range: 0 to 200 kPa. Accuracy: plus or minus 3 kPa.

.4 Medium pressure steam, compressed air: 1050 kPa. Range: 0 to 700 kPa. Accuracy: plus or minus 7 kPa.

.5 High pressure steam: 2100 kPa. Range: 0 to 2100 kPa. Accuracy: plus or minus 14 kPa.

.6 High temperature water: 2700 kPa. Range: 0-2700 kPa. Accuracy: plus or minus 25 kPa.

.7 For fan operation: Range: 0 to 3000 Pa. Adjustable differential: 10 to 300 Pa.

.7 Provide sensors with isolation valve and snubber between sensor and pressure source on liquid service.

.8 Sensors on steam and high temperature hot water service: provide pigtail syphon.

2.12 TEMPERATURE SWITCHES

.1 Requirements:

.1 Range: see I/O summaries.

.2 Temperature sensor: liquid, vapour or bimetallic type. Operate automatically. Reset automatically, except as follows:

.1 Freeze protection: manual reset. Optional if software does not auto restart.

.2 Fire detection: manual reset. Optional if software does not auto restart.

.3 Duct Heater: high limit manual reset in addition to automatic reset.

.3 Adjustable setpoint and differential.

.4 Accuracy: plus or minus 1 °C.

.5 Snap action rating: 120V, 15 amps or 24V DC as required. Switch to be DPST for hardwire and EMCS connections.

.6 Type as follows:

.1 Room: for wall mounting on standard electrical box with or without protective guard as indicated.

.2 Duct, general purpose: insertion length = 460 mm.

.3 Thermowell: stainless steel, with compression fitting for NPS 3/4 thermowell. Immersion length: 100 mm.

.4 Freeze detection: continuous element with 6000 mm insertion length, duct mounting, to detect coldest temperature in any 300 mm length.

.5 Strap-on: with helical screw stainless steel clamp.

.7 up to 250 volt 10 amps AC.

2.13 ELECTRICAL RELAYS

.1 Requirements:

.1 Double voltage, DPDT, plug-in type with termination base.

.2 Coils: rated for 120V AC or 24V DC. Other voltage: provide transformer.

.3 Contacts: rated at 5 amps at 120 V AC.

.4 Relay to have visual status indication

2.14 SOLID STATE RELAYS

.1 Requirements:

.1 CSA approved.

.2 Suitable to the application as recommended by manufacturer.

.3 Voltage range: 75-265 VAC

.4 Panel mounting.

.5 Suitable for AC or DC loads.

.6 Output surge absorbing element for inductive on/off loads.

.7 Input capacitor/resistor circuit for pulse noise absorption.

.8 For input inductive noise use twisted-pair wires for electromagnetic noise and shielded cable for static noise.

2.15 CURRENT TRANSDUCERS

.1 Requirements:

.1 Range: in accordance with Equipment Schedules.

.2 Purpose: measure line current and produce proportional signal in one of following ranges:

.1 4-20 mA DC.

.2 0-5 volt DC.

.3 0-10 volts DC.

.4 2-10 volts DC.

.3 Frequency insensitive from 10 - 80 hz.

.4 Accuracy to 0.5% full scale.

.5 Zero and span adjustments. Field adjustable range to suit motor applications.

.6 Adjustable mounting bracket to allow for secure/safe mounting inside the MCC or starter enclosure.

2.16 CURRENT SENSING RELAYS

.1 Requirements:

.1 Complete with metering transformer ranged to match load, plug-in base and shorting shunt to protect current transformer when relay is removed from socket.

.2 Suitable for single or 3 phase metering into single relay.

.3 To have adjustable latch level, adjustable delay on latch and minimum differential of 10 % of latch setting between latch level and release level.

.4 3-Phase application: provide for discrimination between phases.

.5 To have adjustable latch level to allow detection of worst case selection. To be powered from control circuit of motor starter being metered. Relay and base to be mounted in adjacent auxiliary cabinet only if control circuit power to be brought into auxiliary cabinet. Adjustments to be acceptable from auxiliary cabinet.

.6 Relay contacts: capable of handling 10 amps at 240 V AC.

2.17 CONTROL DAMPERS

.1 Construction: blades, 152 mm wide, 1219 mm long, maximum. Modular maximum size, 1219 mm wide x 2438 mm high. Multiple sections to have stiffening mullions and jack shafts.

.2 Materials

.1 Frame: 2.3 mm minimum thickness galvanized steel.

.2 Blades: galvanized steel with two sheets 0.5 mm thick or otherwise reinforced to ensure specified low leakage when fully closed.

.3 Bearings: oil impregnated sintered bronze. Provide thrust bearings for vertical blades.

.4 Linkage and shafts: zinc plated steel.

.5 Seals: replaceable neoprene or stainless steel spring on sides, top, bottom of frame, along all blade edges and blade ends.

.3 Performance:

.1 Capacity: refer to I/O Summaries.

.2 0.02 L/s.m 2 maximum allowable leakage against 1000 Pa static pressure.

.3 Temperature range: minus 50°C to plus 100°C.

.4 Arrangements: dampers mixing warm and cold air to be parallel blade, mounted at right angles to each other, with blades opening to mix air stream.

2.18 CONTROL VALVES

.1 Requirements:

.1 NPS 2 and under: bronze with screwed ends.

.2 NPS 2 1/2 and over: cast iron

.3 Leakage: 0.5 % of rated flow with flanged ends.

.4 Trim: type 316 stainless steel.

.5 maximum.

.6 Two or three port as indicated. Normally Open or Normally Closed, as indicated.

.7 Flow characteristics: linear or equal percentage as indicated.

.8 Rangeability: 50:1 minimum.

.9 Performance: Capacity refer to I/O Summaries and Valve Schedule.

2.19 PANELS

.1 Either free-standing or wall mounted enameled steel cabinets with hinged and key-locked front door.

.2 To be modular multiple panels as required to handle requirements with additional space to accommodate future capacity as required by Owner without adding additional cabinets.

.3 Panels to be lockable with same key.

2.20 ELECTRONIC AIR FLOW MEASUREMENT STATIONS AND TRANSMITTERS

.1 Each station to contain an array of velocity sensing elements and straightening vanes inside a flanged sheet metal casing. The velocity sensing elements to be of the thermal, temperature compensated thermistor type, with linearizing means. The sensing elements to be distributed across the duct cross section in the quantity and pattern set forth for measurements and instruments of ASHRAE and SMACNA for the traversing of ducted air flows. The resistance to air flow through the airflow measurement station not to exceed 20 Pa gauge at an airflow of 10 m/s. Station construction suitable for operation at airflows of up to 25 m/s over a temperature range of 5 to 50 degrees C, and accuracy plus or minus 3 percent over a range of 0.625 to 12.5 m/s scaled to air volume.

.2 Transmitters to produce a linear, temperature compensated 4-20 mAdc output corresponding to the required velocity pressure measurement. The transmitter to be a 2-wire, loop powered device with local indication where indicated. The output error of the transmitter not to exceed 0.5 percent of the calibrated measurement.

PART 3 EXECUTION.

3.1 INSTALLATION

.1 Install field control devices, conduit and wire in accordance with manufacturers recommended methods, procedures and instructions. Wiring and conduit above 50 volts by electrical Division. Coordinate requirements with Electrical Contactor.

.2 Temperature transmitters, humidity transmitters, current-to-pneumatic transducers, solenoid air valves, controllers, relays: install in CSA 2 enclosures or as required for specific applications. Provide for electrolytic isolation in all cases when dissimilar metals make contact.

.3 Support field-mounted transmitters, sensors on pipe stands or channel brackets.

.4 Install wall mounted devices on plywood panel properly attached to wall.

3.2 TEMPERATURE AND HUMIDITY SENSORS

.1 Stabilize to ensure minimum field adjustments or calibrations.

.2 To be readily accessible and adaptable to each type of application so as to allow for quick easy replacement and servicing without special tools or skills.

.3 Outdoor installation:

.1 Protect from solar radiation and wind effects by stainless steel shields.

.2 Install in CSA 4X enclosures.

.4 Duct installations

.1 Do not mount in dead air space.

.2 Location to be within sensor vibration and velocity limits.

.3 Securely mount extended surface sensor used to sense average temperature.

.4 Thermally isolate elements from brackets and supports so as to respond to air temperature only.

.5 Support sensor element separately from coils, filter racks.

.5 Averaging duct type temperature sensors:

.1 Sensor length to be not less than 1000 mm per square metre of duct cross-sectional area.

.2 Use multiple sensors where single sensor does not meet minimum length ratio. Wire multiple sensors in series for freeze protection applications.

.3 Wire multiple sensors separately for temperature measurement.

.4 Use either software averaging algorithm to derive overall average for control purposes or separate inputs, based on site requirements.

.6 Thermowells: install for piping installations. Where pipe diameter is less than well insertion length, locate well in elbow. Thermowell to restrict flow by less than 30%.

3.3 PANELS

.1 Arrange for conduit and tubing entry from top, bottom or either side.

.2 Use modular multiple panels if necessary to handle all requirements, with space for additional 20% PCU or FID if applicable without adding additional panels. Space to accommodate maximum capacity of associated controller (ECU, LCU, MCU, PCU, TCU).

.3 Wiring and tubing within panels: locate in trays or individually clipped to back of panel.

.4 Identify wiring and conduit clearly.

3.4 PRESSURE AND DIFFERENTIAL PRESSURE SWITCHES

.1 Install isolation valve and snubber on sensors between sensor and pressure source. In addition, protect sensing elements on steam and high temperature hot water service with pigtail syphon between valve and sensor.

3.5 I/P TRANSDUCERS

.1 Install air pressure gauge on outlet.

3.6 IDENTIFICATION

.1 Identify field devices properly.

.2 Refer to Section 25 05 54 - EMCS: Identification.

3.7 AIR FLOW MEASURING STATIONS

.1 Cap manifold until cleaning of ducts is completed.

3.8 TESTING

.1 Calibrate and test field devices for accuracy and performance. Submit report detailing tests performed, results obtained to Owner for approval. Owner will verify results at random. Provide testing equipment and manpower necessary for this verification.

3.9 COMMISSIONING

.1 Refer to Section 25 08 20 - EMCS: Warranty and Maintenance.

END OF SECTION

PART 1 GENERAL

1.1 DESCRIPTION

.1 This specification describes a high-performance variable frequency drive (VFD) used to control the speed of a NEMA design B induction motor.

.2 Load filters shall be supplied with all drives.

.3 A building automation system serial communication module and EMCS communication card shall be supplied with all drives.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.3 Section 01 91 13.13 – Commissioning (Cx) Requirements.

1.3 REFERENCES

.1 Institute of Electrical and Electronic Engineers (IEEE)

.1 Standard 519 Guide for Harmonic Content and Control.

.2 Underwriters laboratories (ULC)

.1 UL508C Power Conversion Equipment

.3 National Electrical Manufacturer's Association (NEMA)

.1 ICS 7.0, AC Adjustable Speed Drivers

.4 International ElectroTechnical Commission (IEC)

.1 IEC 61800 Adjustable Speed Electrical Power Drive Systems

.5 International Standards Organization (ISO)

.1 ISO-9001 Quality Management Systems

1.4 SUBMITTALS

.1 Submittals shall include the following information:

.1 Outline dimensions, conduit entry locations and weight.
.2 Customer connection and power wiring diagrams.
.3 Complete technical product description include a complete list of options provided.
.4 Compliance to IEEE 519 – harmonic analysis for particular jobsite including total harmonic voltage distortion and total harmonic current distortion (TDD).

.1 The VFD manufacturer shall provide calculations; specific to this installation, showing total harmonic voltage distortion is less than 5%. Input line filters shall be sized and provided as required by the VFD manufacturer to ensure compliance with IEEE standard 519. All VFD's shall include a minimum of 5% impedance reactors, no exceptions**.**

.5 In accordance with Section 01 33 00 - Submittal Procedures.

1.5 QUALITY ASSURANCE

.1 The VFD manufacturing facility shall be ISO 9001 certified. The VFD shall be UL listed, Canadian UL listed, CSA listed, IEEE listed, and NEMA listed.

.2 All printed circuited boards shall be completely tested and burned-in before being assembled into the completed VFD. The VFD shall then be subjected to a preliminary functional test, burn-in, and computerized final test. The burn-in shall be at 40°C, at full rated load, or cycled load. Drive input power shall be continuously cycled for maximum stress and thermal variation. Conformal coating of boards shall be included for each drive.

.3 The drive shall be designed to provide 250 000 hours mean time before failure (MTBF) when the specified preventative maintenance is performed.

.4 VFD manufacturer shall have an analysis laboratory to evaluate the failure of any component. The failure analysis lab shall allow the manufacturer to perform complete electrical testing, x-ray components, and decap or delaminate components and analyze failures within the component.

PART 2 PRODUCTS

2.1 VARIABLE FREQUENCY DRIVES

.1 The VFD package as specified herein shall be enclosed in a NEMA Type 1 or optional NEMA 12 enclosure, completely assembled and tested by the manufacturer in an ISO9001 facility. The VFD tolerated voltage window shall allow the VFD to operate from a line of +30% nominal, and -35% nominal voltage as a minimum.

.1 Environmental operating conditions: 0 to 40°C continuous duty. VFD's that can operate at 40° C intermittently (during a 24 hour period) are not acceptable and must be oversized. Altitude 0 to 1000m above sea level, less than 95% humidity, non-condensing.

.2 Enclosure shall be type NEMA 1 and shall be UL listed as a plenum rated VFD. VFD's without these ratings are not acceptable.

.2 All VFD's shall have the following standard features:

.1 All VFD's shall have the same customer interface, including digital display, and keypad, regardless of horsepower rating. The keypad shall be removable, capable of remote mounting and allow for uploading and downloading of parameter settings as an aid for start-up of multiple VFD's.

.2 The keypad shall include Hand-Off-Auto selections and manual speed control. The drive shall incorporate "bumpless transfer" of speed reference when switching between "Hand"

and "Auto" modes. There shall be fault reset and "Help" buttons on the keypad. The Help button shall include "on-line" assistance for programming and troubleshooting.

.3 There shall be a built-in time clock in the VFD keypad. The clock shall be used to date and time stamp faults and record operating parameters at the time of fault. The clock shall also be programmable to control start/stop functions, constant speeds, PID parameter sets and output relays.

.4 The VFD's shall utilize pre-programmed application macros specifically designed to facilitate start-up. The Application Macros shall provide one command to reprogram all parameters and customer interfaces for a particular application to reduce programming time.

.5 The VFD shall be capable of starting into a coasting load (forward or reverse) up to full speed and accelerate or decelerate to setpoint without safety tripping or component damage (flying start).

.6 The VFD shall have the ability to automatically restart after an over-current, over-voltage, under-voltage, or loss of input signal protective trip. The number of restart attempts, trial time, and time between attempts shall be programmable.

.7 The VFD shall have an integral 5% impedance reactor to reduce the harmonics to the power line and to add protection from AC line transients. The 5% impedance may be from dual (positive and negative DC bus) reactors, or 5% AC line reactors. VFD's with only one DC reactor shall add AC line reactors.

.8 The VFD shall include a coordinated AC transient protection system consisting of 4-120 joule rated MOV's (phase to phase and phase to ground), a capacitor clamp, and 5% impedance reactors.

.9 The VFD shall be capable of sensing a loss of load (broken belt / broken coupling) and signal the loss of load condition. The drive shall be programmable to signal this condition via a keypad warning, relay output and/or over the serial communications bus. Relay outputs shall include programmable time delays that will allow for drive acceleration from zero speed without signaling a false underload condition.

.10 If the input reference (4-20mA or 2-10V) is lost, the VFD shall give the user the option of either (1) stopping and displaying a fault, (2) running at a programmable preset speed, (3) hold the VFD speed based on the last good reference received, or (4) cause a warning to be issued, as selected by the user. The drive shall be programmable to signal this condition via a keypad warning, relay output and/or over the serial communication bus.

.3 All VFD's to have the following adjustments:

.1 Two (2) PID Setpoint controllers shall be standard in the drive. Two (2) programmable analog inputs shall accept current or voltage signals.

.2 Two (2) programmable analog outputs (0-20ma or 4-20 ma). The outputs may be programmed to output proportional to frequency, motor speed, output voltage, output current, motor torque, motor power (kW), DC bus voltage, active reference, and other data.

.3 Six (6) programmable digital inputs. There shall be a run permissive circuit for damper or valve control. Regardless of the source of a run command (keypad, input contact closure, time-clock control, or serial communications) the VFD shall provide a dry contact closure that will signal the damper to open (VFD motor does not operate). When the damper is fully open, a normally open dry contact (end-switch) shall close. The closed end-switch is

wired to a VFD digital input and allows VFD motor operation. Two separate safety interlock inputs shall be provided. When either safety is opened, the motor shall be commanded to coast to stop, and the damper shall be commanded to close. The keypad shall display "start enable 1 (or 2) missing". The safety status shall also be transmitted over the serial communications bus. All digital inputs shall be programmable to initiate upon an application or removal of 24VDC.

.4 Three (3) programmable digital Form-C relay outputs. The relays shall include programmable on and off delay times and adjustable hysteresis. Default settings shall be for run, not faulted (fail safe), and run permissive. The relays shall be rated for maximum switching current 6 amps at 30 VDC and 250 VAC and 0.4 A at 120 VDC; Maximum voltage 300 VDC and 250 VAC; continuous current rating 2 amps RMS. Outputs shall be true form C type contacts; open collector outputs are not acceptable.

.5 The VFD shall include a motor flux optimization circuit that will automatically reduce applied motor voltage to the motor to optimize energy consumption and audible motor noise.

.6 The VFD shall include a carrier frequency control circuit that reduces the carrier frequency based on actual VFD temperature that allows the highest carrier frequency without derating the VFD or operating at high carrier frequency only at low speeds.

.4 Serial Communications

.1 The VFD shall have an RS-485 port as standard. The standard protocols shall be Modbus, Johnson Controls N2 bus, and Siemens Building Technologies FLN, protocols for LonWorks, BACnet, Profibus, Ethernet, and DeviceNet shall be available. Each individual drive shall have the protocol in the base VFD. The use of third party gateways and multiplexers is not acceptable. All protocols shall be "certified" by the governing authority. Use of non-certified protocols is not allowed.

.2 Serial communication capabilities shall include, but not be limited to; run-stop control, speed set adjustment, proportional/integral/derivative PID control adjustments, current limit, accel/decel time adjustments, and lock and unlock the keypad. The drive shall have the capability of allowing the DDC to monitor feedback such as process variable feedback, output speed / frequency, current (in amps), % torque, power (kW), kilowatt hours (resettable), operating hours (resettable), and drive temperature. The EMCS shall also be capable of monitoring the VFD relay output status, digital input status, and all analog input and analog output values. All diagnostic warning and fault information shall be transmitted over the serial communications bus. Remote VFD fault reset shall be possible. The following additional status indications and settings shall be transmitted over the serial communications bus – keypad "Hand" or "Auto" selected, the ability to change the PID setpoint. The EMCS system shall also be able to monitor if the motor is running in the VFD mode over serial communications. A minimum of 15 field parameters shall be capable of being monitored.

.3 The VFD shall allow the EMCS to control the drive's digital and analog outputs via the serial interface. This control shall be independent of any VFD function.

.5 EMI / RFI filters. All VFD's shall include EMI/RFI filters. The onboard filters shall allow the VFD assembles to be CE Marked and the VFD shall meet product standard EN 61800-3 for the First Environment restricted level.

.6 Acceptable Product ABB ACH580

PART 3 PART 3 – EXECUTION

3.1 INSTALLATION

.1 Installation shall be the responsibility of the EMCS contractor. The contractor shall install the drive in accordance with the recommendations of the VFD manufacturer as outlined in the installation manual.

.2 Power wiring shall be completed by the electrical contractor. Three copper conductors and a ground wire are required. Separate the input power wiring from the output power wiring in individual metallic conduit. Do not combine. Provide a separate metallic conduit for control wiring. The contractor shall complete all wiring in accordance with the recommendations of the VFD manufacturer as outlined in the installation manual.

3.2 START-UP

.1 Certified factory start-up shall be provided for each drive by a factory authorized service center in accordance with Section 01 91 13.13 – Commissioning (Cx) Requirements and Section 26 05 00 Common Work Results - Electrical. A certified start-up form shall be filled out for each drive with a copy provided to the owner, and a copy kept on file at the manufacturer.

3.3 PRODUCT SUPPORT

.1 Factory trained application engineering and service personnel that are thoroughly familiar with the VFD products offered shall be locally available at both the specifying and installation locations. A 24/365 technical support line shall be available on a toll-free line.

3.4 WARRANTY

.1 Warranty shall be 24 months from the date of certified start-up, not to exceed 30 months from the date of shipment. The warranty shall include all parts, labor, travel time and expenses. There shall be 365/24 support available via a toll free phone number.

END OF SECTION

PART 1 GENERAL

1.1 DESIGN DOCUMENTATION

.1 Design documentation for each system to include, as a minimum:

- .1 Narrative type of Sequence of Operation.
- .2 Control Description Logic (CDL).
- .3 Input/Output Summary Schedules.
- .4 Schematics.

1.2 RELATED SECTIONS

.1 Section 23 85 01 - Room Pressure Control System

.2 Section 23 74 00 - Packaged outdoor HVAC equipment

1.3 EMCS LANGUAGE DESIGN CRITERIA

.1 Language: refer to Section 25 05 01 - EMCS: General Requirements.

.2 Levels of EMCS Language

- .1 Level 1: alarm and operational messages to convey alarm conditions or operational messages.
- .2 Level 2: full names of equipment and control points. The various systems, their equipment and components and all control points are named in accordance with this section.
- .3 Level 3: system, equipment, component and control point descriptors: unique, alphanumeric identifiers derived from full names of corresponding system component and control point.
- .4 Level 4: commands: represent various computer functions and routines.
  - .1 Operational commands - relate to building operations and building system controls.
  - .2 Computer system commands - relate to computer maintenance, upgrading or development software used to improve and maintain the application software for the building site.
- .5 Level 5: machine language. Languages specific to each manufacturer's product, used internally to perform its functions and routines.

.3 Additional Equipment, Components and/or Control Points. Where additional equipment, components and/or control points are required on specific projects, the following procedures shall be adopted:

- .1 Full names of the equipment, component and control points shall be not more than 40 characters, including numerals.

.2 SYSTEM descriptors shall be not more than 10 alphanumeric characters. INPUT and OUTPUT descriptors shall be not more than 10 alphanumeric characters. The letters shall be based upon the English/French language full name, and should, where possible, be the first letter of each word of the full name.

.4 The descriptor shall be unique.

.5 Descriptors and expansions: table lists standardized system identifiers and point identifiers.

.1 Table:

Identifiers and Expansions

English Identifier (10 characters max)	English Expansion (40 characters max)
OAD	Outside air damper
OAT	Outside air temperature
OAH	Outside air humidity
OAV	Outside air volume
RAD	Return air damper
RAT	Return air temperature
RAH	Return air humidity
RASP	Return air static pressure
MAD	** Mixed air dampers **
MAT	Mixed air temperature
MAPSP	Mixed air plenum static pressure

** MAD shall be used for applications where outside air and return air dampers are controlled from one (1) only output signal.

EAD	Exhaust air damper
PFPD	Pre-filter pressure drop
PFALM	Pre-filter pressure drop alarm
FFPD	Final filter pressure drop
FFALM	Final filter pressure drop alarm
HCVLV	Heating coil valve
HCVLVC	Heating coil valve control
HCVLVS	Heating coil valve status
BPD	Heating coil face and bypass damper
HCFA	Heating coil freeze alarm
CCVLV	Cooling coil valve
CCVLVC	Cooling coil valve control
CCVLVS	Cooling coil valve status

SVLV	Steam valve
SVLVC	Steam valve control
SVLVS	Steam valve status
SF#-C	Supply fan # control
SF#-S	Supply fan # status
SF#-VSD	Supply fan # VSD control
SF#-VSDF	Supply fan # VSD fault
SAV	Supply air volume
SAVC	Supply air volume control
SAT	Supply air temperature
SAH	Supply air humidity
SAVP	Supply air velocity pressure
SASP	Supply air static pressure
RF#-C	Return fan #control
RF#-S	Return fan # status
RF#-VSD	Return fan # VSD control
RF#-VSDF	Return fan # VSD fault
RAV	Return air volume
RAVC	Return air volume control
RAT	Return air temperature
RAH	Return air humidity
RAVP	Return air velocity pressure
RASP	Return air static pressure
EF#-C	Exhaust fan # control
EF#-S	Exhaust fan s# status
EXAT	exhaust air temperature
EXAV	exhaust air volume
Chiller #1:	
CH1F	flow rate
CH1LWT	leaving chilled water temperature
CH1LWP	Leaving chilled water pressure
CH1EWT	Entering chilled water temperature
CH1EWP	Entering chilled water pressure
CD1EWT	Entering condenser water temperature
CD1EWP	Entering condenser water pressure
CD1LWT	Leaving condenser water temperature
CD1LWP	Leaving condenser water pressure
CHP1F	Chilled water pump #1 flow rate
CHP1DP	Chilled water pump #1 discharge pressure

CHP1S	Chilled water pump #1 status
CP3C	Circulating pump #3 control
CP3F	Circulating pump #3 flow rate
CP3DP	Circulating pump #3 discharge pressure
CP3S	Circulating pump #3 status
HTA	High temperature alarm
LTA	Low temperature alarm
HTCO	High temperature cutout
LTCO	Low temperature cutout
HLA	High level alarm
LLA	Low level alarm
HLCO	High level cutout
LLCO	Low level cutout
HWF	Heating water flow rate
HWST	Heating water supply temperature
HWRT	Heating water return temperature
STP	Steam pressure
STF	Steam flow rate
RM-T	Room temperature
RM-H	Room humidity
RM-SP	Room static pressure (add reference point)

Examples of specific space conditions:

RM-TNPER 2	Space temperature, North Perimeter, 2nd floor
RM-SPSPER I9	Space static pressure, South Perimeter, 19th floor
RM-HEINT 9	Space humidity, East Interior, 9th floor
AFS	Air Flow Switch
AFM	Air Flow Monitor
F	Flow
P	Pressure
ST	Supply temperature
RT	Return temperature
FA	Fire alarm
FTA	Fire trouble alarm
CW	Chilled water system
CD	Condenser Water System
HWH	Hot water heating system
RADN	Radiation system

CDR	Condensate return system
HPS	Steam - High pressure system
LPS	Steam - Low pressure system
DCW	Domestic cold water system
DHW	Domestic hot water system
DHWR	Domestic hot water system Recirculation
SANP	Sanitary sewage - pumped system
STMP	Storm water - pumped system
SPRD	Sprinkler - Dry pipe system
SPRW	Sprinkler - Wet pipe system
FSTP	Fire standpipe & hose system
VBA	Volume Box Control Assembly

1.4 I/O SUMMARY SCHEDULES

.1 General:

.1 The EMCS contractor shall provide a complete I/O summary schedule similar to the one listed below, listing and describing all I/O's in detail. Contractor's standard schedule may be used provided all relevant information is provided.

.2 PCU no: identifies the PCU to which all points in the I/O Summary Schedule are wired.

.3 Building/Area: unique label given to each building forming part of a multi-building facility.

.4 Area/System Label: unique label given to each area of the building or to each system.

.1 Column 1: Point no: I/O Summary Schedule reference number.

.2 Column 2: Point label: unique label for each point in the system. Point labels may be repeated for other buildings or systems.

.3 Column 3: Description: describes the point label in expanded terms.

.4 Column 4: Type: (eg. AI, AO, DI, DO).

.5 Column 5: Eng. Units: Describes the engineering units used (eg. for AI, AO: C, kPa, Amp Volt. For DI, DO: OFF, ON).

.6 Column 6: Access level: Defines the level of access for varying complexity of functions. Usually associated with password feature. Usually assigned value between 0 (lowest) and 4 (highest).

.7 Column 7: Sensor type: describes in 2 or 3words.

.8 Column 8: Assoc. Point: Identifies/ describes points for purposes of alarm suppression, software interlocks.

.9 Column 9: Type: defines the type of alarm (eg. CR = CRITICAL, CA = CAUTIONARY, M = MAINTENANCE).

.10 Column 10: DI/DO, NO/NC: defines the NORMAL condition of alarm. (NC = NORMALLY CLOSED. NO = NORMALLY OPEN).

.11 Column 11: Limits: Defines alarm levels (eg. L2 = Low alarm, Level2. H1 = High alarm, Level1).

.12 Column 12: Alarm Mess: Defines alarm message number. This number is related to pre-composed message detailing the problem and describing the required action.

.13 Column 13: Maint Mess: defines maintenance message number. This number as related to pre-composed message detailing the problem and describing the required action.

.14 Column 14: Set Point: Defines the design set-point of the control loop.

.15 Column 15: Dead band: defines the range above or below the set-point at which no change in output signal is to occur.

.16 Column 16: Dev alarm limit: defines the limit on deviation of the measured value from the set-point (sometimes also referred to as the "error limit").

.17 Column 17: NC/NO: defines NORMAL condition when de-energized. NC - NORMALLY CLOSED. NO = NORMALLY OPEN. DA/RA: defines the form of action. DA = direct acting. RA = REVERSE ACTING.

.18 Column 18: Contacts: NO/NC: defines NORMAL condition when de-energized. NC = NORMALLY CLOSED. NO = NORMALLY OPEN.

.19 Column 19: Delay Succ starts: defines the time limits (usually in seconds). To prevent overheating of motors or equipment from frequent re-starting.

.20 Column 20: Heavy motor delay: defines the time (usually up to 60seconds). To prevent heavy electrical load from simultaneous starting of large consumption equipment.

.21 Column 21: auto-reset: A = AUTOMATIC. M=MANUAL.

.22 Column 22: Programs:

.1 Examples of Applications Programs include: Night set-back; optimum start/stop; demand limiting (load shedding).

.2 Optimization routines (eg. chiller optimization, supply air temperature optimization, enthalpy control) should be described as part of CDL's.

.3 Parameters for all application programs should be provided separately as part of the design documentation (eg. the Systems Operation Manual).

.4 Note requirements for computer totalization, recording, print-out of accumulated value of a point over a period of time. If totalization depends upon a number of analog points, include for pseudo energy points.

.5 Run time totals: for calculation of operation of digital points.

.6 Optimum start/stop: Example: HVAC unit to start before scheduled occupancy, based upon HVAC unit capacity, heat loss, interior and exterior environmental conditions, etc.

.2 Schedule:

INPUT/OUTPUT			SCHEDULE PCU NO.					(see 1.3.2)		
PROJECT NO.			BLDG/AREA				NAME	(see 1.3.3)		
PROJECT NAME			AREA/SYSTEM				NAME	(see 1.3.3)		
POINT IDENTIFICATION								ALARMS		
1	2	3	4	5	6	7	8	9	10	11
Point. No	Point Label	Descrip	Type	Eng. Unit	Access Level	Sensor type	Assoc Point	Type (M,CR)	DI/D0 NO/NC	Limits

MESSAGES								DI/DO		
12	13	14	15	16	17	18	19	20	21	22
Alarm Limit	Maint	Set-Point MO/MA	Dead band start	Dev. alarm delay	NO/NC DA/RA	Cont's NO/NC	Delay succ.	Heavy Motor	Auto reset	Prog

1.5 CONTROL NARRATIVE SEQUENCE OF OPERATIONS

.1 General System Operation:

.1 System is comprised of a 100% outside air (OA) variable volume makeup air unit (MAU) EN-LMU-1 with electric heat, packaged DX cooling, and—two fume hood exhaust fans. The system will utilize critical control valves for fume hood airflow control and a general room exhaust for room pressure control and when one or more fume hoods are not operating. It is intended that the fume hoods would normally operate 24/7.

.2 The fume hood exhaust fans (EN-EF-018 and EN-EF-019) shall operate at a constant flow ~376 LPS each, exact numbers to be determined in balancing.

.3 The system shall operate continuously and maintain the lab at a negative pressure with an exhaust offset (adj) initially set at 100 LPS. The room pressure target is -5pa relative to the adjacent corridor.

.4 The MAU supply shall maintain the supply airflow identified on the drawings and to maintain the room pressure relationship and shall only reduce airflow via an signal from the Honeywell EMCS system to the MAU internal VFD when a fume hood is commanded off. The EMCS system will monitor AHU supply airflow via an airflow station and a static pressure sensor.

.1 The MAU equipment has a minimum airflow limit of ~435 LPS.

.2 The EMCS shall adjust the MAU fan speed for airflow based on the number of fume hoods operating.

.5 A general room exhaust valve shall modulate to maintain the negative airflow balance in the room when either or both fume hoods are inactive, failed, or room pressure to corridor is outside of the pressurization setpoint.

.1 The EMCS shall utilize the room pressure sensor and airflow stations on the supply and general exhaust to achieve this.

.2 Static pressure values determined in balancing shall be used for EN-EF-018 and EN-EF-019 for determining total exhaust flow along with drive frequency.

.3 The EMCS should ensure on a manually commanded shutdown of either lab fan that the commanded fan ramps down as the general exhaust fan ramps up to maintain negative pressure in the lab.

.6 EN-EF-018, 019, shall maintain static pressure setpoints set in balancing.

.7 Magnetic door sensors on the hallway, office and stairwell doors shall pause the pressurization control based on room pressure feed back. i.e. if the doors are open and room pressure changes don't try to pressurize but maintain the exhaust airflow offset.

.8 Failure of any fan within 60 seconds shall generate a fault alarm.

.9 Room pressure greater that 0 Pa and less than -10Pa shall generate an alarm.

.10 Supply air temperature (SAT) shall be maintained above 12°C via the heating algorithm internal to the AHU.

.11 Exhaust and supply airflow shall be measured via critical control output and flow station respectively and totalized as.

.12 Air change rates shall be calculated using exhaust airflow volumes and room volumes.

.13 Supply air temperature reset logic shall adjust the SAT setpoint based on lab zone demand analysis.

.14 Supply temperature setpoint shall be adjustable locally at the unit controller or remotely via EMCS

.2 MAU START AND STOP AND CONTROL

.1 The MAU unit shall be enabled by a contact closure from the EMCS.

.2 The following is Internal to the MAU

.1 After an initial delay for microprocessor initialization, the OA damper actuator shall open. Once damper position is proven, the supply fan shall start after an adjustable delay

.2 When the unit is disabled the supply fan shall be OFF and the OA damper shall be spring-returned closed. Temperature and humidity sensors shall remain active for monitoring but shall not trigger alarms.

.3 Read /Write

.1 Temperature Setpoint

.2 Min/Max SAT cooling

.3 Min/Max SAT Heating

.4 Cooling Ambient lockout

.5 Heating Ambient Lockout

.6 Low Supply Temp for unit shutdown

.7 BMS to control signal for Supply Fan Speed

.8 Unit Status word (look up table).

.9 BMS watchdog command?

.10 BMS occupancy Command

.11 Alarm Reset Command

.12 Other points as required to facilitate sequences.

.3 Exhaust Fans:

.1 EN-EF-018, 019 (fume hood exhausts) shall operate continuously to maintain duct static pressure as determined in TAB. Each fume hood will exhaust approximately at ~346 LPS each. On startup and shutdown, the exhaust fan VFD's shall be gradually ramped to allow the critical control system to react.

.2 The general exhaust valve shall modulate to maintain negative pressure of the lab as measured from the room pressure sensor.

.3 Alarm shall be triggered upon any failure of airflow measurement or fan status feedback.

.4 MAU Air Tempering Heating **(internal to the MAU but unit programming to be setup by factory trained MAU vendor and coordinated by Honeywell):**

.1 If outdoor air temperature (OAT) is below 18°C (adj.), electric heat is enabled.

.1 Cooling is locked out

.2 Electric heater shall be modulated via the unit's internal microprocessor controller to maintain the active SAT setpoint. Initial setpoint of SAT to be room temperature setpoint.

.3 Supply air temperature setpoint shall be set by EMCS.

.1 Room adjustable thermostats shall inform EMCS space user temperature preference.

.2 If OAT is above 18°C (adj.), heating is disabled.

.5 MAU Cooling **(internal to the MAU but unit programming to be setup by factory trained MAU vendor and coordinated by Honeywell):**

.1 Cooling is for tempering only and not for humidity control.

.2 If OAT is above 24°C (adj.), DX cooling shall be enabled.

.3 MAU internal controls shall do the following in cooling mode:

.1 Cooling shall maintain the active SAT setpoint using a single-stage scroll compressor**.**

.2 Hot gas bypass shall be active under low load to protect the DX coil from frosting.

.3 Leak detection

.1 Leak detection system shall monitor both the airstream and compressor section.

.2 On leak detection, unit shall enter ventilation mode: OA damper opens and fan runs at minimum speed override for at least 5 minutes or until cleared.

.3 If Fire Shutdown Alarm is active, the override sequence shall be bypassed per UL 60335-2-40.

.4 High/low SAT alarms shall be ignored during leak response. Alarm and status notifications shall be sent to EMCS.

.5 If OAT is below 24°C (adj.), cooling is disabled.

.6 Trending:

.1 Supply and exhaust airflow, SAT, OAT, fan status, and electric heater outputs shall be logged and available for review via EMCS

.7 System Alarms and monitoring:

.1 The MAU Internal Controls shall monitor and record alarms including time, date, temperatures, and unit status. Alarm conditions shall be communicated to the EMCS via BACnet.

.2 Alarm conditions include:

.1 **Global Alarm** (aggregate of active faults)
.2 OA temperature sensor failure
.3 SAT sensor failure (unit shutdown)
.4 Low SAT below 2°C for 300 seconds (adj.) → unit shutdown
.5 Dirty filter via differential pressure switch (field adjustable)
.6 Refrigerant pressure high/low trip
.7 Supply fan failure to prove airflow within 30 seconds (adj.)

.3 Unit Status Tables

.1 The controls contractor shall integrate the BACnet object unit_status_word or equivalent status/alarm state from the AHU controller into the EMCS system. This object typically presents a numeric value corresponding to the current unit operating state. The contractor shall implement a lookup table or equivalent logic within the control program to decode the numeric value into a meaningful, descriptive system state (e.g., "Off", "Preheat", "Cooling", "Heating", "Alarm", etc.). The resulting decoded state shall be displayed on the operator interface in plain text for ease of interpretation by facility staff.

.8 Room Temperature Control:

.1 Simultaneous AHU cooling and space heating shall be prevented.

.2 Space temperatures shall follow EMCS schedules with occupied and setback modes.

.9 Fume hood

.1 Fume hood exhaust critical control valve shall modulate as required to maintain the hood constant fume hood exhaust volume as specified.

.2 Sash Movement / Bypass Action Changes in sash position shall be accommodated by the hood's internal bypass arrangement; however when the sash is raised above normal operating height of 457 mm to be confirmed) the valve shall be

permitted to increase total exhaust to maintain 100 fpm or up an airflow determined in balancing based on the capacity of the valve. The valves have been sized to operate at the lower sash height airflow and are not intended to support a 100 fpm velocity at sash height of 711 mm.

.3 Room pressure control shall be achieved by trim adjustments of the general exhaust valve, not by varying the fume hood design volume.

.4 The face velocity sensors for the fume hoods with outputs to be picked up by the EMCS.

.5 Alarms and faults to be pushed to EMCS.

1.6 INPUT/OUTPUT POINT SUMMARY TABLE

.1 The input/output table summarizes the Input/Output (I/O) points for the various systems as outlined within the EMCS specifications and control schematic drawings. However, the tables are not all inclusive as they do not list the typical room temperature sensors, reheat coil valves, radiator valves, unit heater/force flow valves, terminal unit control assemblies, infloor heating manifold loop valves, etc. The number and location of these devices can be found on the floor plans and/or listed in relevant schedules. All points and field devices required to accomplish the specified sequence of operation shall be provided. Any discrepancies in I/O counts between the points list, specs and drawings shall be reported to the Owner.

1.7 INTEGRATION

.1 For all systems provide a detailed list of points including all point descriptors with BACNet protocol to EMCS Integrator contractor for integration into EMCS system in accordance with owners naming convention. Coordinate with EMCS systems integrator fully per 01 36 00 EMCS Systems Integrator.

.2 Coordinate with integrator on Engineering unit requirements, naming and alarms. Limit points broadcast to integrator the utilized points. All points and calculations, alarms, commands, etc. are to be provided.

.3 Provide all programming as required for lookup tables or device polling to read alarms, cautions and other communication from all BACNET devices.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

Memorial University of Newfoundland

ENGINEERING BUILDING

RENOVATIONS TO EN-2078

DECEMBER 9, 2025

ISSUED FOR TENDER

LIST OF DRAWINGS

A-0 - GENERAL NOTES, SYMBOL LEGEND & SITE ACCESS PLANS
A-0.1 - SITE ACCESS & CORE LOCATION PLANS
A-0.2 - SITE ACCESS, PARTIAL DEMOLITION & ROOF PLANS
A-1.0 - DEMOLITION FLOOR PLANS
A-1.1 - LAB BENCH PLANS & ELEVATIONS CP-5006, 5006A & SN-3108
A-1.2 - LAB BENCH & FIXTURE PLANS & ELEVATIONS SN-1008, 3123
A-2.0 - REFLECTED CEILING PLANS
A-3.0 - NEW FLOOR & FINISH PLANS
A-3.1 - NEW FURNITURE & FINISH PLANS
A-4.0 - DOOR & ROOF SCHEDULE, ELEVATIONS & DETAILS

EN-164-21 ISSUED FOR TENDER

This University was raised by the people of Newfoundland as a memorial to the fallen in the great wars, 1914-1918, 1939-1945, that in freedom of learning, their cause and sacrifice might not be forgotten.

- Dedication plaque, Arts & Administration Building, St. John's Campus

MEMORIAL UNIVERSITY

FACILITIES MANAGEMENT

GENERAL NOTES: (APPLY TO ALL DWG SHEETS)

1. ALL WORK TO BE DONE IN ACCORDANCE WITH LATEST EDITION OF THE NATIONAL BUILDING CODE AND APPLICABLE LOCAL BUILDING CODES.
2. ALL CONTRACTORS AND SUBCONTRACTORS PERFORMING WORK ON THE PROJECT ARE TO PROVIDE UTMOST QUALITY WORKMANSHIP. THEY MUST ALSO ADHERE TO ALL SCHEDULES AS SET OUT IN THE CONTRACT DOCUMENTS.
3. CONTRACTOR TO ENSURE A HAZARD ASSESSMENT IS DONE ONSITE PRIOR TO THE START OF WORK TO IDENTIFY POTENTIAL HAZARDS AND RECOMMENDED CONTROLS.
4. CONTRACTOR SHALL BE AWARE THAT ASBESTOS CONTAINING MATERIAL (ACM) EXISTS THROUGHOUT THE CAMPUS. COORDINATE ALL CUTTING, DRILLING, AND DEMOLITION OF VINYL TILE, DRYWALL JOINT COMPOUND, AND PARGING CEMENT AT PIPE ELBOWS IN THE ENGINEERING BUILDING BY ALL TRADES WITH MUN PROJECT COORDINATOR AND MUN ASBESTOS COORDINATOR.
5. CONTRACTOR SHALL BE AWARE THAT LEAD CONTAINING MATERIAL EXISTS THROUGHOUT THE CAMPUS. COORDINATE ALL CUTTING, DRILLING, AND DEMOLITION OF PAINTED SURFACES IN THE ENGINEERING BUILDING BY ALL TRADES WITH MUN PROJECT COORDINATOR AND MUN ASBESTOS COORDINATOR.
6. THE AREA OF WORK MAY BE OCCUPIED BY THE CLIENT STAFF FOR THE DURATION OF THE PROJECT. THE MUN PROJECT COORDINATOR AND GENERAL CONTRACTOR SHALL COORDINATE RENOVATING SMALL AREAS OF THE SPACE AT A TIME TO MINIMIZE DUST, DEBRIS, AND NOISE LEVELS. THE PROJECT COORDINATOR SHALL COORDINATE WITH THE CLIENT AND GENERAL CONTRACTOR TO ESTABLISH A SCHEDULE OF WORK.
7. ALL TEMPORARY HOARDING AND ACCESSES REQUIRED IN EGRESS CORRIDORS, ATRIUMS, FOYERS AND STAIRWELLS TO BE OF NON-COMBUSTABLE FIRE RATED CONSTRUCTION AS PER NBC.
8. CONTRACTOR IS TO HOARD WORK AS NECESSARY AND PROTECT REMAINING PREMISES IN THE WORK AREA AND ADJACENT TENANT SPACES FROM DAMAGE AND MAKE GOOD ANY DAMAGES THAT MAY OCCUR DURING THE WORK. CONTRACTOR TO SEAL ALL AFFECTED DUCT SYSTEMS FOR DUST CONTROL WITHIN THE WORK AREA AND ADJACENT SPACES. ALL MATERIALS TO BE PROTECTED & COVERED DURING PAINTING.
9. CONCRETE BLOCK REMOVAL AND WORK CREATING EXCESSIVE NOISE SHALL BE SCHEDULED FOR AFTER NORMAL BUSINESS HOURS 8:30AM – 5:00PM, MONDAY – FRIDAY. TO LIMIT NOISE AND DISRUPTIONS TO SURROUNDING OCCUPANTS OF BUILDING.
10. CONTRACTOR TO CAREFULLY REMOVE EXISTING SIGNAGE FROM WALL LOCATIONS AT INTERIOR AND EXTERIOR OF CONSTRUCTION SPACE PRIOR TO DEMOLITION. TURN OVER TO PROJECT COORDINATOR.
11. ALL DEMOLISHED MATERIAL BECOMES THE PROPERTY OF THE CONTRACTOR. WORK SITE TO BE LEFT IN SAFE CONDITION AT THE END OF EACH WORK DAY.
11. PROVIDE FIRE STOPPING AT ALL PENETRATIONS THROUGH FLOOR SLABS AND CONCRETE BLOCK WALLS.
12. READ IN CONJUNCTION WITH MECHANICAL AND ELECTRICAL PLANS AND SPECIFICATIONS, COORDINATE ALL WORK WITH OTHER TRADES.
13. ALL CIRCUIT BREAKER / PANEL SHUTDOWNS WILL REQUIRE MUN ELECTRICIAN PRESENT TO PROVIDE LOCK OUT/TAG OUT. CONTRACTOR SHALL CONTACT PROJECT COORDINATOR MIN. 48Hrs IN ADVANCE TO SCHEDULE MUN ELECTRICIAN. LIVE ELECTRICAL WORK IS NOT PERMITTED.
14. CONTRACTOR TO OBTAIN AND PAY FOR ANY PERMITS REQUIRED BY LOCAL CODES AND REGULATIONS.
15. CONTRACTOR TO REVIEW EXISTING SITE CONDITIONS, VERIFY ALL DIMENSIONS AND SCOPE OF WORK AND REPORT ANY DISCREPANCIES TO THE MUN PROJECT COORDINATOR PRIOR TO SUBMISSIONS OF TENDER.
16. WHERE DRAWINGS INDICATE TO MATCH EXISTING, NO CHARGES AFTER TENDER ACCEPTANCE FOR MINIMUM QUANTITIES OR SPECIAL SHIPPING COSTS WILL BE CONSIDERED.
17. NO CHANGES OR REVISIONS TO THE WORK ARE TO BE EXECUTED WITHOUT THE PRIOR APPROVAL OF THE OWNER.
18. CONTRACTORS SHALL AWAIT WRITTEN APPROVAL FOR ANY CHANGE ORDERS BY THE OWNER'S REPRESENTATIVE PRIOR TO COMMENCING ANY WORK OR ORDER OF ANY MATERIALS RELATING TO A CHANGE.
19. PROVIDE CERTIFICATE OF GUARANTEE OF WORKMANSHIP AND MATERIAL FOR A PERIOD OF ONE YEAR FROM DATE OF ACCEPTANCE BY OWNER.
20. ISOLATION OF WORK AREAS IN OCCUPIED FACILITIES:

20.1. MATERIALS:

20.1.1. POLYETHYLENE SHEET: REINFORCED, FIRE–RESISTIVE SHEET, 0.25mm MINIMUM THICKNESS, WITH FLAME–SPREAD RATING OF 15 OR LESS PER ASTM E 84.

20.1.2. DUST CONTROL ADHESIVE–SURFACE WALK–OFF MATS: PROVIDE MATS MINIMUM 914 X 1624mm.

20.2. INSTALLATION:

20.2.1. PREVENT DUST, FUMES, AND ODOURS FROM ENTERING OCCUPIED AREAS.

20.2.2. PRIOR TO COMMENCING WORK, ISOLATE THE HVAC SYSTEM IN AREA WHERE WORK IS TO BE PERFORMED. ENCLOSE ALL REGISTERS/DIFFUSERS WITH REINFORCED FIRE RESISTIVE SHEET THROUGHOUT AREA OF WORK. COORDINATE WITH OWNER WHERE SYSTEM REQUIRES BLANKING AT DUCTWORK.

20.2.3. DISCONNECT SUPPLY AND RETURN DUCTWORK IN WORK AREA FROM HVAC SYSTEMS SERVICING OCCUPIED AREAS WHERE REPAIRS ARE TO BE COMPLETED TO THE HVAC SYSTEM.

20.2.4. MAINTAIN NEGATIVE AIR PRESSURE WITHIN WORK AREA USING HEPA–EQUIPPED AIR FILTRATION UNITS, STARTING WITH COMMENCEMENT OF TEMPORARY PARTITION CONSTRUCTION, AND CONTINUING UNTIL REMOVAL OF TEMPORARY PARTITIONS IS COMPLETE. AT THE DISCRETION OF THE PROJECT COORDINATOR.

20.2.4.1. NON–DUCTED, SELF–CONTAINED AIR FILTRATION UNITS ARE PERMITTED TO BE USED FOR DUST CONTROL

20.2.4.2. WHERE DUCTED AIR FILTRATION UNITS ARE USED; CONTRACTOR TO EXHAUST DUCT TO EN–2078 WINDOWS; ALL DUCT MUST BE FASTENED AND SECURED OVERHEAD. NO DUCT PERMITTED THROUGH EXIT DOORS, OR ADJACENT SUITES.

20.2.5. MAINTAIN DUST PARTITIONS DURING THE WORK. USE VACUUM COLLECTION ATTACHMENTS ON DUST–PRODUCING EQUIPMENT. ISOLATE LIMITED WORK WITHIN OCCUPIED AREAS USING PORTABLE DUST CONTAINMENT DEVICES.

20.2.6. PERFORM DAILY CONSTRUCTION CLEANUP AND FINAL CLEANUP USING APPROVED, HEPA–FILTER–EQUIPPED VACUUM EQUIPMENT.

21. GENERAL CONTRACTOR MUST REFER TO ARCHITECTURAL AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR EXTENT OF WORK AND COORDINATE WITH OTHER TRADES PRIOR TO THE COMMENCEMENT OF ANY WORK.
22. MAINTAIN FIRE RATINGS BETWEEN FLOOR AND WALL ASSEMBLIES. FILL AND PATCH HOLES IN FLOORS AND WALLS AS A RESULT OF DEMOLITION WORK. COORDINATE OPENINGS REQUIRED IN EXISTING FIRE RATED CONCRETE BLOCK WALLS AND FLOORS WITH MECHANICAL AND ELECTRICAL SUB–TRADES. APPROPRIATELY FIRE SEAL PENETRATIONS TO MAINTAIN 1 HOUR FIRE RESISTANCE RATING. SUBMIT PRODUCT DATA SHEETS FOR REVIEW AND APPROVAL.
23. REMOVE AND SALVAGE LOCKSETS, CLOSURES, AND OPERATOR SYSTEMS UNLESS OTHERWISE NOTED. TURN OVER TO OWNER.
24. REFER TO SECTION 01 10 00 FOR WORK RESTRICTIONS.
25. PERFORM DEMOLITION WORK SHOWN AND/OR REQUIRED TO COMPLETE THE WORK. DO NOT ASSUME DEMOLITION DRAWINGS SHOW THE FULL EXTENT OF DEMOLITION WORK REQUIRED.
26. PROVIDE CUTTING, FITTING, HOLE CORING, PATCHING, FRAMING, FURRING, BLOCKING AND MISCELLANEOUS RELATED COMPONENTS REQUIRED TO EXECUTE THE WORK OF THIS CONTRACT, INCLUDING WORK REQUIRED BY ELECTRICAL AND OTHER TRADES. REINSTATE AND/OR MAKE GOOD ALL EXISTING SURFACES AFFECTED BY THE WORK. TO BE PREPARED TO RECEIVE NEW FINISHES OR FINISH TO MATCH ADJACENT CONDITIONS. COORDINATE EXTENT WITH SUB–TRADES.
27. WHEREVER EXCESSIVE DEMOLITION OCCURS OR IF DAMAGE OCCURS TO ADJACENT SURFACES NOT INTENDED FOR DEMOLITION OR REMOVAL, REINSTATE ALL AFFECTED SURFACES AND PREPARE THEM TO RECEIVE NEW FINISHES IF SPECIFIED, OTHERWISE REFINISH TO MATCH EXISTING ADJACENT CONDITIONS.
28. ALL DATA DROPS NOTED TO BE REMOVED SHALL BE DISCONNECTED BY MUN FORCES PRIOR TO DEMOLITION WORK BY ELECTRICAL SUB–TRADE. CONTRACTOR SHALL CONTACT PROJECT COORDINATOR 48hrs IN ADVANCE TO NOTIFY / SCHEDULE DATA DROP DISCONNECTION. DO NOT CUT OR DISCONNECT DATA CABLES.
29. REMOVE ALL WIRING AND CONDUIT BACK TO NEAREST JUNCTION BOXES FOR RECEPTACLES, SWITCHES, ETC. THAT ARE INDICATED TO BE REMOVED OR RELOCATED.
30. ELECTRICAL CONTRACTOR IS RESPONSIBLE TO VERIFY INDICATED CIRCUITS AND TRACE OUT ANY UNKNOWN POWER AND LIGHTING CIRCUITS PRIOR TO ANY WORK TAKING PLACE.
31. REUSE EXISTING LIGHTING POWER CIRCUITS AS INDICATED. RE–ROUTE, EXTEND, OR MODIFY POWER FEEDS AS REQUIRED TO FACILITATE ALL NEW LOCATIONS OF LIGHT FIXTURES, ILLUMINATED EXIT SIGNS, LINE VOLTAGE DIMMER SWITCHES, AND LOW VOLTAGE SWITCHES.
32. ALL ELECTRICAL ISOLATIONS SHALL BE PERFORMED IN ACCORDANCE WITH MUN ZERO ENERGY ISOLATION PROGRAM (ZEIP). ELECTRICAL CONTRACTORS ARE REQUIRED TO HAVE COMPLETED MUN ZEIP TRAINING PRIOR TO PERFORMING ELECTRICAL WORK.
33. CONTRACTOR TO NOTIFY PROJECT COORDINATOR 48HRS PRIOR TO COMPLETING HOT WORK. HOT WORK INCLUDES BUT IS NOT LIMITED TO; CUTTING, WELDING, SOLDERING, SWEATING, OR OTHER WORK INVOLVING TORCH, OPEN FLAME, OR IGNITION SOURCE. CONTRACTOR IS RESPONSIBLE TO OBTAIN A HOT WORK PERMIT VIA ENVIRONMENTAL HEALTH AND SAFETY INSPECTION PRIOR TO START OF WORK. HOT WORK REQUIREMENTS INCLUDE;
    33.1. ONE (1) HOUR FIRE WATCH
    33.2. THREE (3) HOUR SITE MONITORING
    33.3. FIRE AND SMOKE ALARM BYPASS IN CONJUNCTION WITH MUN FORCES
34. CONTRACTOR IS RESPONSIBLE TO SCAN EXISTING FLOOR SLAB TO LOCATE CONDUIT, OR OBSTRUCTIONS RESULTING IN INTERFERENCE WITH NEW MECHANICAL AND ELECTRICAL PENETRATIONS THROUGH SLAB LOCATED BETWEEN EN–2078 AND EN–1034/A. SCAN TO BE COMPLETED PRIOR TO COMPLETING CORES THROUGH EXISTING SLAB.

ARCHITECTURAL SYMBOL LEGEND:

- NEW WALL CONSTRUCTION, SEE WALL TYPE
- EXISTING GYPSUM BOARD WALL CONSTRUCTION TO REMAIN
- EXISTING GYPSUM BOARD WALL CONSTRUCTION TO BE REMOVED
- NEW CONCRETE BLOCK WALL CONSTRUCTION, SEE WALL TYPE
- EXISTING CONCRETE BLOCK WALL CONSTRUCTION TO REMAIN
- EXISTING CONCRETE BLOCK WALL CONSTRUCTION TO BE REMOVED
- NEW TEMP HOARDING WALL:
  - FIRE RETARDENT RIP PROOF TARP (WHITE)
  - 92mm METAL STUDS @ 400 O.C.
- NEW TEMP HOARDING WALL:
  - 6mil POLYETHYLENE SHEETING
- NEW 25mm CONDUIT
- EXISTING DOOR TO REMAIN
- EXISTING DOOR TO BE REMOVED
- NEW DOOR
- (####) NEW DOOR NUMBERS
- (#) REFER TO CONSTRUCTION NOTE
- # REFER TO DEMOLITION NOTE
- = LAT CEILING SYSTEM TO BE REMOVED
- = LAT CEILING SYSTEM TO REMAIN
- = NEW LAT CEILING SYSTEM, SEE SPEC
- = EXISTING GYPSUM CEILING SYSTEM 16mm GYPSUM BOARD CEILING SYSTEM
- (####) = NEW CEILING INSTALLATION HEIGHT ABOVE FINISH FLOOR

WALL TYPES: (EXISTING FLOOR TO U/S OF STRUCTURE IS APROX. 4400mm)

1 WALL TYPE 1:
- 92mm METAL STUD FRAMING @ 400 O.C.
- 16mm GYPSUM BOARD

WALL CONSTRUCTION TO EXTEND 150mm ABOVE FINISHED CEILING, METAL STUDS TO EXTEND TO U/S OF STRUCTURE FOR STABILITY AS REQ'D

2 WALL TYPE 2:
- 13mm TYPE 'X' GYPSUM BOARD
- 92mm METAL STUD FRAMING @ 400 O.C.
- 13mm TYPE 'X' GYPSUM BOARD
- APPROPRIATELY FIRE SEAL GAPS BETWEEN NEW PARTITION AND UNDERSIDE OF BEAM, OR METAL DECKING TO MAINTAIN 1 HOUR FIRE RESISTANCE RATING

WALL CONSTRUCTION TO EXTEND TO U/S OF BEAM, OR METAL DECKING

3 WALL TYPE 3:
- 92mm METAL STUD FRAMING @ 400 O.C.
- 13mm WATER RESISTANT GYPSUM BOARD

WALL CONSTRUCTION TO EXTEND 150mm ABOVE FINISHED CEILING, METAL STUDS TO EXTEND TO U/S OF STRUCTURE FOR STABILITY AS REQ'D

4 WALL TYPE 4:
- 16mm GYPSUM BOARD
- 92mm STUD @ 600mm O.C.
- 16mm GYPSUM BOARD

WALL CONSTRUCTION TO EXTEND 150mm ABOVE FINISHED CEILING, METAL STUDS TO EXTEND TO U/S OF STRUCTURE FOR STABILITY AS REQ'D

5 WALL TYPE 5:
- 150mm CONCRETE MASONRY BLOCK UNIT
- INSTALL USING TOOTHED TECHNIQUE
- APPROPRIATELY FIRE SEAL GAPS BETWEEN CONCRETE MASONRY BLOCK AND UNDERSIDE OF BEAM, OR METAL DECKING TO MAINTAIN 1 HOUR FIRE RESISTANCE RATING

WALL CONSTRUCTION TO EXTEND TO U/S OF BEAM, OR METAL DECKING

6 WALL TYPE 6:
- 13mm GYPSUM BOARD
- 92mm METAL STUD FRAMING @ 400 O.C.
- 13mm GYPSUM BOARD

WALL CONSTRUCTION TO EXTEND 150mm ABOVE FINISHED CEILING, METAL STUDS TO EXTEND TO U/S OF STRUCTURE FOR STABILITY AS REQ'D

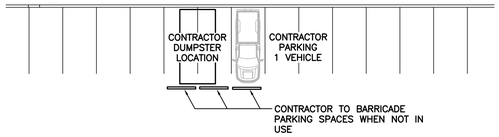
GENERAL CONSTRUCTION NOTES – APPLIES TO ALL SHEETS:

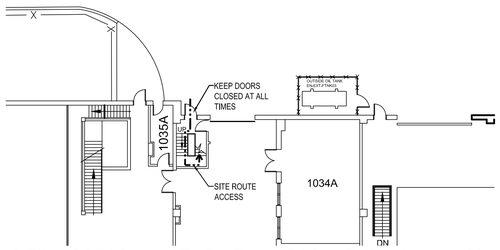
1. EXIT DOORS THROUGH LOADING BAY TO LOADING DOCK SHALL NOT BE PROPPED OR HELD OPEN OR LEFT UNATTENDED WHILE OPENED.
2. EXIT DOORS AT STAIRWELL TO CLASSROOM AND EXTERIOR EXIT SHALL NOT BE PROPPED OR HELD OPEN OR LEFT UNATTENDED WHILE OPENED.
3. CONTRACTOR SHALL OBTAIN PARKING PERMITS FROM CAMPUS ENFORCEMENT PATROL (CEP) FOR THE DURATION OF THE PROJECT. PARKING IS NOT PERMITTED IN LOADING ZONES OR MATERIAL DROP OFF AREA.
4. CONTRACTORS SHALL BE RESPONSIBLE FOR PAYING ALL PARKING TICKETS ISSUED BY CAMPUS ENFORCEMENT PATROL. CONTESTED OR DISPUTED TICKETS SHALL BE BETWEEN THE CONTRACTOR AND CAMPUS ENFORCEMENT PATROL.
5. ALL SCOPE OF WORK LOCATED OUTSIDE CONSTRUCTION AREAS AND ABOVE CEILING SYSTEMS ON LEVEL 2 SHALL BE DONE AFTER REGULAR BUSINESS HOURS OF 8:30AM TO 5:00PM EACH DAY TO ENSURE THE SAFETY OF BUILDING OCCUPANTS. THE EXACT DATE AND TIME OF WORK TO BE SCHEDULED WITH PROJECT COORDINATOR TO PROVIDE BUILDING OCCUPANTS NOTICE OF WORK TO BE DONE IN CORRIDORS AND ADJACENT SPACES AND TO ENSURE WORK IS NOT CARRIED OUT DURING EVENING CLASSES.
6. THE GENERAL CONTRACTOR IS TO SUPPLY A DUMP TRAILER FOR MATERIAL REMOVAL. DUMPSTER BINS ARE NOT PERMITTED IN THE LOADING BAY AREA. THIS IS REQUIRED SO AS NOT TO INTERFERE WITH DAILY DELIVERIES TO THE BUILDING. DUMP TRAILER TO BE RELOCATED, OR REMOVED AS REQUIRED THROUGHOUT THE DAY FOR BUILDING DELIVERIES. CONFIRM SITE LOCATION WITH PROJECT COORDINATOR.
7. CONTRACTOR SHALL KEEP GRASS, SIDEWALKS, AND PAVED AREAS CLEAN OF DEBRIS AND MATERIALS. DUMP TRAILER TO BE COVERED AT ALL TIMES.
8. GENERAL CONTRACTOR MUST REFER TO ARCHITECTURAL AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR EXTENT OF WORK AND COORDINATE WITH OTHER TRADES PRIOR TO COMMENCEMENT OF ANY WORK.
9. REFER TO SECTION 01 10 00 FOR WORK RESTRICTIONS.
10. PERFORM DEMOLITION WORK SHOWN AND/OR REQUIRED TO COMPLETE WORK. DO NOT ASSUME DEMOLITION DRAWINGS SHOW THE FULL EXTENT OF DEMOLITION WORK REQUIRED.
11. REFER TO SHEET A–0 AND SECTION 02 41 19 FOR ADDITIONAL REQUIREMENTS AND INSTRUCTIONS FOR DEMOLITION WORK.
12. PROVIDE CUTTING, FITTING, HOLE CORING, PATCHING, FRAMING, FURRING, BLOCKING, AND MISCELLANEOUS RELATED COMPONENTS REQUIRED TO EXECUTE THE WORK OF THIS CONTRACT; INCLUDING WORK REQUIRED BY MECHANICAL, ELECTRICAL AND OTHER TRADES. REINSTATE AND/OR MAKE GOOD ALL EXISTING SURFACES AFFECTED BY THE WORK. PREPARE SURFACES TO RECEIVE NEW FINISHES, OR FINISH TO MATCH ADJACENT CONDITIONS. COORDINATE EXTENT WITH SUB–TRADES.
13. WHEREVER EXCESSIVE DEMOLITION OCCURS, OR, IF DAMAGE OCCURS TO ADJACENT SURFACES NOT INTENDED FOR DEMOLITION, OR REMOVAL, CONTRACTOR IS RESPONSIBLE TO REINSTATE ALL AFFECTED SURFACES AND PREPARE THEM TO RECEIVE NEW FINISHES IF SPECIFIED, OTHERWISE REFINISH TO MATCH ADJACENT CONDITIONS.
14. REVIEW DEMOLITION PLAN IN CONJUNCTION WITH ALL OTHER PLANS AND DETAILS. FURTHER DEMOLITION REQUIRED FOR NEW MECHANICAL AND ELECTRICAL BASED ON NEW FLOOR PLAN LAYOUT AND SITE CONDITIONS. CHECK SITE DIMENSIONS AND CONDITIONS AND REPORT UNACCEPTABLE CONDITIONS TO PROJECT COORDINATOR FOR REMEDIAL INSTRUCTIONS PRIOR TO PROCEEDING WITH THE WORK.
15. PATCH AND REPAIR WALLS AND FLOORS AS A RESULT OF MECHANICAL AND ELECTRICAL DEMOLITION AND NEW WORK.
16. WHERE REMOVING FLOORING DOWN TO CONCRETE FLOOR SLAB, PREPARE EXISTING CONCRETE FLOOR SLAB FOR NEW FLOORING INSTALLATION INCLUDING BUT NOT LIMITED TO SKIM COATING, LEVELING, FILLING, PATCHING, ETC. TO FACILITATE INSTALLATION OF NEW FLOORING.
17. NEW PAINT FINISH ON ALL NEW AND EXISTING WALLS, DOORS, FRAMES, HEATER CABINETS, ETC. PREPARE SURFACES TO RECEIVE NEW FINISH; INCLUDING BUT NOT LIMITED TO PATCH AND REPAIR, SCRAPING, SANDING, ETC. PAINT FINISH TO BE MINIMUM OF ONE (1) COAT PRIMER AND TWO (2) FINISH. SEE DWG A–3.1 & A–3.3 FOR FINISH SELECTIONS. REFER TO SECTION 09 91 23 FOR ADDITIONAL INFO.
18. PATCH (REPAIR) ANY DAMAGE TO EXISTING SPRAY–APPLIED FIRE RESISTIVE MATERIAL (SFRM) ON STEEL STRUCTURE AS A RESULT OF WORK CARRIED OUT UNDER THIS CONTRACT. CONTRACTOR TO REQUEST REVIEW WITH PROJECT COORDINATOR OF EXISTING CONDITION OF SFRM ON STRUCTURE PRIOR TO START OF WORK TO CONFIRM EXISTING CONDITIONS.

**** CONTRACTOR'S ARE TO TAKE NOTE THAT ASBESTOS CONTAINING MATERIALS (ACMs) ARE PRESENT IN VARIOUS BUILDING MATERIALS IN THE ENGINEERING BUILDING. AN ASBESTOS SURVEY HAS BEEN INCLUDED IN THE SPECIFICATION SECTION 02 26 00 OUTLINING SPECIFIC INFORMATION. REMOVAL/DEMOTION OF/TO THE VINYL TILE, DRYWALL JOINT COMPOUND, AND PARGING CEMENT AT PIPE ELBOW INSULATION INDICATED TO BE CONTAINING FOR ASBESTOS ARE TO BE REMOVED/CARRIED OUT USING APPROPRIATE ABATEMENT PROCEDURES AS PER THE PROVINCIAL REGULATIONS AND THOSE OUTLINED IN SECTION 02 82 00.02. ****

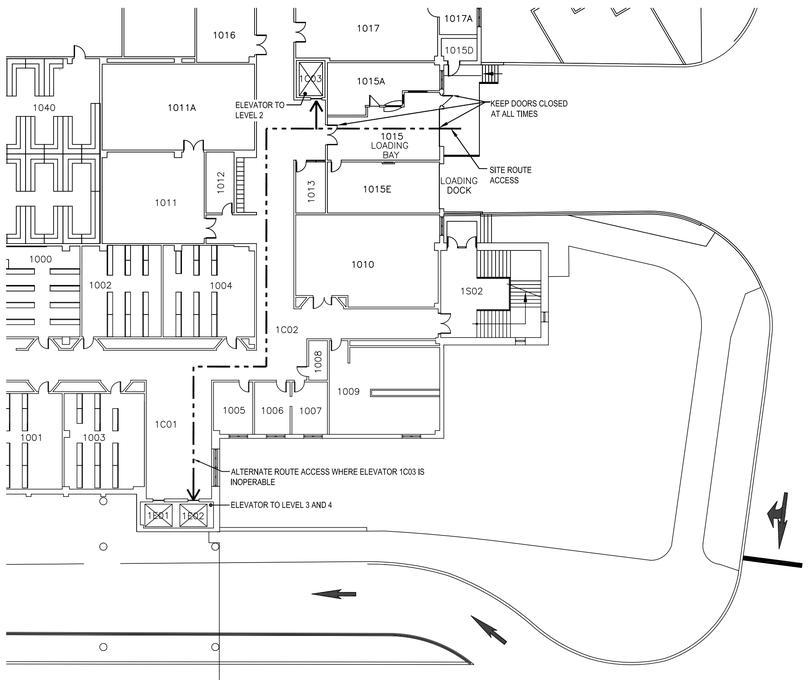
LIST OF SUBSCRIPTS:

W	INDICATES WALL MOUNTED
P	INDICATES PEDESTAL MOUNTED
N	INDICATES NEW DEVICE
C	INDICATES CEILING MOUNTED
E	INDICATES EXISTING TO REMAIN
ER	INDICATES EXISTING TO BE REMOVED
RL	INDICATES EXISTING TO BE RELOCATED
NL	INDICATES EXISTING IN NEW LOCATION

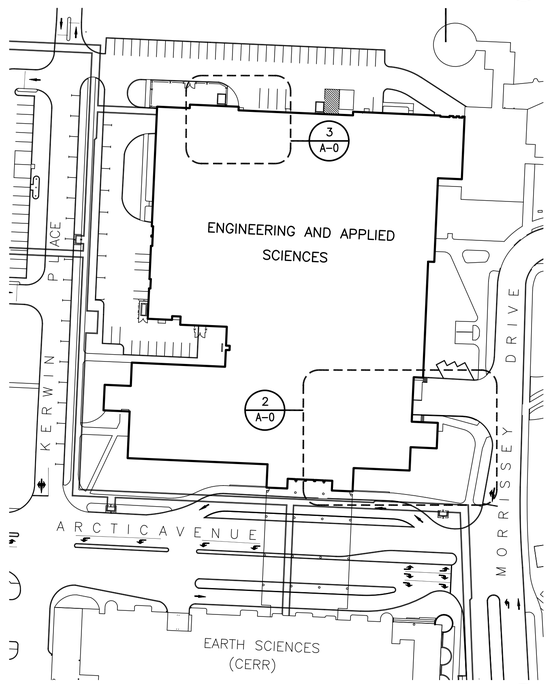




SITE ACCESS – STAIRWELL 1S08 LEVEL 1 (3 / A–0)
SCALE: N.T.S.



SITE ACCESS – LOADING BAY LEVEL 1 (2 / A–0)
SCALE: N.T.S.



SITE / BUILDING LOCATION PLAN (1 / A–0)
SCALE: N.T.S.

A – DETAIL
B – LOCATION/DRAWING No.
C – DRAWING No.

No.	REVISION	DATE
R0	ISSUED FOR TENDER	DECEMBER 9, 2025

GENERAL NOTES

1. DRAWINGS TO BE READ AS A SET.
2. DO NOT SCALE FROM DRAWINGS.
3. THE CONTRACTOR IS TO VERIFY ALL DIMENSIONS AND SITE CONDITIONS PRIOR TO SUBMISSION OF TENDERS.
4. ALL DEFICIENCIES FOUND IN THIS DRAWING IS TO BE BROUGHT TO THE ATTENTION OF THE FACILITIES ENGINEERING AND DEVELOPMENT OFFICE OF THE DEPARTMENT OF FACILITIES MANAGEMENT, MEMORIAL UNIVERSITY OF NEWFOUNDLAND, PRIOR TO THE SUBMISSION OF THE TENDERS.

NORTH

MEMORIAL UNIVERSITY
FACILITIES MANAGEMENT

This University was raised by the people of Newfoundland as a memorial to the fallen in the great wars, 1914-1918, 1939-1945, that in freedom of learning, their cause and sacrifice might not be forgotten.

- Dedication plaque, Arts & Administration Building, St. John's Campus

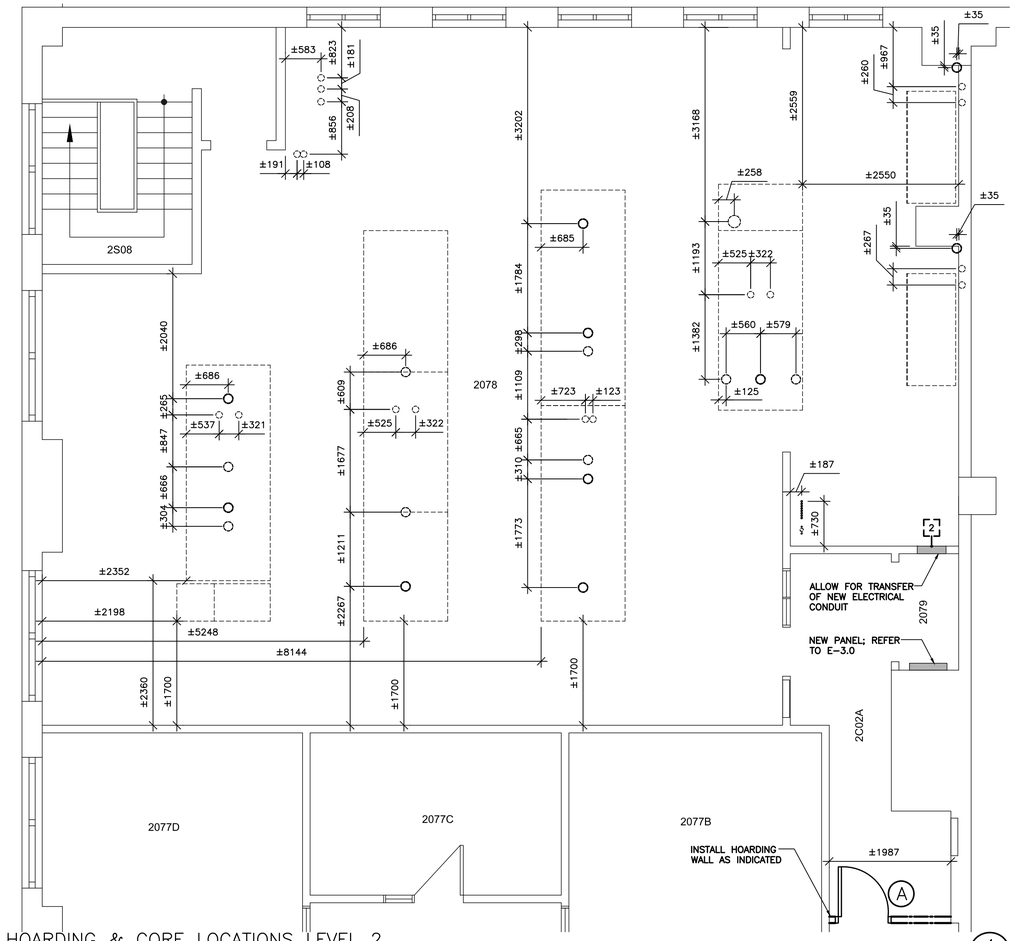
PROJECT NAME:

ENGINEERING BUILDING RENOVATIONS TO EN-2078
Project #: EN-164-21

DRAWING TITLE:

GENERAL NOTES, SYMBOL LEGEND & SITE ACCESS PLANS

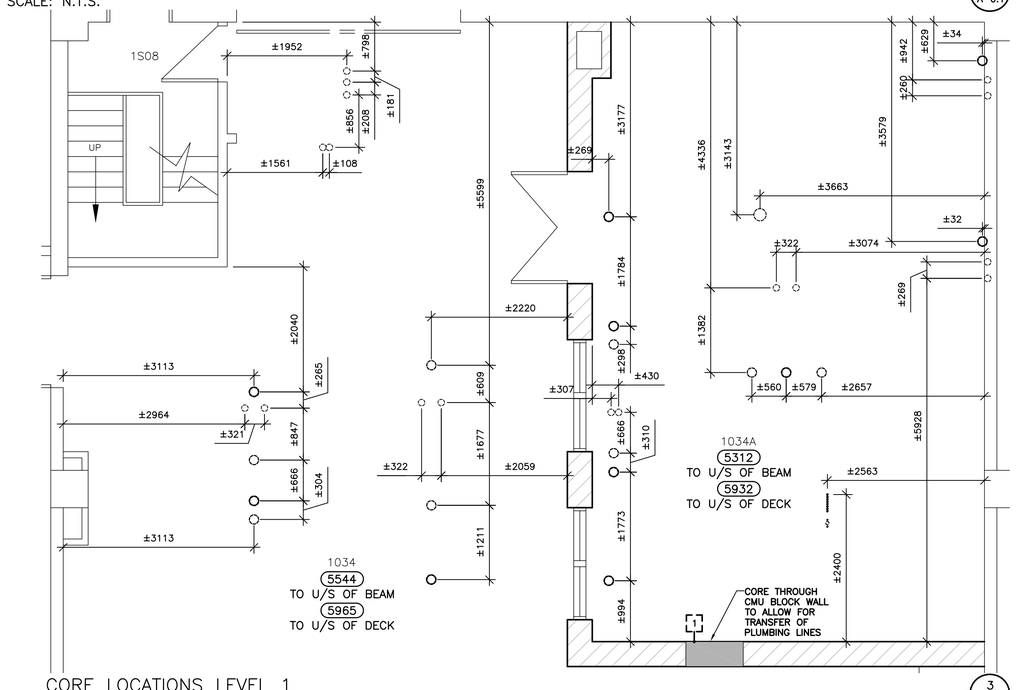
DESIGNED:	DRAWN:
E.B.	E.B.
REVIEWED: M.F.	APPROVED: M.F.
SCALE: AS SHOWN	DATE: DECEMBER, 2025
PROJECT No. EN-164-21	DRAWING No. A-0



HOARDING & CORE LOCATIONS LEVEL 2

SCALE: N.T.S.

4 A-0.1



CORE LOCATIONS LEVEL 1

SCALE: N.T.S.

3 A-0.1

SYMBOL LEGEND: (A)

HOARDING WALL CONSTRUCTED USING FIRE RETARDENT RIP PROOF TARP (WHITE), 92mm STEEL STUDS @ 600 O.C. ALL TARP JOINTS TO BE TAPED TO PREVENT DUST AND DEBRIS MOVEMENT THROUGH WALL CONSTRUCTION. CARE TO BE TAKEN TO ENSURE NO DAMAGE TO EXISTING/SURROUNDING FINISHES.

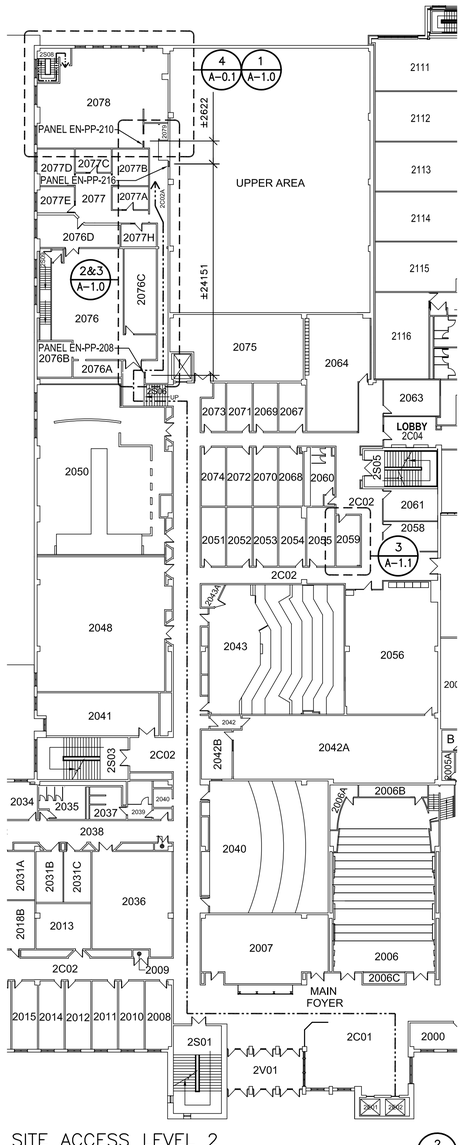
NOTE A: 2450mm HIGH GYPSUM BOARD WALL. INSTALL TARP FROM U/S OF DROPPED CEILING TO FINISHED FLOOR.

GENERAL CONSTRUCTION NOTES – APPLIES TO ALL SHEETS:

1. CONTRACTOR SHALL NOT USE ANY INTERIOR SPACES, OTHER THAN CONSTRUCTION AREAS INSIDE HOARDING WALLS, FOR STORAGE OR LAY-DOWN AREAS.
2. INSTALL PROTECTIVE COVERING OVER EXISTING FLOORING AS REQUIRED IN ACCESS ROUTES AND IN HOARDING AREA. MAINTAIN COVERINGS FOR DURATION OF THE PROJECT OR UNTIL AGREED TO WITH THE CONTRACTOR AND OWNER.
3. CONSTRUCT HOARDING WALLS TO UNDERSIDE OF EXISTING DROPPED CEILINGS TO PREVENT DUST MOVEMENT THROUGH WALL CONSTRUCTION. CONTRACTOR TO REPAIR/REPLACE DAMAGED CEILING, WALL AND FLOOR FINISHES IN THE EVENT OF DAMAGE INCURRED THROUGH THIS SCOPE OF WORK.
4. MAINTAIN FIRE RATINGS BETWEEN FLOOR AND WALL ASSEMBLIES. FILL AND PATCH HOLES IN FLOORS AND WALLS AS A RESULT OF DEMOLITION WORK. COORDINATE OPENINGS REQUIRED IN EXISTING FIRE RATED CONCRETE BLOCK WALLS AND FLOORS WITH MECHANICAL AND ELECTRICAL SUB-TRADES. APPROPRIATELY FIRE SEAL PENETRATIONS TO MAINTAIN 1 HOUR FIRE RESISTANCE RATING.
5. ALL WORK REQUIRED TO BE PERFORMED OUTSIDE HOARDING/ CONSTRUCTION SITE SHALL BE DONE AFTER 5PM TO 8AM. PROVIDE 24 HOURS NOTICE PRIOR TO EACH WORK SHIFT.

ARCHITECTURAL DEMOLITION NOTES: [#]

1. CORE HOLE IN CMU BLOCK PARTITION TO FACILITATE INSTALLATION OF PLUMBING LINES. SEAL WITH FIRE CAULK. COORDINATE CORE SIZE AND LOCATION W/ MECHANICAL SUBTRADE. MECHANICAL SUBTRADE TO KEEP ALL LINES TOGETHER AS JOB PERMITS TO MINIMIZE AMOUNT OF PENETRATIONS REQUIRED AT CMU BLOCK PARTITION.
2. ALLOW FOR TRANSFER OF ELECTRICAL CONDUIT FROM NEW PANEL LOCATED IN EN-2079 TO CHASE IN EN-2078. CONTRACTOR TO COPE AROUND ELECTRICAL WHEN INSTALLING NEW PARTITION ABOVE CEILING AS PER DWG 2/A-2.0. SEAL WITH FIRE CAULK. COORDINATE SIZE AND LOCATION W/ ELECTRICAL SUBTRADE.



SITE ACCESS LEVEL 2

SCALE: N.T.S.

2 A-0.1

SITE ACCESS LEVEL 1

SCALE: N.T.S.

1 A-0.1

A – DETAIL
B – LOCATION/DRAWING No.
C – DRAWING No.

No.	REVISION	DATE
R0	ISSUED FOR TENDER	DECEMBER 9, 2025

GENERAL NOTES

1. DRAWINGS TO BE READ AS A SET.
2. DO NOT SCALE FROM DRAWINGS.
3. THE CONTRACTOR IS TO VERIFY ALL DIMENSIONS AND SITE CONDITIONS PRIOR TO SUBMISSION OF TENDERS.
4. ALL DEFICIENCIES FOUND IN THIS DRAWING IS TO BE BROUGHT TO THE ATTENTION OF THE FACILITIES ENGINEERING AND DEVELOPMENT OFFICE OF THE DEPARTMENT OF FACILITIES MANAGEMENT, MEMORIAL UNIVERSITY OF NEWFOUNDLAND, PRIOR TO THE SUBMISSION OF THE TENDERS.

MEMORIAL UNIVERSITY
FACILITIES MANAGEMENT

This University was raised by the people of Newfoundland as a memorial to the fallen in the great wars, 1914-1918, 1939-1945, that in freedom of learning, their cause and sacrifice might not be forgotten.

- Dedication plaque, Arts & Administration Building, St. John's Campus

PROJECT NAME:

ENGINEERING BUILDING RENOVATIONS TO EN-2078
Project #: EN-164-21

DRAWING TITLE:

SITE ACCESS & CORE LOCATION PLANS

DESIGNED:	DRAWN:
E.B.	E.B.
REVIEWED:	APPROVED:
M.F.	M.F.
SCALE:	DATE:
AS SHOWN	DECEMBER, 2025
PROJECT No.	DRAWING No.
EN-164-21	**A-0.1**



EXISTING ROOF SAMPLE PHOTO (10 / A-0.2)

SCALE: NTS

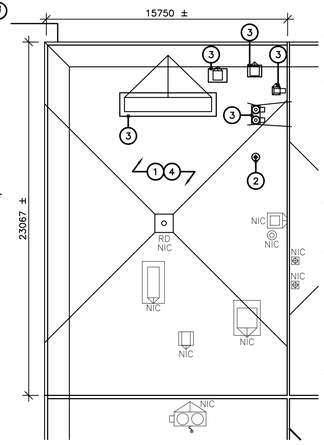


EXISTING ROOF SAMPLE PHOTO (9 / A-0.2)

SCALE: NTS

ROOF PLAN CONSTRUCTION NOTES: (#)

1. EXISTING ROOFING ASSEMBLY – MODIFIED ROOF ASSEMBLY TYPE 1:
   - MODIFIED CAP SHEET MEMBRANE
   - MODIFIED BASE SHEET MEMBRANE
   - 6mm PROTECTION BOARD
   - TAPERED INSULATION: MIN 1% SLOPE TOWARD ROOF DRAINS
   - 38mm BASE LAYER INSULATION
   - VAPOUR BARRIER
   - CONCRETE DECK
2. INSTALL NEW PENETRATION FLASHING AT NEW PIPE PENETRATION LOCATION, COMPLETE WITH NEW LIQUID APPLIED WATERPROOFING FILLER AS PER DWG 12/A-4.0.
3. CONSTRUCT NEW ROOF CURBS FOR ALL NEW ROOF TOP UNITS AS INDICATED. SEE DWG 11/A-4.0. COLOR AND PROFILE OF NEW METAL FLASHING TO MATCH ADJACENT EXISTING CONDITIONS.
4. COORDINATE WITH MECHANICAL AND ELECTRICAL SUBTRADES TO PROVIDE CORES AS REQUIRED TO FACILITATE INSTALLATION OF NEW ROOF TOP UNITS.



PARTIAL NEW ROOF PLAN (8 / A-0.2)

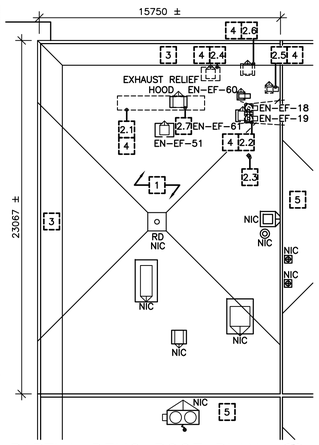
SCALE: 1:200

ROOF PLAN DEMOLITION NOTES: (#)

1. ITEMS MARKED 'NIC' ARE NOT INCLUDED IN CONTRACT. EXISTING ROOF TOP FANS AND EXHAUST VENTING TO REMAIN.
2. REMOVE ALL EXISTING ROOFING MATERIAL DOWN TO CONCRETE DECK WHERE INDICATED FOR THE FOLLOWING ITEMS:
   - 2.1. x1 NEW MAKE UP AIR UNIT EN-LMU-1
   - 2.2. x2 NEW HIGH PLUME FANS
   - 2.3. x1 ARD PLUMBING VENT
   - 2.4. x1 RELOCATION OF EN-EF-51
   - 2.5. x1 RELOCATION OF EN-EF-60
   - 2.6. x1 RELOCATION OF EN-EF-61
   - 2.7. x1 EXHAUST RELIEF HOOD

   SEE MECHANICAL DWGS FOR ADDITIONAL INFO.
3. INSTALL ROOF GUARD RAILING SYSTEM WITH MESH MATERIAL PRIOR TO START OF ROOF DEMOLITION. REFER TO GENERAL NOTES FOR CLEAN-UP INSTRUCTIONS.
4. COORDINATE NEW CURB CONSTRUCTION WITH OWNER. NEW CURB CONSTRUCTION AS PER DWG 11/A-4.0.

   NOTE: ALL ELECTRICAL AND MECHANICAL UNITS WILL REQUIRE LOCK OUT – TAG OUT. CONTRACTOR WILL BE RESPONSIBLE TO REMOVE/REINSTALL MECHANICAL UNITS (I.E. LIFT OFF CURB, TEMPORARILY STORE AND PROTECT, AND REINSTALL).
5. CONTRACTOR TO LIMIT TRAFFIC ON ADJACENT ROOF AREAS. STORAGE OF MATERIALS WILL NOT BE PERMITTED ON ADJACENT WORK AREAS DUE TO POTENTIAL DAMAGES. CONTRACTOR TO REVIEW EXISTING ADJACENT AREA WITH MUN'S COORDINATOR PRIOR TO START OF WORK TO CONFIRM EXISTING CONDITIONS.

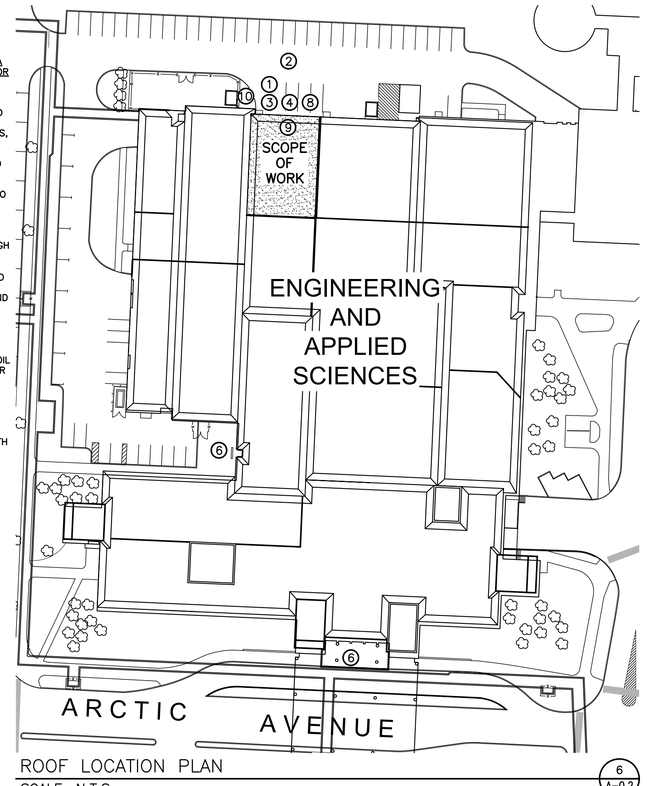


PARTIAL DEMO ROOF PLAN (7 / A-0.2)

SCALE: 1:200

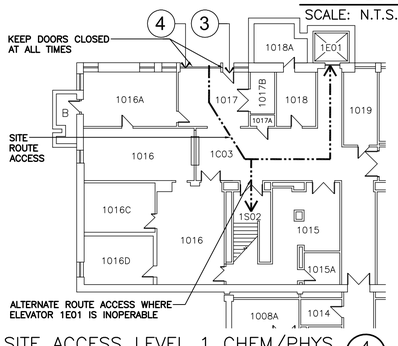
GENERAL NOTES: (#)

1. COORDINATE DELIVERY OF MATERIALS USING FLAT BED TRUCK / BOOM TRUCK WITH MUN PROJECT COORDINATOR. 24HOURS NOTICE REQUIRED. ALL BOOM TRUCK OPERATORS SHALL BE REQUIRED TO PRESENT A HAZARD ASSESSMENT TO MUN SAFETY PERSONNEL PRIOR TO THE START OF OPERATION.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR DAILY CLEANUP OF DEBRIS FIELD INCLUDING BUT NOT LIMITED TO; REMOVING DEMOLISHED ROOFING MATERIALS FROM GRASS, ADJACENT ROOFS AND ROOF DRAINS, SIDEWALKS, PARKING SPACES AND ROADWAYS.
3. CONTRACTOR TO PLACE DUMPSTER AT PRE DETERMINED LOCATIONS. VERIFY WITH PROJECT COORDINATOR.
4. PROVIDE ALL NECESSARY BRACING AND COMPONENTS TO SUPPORT INSTALLATION OF REFUSE CHUTES AT PRE DETERMINED LOCATIONS. VERIFY WITH PROJECT COORDINATOR IF CHUTE IS REQUIRED.
5. ROOF ACCESS BY CONTRACTOR NOT PERMITTED THROUGH INTERIOR OF BUILDING PENTHOUSE.
6. CONTRACTOR TO USE MAIN ENTRANCE (SOUTH) LOCATED NEAR PRINCE PHILIP DRIVE ENTRANCE OR ENTRANCE FACING KERWIN PLACE. ALL ROOFING PRODUCT DIRT AND DEBRIS SHALL BE CLEANED FROM FLOORS AND STAIRS. AREAS WILL BE SUBJECT TO FINAL INSPECTION AT SUBSTANTIAL COMPLETION.
7. CONTRACTOR TO PATCH AND REPAIR AREAS OF GRASS/LANDSCAPPING DAMAGE WITH MIN. 10mm TOPSOIL AND NURSERY SOD. CONTRACTOR TO WATER GRASS FOR A MINI OF 6 WEEKS AFTER INSTALLATION.
8. ROOF ACCESS BY CONTRACTOR SUPPLIED LADDER AT THIS LOCATION ONLY. NO ROOF ACCESS THROUGH INTERIOR OF BUILDING.
9. INSTALL GUARD RAIL FALL PROTECTION SYSTEM ON BOTH SIDES OF ACCESS LADDER FOR THE DURATION OF THE WORK.
10. PORTABLE TOILETS TO BE SUPPLIED BY THE CONTRACTOR.



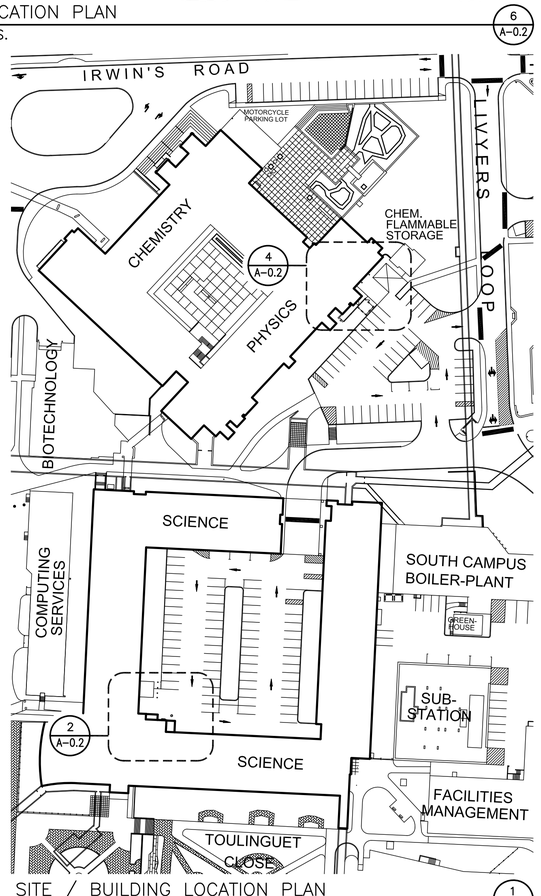
ROOF LOCATION PLAN (6 / A-0.2)

SCALE: N.T.S.



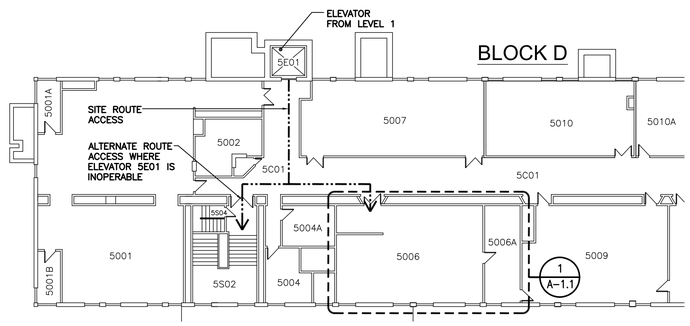
SITE ACCESS LEVEL 1 CHEM/PHYS (4 / A-0.2)

SCALE: N.T.S.



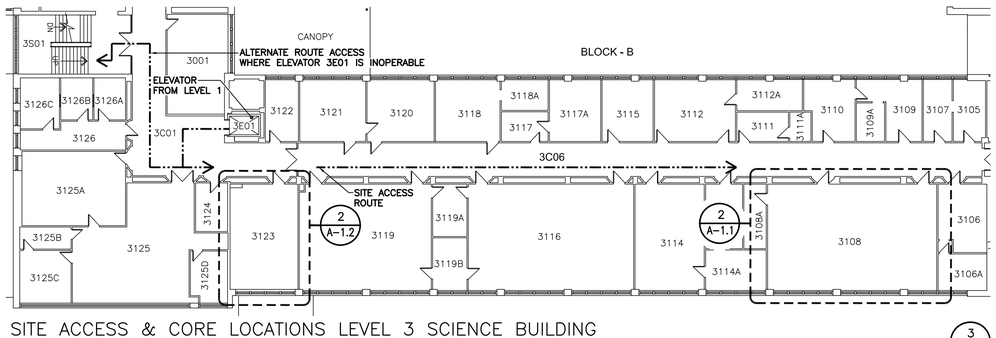
SITE / BUILDING LOCATION PLAN (1 / A-0.2)

SCALE: N.T.S.



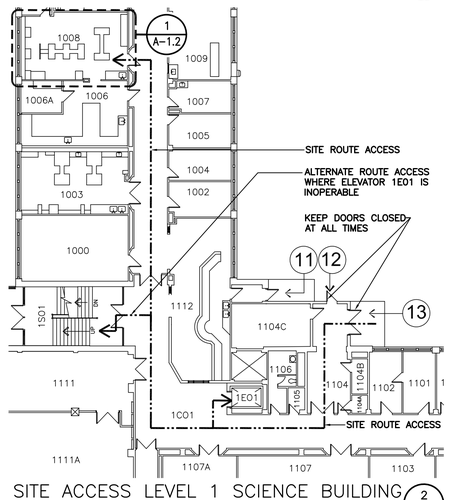
SITE ACCESS LEVEL 5 CHEMISTRY/PHYSICS BUILDING (5 / A-0.2)

SCALE: N.T.S.



SITE ACCESS & CORE LOCATIONS LEVEL 3 SCIENCE BUILDING (3 / A-0.2)

SCALE: N.T.S.



SITE ACCESS LEVEL 1 SCIENCE BUILDING (2 / A-0.2)

SCALE: N.T.S.

No.	REVISION	DATE
R0	ISSUED FOR TENDER	DECEMBER 9, 2025

A – DETAIL
B – LOCATION/DRAWING No.
C – DRAWING No.

GENERAL NOTES

1. DRAWINGS TO BE READ AS A SET.
2. DO NOT SCALE FROM DRAWINGS.
3. THE CONTRACTOR IS TO VERIFY ALL DIMENSIONS AND SITE CONDITIONS PRIOR TO SUBMISSION OF TENDERS.
4. ALL DEFICIENCIES FOUND IN THIS DRAWING IS TO BE BROUGHT TO THE ATTENTION OF THE FACILITIES ENGINEERING AND DEVELOPMENT OFFICE OF THE DEPARTMENT OF FACILITIES MANAGEMENT, MEMORIAL UNIVERSITY OF NEWFOUNDLAND, PRIOR TO THE SUBMISSION OF THE TENDERS.

NORTH

MEMORIAL UNIVERSITY
FACILITIES MANAGEMENT

This University was raised by the people of Newfoundland as a memorial to the fallen in the great wars, 1914-1918, 1939-1945, that in freedom of learning, their cause and sacrifice might not be forgotten.

- Dedication plaque, Arts & Administration Building, St. John's Campus

PROJECT NAME:

ENGINEERING BUILDING RENOVATIONS TO EN-2078
Project #: EN-164-21

DRAWING TITLE:

SITE ACCESS, PARTIAL DEMOLITION & ROOF PLANS

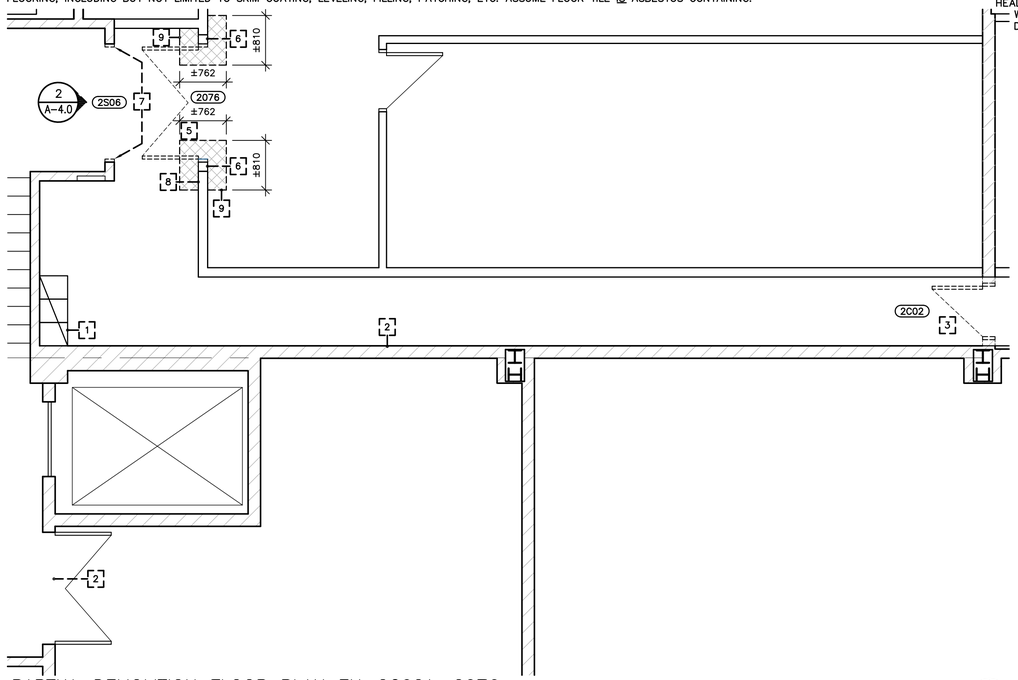
DESIGNED:	DRAWN:
E.B.	E.B.
REVIEWED:	APPROVED:
M.F.	M.F.
SCALE: AS SHOWN	DATE: DECEMBER, 2025
PROJECT No. EN-164-21	DRAWING No. A-0.2

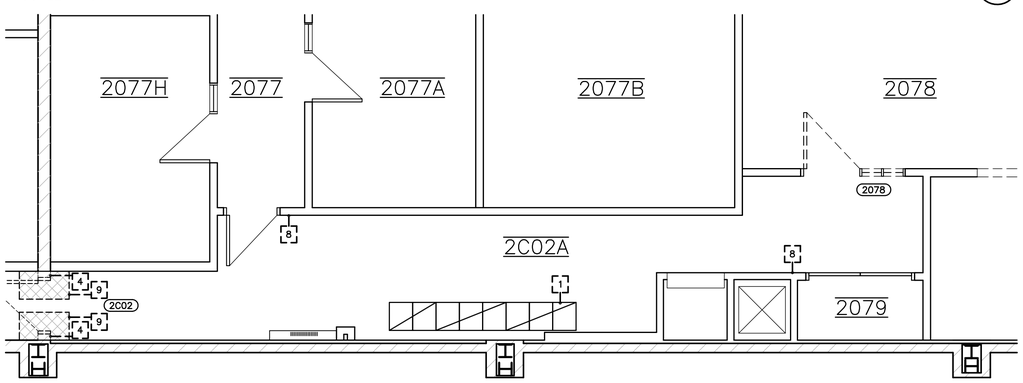
GENERAL CONSTRUCTION NOTES – APPLIES TO ALL SHEETS:

1. PERFORM DEMOLITION WORK SHOWN AND/OR REQUIRED TO COMPLETE THE WORK. DO NOT ASSUME DEMOLITION DRAWINGS SHOW THE FULL EXTENT OF DEMOLITION WORK REQUIRED.
2. REFER TO SHEET A–0 AND SECTION 02 41 19 FOR ADDITIONAL REQUIREMENTS AND INSTRUCTIONS FOR DEMOLITION WORK.
3. INSTALL PROTECTIVE COVERING OVER EXISTING FLOORING AS REQUIRED IN ACCESS ROUTES AND IN HOARDING AREA. MAINTAIN COVERINGS FOR DURATION OF THE PROJECT OR UNTIL AGREED TO WITH THE CONTRACTOR AND OWNER.
4. ALL WORK REQUIRED TO BE PERFORMED OUTSIDE HOARDING/ CONSTRUCTION SITE SHALL BE DONE AFTER 5PM TO 8AM. PROVIDE 24 HOURS NOTICE PRIOR TO EACH WORK SHIFT.
5. PATCH AND REPAIR ALL EXISTING WALLS IN CONSTRUCTION AREA AND CORRIDORS INCLUDING AREAS OF EXISTING WALL REMOVAL, DOOR AND FRAME REMOVAL, EXISTING DAMAGES, PLUMBING, MECHANICAL, AND ELECTRICAL FIXTURE REMOVAL, ETC.. SCOPE OF WORK TO INCLUDE BUT NOT BE LIMITED TO DENTS, NICKS, HOLES, SCRATCHES, CRACKS, ETC..
6. GENERAL CONTRACTOR MUST COORDINATE NEW PARTITIONS, MILLWORK, ELECTRICAL AND MECHANICAL LAYOUTS, ETC. WITH SUB–CONTRACTORS PRIOR TO INSTALLATION TO ENSURE THERE ARE NO CONFLICTS BETWEEN LOCATION OF THESE ITEMS. WHERE CONFLICTS OCCUR, REPORT THESE TO THE OWNER PRIOR TO INSTALLATION OF ANY ITEM IN ORDER TO ARRANGE FOR THE OWNER TO REVIEW AND ADVISE. ANY COSTS INCURRED TO CORRECT OR RESOLVE CONFLICTS THAT ARE A RESULT OF LACK OF COORDINATION BY THE GENERAL CONTRACTOR AND/OR SUB–CONTRACTORS ARE TO BE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR.

ARCHITECTURAL DEMOLITION NOTES: [#]

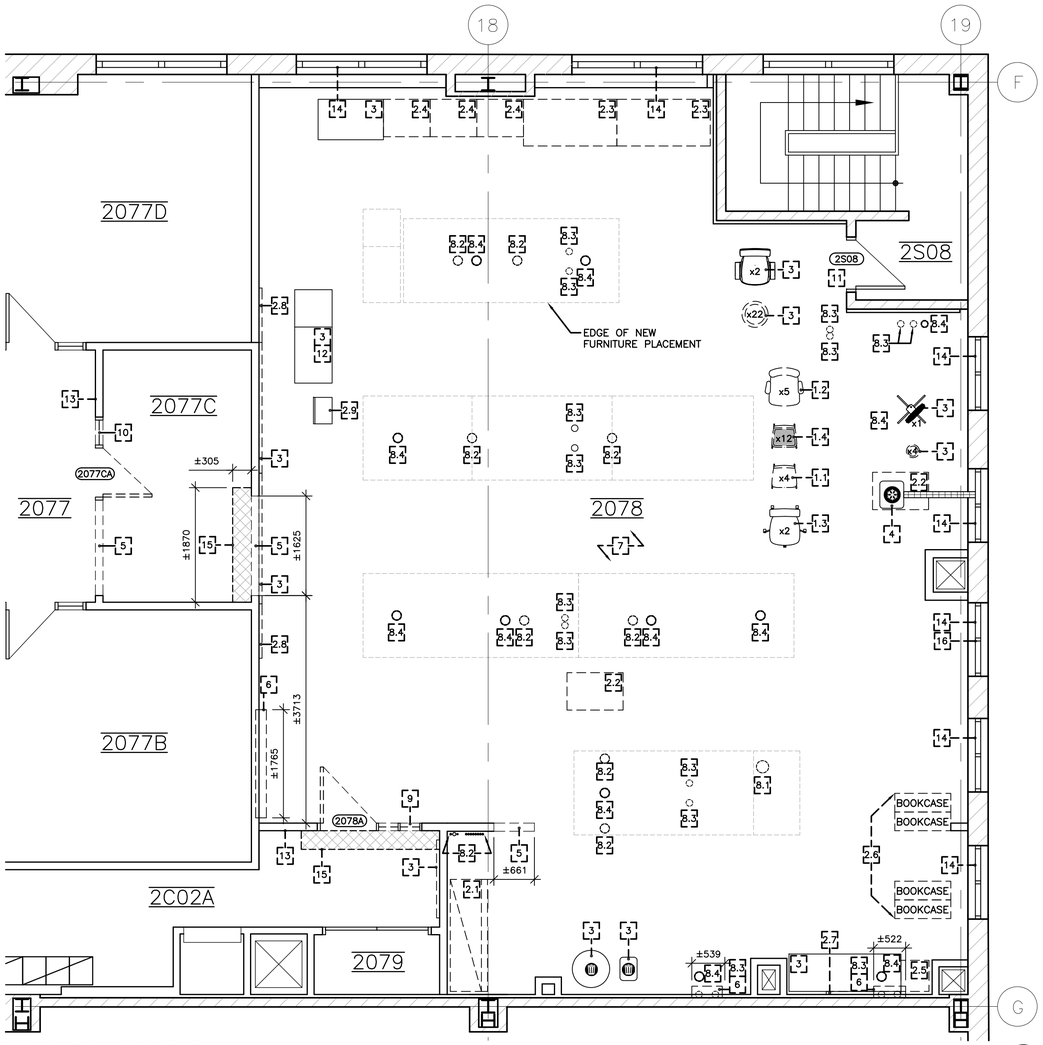
1. EXISTING LOCKERS TO REMAIN. CONTRACTOR IS RESPONSIBLE TO REMOVE AND RELOCATE LOCKERS TO FACILITATE PLASTER/PAINTING.
2. CORE HOLE IN CMU BLOCK PARTITION ABOVE CEILING TO FACILITATE INSTALLATION OF ELECTRICAL CONDUIT. SEAL WITH FIRE CAULK. COORDINATE CORE SIZE AND LOCATION W/ ELECTRICAL SUBTRADE.
3. REMOVE AND DISPOSE OF EXISTING DOOR AND FRAME. SALVAGE HARDWARE AND TURN OVER TO PROJECT COORDINATOR.
4. REMOVE CONCRETE BLOCK WALL AS INDICATED FOR NEW LAYOUT USING TOOTHED TECHNIQUE. INFILL AND PATCH CMU BLOCK AT CORNERS AND WALL JOINS. CARE TO BE TAKEN WHERE REMOVING PORTIONS OF WALL INTERSECTING WITH REMAINING CONCRETE BLOCK WALLS. REMOVE CONCRETE BLOCK FULL HEIGHT. WALL CONSTRUCTED OF 150mm CMU BLOCK. ASSUME PAINT IS LEAD CONTAINING.
5. REMOVE AND SALVAGE DOORS, FRAME AND HARDWARE TO REINSTATE HAVING OPPOSITE SWING AS PER DWG 3/A–3.0. REMOVE FIRE BLANKET AND FIRE EXTINGUISHER AS REQUIRED TO FACILITATE REMOVAL OF DOOR. CONTRACTOR TO REINSTATE FIRE BLANKET AND FIRE EXTINGUISHER AS PER DWG 3/A–3.0.
6. REMOVE PORTIONS OF GYPSUM BOARD SHEATHING TO FACILITATE REMOVAL/REINSTATEMENT OF EXISTING DOOR. CONTRACTOR TO ALLOW FOR APPROX. 1m² PER EACH SIDE OF DOOR FRAME. ASSUME DRYWALL JOINT COMPOUND IS ASBESTOS CONTAINING.
7. REMOVE EXISTING DOOR FRAME IN PREPARATION TO RECEIVE NEW DOOR AND FRAME AS PER DWG 3/A–3.0.
8. REMOVE SIGNAGE AND TURN OVER TO PROJECT COORDINATOR. PATCH AND REPAIR WALLS AS PER DWG 2 AND 3/A–3.0.
9. REMOVE EXISTING VCT, VINYL BASE, AND ASSOCIATED COMPONENTS TO CONCRETE SLAB TO FACILITATE DOOR REMOVAL. SLAB TO BE PREPPED AS REQUIRED TO ACCEPT NEW FLOORING, INCLUDING BUT NOT LIMITED TO SKIM COATING, LEVELING, FILLING, PATCHING, ETC. ASSUME FLOOR TILE IS ASBESTOS CONTAINING.





ARCHITECTURAL DEMOLITION NOTES: [#]

1. RELOCATE EXISTING FURNITURE AND WALL MOUNTED ITEMS AS INDICATED:
   - 1.1. x4 WOOD CHAIRS TO CSF–4121
   - 1.2. x5 COMPUTER CHAIRS TO EN–1011
   - 1.3. x2 COMPUTER STOOLS TO EN–4029
   - 1.4. x12 WOOD CHAIRS W/ CUSHION TO VARIOUS LOCATIONS AS NOTED:
     - 1.4.1. x2 EN–3070
     - 1.4.2. x4 EN–3016
     - 1.4.3. x3 EN–3044
     - 1.4.4. x3 EN–1035
2. REMOVE AND DISPOSE OF EXISTING FURNITURE AS INDICATED:
   - 2.1. x1 DESK W/ HUTCH (20x72")
   - 2.2. x2 TABLE (24x36")
   - 2.3. x2 DESK (30x60")
   - 2.4. x3 DESK (24X30")
   - 2.5. x1 CABINET (12x20")
   - 2.6. x4 BOOKSHELVES (12x36")
   - 2.7. x1 WHITEBOARD CABINET (48x48")
   - 2.8. x2 WHITEBOARD (34x47")
   - 2.9. x1 PODIUM (17x12")
3. RELOCATE AND STORE EXISTING FURNITURE ON SITE WITHIN EN–2078. SEE NEW PLAN A–3.0 FOR NEW LOCATIONS. CONTRACTOR IS RESPONSIBLE TO PROTECT EXISTING FURNITURE AGAINST DAMAGE THROUGHOUT DURATION OF CONSTRUCTION.
4. REMOVE EXISTING PORTABLE AC UNIT DUCT FROM WINDOW. REINSTATE WINDOW PANE. AC UNIT TO REMAIN ON SITE WITHIN EN–2078. SEE NEW PLAN A–3.0 FOR NEW LOCATIONS. CONTRACTOR IS RESPONSIBLE TO PROTECT EXISTING PORTABLE AC UNIT AGAINST DAMAGE THROUGHOUT DURATION OF CONSTRUCTION.
5. REMOVE EXISTING GYPSUM BOARD/STEEL STUD PARTITION WALLS AS INDICATED FOR NEW LAYOUT. DRYWALL JOINT COMPOUND IS NOT ASBESTOS CONTAINING.
6. REMOVE PORTIONS OF GYPSUM BOARD SHEATHING TO FACILITATE INSTALLATION OF MECHANICAL AND ELECTRICAL SERVICES. COORDINATE SIZE AND LOCATIONS OF OPENINGS W/ ELECTRICAL AND MECHANICAL SUBTRADE FOR EACH LOCATION. DRYWALL JOINT COMPOUND IS NOT ASBESTOS CONTAINING.
7. REMOVE EXISTING SHEET CARPET, VINYL BASE, AND ASSOCIATED COMPONENTS TO CONCRETE SLAB. SLAB TO BE PREPPED AS REQUIRED TO ACCEPT NEW FLOORING, INCLUDING BUT NOT LIMITED TO SKIM COATING, LEVELING, FILLING, PATCHING, ETC. TYPICAL THROUGHOUT.
8. CORE HOLES IN FLOOR SLAB TO FACILITATE THE INSTALLATION OF THE FOLLOWING ITEMS. SEAL WITH FIRE CAULK. COORDINATE CORE SIZE W/ ELECTRICAL AND MECHANICAL SUBTRADE FOR EACH LOCATION. REFER TO DWG 2/A–0.2 AND 2/A–0.3 FOR CORE LOCATIONS. LEVEL 1 ACCESS LOCATED IN EN1034 AND 1034A HAVING EXPOSED CEILINGS TO UNDERSIDE OF METAL DECK. EXACT QUANTITY TO BE DETERMINED ON SITE. CONTRACTOR TO ALLOW FOR MINIMUM CORE QUANTITIES AS NOTED BELOW:
   - 8.1. x1 FLOOR BOX
   - 8.2. x19 POWER & DATA CONDUIT
   - 8.3. x16 SUPPLY PIPING
   - 8.4. x10 SANITARY/VENT PIPING
9. REMOVE AND SALVAGE DOOR FRAME AND LITE TO REINSTATE HAVING OPPOSITE SWING AS PER DWG 1/A–3.0. REMOVE DOOR AND RELOCATE TO EN–4029.
10. REMOVE AND DISPOSE OF EXISTING DOOR. TURN OVER DOOR HARDWARE TO OWNER.
11. EXISTING DOOR AND HARDWARE TO REMAIN.
12. CONTRACTOR TO COORDINATE WITH ELECTRICAL SUBTRADE TO ISOLATE AND REMOVE ELECTRICAL FEEDS PRIOR TO RELOCATION OF INSTRUCTOR'S PODIUM. NEW LOCATION AS PER DWG 1/A–3.0. NOTIFY PROJECT COORDINATOR IN ADVANCE TO ALLOW MUN FORCES/CITL TO REMOVE ALL EXISTING EQUIPMENT AND CABLING.
13. REMOVE SIGNAGE AND TURN OVER TO PROJECT COORDINATOR. PATCH AND REPAIR WALLS AS PER DWG 2/A–3.1.
14. REMOVE AND DISPOSE OF EXISTING BLINDS AND VALENCE. PATCH AND FILL HOLES FROM FASTENERS.
15. REMOVE EXISTING VCT, VINYL BASE, AND ASSOCIATED COMPONENTS TO CONCRETE SLAB TO FACILITATE WALL OR, DOOR REMOVAL. SLAB TO BE PREPPED AS REQUIRED TO ACCEPT NEW FLOORING, INCLUDING BUT NOT LIMITED TO SKIM COATING, LEVELING, FILLING, PATCHING, ETC. FLOOR TILE IS NOT ASBESTOS CONTAINING.
16. REMOVE AND REINSTATE EXISTING WINDOW GLAZING TO FACILITATE TRANSFER OF NEW STRUCTURAL SUPPORTS INTO EN–2078. CONTRACTOR IS RESPONSIBLE TO PROTECT EXISTING OPENING, GLAZING, TRIMS, AND SILLS FROM DAMAGES AS A RESULT OF WORK. REMOVE GLAZING STOPS, SEALANTS, ETC AS REQUIRED TO REMOVE GLAZING UNIT. CLEAN FRAME AND INSTALL NEW GLAZING BUTYL TAPE AND HEAL BEAD SEALANT IN FRAME CORNERS UPON REINSTALLATION. REINSTALL EXISTING GLAZING STOPS WITH NEW CONTINUOUS PERIMETER SEALANT BETWEEN GLAZING UNIT AND FRAME. SEAL ALL GAPS WITH SEALANT. CLEAN EXCESS SEALANT FROM GLAZING. ACCEPTABLE SEALANT: SPECTREM 2 BY TREMCO, OR APPROVED ALTERNATE. CONTRACTOR IS RESPONSIBLE TO REPLACE GLAZED UNIT WHERE DAMAGED DURING REMOVAL/REINSTATEMENT, OR WHERE NEW SEAL FAILS.



A – DETAIL
B – LOCATION/DRAWING No.
C – DRAWING No.

No.	REVISION	DATE
R0	ISSUED FOR TENDER	DECEMBER 9, 2025

GENERAL NOTES

1. DRAWINGS TO BE READ AS A SET.
2. DO NOT SCALE FROM DRAWINGS.
3. THE CONTRACTOR IS TO VERIFY ALL DIMENSIONS AND SITE CONDITIONS PRIOR TO SUBMISSION OF TENDERS.
4. ALL DEFICIENCIES FOUND IN THIS DRAWING IS TO BE BROUGHT TO THE ATTENTION OF THE FACILITIES ENGINEERING AND DEVELOPMENT OFFICE OF THE DEPARTMENT OF FACILITIES MANAGEMENT, MEMORIAL UNIVERSITY OF NEWFOUNDLAND, PRIOR TO THE SUBMISSION OF THE TENDERS.

NORTH

MEMORIAL UNIVERSITY
FACILITIES MANAGEMENT

This University was raised by the people of Newfoundland as a memorial to the fallen in the great wars, 1914-1918, 1939-1945, that in freedom of learning, their cause and sacrifice might not be forgotten.

- Dedication plaque, Arts & Administration Building, St. John's Campus

PROJECT NAME:

ENGINEERING BUILDING RENOVATIONS TO EN-2078
Project #: EN-164-21

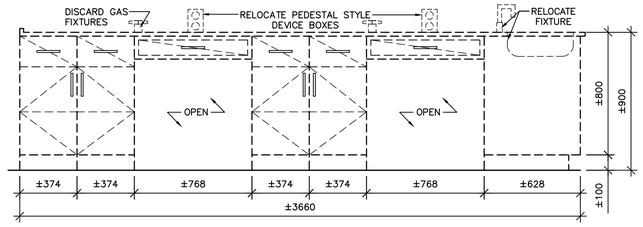
DRAWING TITLE:

DEMOLITION FLOOR PLANS

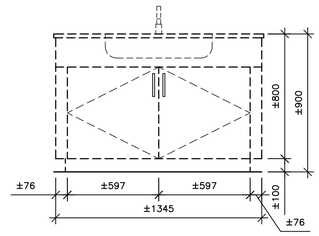
DESIGNED:	DRAWN:
E.B.	E.B.
REVIEWED:	APPROVED:
M.F.	M.F.
SCALE:	DATE:
AS SHOWN	DECEMBER, 2025
PROJECT No.	DRAWING No.
EN-164-21	**A-1.0**

ARCHITECTURAL DEMOLITION NOTES SN–3108: #

1. REMOVE PORTION OF EXISTING LAB BENCH AND EPOXY COUNTERTOP AS INDICATED. RELOCATE TO EN–2078 FOR REINSTALLATION.
2. CUT AND REMOVE BOTH PORTIONS OF EPOXY COUNTERTOP AS INDICATED. RELOCATE BOTH PORTIONS OF EPOXY COUNTERTOP TO EN–2078 FOR REINSTALLATION. SMALLER PORTION OF EPOXY COUNTERTOP TO BE FASTENED TO HEIGHT ADJUSTABLE LEGS AS PER DWG 7/A–1.2.
3. CONTRACTOR IS RESPONSIBLE TO PROVIDE ADDITIONAL GABLE END AND TOE KICK AS REQUIRED TO SUPPORT EXPOSED PORTION OF CABINETRY ONCE RELOCATED TO EN–2078. CONTRACTOR IS PERMITTED TO REMOVE AND MODIFY PORTIONS OF EXISTING CABINETRY LOCATED IN SN–3108 TO PROVIDE SUPPORTS IN NEW LOCATION.
4. CONTRACTOR TO CUT AND REMOVE BACKSPLASH PORTION OF EPOXY COUNTERTOP FROM SN3108 LAB BENCH 1.
5. CONTRACTOR IS RESPONSIBLE TO REMOVE AND REINSTATE ALL DOORS AS REQUIRED TO RELOCATE FURNITURE, FUME HOODS, AND COMBO SHOWER/EYEWASH STATION.
6. MUN FORCES TO DISCONNECT ELECTRICAL AND PLUMBING FED TO LAB BENCHES, FUME HOODS, AND COMBO SHOWER/EYEWASH STATION. CONTRACTOR IS RESPONSIBLE TO RELOCATE ELECTRICAL AND PLUMBING FIXTURES AS INDICATED TO FACILITATE LAB BENCH, FUME HOOD, AND COMBO SHOWER/EYEWASH STATION INSTALLATION TO EN–2078.



SN3108 LAB BENCH 1 DEMOLITION ELEVATION (9 / A–1.1)
SCALE: 1:20



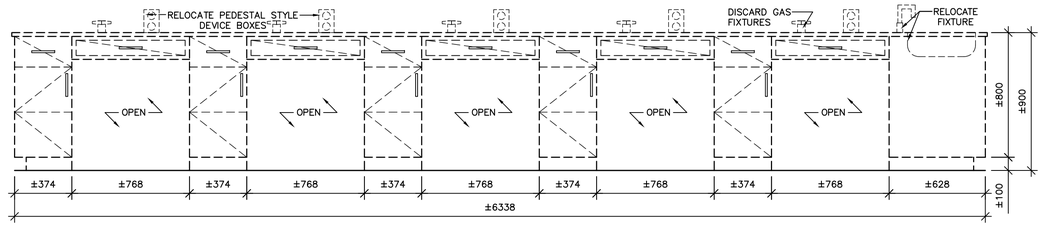
SN3108 BENCH 1 & 2 DEMO ELEVATION (8 / A–1.1)
SCALE: 1:20

ARCHITECTURAL DEMOLITION NOTES EN–2059: #

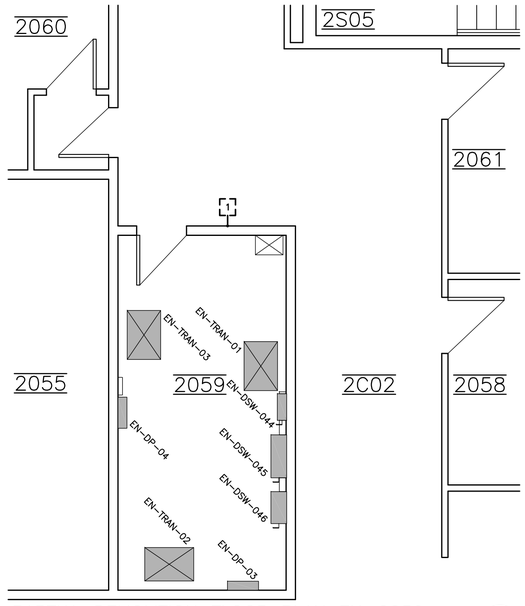
1. CORE HOLE IN CMU BLOCK PARTITION ABOVE CEILING TO FACILITATE INSTALLATION OF ELECTRICAL CONDUIT. SEAL WITH FIRE CAULK. COORDINATE CORE SIZE AND LOCATION W/ ELECTRICAL SUBTRADE.

ARCHITECTURAL DEMOLITION NOTES CP5006/A: #

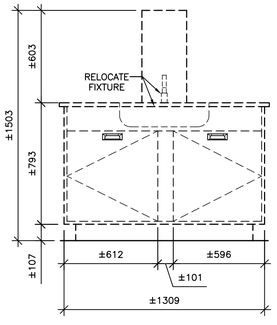
1. REMOVE EXISTING LAB BENCH AND EPOXY COUNTERTOP AS INDICATED. RELOCATE TO EN–2078 FOR REINSTALLATION.
2. REMOVE EXISTING FUME HOODS AND RELOCATE TO EN–2078 FOR REINSTALLATION.
3. FUME HOOD HEIGHTS:
   3.1. CABINET = 939mm
   3.2. HOOD = 1346mm
   3.3. TOTAL HEIGHT = 2285mm
4. CONTRACTOR IS RESPONSIBLE TO REMOVE AND REINSTATE ALL DOORS AS REQUIRED TO RELOCATE FURNITURE, FUME HOODS, AND COMBO SHOWER/EYEWASH STATION.
5. MUN FORCES TO DISCONNECT ELECTRICAL AND PLUMBING FED TO LAB BENCHES, FUME HOODS, AND COMBO SHOWER/EYEWASH STATION. CONTRACTOR IS RESPONSIBLE TO RELOCATE ELECTRICAL AND PLUMBING FIXTURES AS INDICATED TO FACILITATE LAB BENCH, FUME HOOD, AND COMBO SHOWER/EYEWASH STATION INSTALLATION TO EN–2078.



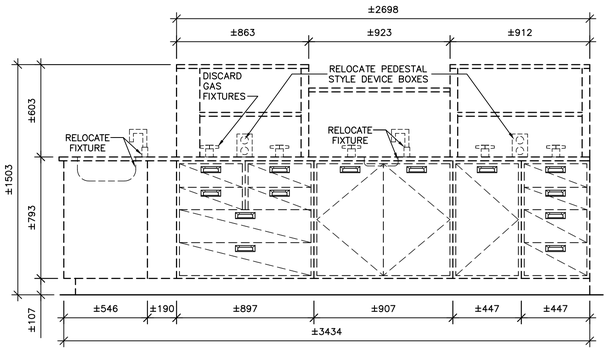
SN3108 LAB BENCH 2 DEMOLITION ELEVATION (7 / A–1.1)
SCALE: 1:20



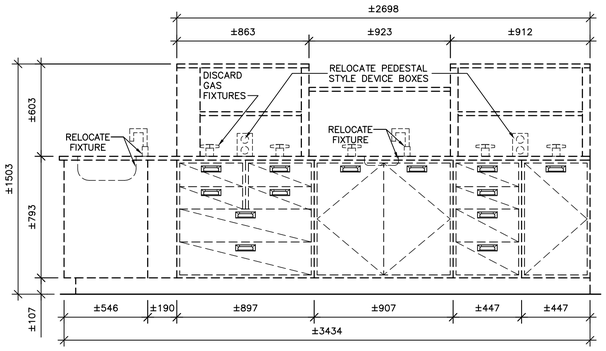
PARTIAL DEMOLITION FLOOR PLAN EN–2059 (3 / A–1.1)
SCALE: 1:50



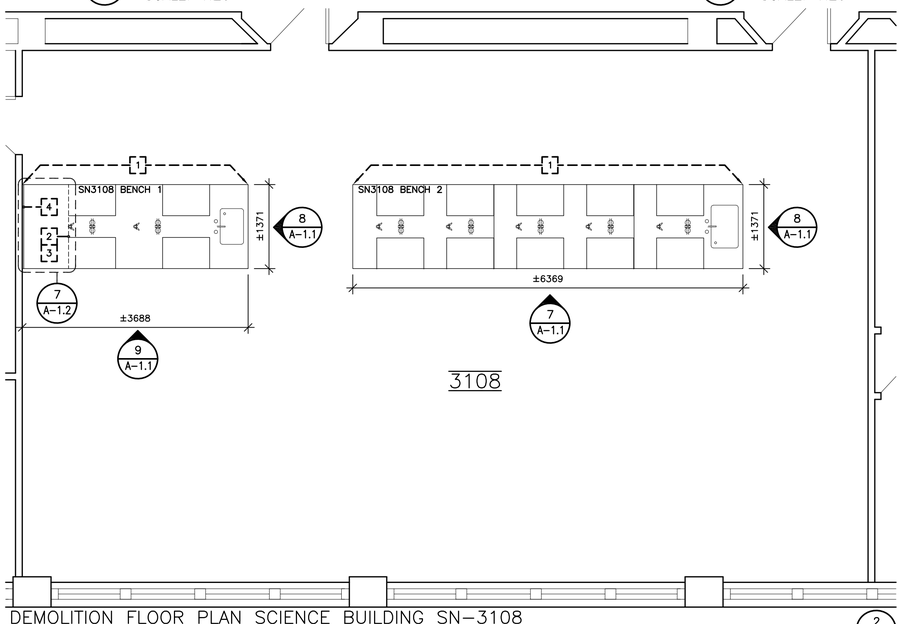
CP5006 LAB BENCH 1,2 & 3 DEMO ELEVATION (6 / A–1.1)
SCALE: 1:20



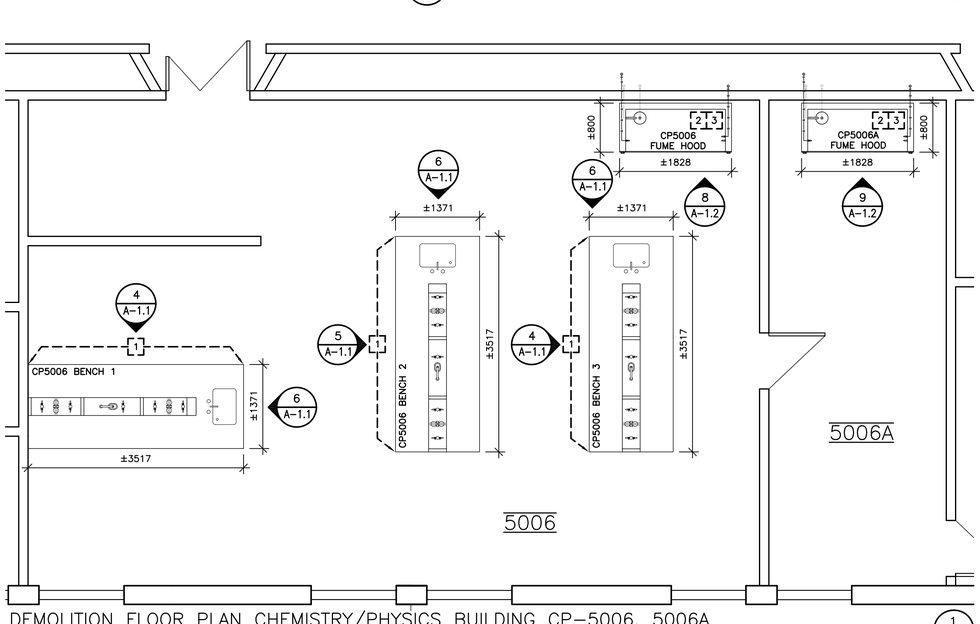
CP5006 LAB BENCH 2 DEMOLITION ELEVATION (5 / A–1.1)
SCALE: 1:20



CP5006 LAB BENCH 1 & 3 DEMOLITION ELEVATION (4 / A–1.1)
SCALE: 1:20



DEMOLITION FLOOR PLAN SCIENCE BUILDING SN–3108 (2 / A–1.1)
SCALE: 1:50



DEMOLITION FLOOR PLAN CHEMISTRY/PHYSICS BUILDING CP–5006, 5006A (1 / A–1.1)
SCALE: 1:50

A – DETAIL
B – LOCATION/DRAWING No.
C – DRAWING No.

No.	REVISION	DATE
RO	ISSUED FOR TENDER	DECEMBER 9, 2025

GENERAL NOTES

1. DRAWINGS TO BE READ AS A SET.
2. DO NOT SCALE FROM DRAWINGS.
3. THE CONTRACTOR IS TO VERIFY ALL DIMENSIONS AND SITE CONDITIONS PRIOR TO SUBMISSION OF TENDERS.
4. ALL DEFICIENCIES FOUND IN THIS DRAWING IS TO BE BROUGHT TO THE ATTENTION OF THE FACILITIES ENGINEERING AND DEVELOPMENT OFFICE OF THE DEPARTMENT OF FACILITIES MANAGEMENT, MEMORIAL UNIVERSITY OF NEWFOUNDLAND, PRIOR TO THE SUBMISSION OF THE TENDERS.

NORTH

MEMORIAL UNIVERSITY
FACILITIES MANAGEMENT

This University was raised by the people of Newfoundland as a memorial to the fallen in the great wars, 1914-1918, 1939-1945, that in freedom of learning, their cause and sacrifice might not be forgotten.

- Dedication plaque, Arts & Administration Building, St. John's Campus

PROJECT NAME:

ENGINEERING BUILDING RENOVATIONS TO EN-2078
Project #: EN-164-21

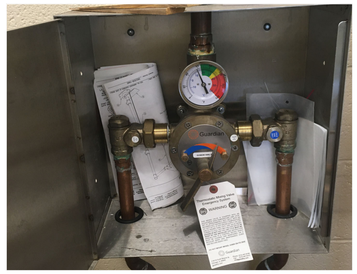
DRAWING TITLE:

LAB BENCH PLANS & ELEVATIONS CP-5006, 5006A & SN-3108

DESIGNED:	DRAWN:
E.B.	E.B.
REVIEWED:	APPROVED:
M.F.	M.F.
SCALE: AS SHOWN	DATE: DECEMBER, 2025
PROJECT No. **EN-164-21**	DRAWING No. **A-1.1**

ARCHITECTURAL DEMOLITION NOTES SN–3123: (#)

1. REMOVE EXISTING COMBO SHOWER/EYEWASH STATION C/W THERMOSTATIC MIXING VALVE IN CABINET AND RELOCATE TO EN–2078 FOR REINSTALLATION.
2. COMBO SHOWER/EYEWASH STATION HEIGHT = 2407mm.
3. CONTRACTOR IS RESPONSIBLE TO REMOVE AND REINSTATE ALL DOORS AS REQUIRED TO RELOCATED FURNITURE, FUME HOODS, AND COMBO SHOWER/EYEWASH STATION.
4. MUN FORCES TO DISCONNECT ELECTRICAL AND PLUMBING FED TO LAB BENCHES, FUME HOODS, AND COMBO SHOWER/EYEWASH STATION. CONTRACTOR IS RESPONSIBLE TO RELOCATE ELECTRICAL AND PLUMBING FIXTURES AS INDICATED TO FACILITATE LAB BENCH, FUME HOOD, AND COMBO SHOWER/EYEWASH STATION INSTALLATION TO EN–2078.
5. HEW HEIGHT ADJUSTABLE BASE AS PER DWG 7/A–1.2. CONTRACTOR TO ATTACH NEW BASE AND SWITCH TO EXISTING EPOXY WORKSTATION TOP. CONTRACTOR TO PROVIDE ALL FASTENERS AND ACCESSORIES REQUIRED TO FACILITATE INSTALLATION OF NEW BASE AND SWITCH TO EXISTING EPOXY WORKSTATION TOP.



SN–3123 SHOWER/EYEWASH PHOTO (11 A–1.2)
SCALE: NTS



SN–3123 SHOWER/EYEWASH PHOTO (10 A–1.2)
SCALE: NTS



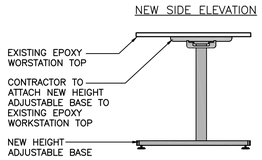
CP–5006A FUME HOOD PHOTO (9 A–1.2)
SCALE: NTS



CP–5006 FUME HOOD PHOTO (8 A–1.2)
SCALE: NTS

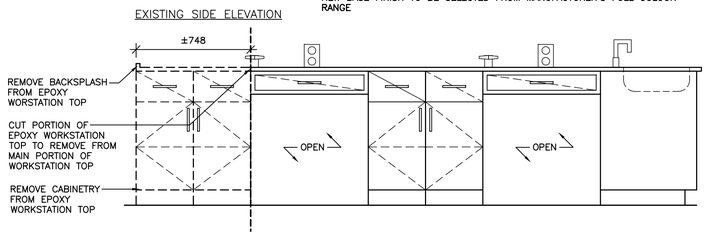
ARCHITECTURAL DEMOLITION NOTES SN–1008: (#)

1. REMOVE EXISTING EPOXY COUNTERTOP W/ BACKSPLASH AS INDICATED. RELOCATE TO EN–2078 FOR REINSTALLATION.
2. CONTRACTOR IS RESPONSIBLE TO PROVIDE ADDITIONAL WORKSTATION BRACKETS, BLOCKING AND SUBSTRATE TO SUPPORT COUNTERTOP ONCE RELOCATED TO EN–2078. CONTRACTOR IS PERMITTED TO REMOVE AND MODIFY PORTIONS OF EXISTING CABINETRY LOCATED IN SN–1008 TO PROVIDE BLOCKING IN NEW LOCATION.
3. MUN FORCES TO DISCONNECT ELECTRICAL AND PLUMBING FED TO LAB BENCHES, FUME HOODS, AND COMBO SHOWER/EYEWASH STATION. CONTRACTOR IS RESPONSIBLE TO RELOCATE ELECTRICAL AND PLUMBING FIXTURES AS INDICATED TO FACILITATE LAB BENCH, FUME HOOD, AND COMBO SHOWER/EYEWASH STATION INSTALLATION TO EN–2078.

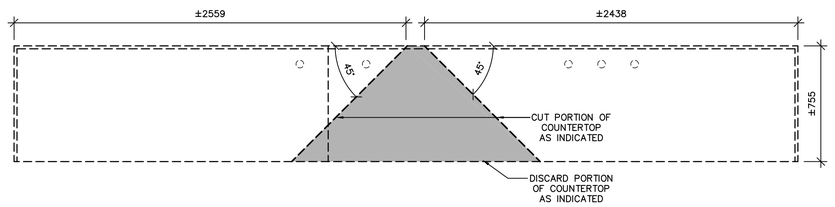


NEW HEIGHT ADJUSTABLE BASE ONLY: QUANTITY (x1)

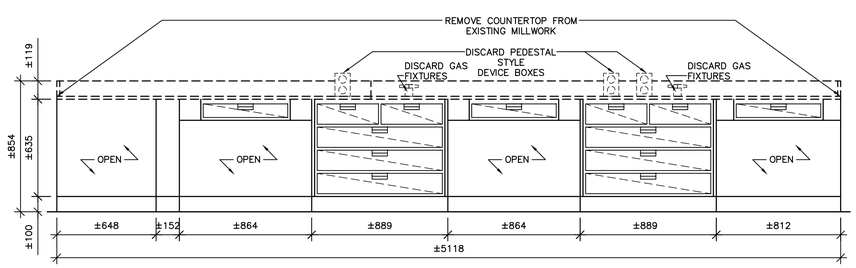
- SUPPLY AND INSTALL NEW ELECTRIC HEIGHT ADJUSTABLE BASE
- BASE TYPE AS NOTED BELOW, OR APPROVED ALTERNATE:
  - "YSRB HISPACE", BY TEKNION
  - "UPSIDE", BY HAWORTH
  - "VICTORY LX", BY ESI
- NEW HEIGHT ADJUSTABLE BASE TO HAVE THE FOLLOWING ITEMS:
  - EXTENDED RANGE ELECTRIC SWITCH FOR DESK HEIGHT POWER; RANGE BETWEEN 22.5–48.5" AFF
  - TOGGLE DISPLAY SWITCH
  - 10FT (3048mm) POWER CORD
  - NEW BASE TO SUPPORT EXISTING EPOXY WORKSTATION TOP SIZED 748x1371mm
  - NEW BASE FINISH TO BE SELECTED FROM MANUFACTURER'S FULL COLOUR RANGE



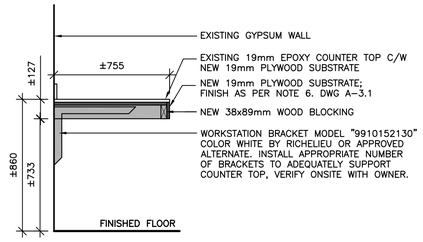
MILLWORK ELEVATIONS – HEIGHT ADJUSTABLE WORKSTATION TOP (7 A–1.2)
SCALE: 1:20



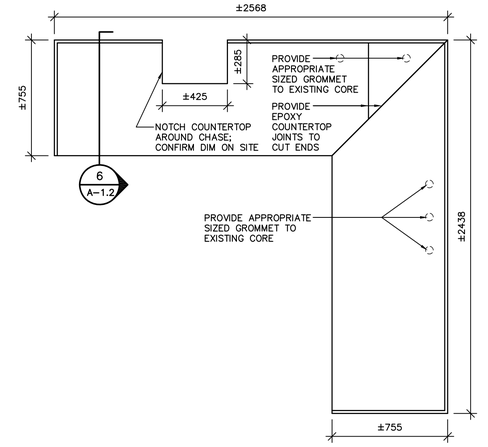
DEMOLITION MILLWORK PLAN SN–1008 (4 A–1.2)
SCALE: 1:20

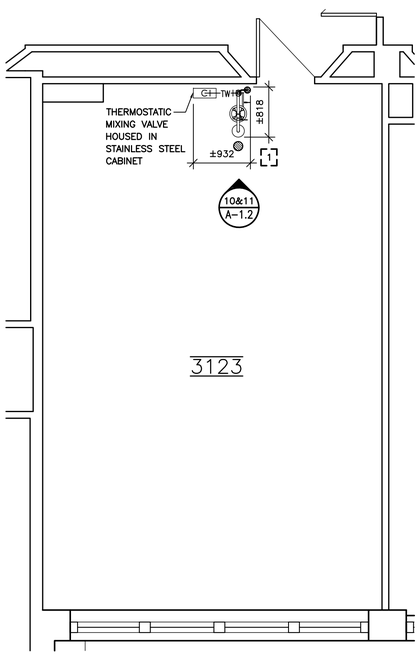


DEMOLITION MILLWORK ELEVATION SN–1008 (3 A–1.2)
SCALE: 1:20



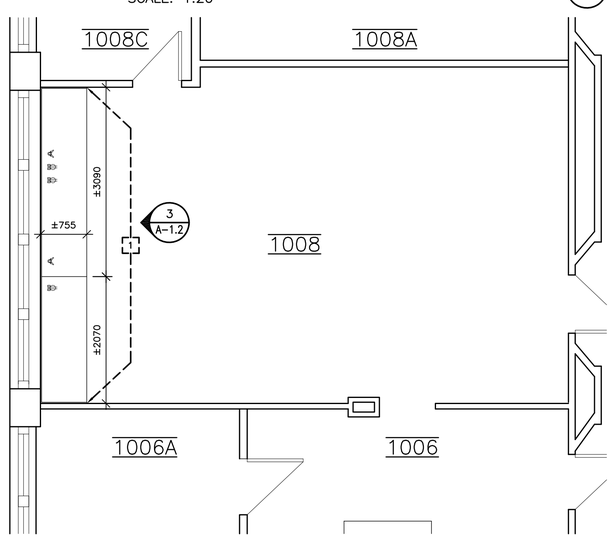
NEW MILLWORK SECTION SN–2078 (6 A–1.2)
SCALE: 1:20





DEMO FLOOR PLAN SN–3123 (2 A–1.2)
SCALE: 1:50

NEW MILLWORK PLAN SN–2078 (5 A–1.2)
SCALE: 1:20



DEMOLITION FLOOR PLAN SN–1008 (1 A–1.2)
SCALE: 1:50

A – DETAIL
B – LOCATION/DRAWING No.
C – DRAWING No.

No.	REVISION	DATE
R0	ISSUED FOR TENDER	DECEMBER 9, 2025

GENERAL NOTES

1. DRAWINGS TO BE READ AS A SET.
2. DO NOT SCALE FROM DRAWINGS.
3. THE CONTRACTOR IS TO VERIFY ALL DIMENSIONS AND SITE CONDITIONS PRIOR TO SUBMISSION OF TENDERS.
4. ALL DEFICIENCIES FOUND IN THIS DRAWING IS TO BE BROUGHT TO THE ATTENTION OF THE FACILITIES ENGINEERING AND DEVELOPMENT OFFICE OF THE DEPARTMENT OF FACILITIES MANAGEMENT, MEMORIAL UNIVERSITY OF NEWFOUNDLAND, PRIOR TO THE SUBMISSION OF THE TENDERS.

NORTH

MEMORIAL UNIVERSITY
FACILITIES MANAGEMENT

This University was raised by the people of Newfoundland as a memorial to the fallen in the great wars, 1914-1918, 1939-1945, that in freedom of learning, their cause and sacrifice might not be forgotten.

- Dedication plaque, Arts & Administration Building, St. John's Campus

PROJECT NAME:

ENGINEERING BUILDING RENOVATIONS TO EN-2078
Project #: EN-164-21

DRAWING TITLE:

LAB BENCH & FIXTURE PLANS & ELEVATIONS SN-1008, 3123

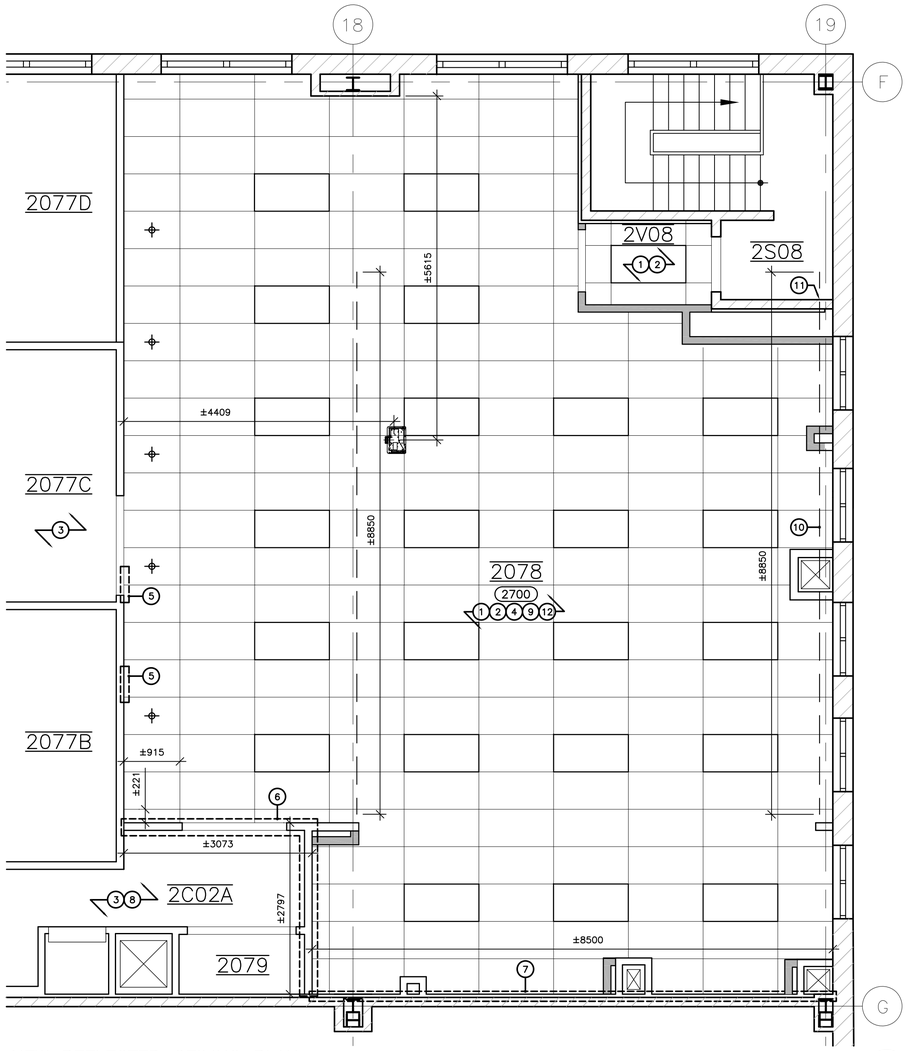
DESIGNED:	DRAWN:
E.B.	E.B.
REVIEWED:	APPROVED:
M.F.	M.F.
SCALE:	DATE:
AS SHOWN	DECEMBER, 2025
PROJECT No.	DRAWING No.
EN-164-21	A-1.2

NEW CEILING PLAN NOTES: (#)

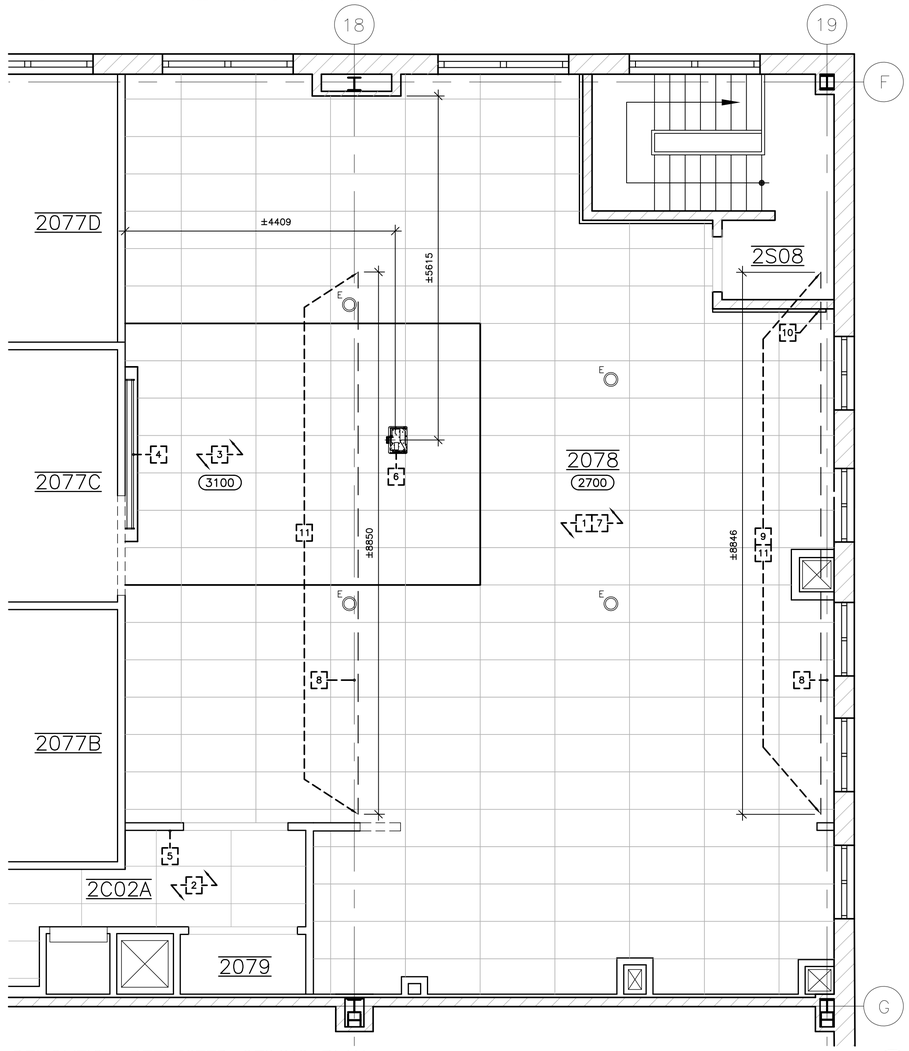
1. SUPPLY AND INSTALL NEW T–BAR CEILING 610x610mm GRID LAYOUT THROUGHOUT. NEW GRID TO BE 'DOWN BRAND DX/DXL' BY 'CGC', OR APPROVED ALTERNATE.
2. SUPPLY AND INSTALL NEW 600x1200x15mm ACOUSTICAL CEILING TILES THROUGHOUT 'RADAR BASIC BY CGC', ITEM NO. 2310, SQUARE EDGE 'SQ'. COLOUR TO BE 'FLAT WHITE 050'.
3. EXISTING T–BAR GRID AND ACOUSTICAL TILE TO REMAIN.
4. NEW CEILING HEIGHT AS SHOWN IN 2078 TO BE DETERMINED ON SITE. CONTRACTOR TO COORDINATE WITH ELECTRICAL AND MECHANCIAL SUBTRADE AND CONFIRM HEIGHT ON SITE PRIOR TO START OF WORK.
5. INFILL LAYER OF DOUBLE LAYER 16mm TYPE 'X' GYPSUM BOARD WHERE REMOVED ABOVE CEILING. TAPE AND MUD JOINS WHERE NEW GYPSUM BOARD SHEATHING ABUTS EXISTING. CONTRACTOR TO ALLOW FOR APPROX. 1m² PER EACH AREA TO BE FILLED.
6. INSTALL NEW 16mm TYPE 'X' GYPSUM BOARD SHEATHING TO EACH SIDE OF NEW 92mm METAL STUDS ABOVE CEILING TO U/S OF DECK. FILL CAVITY WITH MINERAL FIBRE INSULATION. COPE AROUND METAL DECK, MECHANICAL, ELECTRICAL, ETC. SEAL OPENINGS WITH FIRE CAULK BETWEEN GYPSUM BOARD AND METAL DECK, MECHANICAL, ELECTRICAL, ETC.
7. SEAL OPENINGS WITH FIRE CAULK BETWEEN CMU BLOCK AND METAL DECK, MECHANICAL, ELECTRICAL, ETC.
8. REPLACE ALL DAMAGED, WATER STAINED, OR MISSING TILES LOCATED IN 2C02A. CONTRACTOR TO ALLOW FOR 1 BOX OF TILE.
9. CORE EXISTING CEILING TILE AS REQUIRED TO ACCOMMODATE TRANSFER FOR ELECTRICAL CONDUIT, POWER POLE, DUCTWORK, PIPING, ETC. COORDINATE LOCATIONS ON SITE WITH ELECTRICAL AND MECHANICAL SUBTRADES.
10. INSTALL TWO (2) NEW COURSES OF 150mm CONCRETE BLOCK ALONG ENTIRE LENGTH OF NEW STRUCTURAL SUPPORT WHERE REMOVED TO FACILITATE INSTALLATION. NEW CONCRETE BLOCK TO EXTEND TO UNDERSIDE OF NEW STRUCTURAL SUPPORTS.
11. INSTALL NEW 150mm CONCRETE BLOCK AT 2S08 WALL WHERE REMOVED TO FACILITATE INSTALLATION OF STRUCTURAL SUPPORT. NEW CONCRETE BLOCK TO EXTEND TO UNDERSIDE OF NEW STRUCTURAL SUPPORTS.
12. APPLY NEW EXPOSED CEMENTITIOUS (SFRM) SPRAY FIRE–RESISTIVE MATERIAL ON EXPOSED EXISTING STEEL W–BEAMS, NEW STEEL SUPPORTS (SEE STRUCTURAL DWGS S1 TO S4 FOR ADDITIONAL INFO), AND ENTIRE METAL DECK. SEE SPEC FOR ADDITIONAL INFO.
    - 12.1. SFRM STANDARD OF ACCEPTANCE, CAFCO 400 SPRAY APPLIED CEMENTITIOUS FIREPROOFING TO PROVIDE 60 MIN RATING, OR APPROVED ALTERNATE.
    - 12.2. APPLY APPROPRIATE THICKNESS OF EXPOSED CEMENTITIOUS SFRM TO ACHIEVE A 1 HOUR FIRE RATING.
    - 12.3. ALL EXISTING ELECTRICAL JUNCTION BOXES TO BE PROTECTED/COVERED DURING SFRM APPLICATION TO ALLOW ACCESS TO THE JUNCTION BOXES AFTER APPLICATION.
    - 12.4. SEE STRUCTURAL DWGS S1 TO S4 FOR STRUCTURAL STEEL LAYOUT, STEEL SIZING, ETC.
    - 12.5. ACCESS TO WATER AVAILABLE IN EN–2060

CEILING PLAN DEMOLITION NOTES: [#]

1. REMOVE AND DISPOSE OF ALL EXISTING CEILING TILE AND T–BAR GRID AS INDICATED.
2. EXISTING TILE AND T–BAR CEILING GRID TO REMAIN UNLESS OTHERWISE INDICATED.
3. REMOVE RAISED CEILING INCLUDING TILE, T–BAR GRID, FIBERBOARD, AND ALL ASSOCIATED COMPONENTS AS INDICATED.
4. REMOVE AND RELOCATE EXISTING PROJECTOR SCREEN AND MOUNT. RETAIN FOR REINSTALLATION AS PER DWG 1/A–3.0. REMOVE FIBERBOARD HOUSING AND ALL ASSOCIATED COMPONENTS AS INDICATED. AV CABLING AND DATA CABLING TO BE DISCONNECTED AND REMOVED BY MUN FORCES.
5. CORE EXISTING CEILING TILE AS REQUIRED TO RUN WIREMOLD FOR NEW PUSH BUTTON ACTUATOR/PROX AS PER DWGS 1/A–3.0 AND E–0.
6. EXISTING PIPE AND TILE BRIDGE PROJECTOR MOUNT TO BE DISCONNECTED AND REMOVED BY MUN FORCES AS INDICATED.
7. EXISTING SPEAKERS TO BE DISCONNECTED AND REMOVED BY MUN FORCES AS INDICATED.
8. PROVIDE TEMPORARY SUPPORT FOR ALL TRADE WORK INCLUDING BUT NOT LIMITED TO PIPING, CONDUIT, AND SERVICE SUPPORTS ATTACHED TO GRID 18 AND 19 BEAMS TO FACILITATE INSTALLATION OF STRUCTURAL SUPPORTS. SEE STRUCTURAL DWGS S1 TO S4 FOR ADDITIONAL INFO.
9. REMOVE TWO (2) COURSES OF CMU BLOCK AS INDICATED TO FACILITATE INSTALLATION OF NEW STRUCTURAL SUPPORTS. SEE STRUCTURAL DWGS S1 TO S4 FOR ADDITIONAL INFO.
10. REMOVE CMU BLOCK AS REQUIRED AT 2S08 TO FACILITATE INSTALLATION OF NEW STRUCTURAL SUPPORTS. SEE STRUCTURAL DWGS S1 TO S4 FOR ADDITIONAL INFO. COORDINATE AMOUNTS AND LOCATION W/ MECHANICAL SUBTRADE.
11. REMOVE SPRAY APPLIED FIRE–PROOFING MATERIAL AND PREPARE STRUCTURAL STEEL FOR WELDING TO FACILITATE INSTALLATION OF NEW STRUCTURAL SUPPORTS. SEE STRUCTURAL DWGS S1 TO S4 FOR ADDITIONAL INFO.



NEW REFLECTED CEILING PLAN
SCALE: 1:50
2 A–2.0



DEMOLITION REFLECTED CEILING PLAN
SCALE: 1:50
1 A–2.0

A – DETAIL
B – LOCATION/DRAWING No.
C – DRAWING No.

No.	REVISION	DATE
R0	ISSUED FOR TENDER	DECEMBER 9, 2025

GENERAL NOTES

1. DRAWINGS TO BE READ AS A SET.
2. DO NOT SCALE FROM DRAWINGS.
3. THE CONTRACTOR IS TO VERIFY ALL DIMENSIONS AND SITE CONDITIONS PRIOR TO SUBMISSION OF TENDERS.
4. ALL DEFICIENCIES FOUND IN THIS DRAWING IS TO BE BROUGHT TO THE ATTENTION OF THE FACILITIES ENGINEERING AND DEVELOPMENT OFFICE OF THE DEPARTMENT OF FACILITIES MANAGEMENT, MEMORIAL UNIVERSITY OF NEWFOUNDLAND, PRIOR TO THE SUBMISSION OF THE TENDERS.

NORTH

MEMORIAL UNIVERSITY
FACILITIES MANAGEMENT

This University was raised by the people of Newfoundland as a memorial to the fallen in the great wars, 1914-1918, 1939-1945, that in freedom of learning, their cause and sacrifice might not be forgotten.

- Dedication plaque, Arts & Administration Building, St. John's Campus

PROJECT NAME:

ENGINEERING BUILDING RENOVATIONS TO EN-2078
Project #: EN-164-21

DRAWING TITLE:

REFLECTED CEILING PLANS

DESIGNED:	DRAWN:
E.B.	E.B.
REVIEWED:	APPROVED:
M.F.	M.F.
SCALE:	DATE:
AS SHOWN	DECEMBER, 2025
PROJECT No.	DRAWING No.
EN-164-21	**A-2.0**

FLOOR PLAN CONSTRUCTION NOTES EN–2C02A, 2078, 2S06: (#)

1. CONSTRUCT NEW CMU BLOCK FLUSH END WHERE EXISTING WALL REMOVED USING TOOTHED TECHNIQUE AT OPENING. NEW INFILL PORTION OF WALL TO EXTEND TO BEAM, AND/OR UNDERSIDE OF METAL DECKING.
2. FILL IN OPENING ABOVE CEILING WITH NEW 150mm CMU BLOCK. COPE AROUND METAL DECK, MECHANICAL, ELECTRICAL, ETC. SEAL OPENINGS WITH FIRE CAULK BETWEEN CMU BLOCK AND METAL DECK, MECHANICAL, ELECTRICAL, ETC. CONTRACTOR TO ALLOW FOR APPROX. 5m² OF AREA TO BE FILLED.
3. SEAL OPENINGS WITH FIRE CAULK BETWEEN CMU BLOCK AND MECHANICAL, ELECTRICAL, ETC WHERE CONDUIT TRANSFERS FROM EN–2C02A AND EN–2075.
4. REINSTATE EXISTING DOOR AND FRAME TO HAVE OPPOSITE SWING. REINSTATE EXISTING HARDWARE. REFER TO DOOR ELEVATIONS AND SCHEDULE ON DWG A–4.0. COORDINATE WITH PROJECT COORDINATOR FOR HARDWARE SUPPLIED BY MUN. REINSTATE FIRE BLANKET AND FIRE EXTINGUISHER WHEN DOOR IS REINSTATED. CONTRACTOR TO PROVIDE REQUIRED FASTENERS AND HARDWARE TO REATTACH FIRE BLANKET AND FIRE EXTINGUISHER.
5. FILL AREAS WHERE EXISTING WALLS WERE REMOVED TO FACILITATE DOOR INSTALLATION WITH NEW 13mm TYPE 'X' GYPSUM BOARD SHEATHING. CONTRACTOR TO ALLOW FOR APPROX. 1m² OF AREA TO BE FILLED AT EACH SIDE OF DOOR FRAME. TAPE AND MUD JOINS WHERE NEW GYPSUM BOARD SHEATHING ABUTS EXISTING.
6. INSTALL NEW DOOR AND FRAME. INSTALL HARDWARE PROVIDED BY OWNER. REFER TO DOOR ELEVATIONS AND SCHEDULE ON DWG A–4.0. COORDINATE WITH PROJECT COORDINATOR FOR HARDWARE SUPPLIED BY MUN.
7. INSTALL NEW VINYL COMPOSITE TILE FLOORING AND VINYL BASE:
   - 7.1. "STANDARD EXCELON IMPERIAL TEXTURE" BY ARMSTRONG FLOORING, FINISH TO BE CHOSEN FROM MANUFACTURER'S FULL COLOR RANGE.
   - 7.2. 100mm COVED RUBBER BASE AT AREAS OF WALL AND DOOR FRAME REMOVAL, "BENGUARD", OR APPROVED ALTERNATE. BASE FINISH TO BE CHOSEN FROM MANUFACTURER'S FULL COLOR RANGE.
   - 7.3. INCLUDE FOR APPROPRIATE AMOUNT OF MANUFACTURER'S RECOMMENDED ADHESIVE FOR TILE AND BASE.

GENERAL FINISH PLAN CONSTRUCTION NOTES:

1. NEW PAINT FINISH ON ALL NEW AND EXISTING WALLS, NEW AND EXISTING DOORS AND FRAMES, AND NEW AND EXISTING BULKHEADS. WHERE WALLS AND CEILINGS HAVE SURFACE MOUNTED MECHANICAL AND ELECTRICAL EQUIPMENT SUCH AS CONDUIT, HEATERS, DUCTWORK, ETC. ALL EXPOSED MECHANICAL AND ELECTRICAL SURFACES ARE TO RECEIVE NEW PAINT FINISH UNLESS OTHERWISE NOTED. PREPARE SURFACES AS REQUIRED TO RECEIVE NEW PAINT FINISH INCLUDING BUT NOT LIMITED TO PATCH AND REPAIR, SCRAPING, SANDING, ETC. PAINT FINISH ON NEW MATERIALS TO BE MINIMUM ONE COAT APPROPRIATE PRIMER AND MINIMUM TWO COATS FINISH. PAINT FINISH ON EXISTING MATERIALS TO BE MINIMUM TWO COATS FINISH. COLORS TO BE SELECTED BY OWNER. SEE SPEC FOR MORE PAINTING INFORMATION.
2. REMOVE ALL RECEPTACLE, SWITCH RELAYS, DATA DROPS, AND OTHER SIMILAR COVER PLATES TO FACILITATE WALL PAINTING. REINSTATE ALL EXISTING COVER PLATES THAT ARE NOT BEING REPLACED ONCE PAINTING HAS BEEN COMPLETED.
3. WALL PAINTING OUTSIDE OF HOARDING WALL TO BE COMPLETED AFTER 5:00PM, OR BEFORE 8:00AM TO LIMIT DISRUPTIONS TO SURROUNDING BUILDING OCCUPANTS. CONTRACTOR IS RESPONSIBLE TO NOTIFY PROJECT COORDINATOR 24HRS IN ADVANCE OF AFTER HOURS WORK.

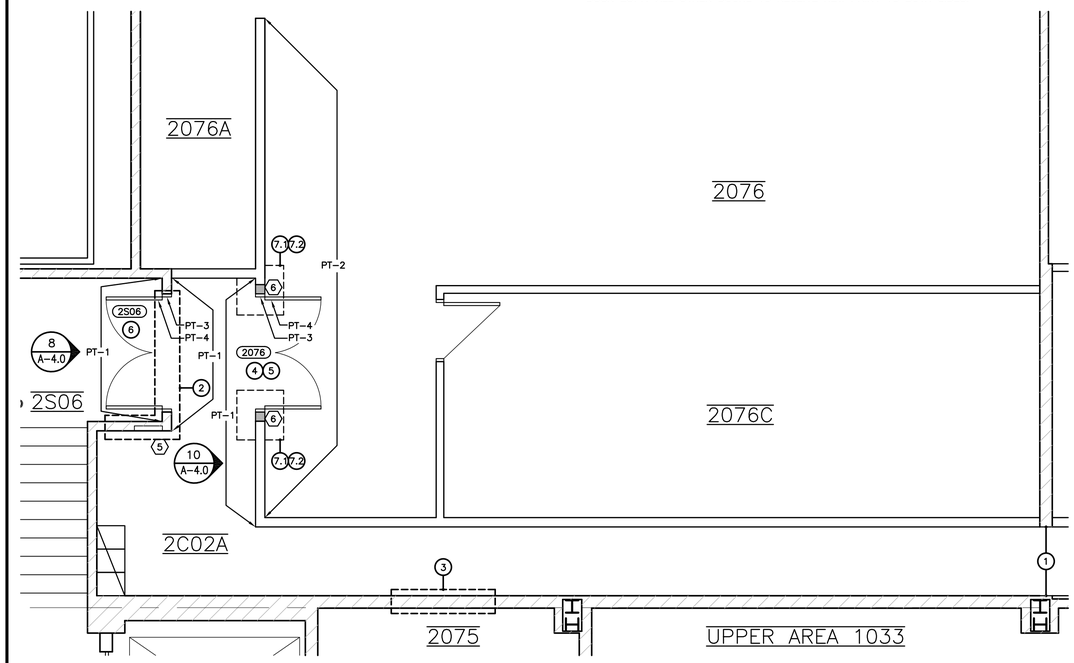
PAINT LEGEND:

- PT–1 – EXISTING CORRIDOR WALL COLOR TO MATCH EXISTING. CONFIRM DRY–OUT COLOR SAMPLE WITH PROJECT COORDINATOR PRIOR TO USE.
- PT–2 – EXISTING WALL COLOR TO MATCH EXISTING. CONFIRM DRY–OUT COLOR SAMPLE WITH PROJECT COORDINATOR PRIOR TO USE.
- PT–3 – EXISTING AND NEW DOOR TRIM COLOR CSP–150 WINDY CITY BY BENJAMIN MOORE. SEMI–GLOSS FINISH.
- PT–4 – EXISTING AND NEW DOOR COLOR 2057–30 NAPLES BLUE BY BENJAMIN MOORE. FINISH TO MATCH EXISTING.

PLEASE NOTE: PT–3 AND PT–4 TO BE APPLIED TO CORRIDOR SIDE ONLY FOR DOOR 2077. ALL OTHER DOORS TO RECEIVE NEW PAINT TO BOTH SIDES.

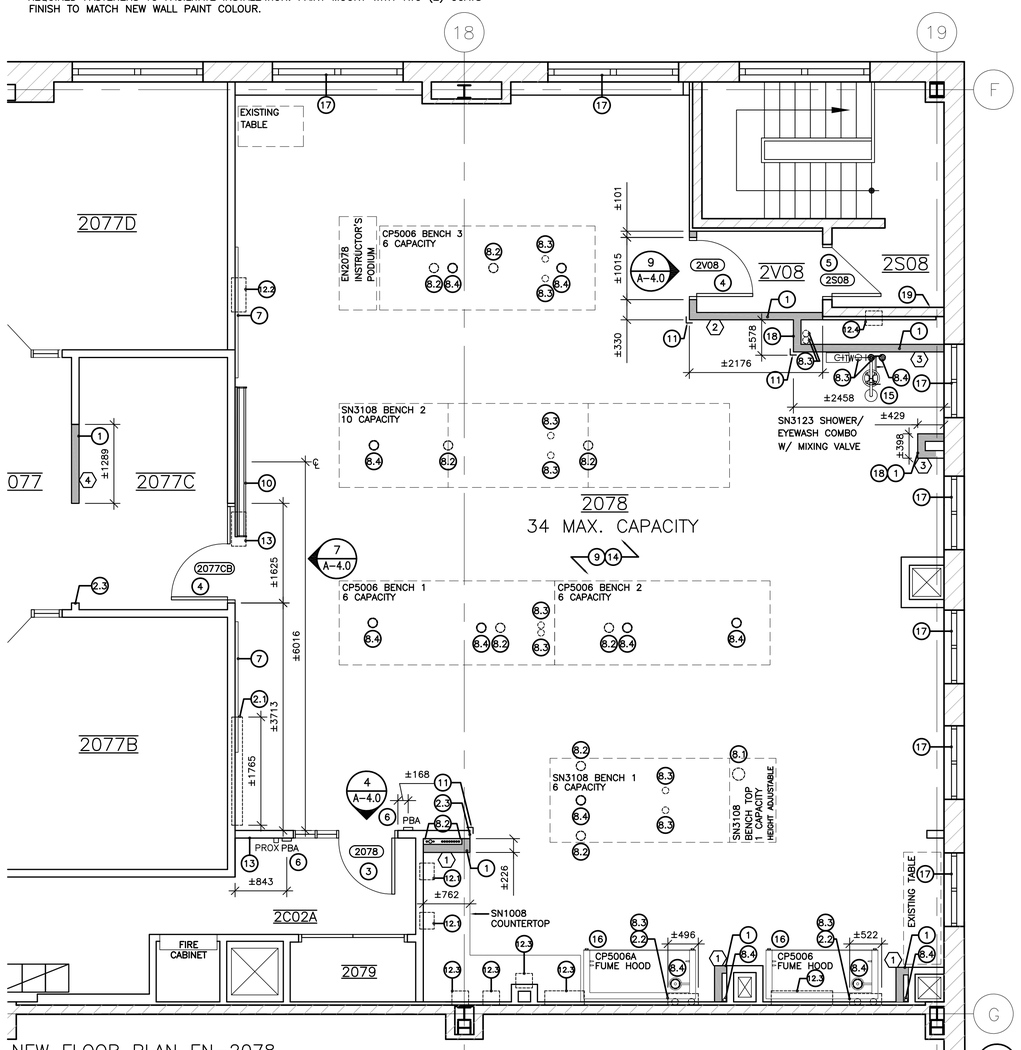
FLOOR PLAN CONSTRUCTION NOTES EN–2078: (#)

1. CONSTRUCT NEW PARTITIONS AS INDICATED AND PREPARE TO RECEIVE NEW FINISHES AS SPECIFIED. FURRING TO BE AS TIGHT AS POSSIBLE AROUND CONDUIT AND/OR PLUMBING LINES.
2. FILL AREAS WHERE EXISTING WALLS WERE REMOVED WITH NEW GYPSUM BOARD SHEATHING AS INDICTED BELOW. TAPE AND MUD JOINS WHERE NEW GYPSUM BOARD SHEATHING ABUTS EXISTING.
   - 2.1. DOUBLE LAYER 16mm TYPE 'X' GYPSUM BOARD SHEATHING
   - 2.2. 19mm GYPSUM BOARD SHEATHING
   - 2.3. 16mm GYPSUM BOARD SHEATHING
3. REINSTATE EXISTING FRAME HAVING OPPOSITE SWING. INSTALL NEW DOOR TO EXISTING FRAME. REINSTATE EXISTING HARDWARE. REFER TO DOOR ELEVATIONS AND SCHEDULE ON DWG A–4.0. CONTRACTOR RESPONSIBLE TO MAKE REQUIRED MODIFICATIONS TO DOOR FRAME TO FACILITATE INSTALLATION OF NEW DOOR.
4. INSTALL NEW DOOR AND FRAME. INSTALL HARDWARE PROVIDED BY OWNER. REFER TO DOOR ELEVATIONS AND SCHEDULE ON DWG A–4.0. COORDINATE WITH PROJECT COORDINATOR FOR HARDWARE SUPPLIED BY MUN.
5. EXISTING DOOR TO REMAIN.
6. SUPPLY AND INSTALL NEW CAMDEN PUSH BUTTON ACTUATORS FOR AUTOMATIC DOOR OPERATOR CONTROL IN CONJUNCTION WITH NEW HORTON AUTOMATIC DOOR OPERATOR. INSTALL NEW CONDUIT/WIREMOLD TO RECEIVE OWNER SUPPLIED PROX. CORE APPROPRIATE SIZE HOLE IN GYPSUM BOARD WALL TO ALLOW FOR CONDUIT TRANSFER; COORDINATE LOCATION ON SITE WITH ELECTRICAL SUBTRADE. SEE DWG A–4.0 FOR DOOR ELEVATIONS, DOOR SCHEDULE AND HARDWARE GROUPS. SEE DWG E–0 FOR EQUIPMENT AND CONDUIT ELEVATIONS.
7. REINSTATE EXISTING WHITEBOARD AS INDICATED. CONTRACTOR IS RESPONSIBLE TO PROVIDE ALL REQUIRED FASTENERS AND BLOCKING TO COMPLETE WORK. EXACT LOCATION TO BE DETERMINED ON SITE.
8. APPROXIMATE LOCATION FOR CORE HOLES IN FLOOR SLAB TO FACILITATE THE INSTALLATION OF THE FOLLOWING ITEMS. SEAL WITH APPROVED FIRE CAULK SYSTEM. COORDINATE CORE SIZE W/ ELECTRICAL AND MECHANICAL SUBTRADE FOR EACH LOCATION. REFER TO DWG 3 & 4/A–0.1 FOR CORE LOCATIONS. LEVEL 1 ACCESS LOCATED IN EN1034 AND 1034A HAVING EXPOSED CEILINGS TO UNDERSIDE OF METAL DECK. EXACT QUANTITY TO BE DETERMINED ON SITE. CONTRACTOR TO ALLOW FOR MINIMUM CORE QUANTITIES AS NOTED BELOW:
   - 8.1. x1 FLOOR BOX
   - 8.2. x19 POWER & DATA CONDUIT
   - 8.3. x16 SUPPLY PIPING
   - 8.4. x10 SANITARY/VENT PIPING
9. NEW FLOOR FINISH; SEE FINISH PLAN AND NOTES ON DWG 2/A–3.1.
10. REINSTATE PROJECTOR SCREEN AND MOUNT AS INDICATED IN DWG 3/A–4.0. PROVIDE REQUIRED FASTENERS TO FACILITATE INSTALLATION. PAINT MOUNT WITH TWO (2) COATS FINISH TO MATCH NEW WALL PAINT COLOUR.
11. ENDWALL/CORNER GUARDS: STAINLESS STEEL MOUNTED AS PER MANUFACTURER'S INSTRUCTIONS (WHERE INDICATED ON DRAWINGS):
    - 11.1. SIZE: 50mm X 50mm X 1220mm
    - 11.2. TYPE: STAINLESS STEEL 18 GAUGE PRE–DRILLED WITH OVAL HEAD SHEET METAL SCREWS AND WASHERS
    - 11.3. ACCEPTABLE PRODUCT: WALLGUARD, OR APPROVED ALTERNATE.
12. FILL AREAS WHERE EXISTING DATA AND RECEPTACLE WERE REMOVED WITH NEW GYPSUM BOARD SHEATHING AS INDICATED BELOW. TAPE AND MUD JOINS WHERE NEW GYPSUM BOARD SHEATHING ABUTS EXISTING.
    - 12.1. 16mm GYPSUM BOARD SHEATHING
    - 12.2. DOUBLE LAYER 16mm TYPE 'X' GYPSUM BOARD SHEATHING
    - 12.3. 19mm GYPSUM BOARD SHEATHING
    - 12.4. 13mm GYPSUM BOARD SHEATHING
13. CORE APPROPRIATE SIZE HOLE IN GYPSUM BOARD WALL TO ALLOW FOR TRANSFER OF ROOM PRESSURE SENSOR AND MONITOR CONTROL CABLING. SEAL WITH FIRE CAULK. COORDINATE EXACT LOCATION W/ ELECTRICAL AND MECHANICAL SUBTRADE FOR EACH LOCATION.
14. MAINTAIN FIRE RATINGS BETWEEN FLOOR AND WALL ASSEMBLIES. FILL AND PATCH EXISTING HOLES IN FLOORS AND WALL. RE–GROUT SMALL OPENINGS IN CMU BLOCK WALLS. APPROPRIATELY FIRE SEAL EXISTING PENETRATIONS TO MAINTAIN 1 HOUR FIRE RESISTANCE RATING AS REQUIRED.
15. REMOVE, TRANSPORT AND REINSTATE EYEWASH/SHOWER STATION FROM SCIENCE BUILDING AS PER DWG 1/A–1.4. PROVIDE REQUIRED FASTENERS AND ASSOCIATED COMPONENTS REQUIRED TO INSTALL EYEWASH/SHOWER STATION TO NEW LOCATION.
16. REMOVE, TRANSPORT AND REINSTATE FUME HOOD FROM SCIENCE BUILDING AS PER DWG 1/A–1.3. PROVIDE REQUIRED FASTENERS AND ASSOCIATED COMPONENTS REQUIRED TO INSTALL FUME HOODS TO NEW LOCATIONS.
17. FIX HOPPER WINDOWS SHUT WITH NEW BLACK TIP FASTENERS. PRE–DRILL PILOT HOLES FOR FASTENERS TO ENSURE MINIMAL DAMAGE TO FRAME. CONTRACTOR TO PROVIDE FASTENERS REQUIRED TO FACILITATE WORK. CONTRACTOR TO TAKE CARE NOT TO BREAK, OR DAMAGE GLAZING.
18. INSTALL NEW 610x610mm ACCESS DOOR AT ALL CONCEALED VALVES AND CLEANOUTS. CONTRACTOR TO COORDINATE WITH MECHANICAL SUBTRADE FOR EXACT LOCATION OF NEW ACCESS DOOR.



PARTIAL NEW FLOOR/FINISH PLAN EN–2C02A, 2076
SCALE: 1:50 — 3/A–3.0

PARTIAL NEW FLOOR/FINISH PLAN EN–2C02A
SCALE: 1:50 — 2/A–3.0



NEW FLOOR PLAN EN–2078
SCALE: 1:50 — 1/A–3.0

A – DETAIL
B – LOCATION/DRAWING No.
C – DRAWING No.

No.	REVISION	DATE
R0	ISSUED FOR TENDER	DECEMBER 9, 2025

GENERAL NOTES

1. DRAWINGS TO BE READ AS A SET.
2. DO NOT SCALE FROM DRAWINGS.
3. THE CONTRACTOR IS TO VERIFY ALL DIMENSIONS AND SITE CONDITIONS PRIOR TO SUBMISSION OF TENDERS.
4. ALL DEFICIENCIES FOUND IN THIS DRAWING IS TO BE BROUGHT TO THE ATTENTION OF THE FACILITIES ENGINEERING AND DEVELOPMENT OFFICE OF THE DEPARTMENT OF FACILITIES MANAGEMENT, MEMORIAL UNIVERSITY OF NEWFOUNDLAND, PRIOR TO THE SUBMISSION OF THE TENDERS.

NORTH

MEMORIAL UNIVERSITY
FACILITIES MANAGEMENT

This University was raised by the people of Newfoundland as a memorial to the fallen in the great wars, 1914–1918, 1939–1945, that in freedom of learning, their cause and sacrifice might not be forgotten.

- Dedication plaque, Arts & Administration Building, St. John's Campus

PROJECT NAME:

ENGINEERING BUILDING RENOVATIONS TO EN-2078
Project #: EN-164-21

DRAWING TITLE:

NEW FLOOR & FINISH PLANS

DESIGNED:	DRAWN:
E.B.	E.B.
REVIEWED:	APPROVED:
M.F.	M.F.
SCALE:	DATE:
AS SHOWN	DECEMBER, 2025
PROJECT No.	DRAWING No.
EN-164-21	**A-3.0**

FLOORING CONSTRUCTION NOTES:(#)

1. INSTALL NEW HOMOGENEOUS SHEET FLOORING WITH INTEGRAL COVE BASE:

1.1. "iQ EMINENT" BY TARKETT, SHEET FLOORING INSTALLATION, COLOR TO BE '21030 904 WHITE CG'.

1.2. "iQ GRANIT" BY TARKETT, SHEET FLOORING INSTALLATION, COLOR TO BE '21142 369 LIGHT AQUA'.

1.3. "iQ GRANIT" BY TARKETT, SHEET FLOORING INSTALLATION, COLOR TO BE '21142 390 LIGHT GREEN'.

1.4. INTEGRAL COVE BASE FORMED BY EXTENDING SHEET FLOORING FROM FLOOR TO WALL. COVE BASE TO BE TOPPED WITH COVE CAP, MODEL "SCC-XX-D" BY JOHNSONITE. CONTRACTOR TO TAKE CARE WITH SEAMS WHERE FLOORING COLORS MEET. CONTRACTOR IS RESPONSIBLE TO PURCHASE AND INSTALL ALL FLOORING COMPONENTS REQUIRED TO FACILITATE INSTALLATION OF COVE BASE.

1.5. ALL SEAMS TO BE HEAT WELDED.

1.6. INCLUDE FOR APPROPRIATE AMOUNT OF COMPATIBLE ADHESIVE FOR SHEET FLOORING, COVE, AND COVE CAP.

1.7. EXACT CURVATURE TO BE DETERMINED ON SITE WITH FLOORING CONTRACTOR

2. INSTALL NEW VINYL COMPOSITE TILE FLOORING AND VINYL BASE:

2.1. "STANDARD EXCELON IMPERIAL TEXTURE" BY ARMSTRONG FLOORING, FINISH TO BE CHOSEN FROM MANUFACTURER'S FULL COLOR RANGE.

2.2. 100mm COVED RUBBER BASE AT AREAS OF WALL AND DOOR FRAME REMOVAL, "BENGUARD", OR APPROVED ALTERNATE. BASE FINISH TO BE CHOSEN FROM MANUFACTURER'S FULL COLOR RANGE.

2.3. INCLUDE FOR APPROPRIATE AMOUNT OF MANUFACTURER'S RECOMMENDED ADHESIVE FOR TILE AND BASE.

3. EXISTING FLOORING TO REMAIN.

4. INSTALL NEW VINYL TRANSITION STRIP FOR NEW SHEET FLOORING TO VINYL COMPOSITE TILE TRANSITION AT DOOR OPENINGS, MODEL "CTA-XX-X" BY JOHNSONITE. FINISH TO BE SELECTED FROM MANUFACTURER'S FULL COLOR RANGE.

5. INSTALL NEW VINYL REDUCER STRIP FOR NEW SHEET FLOORING TO CONCRETE FLOOR TRANSITION AT DOOR OPENING, MODEL "RRS-XX-B" BY JOHNSONITE. FINISH TO BE SELECTED FROM MANUFACTURER'S FULL COLOR RANGE.

FLOOR LEGEND:

— — — EDGE OF HOMOGENEOUS SHEET FLOORING

— - — - EDGE OF VINYL COMPOSITE TILE

PAINT LEGEND:

PT-1 – EXISTING CORRIDOR WALL COLOR TO MATCH EXISTING. CONFIRM DRY-OUT COLOR SAMPLE WITH PROJECT COORDINATOR PRIOR TO USE.

PT-2 – EXISTING WALL COLOR TO MATCH EXISTING. CONFIRM DRY-OUT COLOR SAMPLE WITH PROJECT COORDINATOR PRIOR TO USE.

PT-3 – EXISTING AND NEW DOOR TRIM COLOR CSP-150 WINDY CITY BY BENJAMIN MOORE. SEMI-GLOSS FINISH.

PT-4 – EXISTING AND NEW DOOR COLOR 2057-30 NAPLES BLUE BY BENJAMIN MOORE. FINISH TO MATCH EXISTING.

PT-5 – MAIN WALL COLOR CC-30 OXFORD WHITE BY BENJAMIN MOORE. SEMI-GLOSS FINISH.

PT-6 – ACCENT WALL COLOR 2035-60 LEISURE GREEN BY BENJAMIN MOORE. SEMI-GLOSS FINISH.

PT-7 – EXISTING LAB BENCHING COLOR TO MATCH METAL CASEWORK COLOR 2041-10 HUNTER GREEN BY BENJAMIN MOORE. CLEAR COAT POLYCRYLIC SATIN FINISH.

OWNER RESERVES THE RIGHT TO CHOOSE UP TO EIGHT (8) DIFFERENT PAINT SELECTIONS TO BE APPLIED THROUGHOUT THE SPACE; SEE SPECIFICATION 09 01 90.63 AND 09 91 23.

PLEASE NOTE: PT-3 AND PT-4 TO BE APPLIED TO CORRIDOR SIDE ONLY FOR DOOR 2077. ALL OTHER DOORS TO RECEIVE NEW PAINT TO BOTH SIDES.

GENERAL FINISH PLAN CONSTRUCTION NOTES:

1. MAINTAIN FIRE RATINGS BETWEEN FLOOR AND WALL ASSEMBLIES. FILL AND PATCH HOLES IN FLOORS AND WALLS AS A RESULT OF DEMOLITION WORK. COORDINATE OPENINGS REQUIRED IN EXISTING FIRE RATED CONCRETE BLOCK WALLS AND FLOORS WITH MECHANICAL AND ELECTRICAL SUB-TRADES. APPROPRIATELY FIRE SEAL PENETRATIONS TO MAINTAIN 1 HOUR FIRE RESISTANCE RATING.

2. PERFORM DEMOLITION WORK SHOWN AND/OR REQUIRED TO COMPLETE THE WORK. DO NOT ASSUME DEMOLITION DRAWINGS SHOW FULL EXTENT OF DEMOLITION WORK REQUIRED.

3. WHEREVER EXCESSIVE DEMOLITION OCCURS, OR IF DAMAGE OCCURS TO ADJACENT SURFACES NOT INTENDED FOR DEMOLITION, OR REMOVAL, REINSTATE ALL AFFECTED SURFACES AND PREPARE THEM TO RECEIVE NEW FINISHES IF SPECIFIED, OTHERWISE REFINISH TO MATCH EXISTING ADJACENT CONDITIONS.

4. NEW PAINT FINISH ON ALL NEW AND EXISTING WALLS, NEW AND EXISTING DOORS AND FRAMES, AND NEW AND EXISTING BULKHEADS. WHERE WALLS AND CEILINGS HAVE SURFACE MOUNTED MECHANICAL AND ELECTRICAL EQUIPMENT SUCH AS CONDUIT, HEATERS, DUCTWORK, ETC. ALL EXPOSED MECHANICAL AND ELECTRICAL SURFACES ARE TO RECEIVE NEW PAINT FINISH UNLESS OTHERWISE NOTED. PREPARE SURFACES AS REQUIRED TO RECEIVE NEW PAINT FINISH INCLUDING BUT NOT LIMITED TO PATCH AND REPAIR, SCRAPING, SANDING, ETC. PAINT FINISH ON NEW MATERIALS TO BE MINIMUM ONE COAT APPROPRIATE PRIMER AND MINIMUM TWO COATS FINISH. PAINT FINISH ON EXISTING MATERIALS TO BE MINIMUM TWO COATS FINISH. COLORS TO BE SELECTED BY OWNER. SEE SPEC FOR MORE PAINTING INFORMATION.

5. REMOVE ALL RECEPTACLE, SWITCH RELAYS, DATA DROPS, AND OTHER SIMILAR COVER PLATES TO FACILITATE WALL PAINTING. REINSTATE ALL EXISTING COVER PLATES THAT ARE NOT BEING REPLACED ONCE PAINTING HAS BEEN COMPLETED.

6. WALL PAINTING OUTSIDE OF HOARDING WALL TO BE COMPLETED AFTER 5:00PM, OR BEFORE 8:00AM TO LIMIT DISRUPTIONS TO SURROUNDING BUILDING OCCUPANTS. CONTRACTOR IS RESPONSIBLE TO NOTIFY PROJECT COORDINATOR 24HRS IN ADVANCE OF AFTER HOURS WORK.

FURNITURE PLAN CONSTRUCTION NOTES:(#)

1. REMOVE, TRANSPORT AND REINSTATE MILLWORK FROM SCIENCE BUILDING AS PER DWG 2/A-1.1. PROVIDE REQUIRED FASTENERS, 38x139mm LEDGER BOARDS AND ASSOCIATED COMPONENTS REQUIRED TO REINSTATE MILLWORK TO NEW LOCATION. PROVIDE EPOXY JOINTS AS INDICATED. CAULK UNDERSIDE OF COUNTERTOP WITH SILICON.

2. REMOVE, TRANSPORT AND REINSTATE MILLWORK FROM CHEMISTRY/PHYSICS BUILDING AS PER DWG 1/A-1.1. PROVIDE REQUIRED FASTENERS, 38x139mm LEDGER BOARDS AND ASSOCIATED COMPONENTS REQUIRED TO REINSTATE MILLWORK TO NEW LOCATION. PROVIDE EPOXY JOINTS AS INDICATED. CAULK UNDERSIDE OF COUNTERTOP WITH SILICON.

3. REMOVE, TRANSPORT AND REINSTATE COUNTERTOP FROM SCIENCE BUILDING AS PER DWG 1/A-1.2. PROVIDE REQUIRED FASTENERS, 38X139mm LEDGER BOARDS AND ASSOCIATED COMPONENTS REQUIRED TO REINSTATE COUNTERTOP TO NEW LOCATION. PROVIDE EPOXY JOINTS AS INDICATED.

4. CONTRACTOR TO TAKE CARE TO FINISH ALL ROUGH EDGES AT EXPOSED EPOXY COUNTERTOPS WHERE CUT TO ACCOMMODATE NEW ACCESSIBLE WORKSTATION AS PER DWG 2/A-1.4.

5. PROVIDE GROMMETS OF APPROPRIATE SIZE TO EXISTING CORES THROUGHOUT LAB BENCHING WHERE GAS FIXTURES WERE REMOVED AS INDICATED BELOW:
5.1. SN3108 BENCH 1 – x2 GROMMETS
5.2. SN3108 BENCH 2 – x5 GROMMETS
5.3. CP5006 BENCH 1 – x5 GROMMETS
5.4. CP5006 BENCH 2 – x5 GROMMETS
5.5. CP5006 BENCH 3 – x5 GROMMETS
5.6. SN1008 COUNTERTOP – x5 GROMMETS

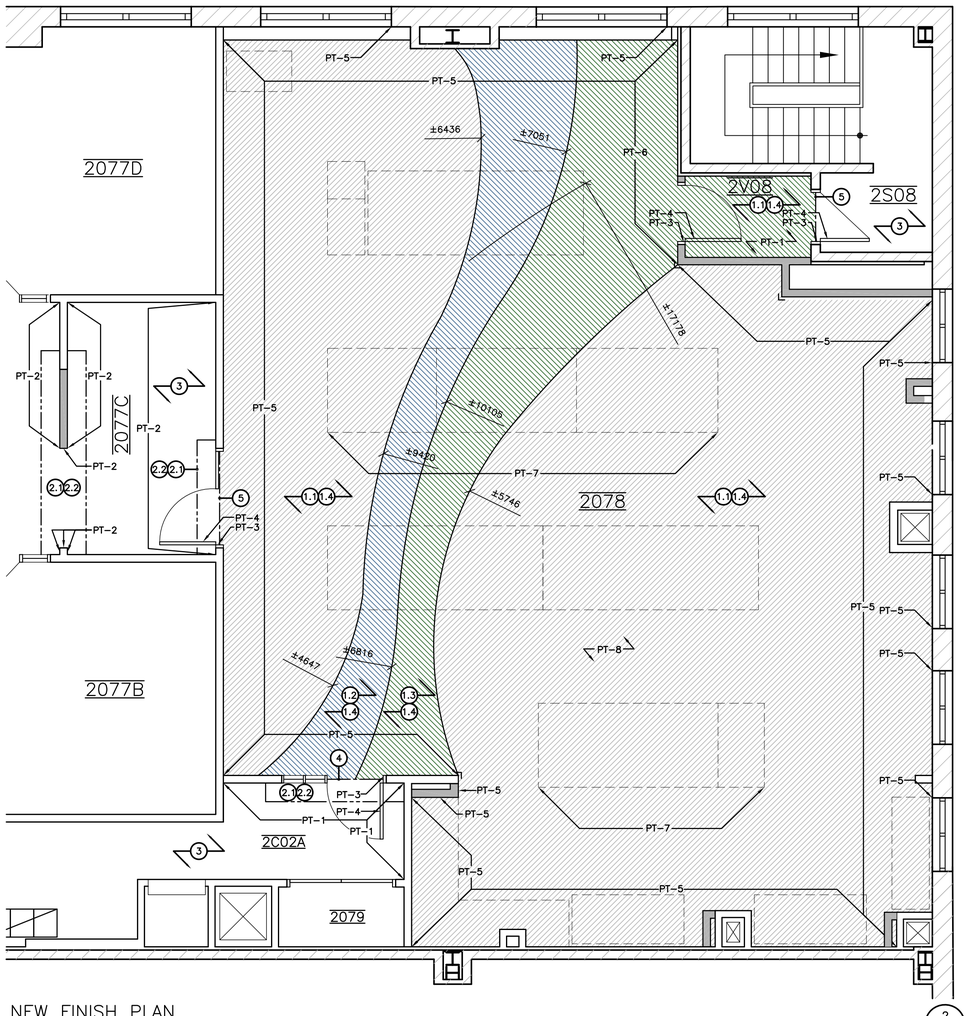
6. SECURE LAB BENCHING TO FLOOR SLAB WHEN ALL WORK HAS BEEN COMPLETED. PROVIDE REQUIRED FASTENERS AND HARDWARE.

7. NEW PAINT AND CLEAR COAT FINISH ON ALL EXPOSED DRAWERS, DOORS, AND FACE FRAMES OF LAB BENCHES AS INDICATED; LAB BENCH SIZING AS PER DWG A-1.1. PREPARE SURFACES AS REQUIRED TO RECEIVE NEW PAINT FINISH INCLUDING BUT NOT LIMITED TO PATCH AND REPAIR, SCRAPING, SANDING, ETC. PAINT FINISH ON EXISTING LAB BENCHING TO BE MINIMUM OF ONE COAT APPROPRIATE PRIMER, MINIMUM TWO COATS OF PAINT FINISH, AND MINIMUM TWO COATS OF CLEAR POLYURETHANE. COLOURS TO BE SELECTED BY OWNER. SEE SPEC SECTION 09 93 00 FOR MORE PAINTING INFORMATION.
7.1. CONTRACTOR TO NOTE: EXISTING LAB BENCHES HAVE PLASTIC LAMINATE FINISH AND WILL REQUIRE A PRIMER CAPABLE OF ADHESION TO PLASTIC LAMINATE FINISH.

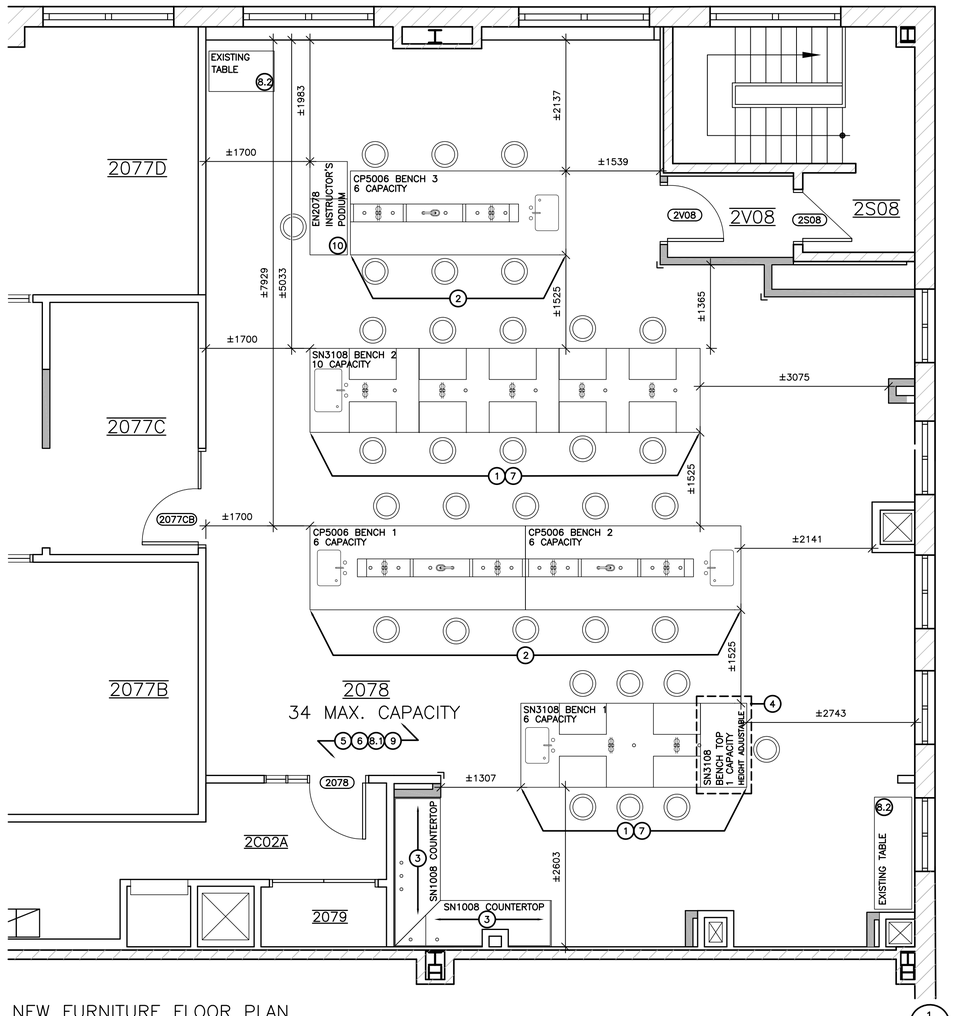
8. REINSTATE FURNITURE AS SHOWN WHEN ALL WORK HAS BEEN COMPLETED:
8.1. LAB STOOLS
8.2. EXISTING TABLES

9. SUPPLY AND INSTALL NEW 100mm 'BENGUARD' VINYL BASE AT BASE OF ALL REINSTATED MILLWORK THROUGHOUT. COLOR TO SELECTED FROM MANUFACTURER'S FULL COLOR RANGE.

10. RELOCATE INSTRUCTOR'S PODIUM TO NEW LOCATION AS SHOWN.



NEW FINISH PLAN
SCALE: 1:50
2 A-3.1



NEW FURNITURE FLOOR PLAN
SCALE: 1:50
1 A-3.1

A – DETAIL
B – LOCATION/DRAWING No.
C – DRAWING No.

No.	REVISION	DATE
R0	ISSUED FOR TENDER	DECEMBER 9, 2025

GENERAL NOTES

1. DRAWINGS TO BE READ AS A SET.
2. DO NOT SCALE FROM DRAWINGS.
3. THE CONTRACTOR IS TO VERIFY ALL DIMENSIONS AND SITE CONDITIONS PRIOR TO SUBMISSION OF TENDERS.
4. ALL DEFICIENCIES FOUND IN THIS DRAWING IS TO BE BROUGHT TO THE ATTENTION OF THE FACILITIES ENGINEERING AND DEVELOPMENT OFFICE OF THE DEPARTMENT OF FACILITIES MANAGEMENT, MEMORIAL UNIVERSITY OF NEWFOUNDLAND, PRIOR TO THE SUBMISSION OF THE TENDERS.

NORTH

MEMORIAL UNIVERSITY
FACILITIES MANAGEMENT

This University was raised by the people of Newfoundland as a memorial to the fallen in the great wars, 1914-1918, 1939-1945, that in freedom of learning, their cause and sacrifice might not be forgotten.

- Dedication plaque, Arts & Administration Building, St. John's Campus

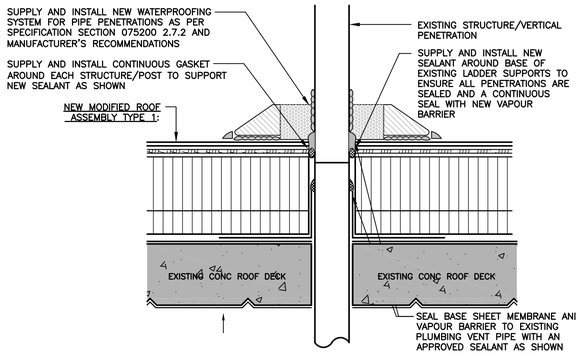
PROJECT NAME:

ENGINEERING BUILDING RENOVATIONS TO EN-2078
Project #: EN-164-21

DRAWING TITLE:

NEW FURNITURE & FINISH PLANS

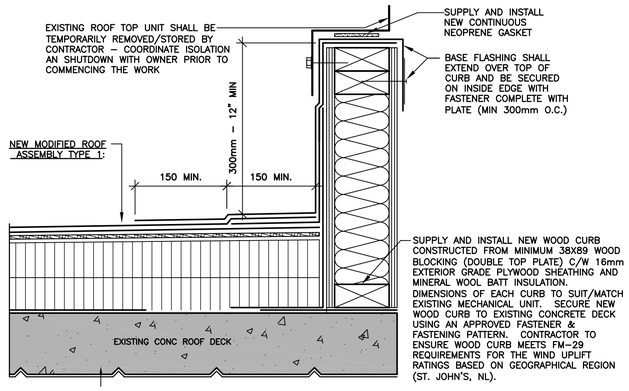
DESIGNED:	DRAWN:
E.B.	E.B.
REVIEWED:	APPROVED:
M.F.	M.F.
SCALE:	DATE:
AS SHOWN	DECEMBER, 2025
PROJECT No.	DRAWING No.
EN-164-21	**A-3.1**



NEW ROOF PENETRATION FLASHING DETAIL

SCALE: 1:5

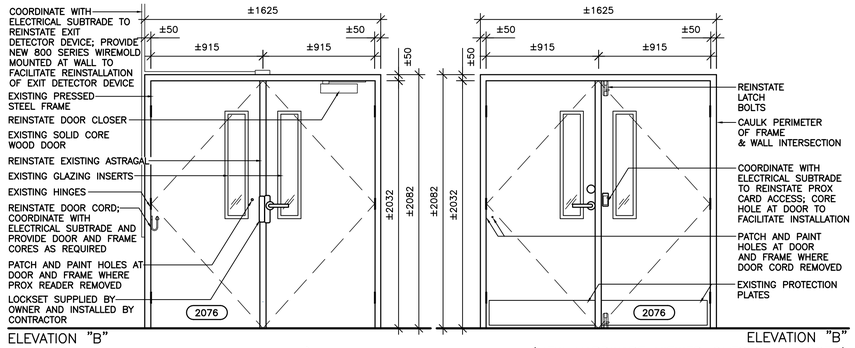
12 A-4.0



NEW MECHANICAL CURB DETAIL

SCALE: 1:5

11 A-4.0



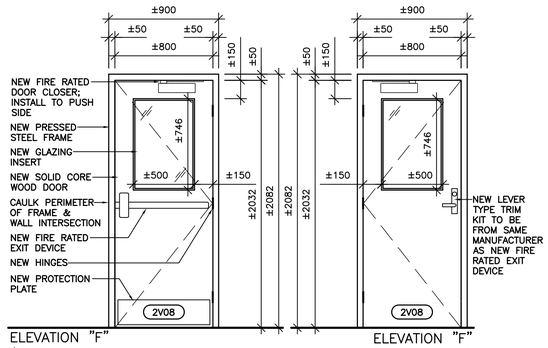
ELEVATION "B" (NEW HARDWARE VIEWED INSIDE EN–2076)

ELEVATION "B" (NEW HARDWARE VIEWED OUTSIDE EN–2076)

DOOR ELEVATION B

SCALE: 1:25

10 A-4.0



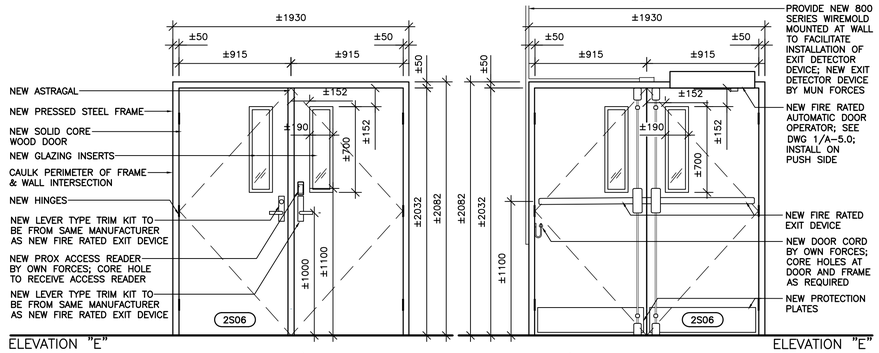
ELEVATION "F" (NEW HARDWARE VIEWED INSIDE EN–2078)

ELEVATION "F" (NEW HARDWARE VIEWED OUTSIDE EN–2078)

DOOR ELEVATION F

SCALE: 1:25

9 A-4.0



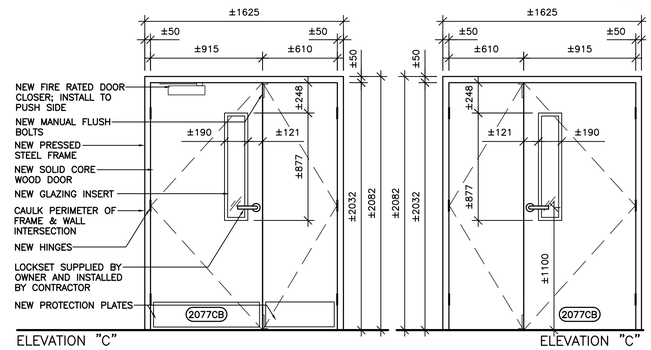
ELEVATION "E" (NEW HARDWARE VIEWED FROM SN–2S06)

ELEVATION "E" (NEW HARDWARE VIEWED FROM SN–2C02A)

DOOR ELEVATION E

SCALE: 1:25

8 A-4.0



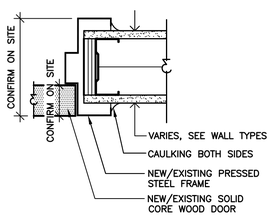
ELEVATION "C" (NEW HARDWARE VIEWED INSIDE EN–2078)

ELEVATION "C" (NEW HARDWARE VIEWED OUTSIDE EN–2078)

DOOR ELEVATION C

SCALE: 1:25

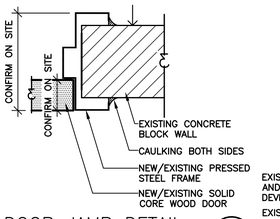
7 A-4.0



DOOR JAMB DETAIL

SCALE: 1:5

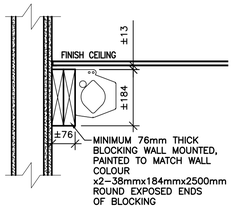
6 A-4.0



DOOR JAMB DETAIL

SCALE: 1:5

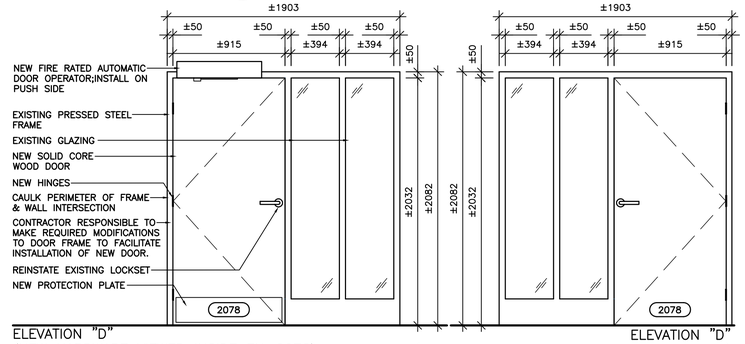
5 A-4.0



SCREEN MOUNT DETAIL

SCALE: 1:10

3 A-4.0



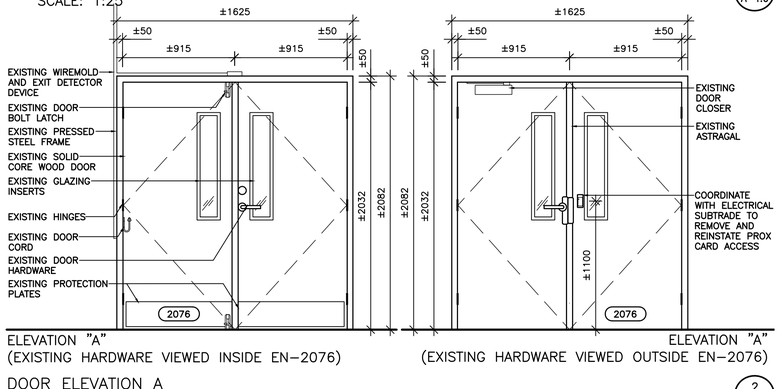
ELEVATION "D" (NEW HARDWARE VIEWED INSIDE EN–2078)

ELEVATION "D" (NEW HARDWARE VIEWED OUTSIDE EN–2078)

DOOR ELEVATION D

SCALE: 1:25

4 A-4.0



ELEVATION "A" (EXISTING HARDWARE VIEWED INSIDE EN–2076)

ELEVATION "A" (EXISTING HARDWARE VIEWED OUTSIDE EN–2076)

DOOR ELEVATION A

SCALE: 1:25

2 A-4.0

DOOR SCHEDULE NOTES:

1. REMOVE AND SALVAGE EXISTING LOCKSETS, CLOSURES, AND OPERATOR SYSTEMS UNLESS OTHERWISE NOTED. TURN OVER HARDWARE TO OWNER.
2. EXISITNG DOOR FRAME TO BE PREPARED ON LATCH SIDE BY ELECTRICAL CONTRACTOR FOR PROXIMITY CARD READER AND ELECTRIC STRIKE, WIREMOLD TO BE STUBBED FROM CEILING SPACE AND SURFACE MOUNTED DOWN ALONG DOOR FRAME.
3. ELECTRICAL CONTRACTOR TO SUPPLY AND INSTALL WIREMOLD TO SURFACE MOUNT MOUNTING BOX AT NEW PUSH BUTTON ACTUATORS; LOCATIONS AS PER DWG 1/A–3.0 AND E–0.
4. COORDINATE AUTOMATIC DOOR OPERATOR INSTALLATION WITH ELECTRICAL CONTRACTOR.
5. NOTCH EXISTING FRAME AS REQUIRED TO RECEIVE ELECTRIC STRIKE.

HARDWARE GROUPS:

1. HG1:
   - 1.1. EXISTING HARDWARE TO REMAIN; CONTRACTOR TO REMOVE AND REINSTATE:
     - 1.1.1. BOLT LATCHES
     - 1.1.2. HINGES
     - 1.1.3. PROTECTION PLATES
     - 1.1.4. DOOR CLOSER
   - 1.2. COORDINATE WITH ELECTRICAL SUBTRADE TO REMOVE AND REINSTATE:
     - 1.2.1. EXIT DETECTOR DEVICE AND ASSOCIATED WIREMOLD; PROVIDE NEW LEGRAND 800 SERIES WIREMOLD TO FACILITATE INSTALLATION OF EXIT DETECTOR DEVICE
     - 1.2.2. DOOR CORD
     - 1.2.3. PROX ACCESS READER
   - 1.3. NEW LOCKSET SUPPLIED BY OWNER AND INSTALLED BY CONTRACTOR
2. HG2:
   - 2.1. TURN OVER HARDWARE TO OWNER
3. HG3:
   - 3.1. NEW WALL MOUNTED DOOR STOP INSTALLED TO ADJACENT WALL, MODEL 'S120', BY STANDARD METAL HARDWARE, OR APPROVED ALTERNATE.
   - 3.2. NEW FIRE RATED DOOR CLOSER TO PUSH SIDE, MODEL '4040XP' BY LCN, OR APPROVED ALTERNATE
   - 3.3. (x6) NEW STANLEY HINGES FBB 179, 114x101, NRP
   - 3.4. (x2) NEW IVES 8400 COMMERCIAL PROTECTION PLATE, SATIN STAINLESS STEEL, BEVELED EDGES, B–CS INSTALLED TO PUSH SIDE OF DOOR
   - 3.5. NEW LOCKSET SUPPLIED BY OWNER AND INSTALLED BY CONTRACTOR
   - 3.6. (x2) NEW MANUAL FLUSH BOLTS, MODEL 'FB358' BY IVES, OR APPROVED EQUAL; CONTRACTOR RESPONSIBLE TO ROUTER DOORS AND CORE DOOR FRAME AS REQUIRED
4. HG4:
   - 4.1. EXISTING HARDWARE TO REMAIN; CONTRACTOR TO REMOVE AND REINSTATE:
     - 4.1.1. HINGES
     - 4.1.2. PROTECTION PLATE
   - 4.2. COORDINATE WITH ELECTRICAL SUBTRADE TO INSTALL:
     - 4.2.1. NEW HORTON 7100 SERIES DOOR OPERATOR TO EXISTING DOOR. OPERATOR TO BE INSTALLED ON THE PUSH SIDE OF THE DOOR.
     - 4.2.2. NEW AUTOMATIC DOOR CONTROL ITEMS BELOW BY CAMDEN DOOR CONTROLS, OR APPROVED ALTERNATE:
       - 4.2.2.1. (x2) NEW CM–7536/40 36" HARDWIRED LOW VOLTAGE WALL MOUNTED PUSH BUTTON ACTUATORS HAVING LONG ANODIZED ALUMINUM COLUMN PLATE W/ ENGRAVED BLUE FILLED HANDICAP GRAPHIC, 'PUSH TO OPEN' LETTERING, AND SHOE GRAPHIC. SEE DWG 1/A–3.0 AND E–0 FOR PUSH BUTTON LOCATIONS.
       - 4.2.2.2. (x2) NEW CM–75SB SURFACE MOUNT BOXES FOR 36" COLUMN SWITCHES.
       - 4.2.2.3. (x1) NEW CX–12 PLUS DOOR INTERFACE RELAY TO BE LOCATED INSIDE DOOR OPERATOR.
       - 4.2.2.4. (x1) NEW CX–MDA MAGNETIC CONTACT, SURFACE, SPST, WHITE
   - 4.3. ELECTRICAL SUBTRADE TO REINSTATE EXISTING PROXIMITY CARD READER AND SURFACE MOUNTED ELECTRIC STRIKE
   - 4.4. NEW LOCKSET SUPPLIED BY OWNER AND INSTALLED BY CONTRACTOR
5. HG5:
   - 5.1. TURN OVER HARDWARE TO OWNER
6. HG6:
   - 6.1. (x6) NEW STANLEY HINGES FBB 179, 114x101, NRP
   - 6.2. (x2) NEW IVES 8400 COMMERCIAL PROTECTION PLATE, SATIN STAINLESS STEEL, BEVELED EDGES, B–CS INSTALLED TO PUSH SIDE OF DOOR
   - 6.3. (x2) NEW FIRE RATED EXIT DEVICE, MODEL '8700 VERTICAL ROD EXIT DEVICE' BY SARGENT, OR APPROVED ALTERNATE; NEW EXIT DEVICE TO COME COMPLETE WITH TOP AND BOTTOM STRIKES AND END CAPS
   - 6.4. (x1) NEW KEYED ELECTRIFIED TRIM KIT, MODEL '700 SERIES ET TRIM' BY SARGENT, OR APPROVED ALTERNATE
   - 6.5. (x1) NEW NON–KEYED TRIM KIT, MODEL '700 SERIES ET TRIM' BY SARGENT, OR APPROVED EQUAL.
   - 6.6. NEW LOCKSET SUPPLIED BY OWNER AND INSTALLED BY CONTRACTOR
   - 6.7. COORDINATE WITH ELECTRICAL SUBTRADE TO INSTALL:
     - 6.7.1. NEW HORTON 7100 SERIES DOOR OPERATOR TO EXISTING DOOR. OPERATOR TO BE INSTALLED ON THE PUSH SIDE OF THE DOOR.
     - 6.7.2. NEW LEGRAND 800 SERIES WIREMOLD TO FACILITATE INSTALLATION OF EXIT DETECTOR DEVICE
     - 6.7.3. NEW AUTOMATIC DOOR CONTROL ITEMS BELOW BY CAMDEN DOOR CONTROLS, OR APPROVED ALTERNATE:
       - 6.7.3.1. (x2) NEW CM–7536/40 36" HARDWIRED LOW VOLTAGE WALL MOUNTED PUSH BUTTON ACTUATORS HAVING LONG ANODIZED ALUMINUM COLUMN PLATE W/ ENGRAVED BLUE FILLED HANDICAP GRAPHIC, 'PUSH TO OPEN' LETTERING, AND SHOE GRAPHIC. SEE DWG 1/A–3.0 AND E–0 FOR PUSH BUTTON LOCATIONS.
       - 6.7.3.2. (x2) NEW CM–75SB SURFACE MOUNT BOXES FOR 36" COLUMN SWITCHES.
       - 6.7.3.3. (x1) NEW CX–12 PLUS DOOR INTERFACE RELAY TO BE LOCATED INSIDE DOOR OPERATOR.
       - 6.7.3.4. (x1) NEW CX–MDA MAGNETIC CONTACT, SURFACE, SPST, WHITE
   - 6.8. **PROXIMITY CARD READER AND SURFACE MOUNTED ELECTRIC STRIKE BY MUN FORCES
5. HG7:
   - 5.1. NEW WALL MOUNTED DOOR STOP INSTALLED TO ADJACENT WALL, MODEL 'S120', BY STANDARD METAL HARDWARE, OR APPROVED ALTERNATE.
   - 5.2. NEW FIRE RATED DOOR CLOSER TO PUSH SIDE, MODEL '4040XP' BY LCN, OR APPROVED ALTERNATE
   - 5.3. (x3) NEW STANLEY HINGES FBB 179, 114x101, NRP
   - 5.4. (x1) NEW IVES 8400 COMMERCIAL PROTECTION PLATE, SATIN STAINLESS STEEL, BEVELED EDGES, B–CS INSTALLED TO PUSH SIDE OF DOOR
   - 5.5. (x1) NEW FIRE RATED EXIT DEVICE, MODEL '8888 RIM EXIT DEVICE' BY SARGENT, OR APPROVED ALTERNATE
   - 5.6. (x1) NEW KEYED TRIM KIT, MODEL '700 SERIES ET TRIM' BY SARGENT, OR APPROVED ALTERNATE

DOOR SCHEDULE

NEW DOOR NUMBER	QUANTITY	SIZE: WIDTH: EXISTING ≤ 813mm DOOR	EXISTING 900mm DOOR w/ LITE	NEW 915mm DOOR w/ 610mm LEAF	EXISTING 915mm DOOR w/ ≤2 LITE	EXISTING 986mm DOOR	NEW ≤2 915mm DOOR	SIZE: HEIGHT: NEW 2032mm	NEW 2082mm	EXISTING 2019mm	EXISTING 2100mm	EXISTING 2032mm	ELEVATION TYPE	MATERIAL: SOLID CORE WOOD	FINISH: PAINT	GLAZING: NEW FIRE RATED GLASS TYPE 2	GLAZING: EXISTING	ALUMINUM THRESHOLD	FRAME: FRAME TYPE	FRAME: FINISH: PAINT	WALL TYPE	FIRE RATING (min)	HARDWARE GROUP	REMARKS
2078	1	●											A&B	●	●		●	●	PSF	●	SS	EX	HG1	REVERSE SWING OF DOOR AND FRAME
2077CA	1		●								●		NONE	●	●		●	●	PSF	●	SS	EX	HG2	DISPOSE OF DOOR AND FRAME
2077CB	1			●					●				C	●	●		●		PSF	●	SS	45	HG3	NEW DOOR
2078	1				●						●		D	●	●			●	PSF	●	SS	EX	HG4	REVERSE SWING OF DOOR AND FRAME
2002	1					●				●			NONE	●	●			●	PSF	●	CMU	EX	HG5	DISPOSE OF DOOR AND FRAME
2S06	1						●		●				E	●	●		●		PSF	●	CMU	45	HG6	NEW DOOR
2V08	1							●	●				F	●	●		●		PSF	●	SS	45	HG7	NEW DOOR

LEGEND:
EX = EXISTING
PSF = PRESSED STEEL FRAME
CMU = CONCRETE MASONRY UNIT
SS = STEEL STUD
HG# = HARDWARE GROUP #

DOOR SCHEDULE & NOTES

SCALE: NTS

1 A-4.0

A – DETAIL
B – LOCATION/DRAWING No.
C – DRAWING No.

No.	REVISION	DATE
R0	ISSUED FOR TENDER	DECEMBER 9, 2025

GENERAL NOTES

1. DRAWINGS TO BE READ AS A SET.
2. DO NOT SCALE FROM DRAWINGS.
3. THE CONTRACTOR IS TO VERIFY ALL DIMENSIONS AND SITE CONDITIONS PRIOR TO SUBMISSION OF TENDERS.
4. ALL DEFICIENCIES FOUND IN THIS DRAWING IS TO BE BROUGHT TO THE ATTENTION OF THE FACILITIES ENGINEERING AND DEVELOPMENT OFFICE OF THE DEPARTMENT OF FACILITIES MANAGEMENT, MEMORIAL UNIVERSITY OF NEWFOUNDLAND, PRIOR TO THE SUBMISSION OF THE TENDERS.

NORTH

MEMORIAL UNIVERSITY
FACILITIES MANAGEMENT

This University was raised by the people of Newfoundland as a memorial to the fallen in the great wars, 1914-1918, 1939-1945, that in freedom of learning, their cause and sacrifice might not be forgotten.

- Dedication plaque, Arts & Administration Building, St. John's Campus

PROJECT NAME:

ENGINEERING BUILDING RENOVATIONS TO EN-2078
Project #: EN-164-21

DRAWING TITLE:

DOOR & ROOF SCHEDULE, ELEVATIONS & DETAILS

DESIGNED:	DRAWN:
E.B.	E.B.
REVIEWED:	APPROVED:
M.F.	M.F.
SCALE:	DATE:
AS SHOWN	DECEMBER, 2025
PROJECT No.	DRAWING No.
EN-164-21	**A-4.0**

Memorial University of Newfoundland

S.J. CAREW BUILDING
FACULTY OF ENGINEERING & APPLIED SCIENCE)
EN-2078 RENOVATION

NOVEMBER 28, 2025

ISSUED FOR TENDER

LIST OF DRAWINGS

MR-1.0 - PARTIAL ROOF PLAN - MECHANICAL LAYOUT
MP-1.0 - PARTIAL LEVEL 2 FLOOR PLAN - SANITARY LAYOUT
MP-2.0 - PARTIAL LEVEL 2 FLOOR PLAN - DOMESTIC LAYOUT
MP-3.0 - PARTIAL LEVEL 2 FLOOR PLAN - HEATING LAYOUT
MV-1.0 - PARTIAL LEVEL 2 FLOOR PLAN - VENTILATION LAYOUT
ME-1.0 - PARTIAL LEVEL 2 FLOOR PLAN - NEW RCP & CONTROLS LAYOUT
MP-4.0 - PLUMBING DETAILS
MV-2.0 - VENTILATION DETAILS AND ELEVATIONS
ME-2.0 - CONTROL SCHEMATICS & SCHEDULE

E-0 - ELECTRICAL LEGEND, KEY PLAN, PART PLAN, PART SINGLE LINE AND DETAILS
E-1.0 - POWER AND MISC SYSTEMS DEMOLITION FLOOR PLAN
E-2.0 - LIGHTING AND FIRE ALARM SYSTEMS DEMOLITION FLOOR PLAN
E-3.0 - REVISED POWER AND MISC SYSTEMS FLOOR PLAN
E-4.0 - REVISED LIGHTING AND FIRE ALARM SYSTEMS FLOOR PLAN
E-5.0 - CONTROL SCHEMATICS AND ELECTRICAL SCHEDULES
E-6.0 - ELECTRICAL SPECIFICATION

S-1 - GENERAL NOTES & KEY PLAN
S-2 - PART ROOF FRAMING PLAN
S-3 - SECTIONS & DETAILS
S-4 - SECTIONS & DETAILS

DEPARTMENT OF FACILITIES MANAGEMENT

This University was raised by the people of Newfoundland as a memorial to the fallen in the great wars, 1914-1918, 1939-1945, that in freedom of learning, their cause and sacrifice might not be forgotten.

- Dedication plaque, Arts & Administration Building, St. John's Campus

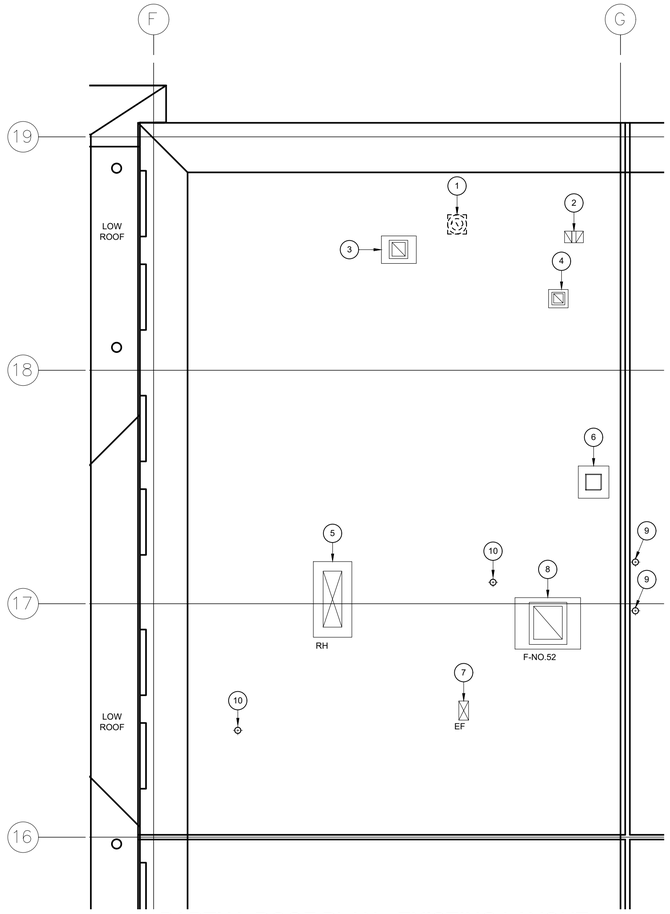
MEMORIAL UNIVERSITY

GENERAL NOTES:

1. CONTRACTOR TO CONFIRM EQUIPMENT LAYOUTS AND LOCATIONS ON SITE BEFORE COMMENCING ANY DEMOLITION. CONTRACTOR SHALL BE RESPONSIBLE FOR IDENTIFYING ALL EXISTING SYSTEMS WHICH MAY BE AFFECTED BY THE WORK, AND REMOVE/MODIFY IN AN APPROVED MANNER TO ALLOW FOR A COMPLETE WORKING SYSTEM.
2. ALL EQUIPMENT BEING REMOVED SHALL BE TURNED OVER TO OWNER DURING DEMOLITION. IF OWNER DOES NOT WANT ANY EXISTING EQUIPMENT, CONTRACTOR WILL BE RESPONSIBLE FOR REMOVING ALL MATERIALS FROM SITE AND DISPOSE AS PER LOCAL CODES.
3. CONTRACTOR TO COORDINATE DELIVERY OF MATERIALS USING FLAT BEDTRUCK / BOOMTRUCK WITH MUN PROJECT COORDINATOR, 24 HOURS NOTICE REQUIRED. ALL BOOM TRUCK OPERATORS SHALL BE REQUIRED TO PRESENT A HAZARD ASSESSMENT TO MUN SAFETY PERSONNEL PRIOR TO START OF OPERATION.
4. CONTRACTOR SHALL BE RESPONSIBLE FOR DAILY CLEAN UP OF DEBRIS FIELD INCLUDING BUT NOT LIMITED TO; REMOVING ALL EQUIPMENT / MATERIALS DEBRIS FROM GRASS, ADJACENT ROOFS AND ROOF DRAINS, SIDEWALKS, PARKING SPACES AND ROADWAYS.

DRAWING NOTES:

1. EXISTING EXHAUST RELIEF HOOD SERVING EN-2078 TO BE REMOVED. ROOF TO BE PATCHED AND REINSTATED.
2. EXISTING EXHAUST FAN EN-EF-60 SERVING MACHINE ROOM/ EN-1034A TO BE RELOCATED.
3. EXISTING FAN-NO.51 SERVING THERMODYNAMICS & HEAT EXHAUST / EN-1034 TO BE RELOCATED.
4. EXISTING FAN-NO.61 SERVING EXHAUST EN-1034A TO BE RELOCATED.
5. FRESH AIR INTAKE PLENUM SERVING / EN-2077,2078.
6. EXISTING CHIMNEY
7. EXISTING EXHAUST RELIEF HOOD SERVING EN-2077.
8. EXISTING FAN-NO.52 SERVING THERMODYNAMICS & HEAT EXHAUST / EN-1034.
9. PLUMBING VENT
10. 50mmØ PLUMBING VENT



PARTIAL ROOF PLAN - EXISTING LAYOUT

SCALE : 1:100

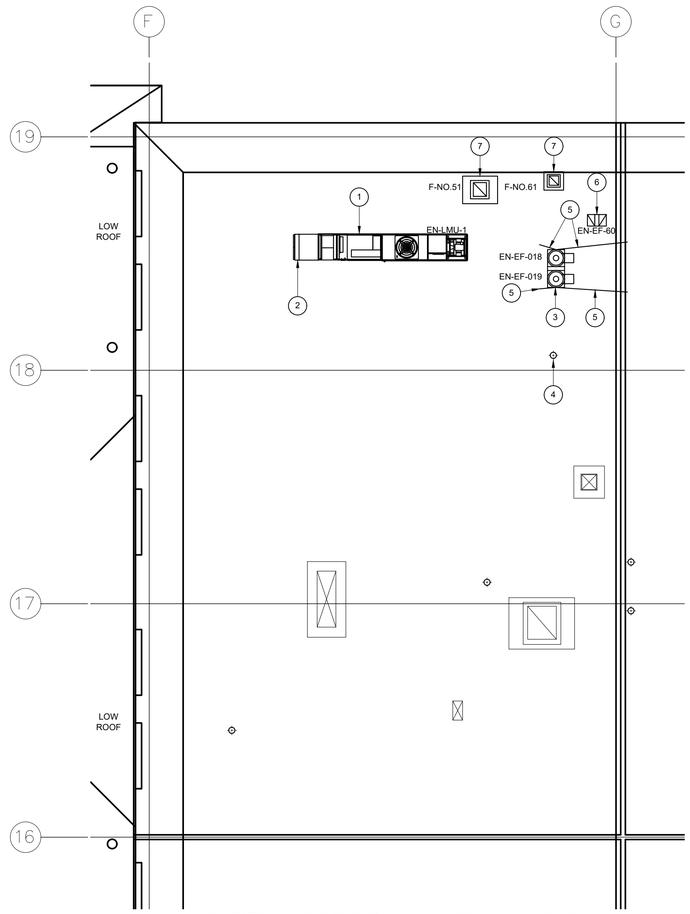
0m 1m 2m 3m 4m 5m 6m 7m 8m 9m 10m

GENERAL NOTES:

1. COORDINATE WITH ALL TRADES TO MAXIMIZE USE OF SPACE.
2. COORDINATE WITH STRUCTURAL AND GENERAL CONTRACTOR FOR INSTALLATION AND SEALING OF ROOF TOP EQUIPMENT AND PENETRATIONS.

DRAWING NOTES:

1. NEW ROOFTOP MAKE UP AIR UNIT EN-LMU-1. SEE SCHEDULE.
2. ENSURE EN-LMU-1 SUCH THAT INTAKE IS 5m SEPARATED FROM EXHAUST CHIMNEYS, PLUMBING VENTS, EXHAUST FANS, OR OTHER CONTAMINATION SOURCES.
3. NEW ROOF TOP HIGH PLUME FANS. SEE SCHEDULE AND DETAILS. 7 MV-2.0
4. NEW ARD PLUMBING VENT REFER TO DWV PLAN.
5. GUY WIRE TO SUPPORT EN-EF-018/019.
6. NEW LOCATION OF EXISTING RELOCATED FANS AND EXHAUST GOOSE NECK.
7. NEW LOCATION OF EXISTING RELOCATED FANS.



PARTIAL ROOF PLAN - NEW LAYOUT

SCALE : 1:100

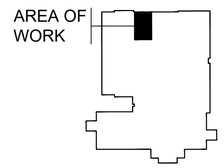
0m 1m 2m 3m 4m 5m 6m 7m 8m 9m 10m

A - DETAIL
B - LOCATION/DRAWING No.
C - DRAWING No.

No.	REVISION	DATE (Y/M/D)
0	ISSUED FOR TENDER	2025.11.28

GENERAL NOTES

1. DRAWINGS TO BE READ AS A SET.
2. DO NOT SCALE FROM DRAWINGS.
3. THE CONTRACTOR IS TO VERIFY ALL DIMENSIONS AND SITE CONDITIONS PRIOR TO SUBMISSION OF TENDERS.
4. ALL DEFICIENCIES FOUND IN THIS DRAWING IS TO BE BROUGHT TO THE ATTENTION OF THE FACILITIES ENGINEERING AND DEVELOPMENT OFFICE OF THE DEPARTMENT OF FACILITIES MANAGEMENT, MEMORIAL UNIVERSITY OF NEWFOUNDLAND, PRIOR TO THE SUBMISSION OF THE TENDERS.



KEY PLAN LEVEL 1

NTS

MECHANICAL & ELECTRICAL CONSULTANT:

CORE ENGINEERING INC.
57 Pippy Place
St. John's, NL, Canada A1B 4H8
Tel (709) 722-8613
Fax (709) 722-0910

REGISTERED PROFESSIONAL ENGINEER
PEGL Newfoundland and Labrador
DAVE ENNIS
SIGNATURE
2025 Nov 28
DATE
PROVINCE OF NEWFOUNDLAND

PROVINCE OF NEWFOUNDLAND
pegnl PROFESSIONAL ENGINEERS AND GEOSCIENTISTS NEWFOUNDLAND & LABRADOR
PERMIT HOLDER
This Permit Allows
CORE ENGINEERING INC.
MIRC: 03823
To practice Professional Engineering in Newfoundland and Labrador.
Permit No. as issued by PEGNL D0209 which is valid for the year 2025.

MEMORIAL UNIVERSITY
Department of Facilities Management

This University was raised by the people of Newfoundland as a memorial to the fallen in the great wars, 1914-1918, 1939-1945, that in freedom of learning, their cause and sacrifice might not be forgotten.

- Dedication plaque, Arts & Administration Building, St. John's Campus

PROJECT NAME:

S.J. CAREW BUILDING (FACULTY OF ENGINEERING & APPLIED SCIENCE) RENOVATIONS TO EN-2078
Project #: EN-164-21

DRAWING TITLE:

PARTIAL ROOF PLAN - MECHANICAL LAYOUT

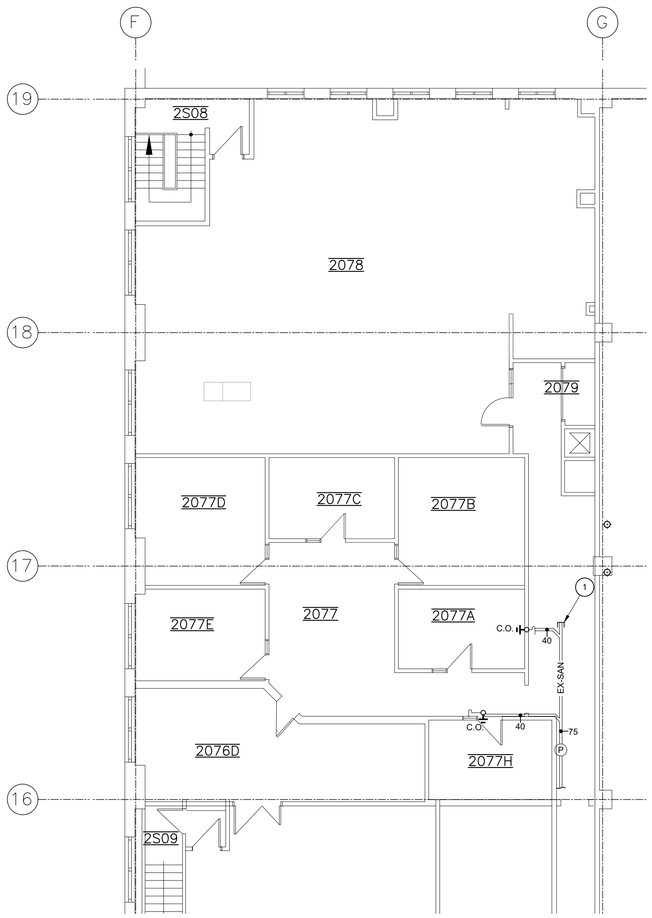
DESIGNED:	DRAWN:
DE/MB	JM
REVIEWED:	APPROVED:
DE/MB	DE
SCALE:	DATE:
AS NOTED	NOVEMBER 2025
PROJECT No.	DRAWING No.
EN-164-21	MR-1.0

GENERAL NOTES:

1. CONTRACTOR TO CONFIRM EXACT PIPING LAYOUTS AND FIXTURE LOCATIONS ON SITE BEFORE COMMENCING ANY DEMOLITION. CONTRACTOR SHALL BE RESPONSIBLE FOR IDENTIFYING ALL EXISTING SYSTEMS WHICH MAY BE AFFECTED BY THE WORK, AND REMOVE/MODIFY IN AN APPROVED MANNER TO ALLOW FOR THE REMAINING PORTION TO REMAIN A COMPLETE WORKING SYSTEM. PROVIDE TEMPORARY PIPING AS REQUIRED
2. CONTRACTOR TO COORDINATE ALL DEMOLITION WORK WITH OWNER. EXISTING DOMESTIC WATER SHUT DOWN TIME TO BE COORDINATE WITH OWNER. ALL CAPPING AND INSTALLATION OF NEW SHUT-OFF VALVES TO BE COMPLETED IN ONE SHUT-DOWN. DOMESTIC WATER SYSTEM SHUT DOWN TIME TO BE KEPT TO A MINIMUM.
3. SHUT-OFF AND ISOLATION OF ANY VALVES TO BE BY OWNER OWN FORCES ONLY AND COORDINATED WITH OWNER.
4. ALL PLUMBING FIXTURES BEING REMOVED SHALL BE TURNED OVER TO OWNER DURING DEMOLITION. IF OWNER DOES NOT WANT ANY EXISTING EQUIPMENT, CONTRACTOR WILL BE RESPONSIBLE FOR REMOVING ALL MATERIALS FROM SITE AND DISPOSE AS PER LOCAL CODES.
5. CONTRACTOR TO REMOVE ALL DOMESTIC WATER, SANITARY, VENT PIPING, TRIM, SUPPLIES, ETC AS REQUIRED WHEN REMOVING EXISTING FIXTURE AND CAP. CONTRACTOR TO REMOVE SANITARY AND VENT PIPING FROM FIXTURE BACK TO EXISTING SANITARY STACKS AND MAINS AS REQUIRED. ALL ABANDONED PIPING TO BE REMOVED.
6. ALL CUTTING AND PATCHING SHALL BE COORDINATED WITH THE GENERAL CONTRACTOR. ACCESS TO PLUMBING VIA LEVELS 1 TO BE SCHEDULED WITH PROJECT COORDINATOR PRIOR TO MOBILIZATION.

DRAWING NOTES:

(1) CAPPED EXISTING GLASS ACID RESISTANT DRAINAGE IN CEILING OF LEVEL 1.



PARTIAL LEVEL 2 FLOOR PLAN - EXISTING SANITARY LAYOUT

SCALE : 1:100

0m 1m 2m 3m 4m 5m 6m 7m 8m 9m 10m

GENERAL NOTES:

1. PROVIDE ANY OFFSETS REQUIRED TO AVOID BUILDING STRUCTURE & COORDINATE INSTALLATION WITH OTHER TRADES.
2. ALLOW FOR EXTRA PIPE & FITTINGS AS REQUIRED TO AVOID INTERFERENCES TO COMPLETE INSTALLATION.
3. ALL PIPING TO BE CONCEALED IN WALLS OR CHASES UNLESS OTHERWISE NOTED.
4. PROVIDE FIRE STOPS AT ALL RATED PENETRATIONS.
5. CLEANOUTS & ACCESS HATCHES LOCATED IN MILLWORK TO BE COORDINATE WITH THE GENERAL CONTRACTOR.
6. SEE ARCHITECTURAL PLANS FOR BUILDING FIRE/SMOKE RATINGS. PROVIDE FIRE RATED ACCESS HATCHES, FIRE RATED CAULKING, ETC. AS REQUIRED TO MAINTAIN INTEGRITY OF FIRE RATINGS.
7. COORDINATE EXACT PLACEMENT OF ALL SERVICES WITH EQUIPMENT.

DRAWING NOTES:

(1) LOOP VENT FOR ISLAND SINK. SEE DETAIL. 6/MP-4.0

(2) OWNER SUPPLIED CASE WORK, SINKS, AND TRIM. CONNECT TO NEW ACID RESISTANT DRAINAGE (ARD) PIPE BY THIS CONTRACTOR. CONTRACTOR SHALL REINSTALL ALL OWNER SINKS AND TRIM IN CASEWORK.

(3) EXISTING EMERGENCY SHOWER AND EYEWASH SUPPLIED BY OWNER INSTALLED BY THIS CONTRACTOR. DRAIN INDIRECTLY TO FUNNEL FLOOR DRAIN. CONTRACTOR IS RESPONSIBLE TO DISASSEMBLE COMBO SHOWER / EYEWASH STATION IN EXISTING LOCATION (SCIENCE BUILDING, SN-3123) AND TRANSPORT THE COMBO SHOWER / EYEWASH TO THE NEW LOCATION (EN-2078) AS SHOWN. PLUMBING SERVICES WILL BE DISCONNECTED BY MUN FORCES. MECHANICAL CONTRACTOR TO REINSTATE IN 2078 LOCATION. 3/MP-4.0

(4) NEW IN WALL BACK FLOW PREVENTER DRAINAGE. 1/MP-4.0

(5) TIE IN NEW ARD TO EXISTING GLASS ARD IN APPROXIMATE THIS LOCATION.

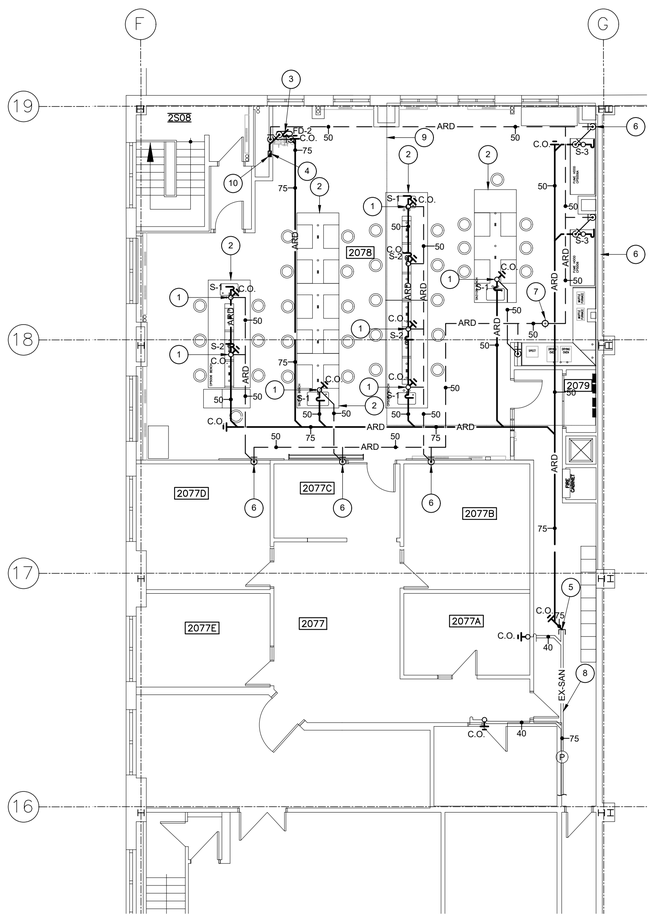
(6) NEW 50mm ARD VENT UP IN WALL.

(7) NEW ARD ROOF VENT INCREASE TO 75mm THROUGH ROOF.

(8) ARD DRAINAGE FLOWS TO NEUTRALIZATION TANK LOCATED IN STAIRWELL ON LEVEL 1 NEAR GRID 19/F.

(9) CONTRACTOR TO BE AWARE OF BLOCK WALL ON LEVEL 1. NOT ALL INTERFERENCES OR EXISTING CONDITIONS ARE SHOWN ON THE DRAWINGS. CONTRACTOR IS EXPECTED TO MAKE THEMSELVES FAMILIAR WITH THE BUILDING AND WORK IN BIDDING AND ALLOW FOR ALL OFFSETS AND EXTRA PIPING AND FITTINGS TO COMPLETE THE INSTALLATION.

(10) BACKFLOW PREVENTERS TO DRAIN TO FUNNEL FLOOR DRAIN. 5/MP-4.0



PARTIAL LEVEL 2 FLOOR PLAN - NEW SANITARY LAYOUT

SCALE : 1:100

0m 1m 2m 3m 4m 5m 6m 7m 8m 9m 10m

A - DETAIL
B - LOCATION/DRAWING No.
C - DRAWING No.

No.	REVISION	DATE (Y/M/D)
0	ISSUED FOR TENDER	2025.11.28

GENERAL NOTES

1. DRAWINGS TO BE READ AS A SET.
2. DO NOT SCALE FROM DRAWINGS.
3. THE CONTRACTOR IS TO VERIFY ALL DIMENSIONS AND SITE CONDITIONS PRIOR TO SUBMISSION OF TENDERS.
4. ALL DEFICIENCIES FOUND IN THIS DRAWING IS TO BE BROUGHT TO THE ATTENTION OF THE FACILITIES ENGINEERING AND DEVELOPMENT OFFICE OF THE DEPARTMENT OF FACILITIES MANAGEMENT, MEMORIAL UNIVERSITY OF NEWFOUNDLAND, PRIOR TO THE SUBMISSION OF THE TENDERS.

MECHANICAL & ELECTRICAL CONSULTANT:

CORE ENGINEERING INC.

57 Pippy Place
St. John's, NL, Canada A1B 4H8

Tel (709) 722-8613
Fax (709) 722-0910

REGISTERED PROFESSIONAL ENGINEER — PROVINCE OF NEWFOUNDLAND AND LABRADOR — PEGNL — DAVE ENNIS — SIGNATURE — 2025 Nov 28 — DATE

PROVINCE OF NEWFOUNDLAND

PERMIT HOLDER
This Permit Allows
CORE ENGINEERING INC.
MIRC: 03823

To practice Professional Engineering in Newfoundland and Labrador.
Permit No. as issued by PEGNL D0209
which is valid for the year 2025.

MEMORIAL UNIVERSITY

Department of Facilities Management

This University was raised by the people of Newfoundland as a memorial to the fallen in the great wars, 1914-1918, 1939-1945, that in freedom of learning, their cause and sacrifice might not be forgotten.

- Dedication plaque, Arts & Administration Building, St. John's Campus

PROJECT NAME:

S.J. CAREW BUILDING (FACULTY OF ENGINEERING & APPLIED SCIENCE) RENOVATIONS TO EN-2078
Project #: EN-164-21

DRAWING TITLE:

PARTIAL LEVEL 2 FLOOR PLAN - SANITARY LAYOUT

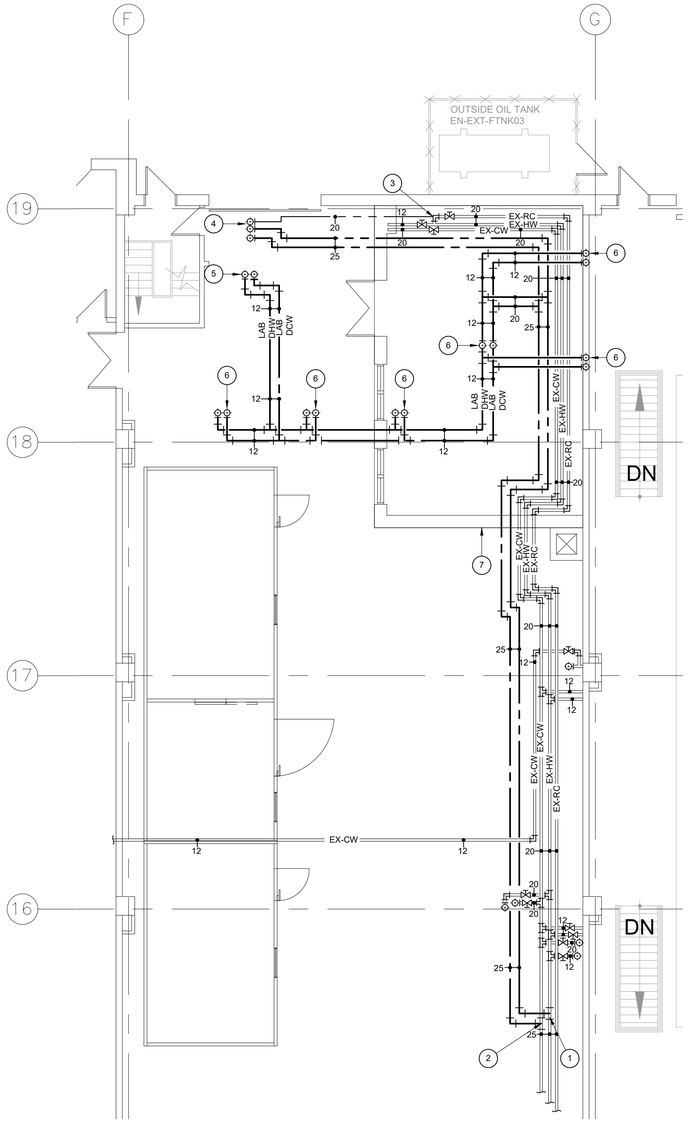
DESIGNED: DE/MB	DRAWN: JM
REVIEWED: DE/MB	APPROVED: DE
SCALE: AS NOTED	DATE: NOVEMBER 2025
PROJECT No. **EN-164-21**	DRAWING No. MP-1.0

GENERAL NOTES:

1. UNDER NO INSTANCE SHALL DOMESTIC WATER PIPING BE RUN IN COLD SPACES. ALL PIPING SHALL BE RUN ON WARM SIDE OF VAPOUR BARRIER.
2. FOR FIXTURE IDENTIFICATION, REFER TO D.W.V. PIPING LAYOUT.
3. INSTALL SHOCK ABSORBERS ON DOMESTIC WATER SYSTEMS. INSTALL AS PER CANADIAN PLUMBING CODE & IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
4. PROVIDE EXTRA PIPE & FITTINGS, AS REQUIRED, TO OFFSET PIPING RUN IN CEILING SPACE, AVOIDING STRUCTURAL MEMBERS, ETC. SA
5. ALL PIPING TO BE RUN IN WALLS/CHASES UNLESS OTHERWISE NOTED.
6. INSTALL ISOLATION VALVES ON ALL BRANCH PIPES SERVING EACH FIXTURE GROUPS.
7. ALL DOMESTIC LAB WATER AFTER THE BACKFLOW PREVENTERS SHALL BE IDENTIFIED AS LAB DCW, LAB DHW, LAB RECIRC.
8. ALL SERVICES SHALL BE INSTALLED AS HIGH AS POSSIBLE.
9. ALL CUTTING AND PATCHING SHALL BE COORDINATED WITH THE GENERAL CONTRACTOR. ACCESS TO PLUMBING VIA LEVELS 1 TO BE SCHEDULED WITH PROJECT COORDINATOR PRIOR TO MOBILIZATION.
10. RUN PIPING TIGHT TO U/S OF STEEL.

DRAWING NOTES:

1. TIE IN NEW 25mm HOT WATER AT THIS APPROXIMATE LOCATION.
2. TIE IN NEW 25mm COLD WATER AT THIS APPROXIMATE LOCATION.
3. TIE IN NEW 20mm RECIRC AT THIS APPROXIMATE LOCATION.
4. 25mm HOT/ 25mm COLD AND 20mm RECIRC UP TO LEVEL 2.
5. 12mm HOT AND 12mm COLD BACKFLOW PROTECTED WATER LINE DOWN FROM LEVEL 2.
6. 12mm HOT AND 12mm COLD BACKFLOW PROTECTED WATER LINE UP TO LEVEL 2.
7. CONTRACTOR TO BE AWARE OF BLOCK WALL ON LEVEL 1. NOT ALL INTERFERENCES OR EXISTING CONDITIONS ARE SHOWN ON THE DRAWINGS. CONTRACTOR IS EXPECTED TO MAKE THEMSELVES FAMILIAR WITH THE BUILDING AND WORK BIDDING AND ALLOW FOR ALL OFFSETS AND EXTRA PIPING AND FITTINGS TO COMPLETE THE INSTALLATION.



PARTIAL LEVEL 1 FLOOR PLAN - NEW DOMESTIC LAYOUT

SCALE : 1:100

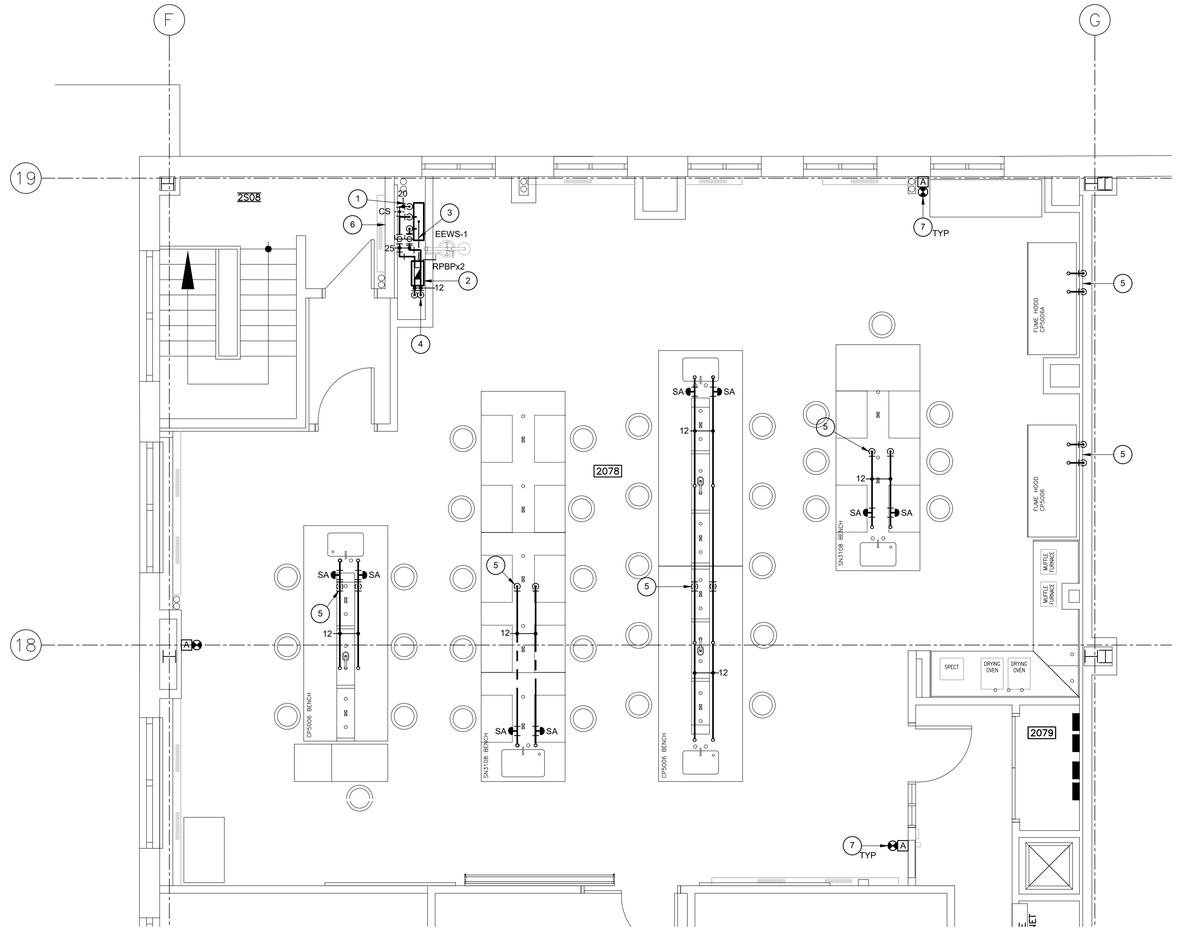
0m 1m 2m 3m 4m 5m 6m 7m 8m 9m 10m

GENERAL NOTES:

1. UNDER NO INSTANCE SHALL DOMESTIC WATER PIPING BE RUN IN COLD SPACES. ALL PIPING SHALL BE RUN ON WARM SIDE OF VAPOUR BARRIER.
2. FOR FIXTURE IDENTIFICATION, REFER TO D.W.V. PIPING LAYOUT.
3. INSTALL SHOCK ABSORBERS ON DOMESTIC WATER SYSTEMS. INSTALL AS PER CANADIAN PLUMBING CODE & IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
4. PROVIDE EXTRA PIPE & FITTINGS, AS REQUIRED, TO OFFSET PIPING RUN IN CEILING SPACE, AVOIDING STRUCTURAL MEMBERS, ETC. SA
5. ALL PIPING TO BE RUN IN WALLS/CHASES UNLESS OTHERWISE NOTED.
6. INSTALL ISOLATION VALVES ON ALL BRANCH PIPES SERVING EACH FIXTURE GROUPS.
7. PROVIDE NEW WATER STOPS AND BRAIDED HOSE FOR CONNECTIONS TO OWNER SUPPLIED SINK FIXTURES

DRAWING NOTES:

1. 25mm HOT WATER AND COLD WATER AND 20mm RECIRC UP FROM LEVEL 1.
2. 25mm HOT AND COLD DOWN TO NEW RPBP BACKFLOW PREVENTERS INSTALLED IN THE NEW FURRING WALL. SEE DETAIL. 1 MP-4.0
3. 25mm HOT AND COLD AND 12MM RECIRC DOWN IN WALL TO EEWS-1 MIXING VALVE SHOWER AND MIXING VALVE SUPPLIED BY OWNER INSTALLED BY CONTRACTOR. REFER TO DETAIL. 3 MP-4.0 4 MP-4.0 5 MP-4.0
4. BACKFLOW PROTECTED 12mm HOT & COLD WATER SERVING LABORATORY DOWN TO LEVEL 1 CEILING.
5. 12mm HOT & COLD WATER UP FROM LEVEL 1.
6. FIRE RATED WALL AROUND STAIRWELL. DO NOT PENETRATE. PIPING SHOWN OFFSET FOR CLARITY.
7. NEW FIRE EXTINGUISHER SEE SCHEDULE. TYPICAL



PARTIAL LEVEL 2 FLOOR PLAN - NEW DOMESTIC LAYOUT

SCALE: 1:50

0m 1m 2m 3m 4m 5m

A - DETAIL
B - LOCATION/DRAWING No.
C - DRAWING No.

No.	REVISION	DATE (Y/M/D)
0	ISSUED FOR TENDER	2025.11.28

GENERAL NOTES

1. DRAWINGS TO BE READ AS A SET.
2. DO NOT SCALE FROM DRAWINGS.
3. THE CONTRACTOR IS TO VERIFY ALL DIMENSIONS AND SITE CONDITIONS PRIOR TO SUBMISSION OF TENDERS.
4. ALL DEFICIENCIES FOUND IN THIS DRAWING IS TO BE BROUGHT TO THE ATTENTION OF THE FACILITIES ENGINEERING AND DEVELOPMENT OFFICE OF THE DEPARTMENT OF FACILITIES MANAGEMENT, MEMORIAL UNIVERSITY OF NEWFOUNDLAND, PRIOR TO THE SUBMISSION OF THE TENDERS.

MECHANICAL & ELECTRICAL CONSULTANT:

CORE ENGINEERING INC.

57 Pippy Place
St. John's, NL, Canada A1B 4H8

Tel (709) 722-8613
Fax (709) 722-0910

REGISTERED PROFESSIONAL ENGINEER PROVINCE OF NEWFOUNDLAND
PEGL PROFESSIONAL ENGINEERS AND GEOSCIENTISTS NEWFOUNDLAND & LABRADOR
DAVE ENNIS
SIGNATURE
2025 Nov 28
DATE

PROVINCE OF NEWFOUNDLAND
pegnl PROFESSIONAL ENGINEERS AND GEOSCIENTISTS NEWFOUNDLAND & LABRADOR
PERMIT HOLDER
This Permit Allows
CORE ENGINEERING INC.
MIRC: 03823
To practice Professional Engineering in Newfoundland and Labrador. Permit No. as issued by PEGNL D0209 which is valid for the year 2025.

MEMORIAL UNIVERSITY

Department of Facilities Management

This University was raised by the people of Newfoundland as a memorial to the fallen in the great wars, 1914-1918, 1939-1945, that in freedom of learning, their cause and sacrifice might not be forgotten.

- Dedication plaque, Arts & Administration Building, St. John's Campus

PROJECT NAME:

S.J. CAREW BUILDING (FACULTY OF ENGINEERING & APPLIED SCIENCE) RENOVATIONS TO EN-2078
Project #: EN-164-21

DRAWING TITLE:

PARTIAL LEVEL 2 FLOOR PLAN - DOMESTIC LAYOUT

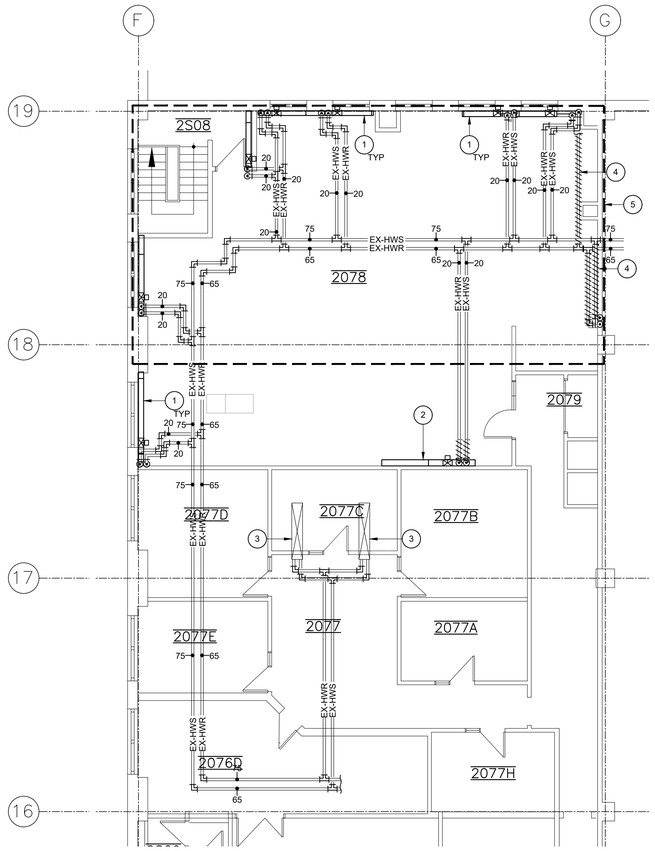
DESIGNED: DE/MB	DRAWN: JM
REVIEWED: DE/MB	APPROVED: DE
SCALE: AS NOTED	DATE: NOVEMBER 2025
PROJECT No. **EN-164-21**	DRAWING No. MP-2.0

GENERAL NOTES:

1. REMOVE ALL PIPING INSULATION, HANGERS, FITTINGS, ETC WHERE PIPING IS INDICATED TO BE REMOVED.
2. CONTRACTOR TO COORDINATE ALL DEMOLITION WORK WITH OWNER. PLAN ALL WORK TO MINIMIZE IMPACT ON EXISTING SYSTEMS. MAX HEATING SYSTEM DOWNTIME TO MAKE CONNECTION SHALL BE 24 HOURS.

DRAWING NOTES:

1. EXISTING HOT WATER HEATING RADIATOR TO REMAIN.
2. RELOCATE EXISTING HYDRONIC HEATER AND PIPING TO ACCOMMODATE NEW DOORWAY.
3. EXISTING HEATING COILS TO REMAIN.
4. EXISTING HYDRONIC PIPING. REROUTE AS REQUIRED TO AVOID INTERFERENCE WITH NEW FUME HOOD DUCTING AND EQUIPMENT.
5. REMOVE AND REPLACE HYDRONIC PIPING AS REQUIRED TO ACCOMMODATE STRUCTURAL REINFORCEMENT OF ROOF STRUCTURE. PROVIDE TEMPORARY REROUTING OF HEATING SYSTEM PIPING TO MAINTAIN HYDRONIC HEATING TO OCCUPIED AREAS. REFER TO STRUCTURAL DRAWING'S.



PARTIAL LEVEL 2 FLOOR PLAN - EXISTING HEATING LAYOUT

SCALE : 1:100

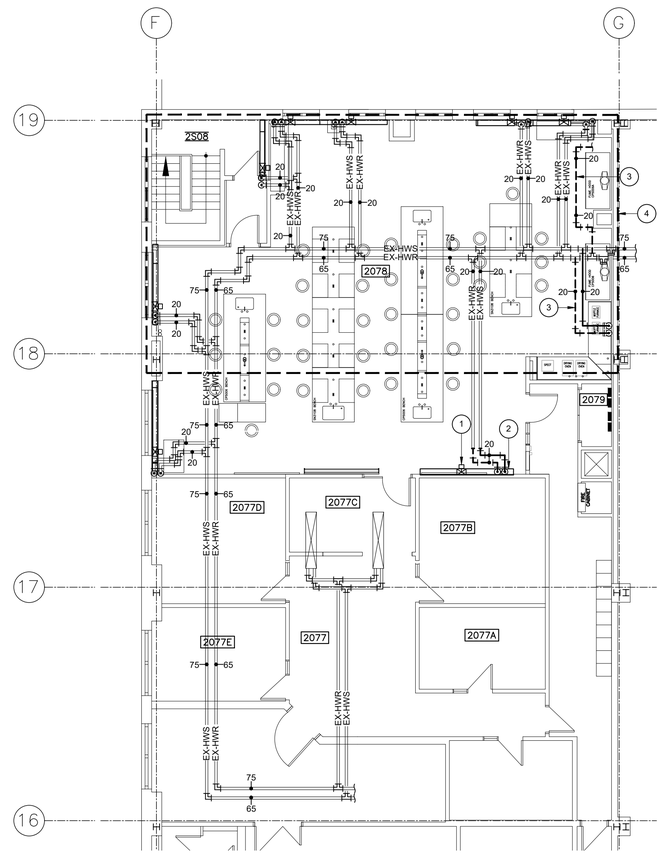
0m 1m 2m 3m 4m 5m 6m 7m 8m 9m 10m

GENERAL NOTES:

1. COORDINATE WITH GENERAL CONTRACTOR ALL PIPE SLEEVES REQUIRED PRIOR TO CONSTRUCTION.
2. PROVIDE EXTRA PIPE & FITTINGS, AS REQUIRED, TO OFFSET PIPING RUN IN CEILING SPACE, AVOIDING STRUCTURAL MEMBERS, ETC.
3. SEE ARCHITECTURAL PLANS FOR BUILDING FIRE RATINGS. PROVIDE FIRE RATED ACCESS HATCHES, FIRE RATED CAULKING, ETC. AS REQUIRED TO MAINTAIN INTEGRITY OF FIRE RATINGS.
4. PROVIDE AUTOMATIC AIR VENTS ON ALL HIGH POINTS.

DRAWING NOTES:

1. EXISTING HYDRONIC HEATER PNEUMATIC VALVE TO BE RELOCATED ALONG WITH HEATER.
2. EXISTING HEATER IN NEW LOCATION. EXTEND PIPING AS REQUIRED.
3. NEW 20mmØ HOT WATER HEATING PIPING TO AVOID DUCT CONNECTIONS FROM FUME HOODS. CONTRACTOR TO MATCH EXISTING SIZE.
4. REMOVE AND REPLACE HYDRONIC PIPING AS REQUIRED TO ACCOMMODATE STRUCTURAL REINFORCEMENT OF ROOF STRUCTURE. PROVIDE TEMPORARY REROUTING OF HEATING SYSTEM PIPING TO MAINTAIN HYDRONIC HEATING TO OCCUPIED AREAS. REFER TO STRUCTURAL DRAWING'S.



PARTIAL LEVEL 2 FLOOR PLAN - NEW HEATING LAYOUT

SCALE : 1:100

0m 1m 2m 3m 4m 5m 6m 7m 8m 9m 10m

A - DETAIL
B - LOCATION/DRAWING No.
C - DRAWING No.

No.	REVISION	DATE (Y/M/D)
0	ISSUED FOR TENDER	2025.11.28

GENERAL NOTES

1. DRAWINGS TO BE READ AS A SET.
2. DO NOT SCALE FROM DRAWINGS.
3. THE CONTRACTOR IS TO VERIFY ALL DIMENSIONS AND SITE CONDITIONS PRIOR TO SUBMISSION OF TENDERS.
4. ALL DEFICIENCIES FOUND IN THIS DRAWING IS TO BE BROUGHT TO THE ATTENTION OF THE FACILITIES ENGINEERING AND DEVELOPMENT OFFICE OF THE DEPARTMENT OF FACILITIES MANAGEMENT, MEMORIAL UNIVERSITY OF NEWFOUNDLAND, PRIOR TO THE SUBMISSION OF THE TENDERS.

MECHANICAL & ELECTRICAL CONSULTANT:

CORE ENGINEERING INC.

57 Pippy Place
St. John's, NL, Canada A1B 4H8

Tel (709) 722-8613
Fax (709) 722-0910

REGISTERED PROFESSIONAL ENGINEER — PEGL — DAVE ENNIS — SIGNATURE — 2025 Nov 28 — DATE — PROVINCE OF NEWFOUNDLAND AND LABRADOR

PROVINCE OF NEWFOUNDLAND
pegnl
PERMIT HOLDER
This Permit Allows
CORE ENGINEERING INC.
MIRC: 03823
To practice Professional Engineering in Newfoundland and Labrador.
Permit No. as issued by PEGNL D0209
which is valid for the year 2025.

MEMORIAL UNIVERSITY

Department of Facilities Management

This University was raised by the people of Newfoundland as a memorial to the fallen in the great wars, 1914-1918, 1939-1945, that in freedom of learning, their cause and sacrifice might not be forgotten.

- Dedication plaque, Arts & Administration Building, St. John's Campus

PROJECT NAME:

S.J. CAREW BUILDING (FACULTY OF ENGINEERING & APPLIED SCIENCE) RENOVATIONS TO EN-2078
Project #: EN-164-21

DRAWING TITLE:

PARTIAL LEVEL 2 FLOOR PLAN - HEATING LAYOUT

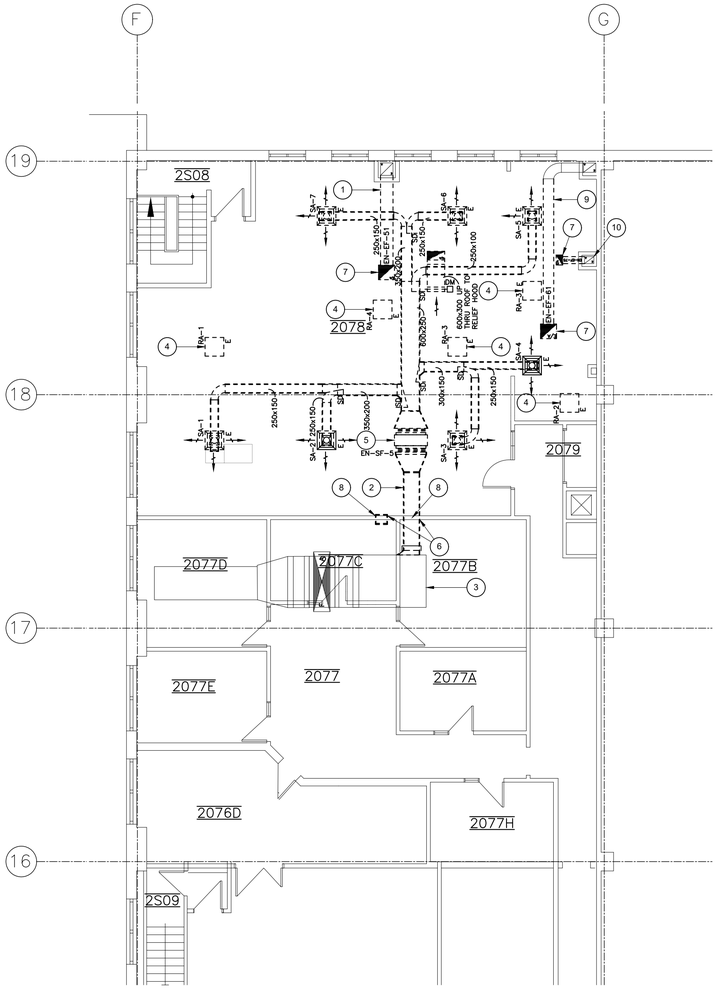
DESIGNED: DE/MB	DRAWN: JM
REVIEWED: DE/MB	APPROVED: DE
SCALE: AS NOTED	DATE: NOVEMBER 2025
PROJECT No. **EN-164-21**	DRAWING No. MP-3.0

GENERAL NOTES:

1. CONTRACTOR TO CONFIRM EXACT LOCATIONS OF EXISTING DUCTWORK AND SIZES OF DUCTWORK ON SITE.
2. CONTRACTOR SHALL PROTECT EXISTING OPERATIONAL SYSTEMS FROM ANY DUST/DEBRIS.
3. DUCTWORK BEING REMOVED TO INCLUDE ALL ASSOCIATED HANGERS, SUPPORTS, COILS, INSULATION, FITTINGS, DAMPERS ETC.
4. CONTRACTOR TO COORDINATE ALL DEMOLITION WORK WITH OWNER. PLAN ALL WORK TO MINIMIZE IMPACT ON EXISTING SYSTEMS.
5. TAB CONTRACTOR TO MEASURE ALL AIR FLOWS AND VERIFY OPERATION OF EXISTING FANS BEFORE THEY ARE RELOCATED.

DRAWING NOTES:

1. SECTION OF EXISTING 400 X 400 EXHAUST DUCT TO BE REMOVED. TO ACCOMMODATE FAN RELOCATION. VERIFY SIZE AND LOCATION ON SITE.
2. EXISTING SUPPLY DUCT TO BE REMOVED CAP BACK AT MAIN.
3. EXISTING SYSTEM LOCATED IN CEILING SPACE TO REMAIN.
4. EXISTING RETURN AIR GRILL TO BE REMOVED.
5. EXISTING FAN TO BE REMOVED.
6. GENERAL CONTRACTOR TO REPAIR HOLES IN WALL.
7. EXISTING EXHAUST FAN AND DAMPER TO BE RELOCATED TO ACCOMMODATE NEW MAU INSTALLATION AND EXHAUST. SEE NEW LOCATION ON NEW PLAN.
8. REMOVE EXISTING FIRE DAMPERS.
9. SECTION OF EXISTING 150 X 300 EXHAUST DUCT TO BE REMOVED TO ACCOMMODATE FAN RELOCATION. VERIFY SIZE AND LOCATION ON SITE.
10. SECTION OF EXISTING 225 X 300 EXHAUST DUCT TO BE REMOVED TO ACCOMMODATE FAN RELOCATION. VERIFY SIZE AND LOCATION ON SITE.



PARTIAL LEVEL 2 FLOOR PLAN - EXISTING VENTILATION LAYOUT

SCALE : 1:100

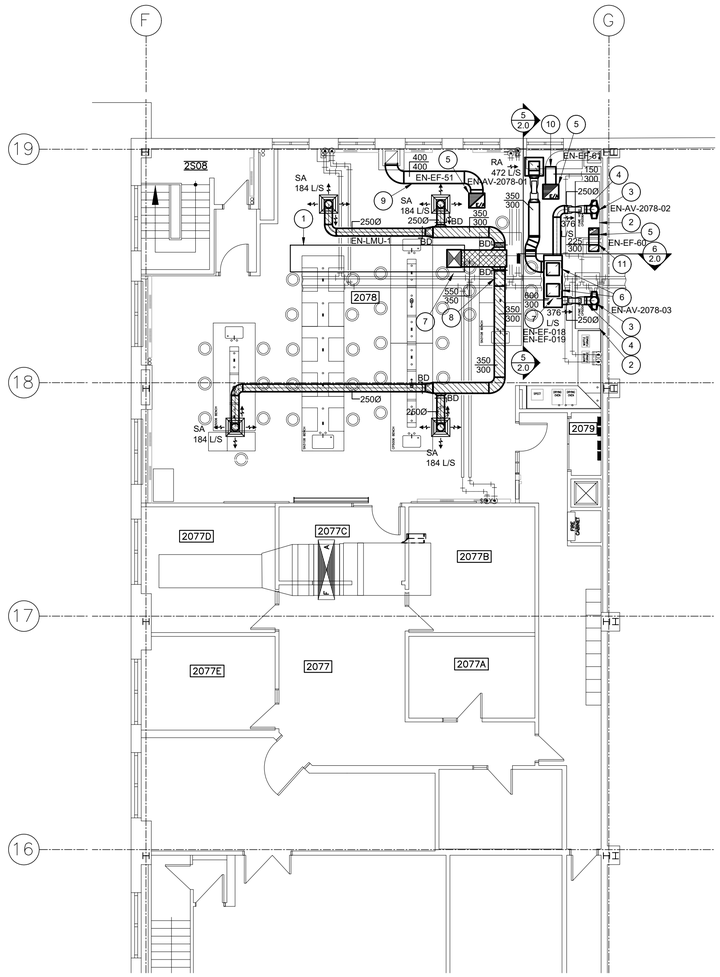
0m 1m 2m 3m 4m 5m 6m 7m 8m 9m 10m

GENERAL NOTES:

1. COORDINATE ALL DUCT ROUTING TO AVOID INTERFERENCES. RE-ROUTE AS REQUIRED.
2. PROVIDE OFFSETS TO AVOID STRUCTURAL BEAMS, PIPING, OTHER DUCT, ETC. CEILING SPACE IS LIMITED SO OFFSETS WILL BE REQUIRED TO COMPLETE INSTALLATION AND THE CONTRACTOR SHALL INCLUDE ALLOWANCE IN PRICING TO PROVIDE OFFSETS ON ALL DUCT RUNS.
3. CONTRACTOR SHALL PROTECT EXISTING OPERATIONAL SYSTEMS FROM ANY DUST/DEBRIS.
4. PLAN ALL WORK TO MINIMIZE IMPACT ON EXISTING SYSTEMS. MAX HEATING SYSTEM DOWNTIME TO MAKE CONNECTION SHALL BE 24 HOURS. IF IN HEATING SEASON DRAIN AN REFILL SYSTEM INCLUDING REMOVING ALL AIR AS NECESSARY TO MAKE ALL HEATING SYSTEM CONNECTIONS AND MODIFICATIONS.
5. REFER TO ANY PHASING LIMITATIONS IN ARCHITECTURAL DOCUMENTS. OWNER TO APPROVE ALL SYSTEM SHUTDOWNS 8 DAYS IN ADVANCE OF SHUTDOWN.

DRAWING NOTES:

1. OUTLINE OF NEW AHU ON ROOF.
2. OWNER SUPPLIED FUME HOODS, CONTRACTOR INSTALLED. GENERAL CONTRACTOR IS RESPONSIBLE TO DISASSEMBLE EXISTING FUMEHOODS AND CABINETS IN EXISTING LOCATIONS (CHEMISTRY PHYSICS BUILDING. C-5006 AND C-5006A) AND TRANSPORT FUMEHOODS AND CABINETS TO NEW LOCATION (EN-2078) AS SHOWN. MECHANICAL SERVICES WILL BE DISCONNECTED BY MUN FORCES.
3. TRANSITION FROM FUME HOOD CONNECTION TO 300mm DUCT AIR VALVE. ALL FUME DUCTS SHALL BE 316L STAINLESS WELDED, CONNECT TO ROOF MOUNTED EXHAUST FANS.
4. BALANCER SET EXHAUST FANS TO ACHIEVE AIRFLOW INDICATED AS STARTING POINT FOR HOOD CERTIFIER.
5. NEW LOCATION OF EXISTING FAN TO ACCOMMODATE NEW INSTALLATION. INSULATE VERTICAL RISER TO ROOF.
6. DUCTED PLENUM UP TO EXHAUST FANS ON ROOF. FAN PLENUM SHALL BE FABRICATED FROM 3.416mm (10 GAUGE) 316 STAINLESS STEEL. FIELD FIT EXHAUST PLENUM. THERMALLY INSULATE BOTH VERTICAL LEGS CONNECTING FAN TO PLENUM AND ENTIRE PLENUM.
7. REFER TO STRUCTURAL DRAWINGS FOR ARRANGEMENT OF NEW STRUCTURAL SUPPORT BEAMS FOR ROOF TOP UNITS AND FANS, COORDINATE PLACEMENT OF EQUIPMENT AND DUCTING WITH NEW AND EXISTING STRUCTURE AND SERVICES.
8. SUPPLY DUCT TO RISE ABOVE EXISTING HYDRONIC PIPING.
9. NEW SECTION OF 400 X 400 EXHAUST DUCT TO ACCOMMODATE FAN RELOCATION. VERIFY SIZE AND LOCATION ON SITE.
10. NEW SECTION OF 150 X 300 EXHAUST DUCT TO ACCOMMODATE FAN RELOCATION. VERIFY SIZE AND LOCATION ON SITE.
11. NEW SECTION OF 225 X 300 EXHAUST DUCT TO ACCOMMODATE FAN RELOCATION. VERIFY SIZE AND LOCATION ON SITE.



PARTIAL LEVEL 2 FLOOR PLAN - NEW VENTILATION LAYOUT

SCALE : 1:100

0m 1m 2m 3m 4m 5m 6m 7m 8m 9m 10m

A - DETAIL
B - LOCATION/DRAWING No.
C - DRAWING No.

No.	REVISION	DATE (Y/M/D)
0	ISSUED FOR TENDER	2025.11.28

GENERAL NOTES

1. DRAWINGS TO BE READ AS A SET.
2. DO NOT SCALE FROM DRAWINGS.
3. THE CONTRACTOR IS TO VERIFY ALL DIMENSIONS AND SITE CONDITIONS PRIOR TO SUBMISSION OF TENDERS.
4. ALL DEFICIENCIES FOUND IN THIS DRAWING IS TO BE BROUGHT TO THE ATTENTION OF THE FACILITIES ENGINEERING AND DEVELOPMENT OFFICE OF THE DEPARTMENT OF FACILITIES MANAGEMENT, MEMORIAL UNIVERSITY OF NEWFOUNDLAND, PRIOR TO THE SUBMISSION OF THE TENDERS.

MECHANICAL & ELECTRICAL CONSULTANT:

CORE ENGINEERING INC.

57 Pippy Place
St. John's, NL, Canada A1B 4H8

Tel (709) 722-8613
Fax (709) 722-0910

REGISTERED PROFESSIONAL ENGINEER PROVINCE OF NEWFOUNDLAND
PEGL Professional Engineers and Geoscientists Newfoundland & Labrador
DAVE ENNIS
SIGNATURE
2025 Nov 28
DATE

PROVINCE OF NEWFOUNDLAND
pegnl PROFESSIONAL ENGINEERS AND GEOSCIENTISTS NEWFOUNDLAND & LABRADOR
PERMIT HOLDER
This Permit Allows
CORE ENGINEERING INC.
MIRC: 03823
To practice Professional Engineering in Newfoundland and Labrador.
Permit No. as issued by PEGNL D0209
which is valid for the year 2025.

MEMORIAL UNIVERSITY

Department of Facilities Management

This University was raised by the people of Newfoundland as a memorial to the fallen in the great wars, 1914-1918, 1939-1945, that in freedom of learning, their cause and sacrifice might not be forgotten.

- Dedication plaque, Arts & Administration Building, St. John's Campus

PROJECT NAME:

S.J. CAREW BUILDING (FACULTY OF ENGINEERING & APPLIED SCIENCE) RENOVATIONS TO EN-2078
Project #: EN-164-21

DRAWING TITLE:

PARTIAL LEVEL 2 FLOOR PLAN - VENTILATION LAYOUT

DESIGNED: DE/MB	DRAWN: JM
REVIEWED: DE/MB	APPROVED: DE
SCALE: AS NOTED	DATE: NOVEMBER 2025
PROJECT No. **EN-164-21**	DRAWING No. MV-1.0

GENERAL NOTES:

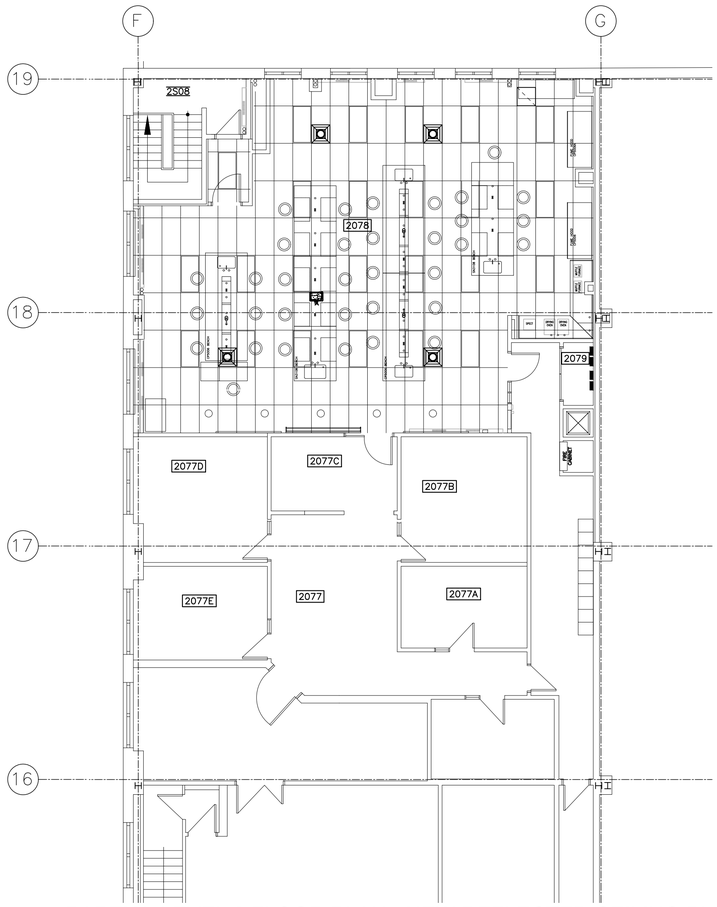
1. ALL CEILING PENETRATIONS, GRILLES AND DIFFUSERS SHALL BE SEALED AIR TIGHT. LEAKAGE AT COLLAR TO TERMINALS IS NOT ACCEPTABLE.

REFLECTED CEILING PLAN LEGEND

SUPPLY AIR DIFFUSER

EXHAUST AIR GRILL

LIGHT FIXTURE (BY ELEC)



PARTIAL LEVEL 2 FLOOR PLAN - NEW REFLECTED CEILING PLAN

SCALE : 1:100

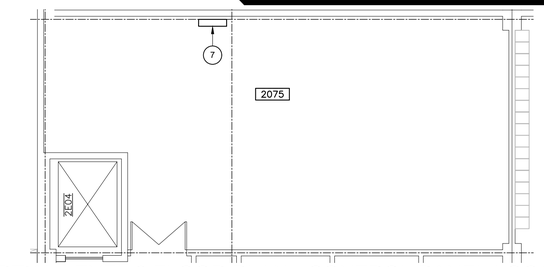
0m 1m 2m 3m 4m 5m 6m 7m 8m 9m 10m

GENERAL NOTES:

1. ALL CONNECTIONS TO THERMOSTATS OR OTHER DEVICES IS SYMBOLIC ONLY, REFER TO CONTROLS SCHEMATICS.
2. CONFIRM LOCATION OF ALL VFD'S, STARTERS, AND THERMOSTATS WITH OWNER PRIOR TO ROUGH IN TO AVOID CONFLICT WITH ANY EQUIPMENT, SHELVING, STORAGE, ETC.
3. REMOVE ALL EXISTING CONTROLS WIRING, CONDUIT AND CONTROL DEVICES. ENSURE EXISTING BUILDING CONTROLS REMAIN OPERATIONAL.
4. INTEGRATION (HONEYWELL): SCOPE OF WORK TO BE INCLUDED IN CASH ALLOWANCE.
5. DIVISION 25 CONTROLS: SCOPE OF WORK TO BE INCLUDED IN CONTRACT PRICE.
6. ALL NEW AND MODIFIED CONTROL POINTS SHALL BE FULLY INTEGRATED INTO THE HONEYWELL EBI SYSTEM. DIVISION 25 SHALL INCLUDE ALL COSTS FOR TESTING, COMMISSIONING, AND POINT NAMING IN ACCORDANCE WITH MUN STANDARDS.
7. THE INTEGRATION CONTRACTOR SHALL CARRY ALL COSTS UNDER THE CASH ALLOWANCE ASSOCIATED WITH POINT DISCOVERY, GRAPHIC UPDATES, AND ALL OTHER SCOPE IDENTIFIED IN SECTION 01 36 00 SYSTEM INTEGRATOR.
8. THE CONTROLS CONTRACTOR AND THE INTEGRATION CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING THEIR RESPECTIVE SCOPES OF WORK AND FOR DOCUMENTING ALL COORDINATION ACTIVITIES.
9. ALL PNEUMATIC AND LOW VOLTAGE CONTROLS (<50V) TO BE REMOVED, RELOCATED, AND INSTALLED NEW TO BE COMPLETED BY DIVISION 25 CONTRACTOR. INCLUDE ALL CONTROL WIRING CONDUITS, DEVICE BOXES, JUNCTION BOXES, AND ACCESSORIES REQUIRED TO FACILITATE CONTROL INSTALLATION.

DRAWING NOTES:

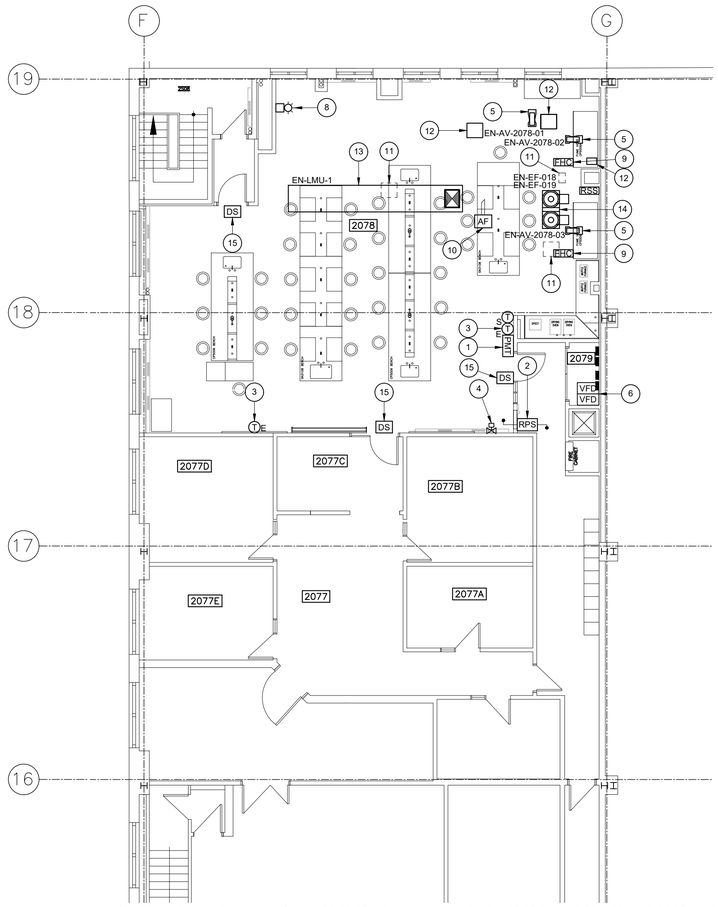
1. NEW ROOM PRESSURE DISPLAY.
2. NEW ROOM PRESSURE SENSOR.
3. EXISTING PNEUMATIC THERMOSTAT TO REMAIN.
4. EXISTING PNEUMATIC HEATING CONTROL VALVE TO BE RELOCATED WITH NEW HEATER LOCATION.
5. CRITICAL CONTROL VALVE. REFER TO SCHEDULE AND SCHEMATICS.
6. VARIABLE FREQUENCY DRIVES SERVING EN-EF-018/019. CONTRACTOR TO COORDINATE DRIVE INSTALLATION WITH EXISTING DEVICES AND NEW ELECTRICAL.
7. NEW DDC CONTROL PANEL LOCATED IN ROOM EN-2075.
8. EYE WASH ALARM SUPPLIED AND INSTALLED BY CONTRACTOR
9. FUME HOOD AIRFLOW MONITOR. INSTALL PER MANUFACTURES RECOMMENDATIONS ON OWNER SUPPLIED FUME HOODS. MATCH HARDWIRE TRANSFORMER TO PRODUCT VOLTAGE AND POWER REQUIREMENT.
10. AIR FLOW STATION.
11. EXISTING FANS AND EXISTING CONTROL DEVICES TO BE RELOCATED TO NEW LOCATION.
12. NEW LOCATION OF EXISTING FANS AND CONTROL DEVICES.
13. AHU ON ROOF ABOVE. REFER TO SCHEMATIC, SCHEDULE AND DETAILS.
14. NEW FANS ON ROOF ABOVE. REFER TO SCHEMATIC, SCHEDULE AND DETAILS.
15. DOOR SWITCHES.



PARTIAL LEVEL 2 FLOOR PLAN - CONTROL PANEL LOCATION

SCALE : 1:100

0m 1m 2m 3m 4m 5m 6m 7m 8m 9m 10m



PARTIAL LEVEL 2 FLOOR PLAN - NEW CONTROLS LAYOUT

SCALE : 1:100

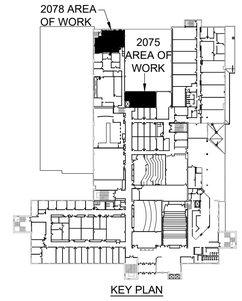
0m 1m 2m 3m 4m 5m 6m 7m 8m 9m 10m

A - DETAIL
B - LOCATION/DRAWING No.
C - DRAWING No.

No.	REVISION	DATE (Y/M/D)
0	ISSUED FOR TENDER	2025.11.28

GENERAL NOTES

1. DRAWINGS TO BE READ AS A SET.
2. DO NOT SCALE FROM DRAWINGS.
3. THE CONTRACTOR IS TO VERIFY ALL DIMENSIONS AND SITE CONDITIONS PRIOR TO SUBMISSION OF TENDERS.
4. ALL DEFICIENCIES FOUND IN THIS DRAWING IS TO BE BROUGHT TO THE ATTENTION OF THE FACILITIES ENGINEERING AND DEVELOPMENT OFFICE OF THE DEPARTMENT OF FACILITIES MANAGEMENT, MEMORIAL UNIVERSITY OF NEWFOUNDLAND, PRIOR TO THE SUBMISSION OF THE TENDERS.



KEY PLAN

MECHANICAL & ELECTRICAL CONSULTANT:

CORE ENGINEERING INC.

57 Pippy Place
St. John's, NL, Canada A1B 4H8

Tel (709) 722-8613
Fax (709) 722-0910

PROVINCE OF NEWFOUNDLAND
PERMIT HOLDER
This Permit Allows
CORE ENGINEERING INC.
MIRC: 03823
To practice Professional Engineering in Newfoundland and Labrador.
Permit No. as issued by PEGNL D0209
which is valid for the year 2025.

DAVE ENNIS
SIGNATURE
2025 Nov 28
DATE

MEMORIAL UNIVERSITY

Department of Facilities Management

This University was raised by the people of Newfoundland as a memorial to the fallen in the great wars, 1914-1918, 1939-1945, that in freedom of learning, their cause and sacrifice might not be forgotten.

- Dedication plaque, Arts & Administration Building, St. John's Campus

PROJECT NAME:

S.J. CAREW BUILDING (FACULTY OF ENGINEERING & APPLIED SCIENCE) RENOVATIONS TO EN-2078
Project #: EN-164-21

DRAWING TITLE:

PARTIAL LEVEL 2 FLOOR PLAN - NEW RCP & CONTROLS LAYOUT

DESIGNED:	DRAWN:
DE/MB	JM
REVIEWED:	APPROVED:
DE/MB	DE
SCALE:	DATE:
AS NOTED	NOVEMBER 2025
PROJECT No.	DRAWING No.
EN-164-21	ME-1.0

MECHANICAL LEGEND

VENTILATION

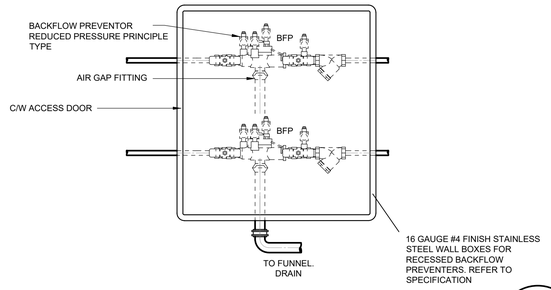
- EXISTING DUCTWORK TO BE REMOVED
- EXISTING DUCTWORK TO REMAIN
- NEW DUCTWORK
- NEW INSULATED DUCTWORK
- NEW ACOUSTIC LINED DUCTWORK
- ROUND DUCTWORK.
- DUCTS UP
- DUCTS DOWN
- DUCT ELBOWS; or 0.5 AS REQ'D, VANED 90° ELBOW.
- DUCT TRANSITIONS; RECT./ROUND, RECT./RECT.
- BD — TYPICAL BALANCING DAMPER
- BD — TYPICAL "SPIN-IN" COLLAR TYPE ROUND DUCT TAKE-OFF, C/W BALANCING DAMPER
- TYPICAL SUPPLY AIR DIFFUSER; RECT. COLLAR or ROUND COLLAR AS SHOWN.
- T — EXISTING THERMOSTAT
- SA 47 L/S — INDICATES TYPE "EXHAUST, SUPPLY, RETURN" INDICATES CAPACITY IN LITRES PER SECOND
- INDICATES DETAIL NUMBER / INDICATES DRAWING SHOWN ON
- VENTURI AIR VALVE

PLUMBING

- SANITARY DRAIN BELOW SLAB\GRADE
- ARD — NEW ACID RESISTANT DRAIN PIPING
- ARD — NEW ARD VENT PIPING
- DOMESTIC HOT WATER
- DOMESTIC COLD WATER
- DOMESTIC HOT WATER RECIRC
- LAB DHW — LAB DOMESTIC HOT WATER RECIRC
- LAB DCW — LAB DOMESTIC HOT WATER RECIRC
- EX-SAN — EXISTING SANITARY DRAIN BELOW SLAB/GRADE
- P — EXISTING PYREX DRAINAGE PIPING (ACID WASTE)
- EX-V — EXISTING VENT PIPING
- EX-CW — EXISTING DOMESTIC COLD WATER
- EX-HW — EXISTING DOMESTIC HOT WATER
- EX-RC — EXISTING DOMESTIC HOT WATER RECIRC
- EX-SAN — EXISTING SANITARY DRAIN BELOW SLAB/GRADE TO BE REMOVED
- C.O. — CLEAN OUT IN WALL/CEILING
- C.O. — CLEAN OUT IN FLOOR
- FD-1 — FLOOR DRAIN NUMBER INDICATES TYPE
- SA — SHOCK ABSORBER (WATER HAMMER ARRESTOR), SEE SPEC
- A — NEW WALL MOUNTED FIRE EXTINGUISHER
- BFP — BACKFLOW PREVENTER

HEATING

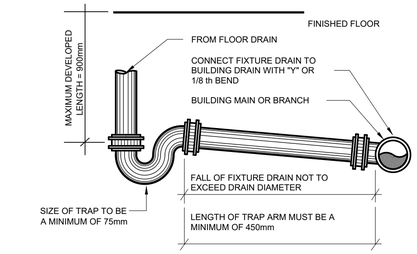
- EX-HWR — EXISTING HOT WATER RETURN
- EX-HWS — EXISTING HOT WATER SUPPLY
- EX-HWR — EXISTING HOT WATER RETURN TO BE REMOVED
- EX-HWS — EXISTING HOT WATER SUPPLY TO BE REMOVED
- HWR — HOT WATER RETURN
- HWS — HOT WATER SUPPLY
- PIPE DROP
- PIPE RISE
- PIPE RISE OFF TOP OF MAIN
- PIPE DROP OFF BOTTOM OF MAIN
- CONTROL VALVE



NEW RECESSED BACKFLOW PREVENTER DETAIL

SCALE: N.T.S.

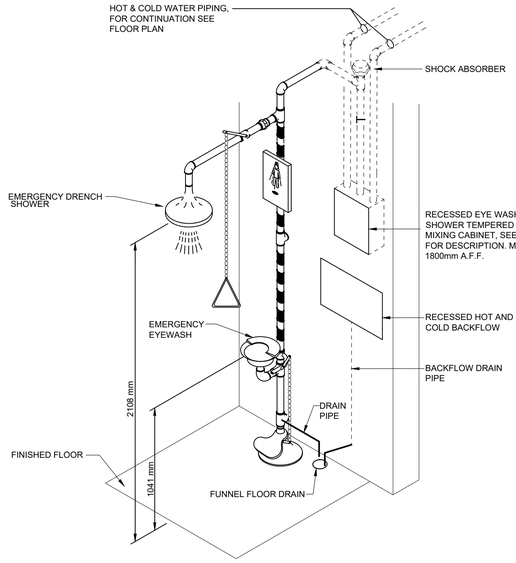
1 / MP-4.0



NEW FLOOR DRAIN - NO VENT DETAIL

SCALE: N.T.S.

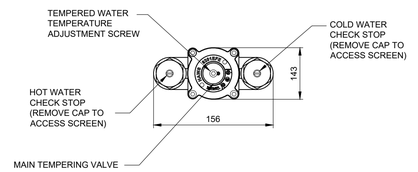
2 / MP-4.0



EXISTING EYEWASH AND DRENCH SHOWER STATION INSTALLATION DETAIL (EEWS-1)

SCALE: N.T.S.

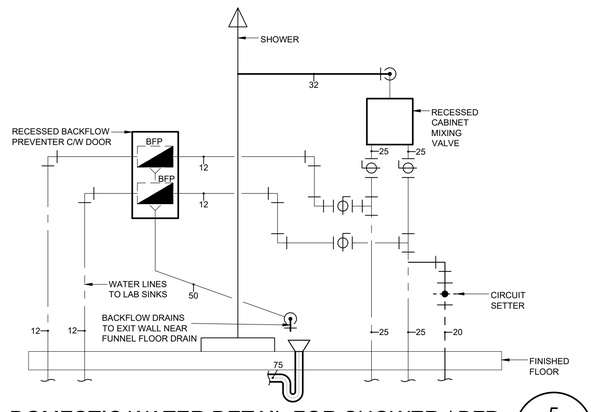
3 / MP-4.0



EXISTING MIXING VALVE DETAIL

SCALE: N.T.S.

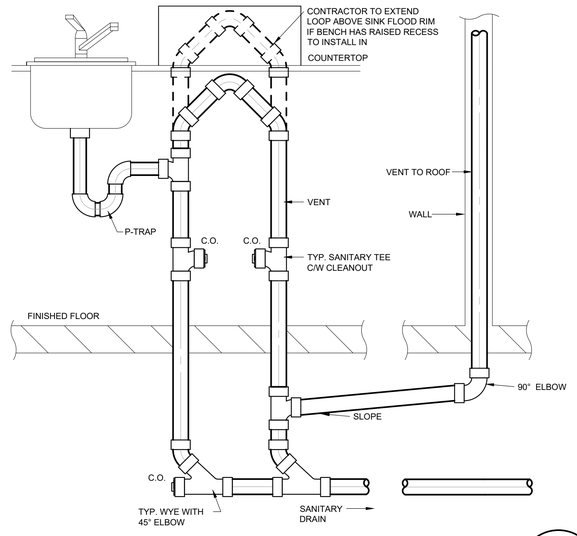
4 / MP-4.0



DOMESTIC WATER DETAIL FOR SHOWER / BFP

SCALE: N.T.S.

5 / MP-4.0



NEW ISLAND FIXTURE LOOP VENT DETAIL

SCALE: N.T.S.

6 / MP-4.0

A - DETAIL
B - LOCATION/DRAWING No.
C - DRAWING No.

No.	REVISION	DATE (Y/M/D)
0	ISSUED FOR TENDER	2025.11.28

GENERAL NOTES

1. DRAWINGS TO BE READ AS A SET.
2. DO NOT SCALE FROM DRAWINGS.
3. THE CONTRACTOR IS TO VERIFY ALL DIMENSIONS AND SITE CONDITIONS PRIOR TO SUBMISSION OF TENDERS.
4. ALL DEFICIENCIES FOUND IN THIS DRAWING IS TO BE BROUGHT TO THE ATTENTION OF THE FACILITIES ENGINEERING AND DEVELOPMENT OFFICE OF THE DEPARTMENT OF FACILITIES MANAGEMENT, MEMORIAL UNIVERSITY OF NEWFOUNDLAND, PRIOR TO THE SUBMISSION OF THE TENDERS.

MECHANICAL & ELECTRICAL CONSULTANT:

CORE ENGINEERING INC.
57 Pippy Place
St. John's, NL, Canada A1B 4H8
Tel (709) 722-8613
Fax (709) 722-0910

PROVINCE OF NEWFOUNDLAND
PERMIT HOLDER
This Permit Allows
CORE ENGINEERING INC.
MIRC: 03823
To practice Professional Engineering in Newfoundland and Labrador.
Permit No. as issued by PEGNL D0209
which is valid for the year 2025.

DAVE ENNIS — SIGNATURE — 2025 Nov 28 — DATE

MEMORIAL UNIVERSITY
Department of Facilities Management

This University was raised by the people of Newfoundland as a memorial to the fallen in the great wars, 1914-1918, 1939-1945, that in freedom of learning, their cause and sacrifice might not be forgotten.

- Dedication plaque, Arts & Administration Building, St. John's Campus

PROJECT NAME:

S.J. CAREW BUILDING (FACULTY OF ENGINEERING & APPLIED SCIENCE) RENOVATIONS TO EN-2078 Project #: EN-164-21

DRAWING TITLE:

PLUMBING DETAILS

DESIGNED: DE/MB	DRAWN: JM
REVIEWED: DE/MB	APPROVED: DE
SCALE: AS NOTED	DATE: NOVEMBER 2025
PROJECT No. **EN-164-21**	DRAWING No. MP-4.0

DUCT HANGER SCHEDULE

RECTANGULAR DUCT				
LONGEST DIMENSION OF DUCT (mm)	HANGER ROD (mmØ)	STRAP HANGERS (mm)	TRAPEZE SHELF HANGERS (mm)	MAX. SPACING (mm)
UP TO 457	3.26 WIRE	25 x 1.29 tk.	25 x 25 x 3.2	3050
483 - 750	3.26 WIRE	25 x 1.29 tk.	25 x 25 x 3.2	3050
787 - 1067	6.35	25 x 1.29 tk.	40 x 40 x 3.2	3050
1092 - 1524	9.5	25 x 1.29 tk.	40 x 40 x 3.2	3050
1550 - 2134	9.5	40 x 1.29 tk.	50 x 50 x 3.2	2438
ROUND DUCT				
DUCT DIAMETER (mmØ)	HANGER ROD (mmØ)	STRAP HANGERS (mm)	No. OF HANGERS	MAX. SPACING (mm)
UP TO 457	3.26 WIRE	25 x 1.29 tk.	1	3050
483 - 750	---	25 x 2.05 tk.	1	3050
787 - 1067	---	50 x 1.29 tk.	1	3050

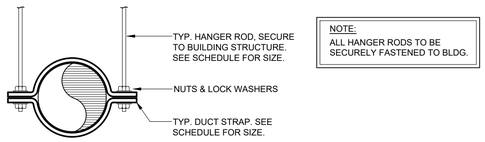
HANGER ROD SCHEDULE

PIPE SIZE (mm)	ROD SIZE (mm)	PIPE SIZE (mm)	ROD SIZE (mm)
UP TO 50	9.5 DIA.	100 THRU 125	16 DIA
65 THRU 75	12.7 DIA.	150 THRU 300	22 DIA.

HANGER ROD SPACING SCHEDULE

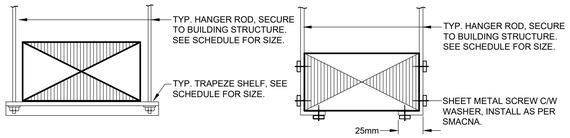
PIPE SIZE (mm)	25	32	40	50	65	75	100	125	150	200	250	300
MAXIMUM ALLOWABLE SPACING (METERS)	2.1	2.4	2.7	3.0	3.3	3.6	4.2	4.8	5.1	5.7	6.7	7.0

NOTE: FOR TRAPEZE HANGER , USE SPACING FOR SMALLEST DIAMETER PIPE



ROUND DUCT

NOTE:
ALL HANGER RODS TO BE SECURELY FASTENED TO BLDG.

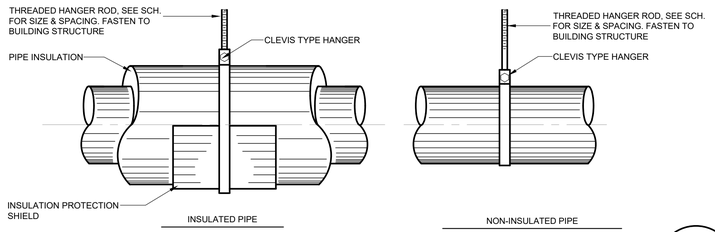


RECTANGLE DUCT — RECTANGLE DUCT (UP TO 300mm)

TYPICAL DUCT SUPPORT DETAILS

SCALE: N.T.S.

1 / MV-2.0

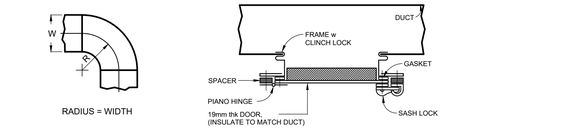


INSULATED PIPE — NON-INSULATED PIPE

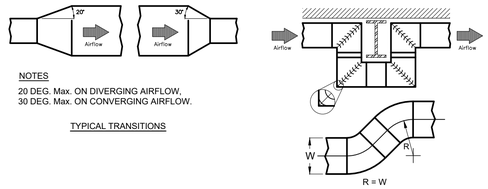
TYP. PIPE HANGERS DETAIL

SCALE: N.T.S.

2 / MV-2.0

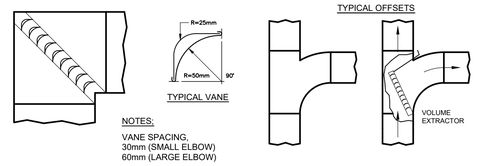


STANDARD RADIUS ELBOW — TYP. DUCT MTD. ACCESS DOOR



NOTES
20 DEG. Max. ON DIVERGING AIRFLOW.
30 DEG. Max. ON CONVERGING AIRFLOW.

TYPICAL TRANSITIONS — TYPICAL OFFSETS



NOTES:
VANE SPACING,
30mm (SMALL ELBOW)
60mm (LARGE ELBOW)

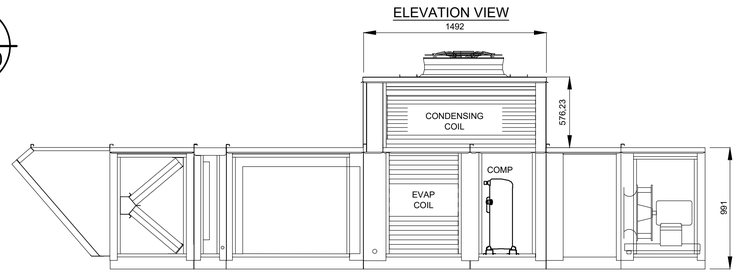
TYPICAL VANED ELBOWS — TYPICAL "TEE" CONNECTIONS

NOTES:
1. ALL DUCTWORK CONSTRUCTION SHALL CONFORM TO SMACNA STANDARDS.
2. NOT ALL CONDITIONS SHOWN ABOVE MAY APPLY TO THIS JOB. COORDINATE ON-SITE

TYP. DUCT CONSTRUCTION STANDARDS

SCALE: N.T.S.

3 / MV-2.0

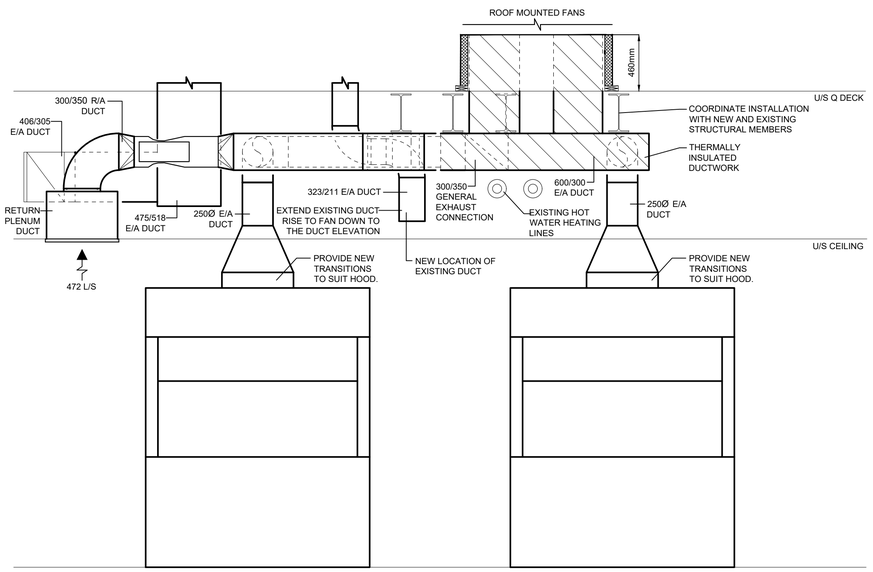


AHU DETAIL - EN-LMU-1

SCALE: 1:25

0m 1m 2m 3m 4m 5m

4 / MV-2.0

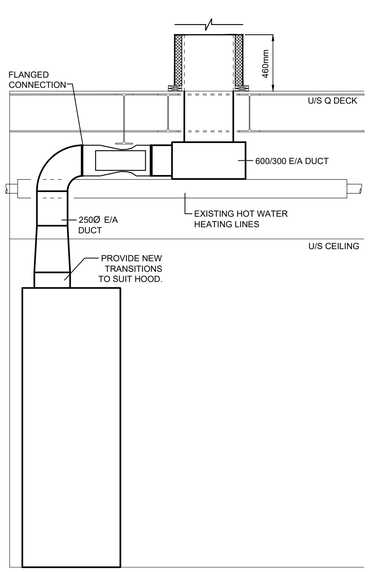


MECHANICAL SECTION

SCALE: 1:25

0m 1m 2m 3m 4m 5m

5 / MV-2.0

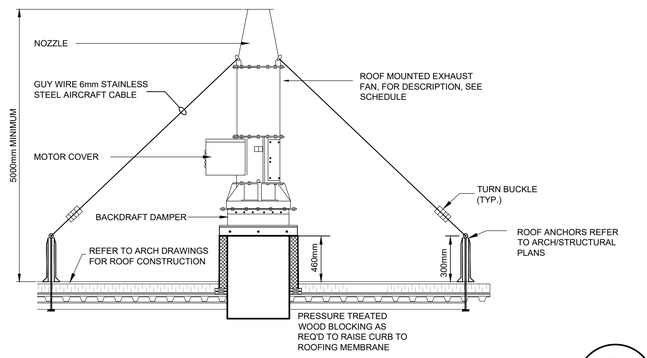


MECHANICAL SECTION

SCALE: 1:25

0m 1m 2m 3m 4m 5m

6 / MV-2.0



ROOF MOUNTED EXHAUST FAN MOUNTING DETAIL

SCALE: N.T.S.

7 / MV-2.0

A - DETAIL
B - LOCATION/DRAWING No.
C - DRAWING No.

No.	REVISION	DATE (Y/M/D)
0	ISSUED FOR TENDER	2025.11.28

GENERAL NOTES

1. DRAWINGS TO BE READ AS A SET.
2. DO NOT SCALE FROM DRAWINGS.
3. THE CONTRACTOR IS TO VERIFY ALL DIMENSIONS AND SITE CONDITIONS PRIOR TO SUBMISSION OF TENDERS.
4. ALL DEFICIENCIES FOUND IN THIS DRAWING IS TO BE BROUGHT TO THE ATTENTION OF THE FACILITIES ENGINEERING AND DEVELOPMENT OFFICE OF THE DEPARTMENT OF FACILITIES MANAGEMENT, MEMORIAL UNIVERSITY OF NEWFOUNDLAND, PRIOR TO THE SUBMISSION OF THE TENDERS.

MECHANICAL & ELECTRICAL CONSULTANT:

CORE ENGINEERING INC.
57 Pippy Place
St. John's, NL, Canada A1B 4H8
Tel (709) 722-8613
Fax (709) 722-0910

REGISTERED PROFESSIONAL ENGINEER — PROVINCE OF NEWFOUNDLAND AND LABRADOR — PEGNL — DAVE ENNIS — SIGNATURE — 2025 Nov 28 DATE

PROVINCE OF NEWFOUNDLAND
PERMIT HOLDER
This Permit Allows
CORE ENGINEERING INC.
MIRC: 03823
To practice Professional Engineering in Newfoundland and Labrador.
Permit No. as issued by PEGNL D0209 which is valid for the year 2025.

MEMORIAL UNIVERSITY
Department of Facilities Management

This University was raised by the people of Newfoundland as a memorial to the fallen in the great wars, 1914-1918, 1939-1945, that in freedom of learning, their cause and sacrifice might not be forgotten.

- Dedication plaque, Arts & Administration Building, St. John's Campus

PROJECT NAME:

S.J. CAREW BUILDING (FACULTY OF ENGINEERING & APPLIED SCIENCE) RENOVATIONS TO EN-2078
Project #: EN-164-21

DRAWING TITLE:

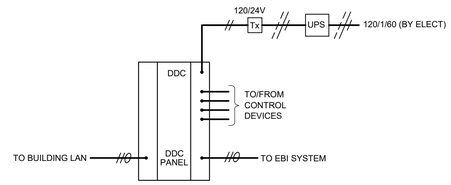
VENTILATION DETAILS AND ELEVATIONS

DESIGNED:	DRAWN:
DE/MB	JM
REVIEWED:	APPROVED:
DE/MB	DE
SCALE:	DATE:
AS NOTED	NOVEMBER 2025
PROJECT No.	DRAWING No.
EN-164-21	MV-2.0

CONTROL LEGEND

TS	TEMPERATURE SENSOR DUCT MOUNTED/PIPE MOUNTED. PROVIDE IMMERSION WELL FOR PIPE MOUNTED APPLICATION. PROVIDE CORRECT LENGTH ELEMENT FOR AVERAGING (AVG) APPLICATION.
VFD	VARIABLE FREQUENCY MOTOR DRIVE BY CONTROLS CONTRACTOR, ULC LABELED WITH FULL GRAPHIC INTERFACE, PROGRAMMABLE GENERAL ALARM OUTPUT, RATED FOR +/- 10% OF MOTOR VOLTAGE, SIZED TO SUIT MOTOR LOAD, BACNET INTERFACE NEMA 1 ENCLOSURE, C/W BUILT-IN DISC. SWITCH, HAND-OFF-AUTO CONTROL WITH MANUAL SPEED ADJUSTMENT. MOUNT 1400mm AFF.
Tx	CONTROL TRANSFORMER - PROVIDE 120/24 VAC CONTROL TRANSFORMERS AS REQUIRED, 'MARCUS' OR EQUAL, SIZE TO SUIT LOADS
UPS	UNINTERRUPTIBLE POWER SUPPLY WITH MIN. 10 MINUTES BATTERY BACKUP AND TRUE GRID POWER ISOLATION WITH ALL POWER TO DEVICES FROM BATTERY AND TRUE SIN WAVE INVERTER. SIZE TO SUIT LOAD.
DDC	DDC PANEL, MOUNT IN EEMAC1 ENCLOSURE C/W CONTROL TRANSFORMER. DDC SYSTEM TO MATCH EXISTING.
DPS	DIFFERENTIAL STATIC PRESSURE SENSOR. SIZE TO SUIT APPLICATION. RANGE: 0-500 Pa ACCURACY +/- 2%, 4-20mA OUTPUT, AND FIELD CALIBRATION C/W LCD DISPLAY FOR FIELD MONITORING. WHERE MOUNTED ON BUILDING EXTERIOR TO BE IN WEATHERTIGHT ENCLOSURE.
RPS	ROOM PRESSURE SENSOR FOR ALL SPACES MONITORED (SEE FLOOR PLAN/SCHEMATICS FOR LOCATIONS). MOUNT 2200mm A.F.F. PRICE MODEL SRPS OR EQUAL. COORDINATE EXACT LOCATION AND HEIGHT ON SITE.
DSW	MAGNETIC DOOR SWITCH. ANTEC MODEL DCS
PMT	TOUCH SCREEN ROOM PRESSURE MONITOR WITH 127X93 PIXEL SCREEN, AUDIBLE/VISUAL ALARM, BACNET CONNECTION. ANTEC LUME PMT OR APPROVED EQUAL. MOUNT 1200mm A.F.F.
AF	AIRFLOW MEASURING STATION SIZED TO SUIT DUCT AND AIRFLOW. ACCURACY: +/- 1% 4-20mA OUTPUT. EBTRON OR APPROVED EQUAL. CALIBRATE DURING COMMISSIONING.
RSS	REMOTE START STOP WITH PILOT LIGHT
	NON-FUSED DISC. SWITCH BY ELECTRICAL TRADE UNLESS OTHERWISE NOTED.
////	SHIELDED WIRE - PROVIDE SHIELDED WIRE WHERE SHOWN AND WHERE NECESSARY
//	INDICATES # OF WIRES - CONTRACTOR TO VERIFY AND INCLUDE ADEQUATE WIRING IN PRICING TO SUIT DEVICE/APPLICATION
DO	DIGITAL OUTPUT SIGNAL FROM THE DDC PANEL
DI	DIGITAL INPUT SIGNAL TO THE DDC PANEL
AO	ANALOG OUTPUT SIGNAL FROM THE DDC PANEL
AI	ANALOG INPUT SIGNAL TO THE DDC PANEL
T E	EXISTING PNEUMATIC THERMOSTAT TO REMAIN
T S	NON- ADJUSTABLE DDC ROOM TEMPERATURE SENSOR, C/W STAINLESS STEEL PLATE. MOUNT 1200mm A.F.F.
FHC	FUME HOOD CONTROLLER TOUCHSCREEN WITH HYBRID SENSING THAT COMBINES BOTH SASH POSITION AND SIDEWALL SENSING. LOCAL AUDIBLE / VISUAL ALARMS WITH EMERGENCY BUTTON; BACnet MS / TP INTERGRATION TO BAS; 24 VAC CLASS 2 POWER. EXPOSE STATUS/ ALARMS / FACE-VELOCITY POINTS TO DDC. ACCEPTABLE PRODUCT. ANTEC CONTROLS CAVA FUME HOOD CONTROLLER.

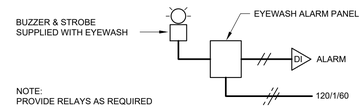
NOTES:
1. ALL CONTROL DEVICES AND ASSOCIATED LOW VOLTAGE WIRING SHALL BE SUPPLIED AND INSTALLED BY THE MECHANICAL TRADE UNLESS OTHERWISE NOTED.
2. MAIN DDC CONTROLLER TO BE MOUNTED IN NEMA1 ENCLOSURE OF SIZE TO SUIT.
3. PROVIDE LAMECOID LABELS FOR ALL EQUIPMENT.
4. ALL DAMPERS AND ACTUATORS SHOWN WITHIN AIR HANDLING UNITS TO BE SUPPLIED WITH UNITS.
5. ALL EXISTING CONTROL SYSTEM IS HONEYWELL CONTROLS. PROVIDE ALL SOFTWARE & HARDWARE AS REQUIRED



NOTES:
1. PROVIDE CONTROL TRANSFORMERS, RELAYS AS REQ'D FOR ALL CONTROL DEVICES.
2. LOCATE PANELS, TRANSFORMERS, RELAYS, ETC IN EEMAC1 ENCLOSURES.
3. ALL COMMUNICATION NETWORKS SHALL BE SEPARATED BY SPEED AND COMMUNICATION PROTOCOLS. PROVIDE SWITCHES, GATEWAYS, AND CONTROLLERS TO CONNECT.

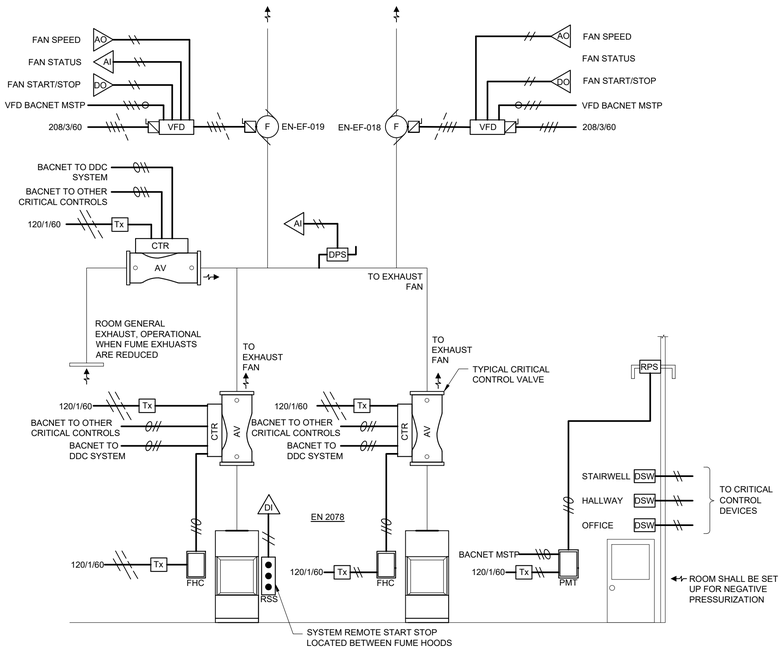
DDC SYSTEM ARCHITECTURE

SCALE: N.T.S.



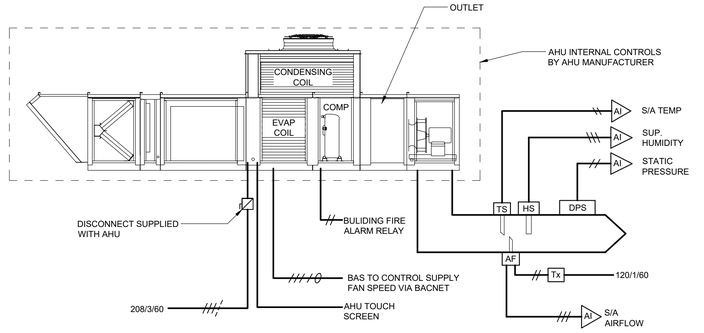
EYEWASH ALARM SCHEMATIC

SCALE: N.T.S.



ROOM CRITICAL CONTROL

SCALE: N.T.S.



EN-LMU-1 AHU CONTROL DETAIL

SCALE: N.T.S.

FIRE EXTINGUISHER SCHEDULE

SYMBOL	MANUFACTURER	TYPE	MODEL	CAPACITY	U.L.C. RATING	REMARKS
A	BADGER	A-B-C DRY CHEMICAL	ADV-5MP-1	2.49 kg	3-A:40B:C	C/W WALL BRACKET

GRILLE & REGISTER SCHEDULE

SYMBOL	MANUFACTURER	MODEL	NECK SIZE (mm)	CONNECTION SIZE (mm)	MODULE SIZE (mm)	AIR FLOW	FRAME MOUNTING	CONSTRUCTION	REMARKS
RA	PRICE	85 SERIES	550 x 550	600 x 600	---	RETURN	SURFACE	ALUMINUM	C/W OBD DAMPER
SA	PRICE	SCD	600 x 600	600 x 600	---	SUPPLY	SURFACE	ALUMINUM	C/W OBD DAMPER

NOTES:
1. GRILLES/REGISTERS MAY REQUIRE DIFFERENT FRAME MOUNTING OTHER THAN SHOWN ABOVE, CONTRACTOR TO VERIFY CEILING TYPES WITH ARCH. REFLECTED CEILING PLAN.
2. PROVIDE HANGERS FOR GRILLES SUSPENDED WITH NO CEILING.

CRITICAL CONTROL AIR VALVE SCHEDULE

BOX No.	ROOM #	SERVICE	MANU.	MODEL	SIZE	CAPACITY (L/S)	MAXIMUM AIR VOLUME (L/S)	MINIMUM AIR VOLUME (L/S)	TOTAL OPER. PRESSURE (Pa)	POWER	REMARKS
EN-AV-2078-01	EN-2078	EXHAUST	ANTEC	VFX	112	472	850	85	74.7	120/1/60	
EN-AV-2078-02	EN-2078	EXHUAST	ANTEC	VFX	110	376	614	38	74.7	120/1/60	PHENOLIC COATING, FAST ACTING ACTUATOR
EN-AV-2078-03	EN-2078	EXHAUST	ANTEC	VFX	110	376	614	38	74.7	120/1/60	PHENOLIC COATING, FAST ACTING ACTUATOR

AIR CONDITIONING UNIT SCHEDULE

SYMBOL	MANU.	MODEL No.	COOLING CAPACITY (kW)				FAN DATA							ELEC. HEAT	VOLTAGE	MCA	MOCP	FILTERS	TOTAL WEIGHT (KG)	REMARKS
			TOTAL COOLING	SENSIBLE	EER	REFRIGERANT	CAP. (L/s)	FRESH AIR (L/s)	EXT. SP. (Pa.)	BHP. (kW)	R.P.M.	MOTOR (kW)	COOLING STAGES	TOTAL KW SCR						
EN-LMU-1	GRENNHECK	MSX-P116	12.4	11.2	15.5	R-454b	822	822	250	0.46	1200	0.55	2	41	208/3/60	147	150	MERV 8 & 14	950	C/W 457mm ROOF CURB, C/W NON-FUSED DISCONNECT, UNPOWERED OUTLET,ECONOMIZER, INSULATED ROOF CURB, DOUBLE WALL, BACNET IP, INTERNAL SUPPLY VFD.

NOTES: 1. COOLING CAPACITY BASED ON 28°C db, 20°C wb EAT, AND 35°C OAT.
2. HEATING CAPACITY BASED ON -16°c OAT.
3.PACKAGED DX W/ 5 YEAR COMPRESSOR WARRANTY
4.PACKAGED DX.
5.REFRIGERANT DETECTION
6.EXP. SP SHALL BE DISCHARGE PRESSURE

FAN SCHEDULE

TAG	SERVING	MANUFACTURER	MODEL	TYPE	CAPACITY (L/S)	PRESSURE LOSS (Pa)	DRIVE	CURB	RPM	ELECTRICAL DATA			BACK-DRAFT DAMPER	FAN SECTION DISCHARGE SOUND DATA (dB)								REMARKS
										B.H.P. (kW)	MOTOR (kW)	POWER (V/P/C)		63	125	250	500	1000	2000	4000	8000	
EN-EF-018/19	EN-2078	GREENHECK	VEKTOR-H-10	CENTRIFUGAL	830	500	BELT	YES	3143	1.95	2.23	208/3/60	YES	95	92	88	88	82	77	73	68	C/W 457MM ROOF CURB,EXPLOSION PROOF MOTOR AND SPARK RESISTANT FAN, 316 STAINLESS STEEL SHAFT. ALL EXPOSED SURFACES TO AIR STREAMS TO HAVE LAB COATING WITH 5 YEAR WARRANTY.

NOTES:
1. ALL FANS TO BE SUPPLIED WITH INVERTER DUTY MOTORS SUITABLE FOR VFD'S.
2. REFER TO PLANS FOR ACTUAL BALANCING AIR FLOWS(SELECT FANS FOR CONDITIONS LISTED ABOVE).
3. PROVIDE BACK DRAFT DAMPERS.
4. C/W LAB-COAT EPOXY COATING.
5. ESP NOTED IN SCHEDULE IS EXTERNAL PRESSURE AT SUCTION CONNECTION, ALL INTERNAL LOSSES, DISCHARGE CONE LOSSES, ETC. SHALL BE ADDED TO FAN SELECTION.
6. SPARK RESISTANT AND EXPLOSION PROOF.

A - DETAIL
B - LOCATION/DRAWING No.
C - DRAWING No.

No.	REVISION	DATE (Y/M/D)
0	ISSUED FOR TENDER	2025.11.28

GENERAL NOTES

1. DRAWINGS TO BE READ AS A SET.
2. DO NOT SCALE FROM DRAWINGS.
3. THE CONTRACTOR IS TO VERIFY ALL DIMENSIONS AND SITE CONDITIONS PRIOR TO SUBMISSION OF TENDERS.
4. ALL DEFICIENCIES FOUND IN THIS DRAWING IS TO BE BROUGHT TO THE ATTENTION OF THE FACILITIES ENGINEERING AND DEVELOPMENT OFFICE OF THE DEPARTMENT OF FACILITIES MANAGEMENT, MEMORIAL UNIVERSITY OF NEWFOUNDLAND, PRIOR TO THE SUBMISSION OF THE TENDERS.

MECHANICAL & ELECTRICAL CONSULTANT:

CORE ENGINEERING INC.
57 Pippy Place
St. John's, NL, Canada A1B 4H8
Tel (709) 722-8613
Fax (709) 722-0910

PROVINCE OF NEWFOUNDLAND
PEGNL Permit Holder
PERMIT HOLDER
This Permit Allows
CORE ENGINEERING INC.
MIRC: 03823
To practice Professional Engineering in Newfoundland and Labrador.
Permit No. as issued by PEGNL D0209 which is valid for the year 2025.

REGISTERED PROFESSIONAL ENGINEER — DAVE ENNIS — SIGNATURE — 2025 Nov 28 DATE — PROVINCE OF NEWFOUNDLAND

MEMORIAL UNIVERSITY
Department of Facilities Management

This University was raised by the people of Newfoundland as a memorial to the fallen in the great wars, 1914-1918, 1939-1945, that in freedom of learning, their cause and sacrifice might not be forgotten.

- Dedication plaque, Arts & Administration Building, St. John's Campus

PROJECT NAME:

S.J. CAREW BUILDING (FACULTY OF ENGINEERING & APPLIED SCIENCE) RENOVATIONS TO EN-2078
Project #: EN-164-21

DRAWING TITLE:

CONTROL SCHEMATICS & SCHEDULE

DESIGNED: DE/MB	DRAWN: JM
REVIEWED: DE/MB	APPROVED: DE
SCALE: AS NOTED	DATE: NOVEMBER 2025
PROJECT No. EN-164-21	DRAWING No. ME-2.0

ELECTRICAL LEGEND

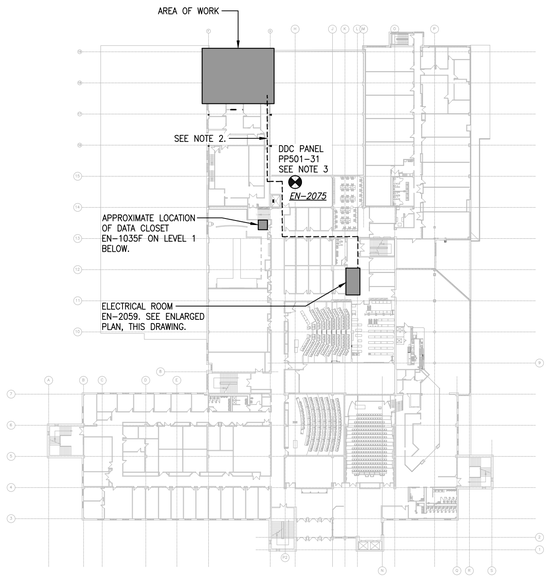
a A	2x4 LIGHTING FIXTURE. "A" INDICATES TYPE AS PER FIXTURE SCHEDULE. WHERE NOTED, "a" INDICATES ASSOCIATED SWITCHES.
aⓔ	CEILING MOUNTED DOWN LIGHT. 'E' INDICATES TYPE AS PER FIXTURE SCHEDULE. WHERE NOTED, "a" INDICATES ASSOCIATED SWITCHES.
3a$	15A, 347V TOGGLE SWITCH. "3" INDICATES 3-WAY SWITCH. "a" INDICATES ASSOCIATED FIXTURES.
D$	15A, 120V, DIMMER SWITCH.
Ⓧ	EXISTING CEILING MOUNTED EXIT SIGN.
Ⓧ	PENDANT MOUNT RUNNING MAN EXIT SIGN COMBO UNIT, C/W 2 x 5WLJ REMOTE HEADS. EQUAL TO AIMLITE CSRP SERIES.
F	FIRE ALARM MANUAL PULL STATION.
FS	FIRE ALARM WALL MOUNTED SPEAKER STROBE.
D	FIRE ALARM DUCT TYPE SMOKE DETECTOR.
ACM	FIRE ALARM ADDRESSABLE CONTROL MODULE.
	15A, 120V QUAD RECEPTACLE (TWO DUPLEX RECEPTACLES IN TWO GANG BOX UNDER COMMON COVERPLATE).
	15A, 120V DUPLEX RECEPTACLE MOUNTED AT COUNTER HEIGHT.
S	15A, 120V DUPLEX RECEPTACLE. WHERE NOTED, 'S' INDICATES SURFACE MOUNTED DEVICE C/W SURFACE MOUNTED WIRING.
	20A, 120V DUPLEX CONVENIENCE RECEPTACLE, NEMA 5-20R. MOUNTED AT 400mm AFF, UNLESS OTHERWISE NOTED.
	20A, 120V DUPLEX CONVENIENCE RECEPTACLE, NEMA 5-20R. MOUNTED AT COUNTERHEIGHT, UNLESS OTHERWISE NOTED.
	20A, 120V GFCI DUPLEX CONVENIENCE RECEPTACLE. MOUNTED AT 400mm AFF, UNLESS OTHERWISE NOTED.
	15A, 120V SURFACE MOUNTED FLOOR DUPLEX RECEPTACLE, C/W SURFACE MOUNTED WIRING.
	OUTLET/JUNCTION BOX.
WP	DISCONNECT SWITCH. 'WP' INDICATES WEATHERPROOF.
CL	WALL MOUNTED DIGITAL CLOCK.
S	DATA OUTLET. WHERE NOTED, 'S' INDICATES SURFACE MOUNTED DEVICE, C/W SURFACE MOUNTED WIRING. CABLING BY OWNER.
	MULTI-SERVICE POLE C/W ONE 20A, 120V DUPLEX RECEPTACLE AND ONE DATA OUTLET AS INDICATED ON DRAWINGS. PROVIDE GROMMETED OPENING IN SERVICE POLE TO ACCOMMODATE EXISTING LOW VOLTAGE WIRING FROM CEILING SPACE TO PODIUM. SERVICE POLE TO BE C/W CEILING FLANGE AND FLOOR ATTACHMENT PLATE AND ALL REQUIRED ACCESSORIES. COORDINATE EXACT LOCATION WITH OWNER PRIOR TO INSTALLATION. OUTLET HEIGHTS TO BE COORDINATE ON SITE TO ACCOMMODATE PODIUM.
	ELECTRICAL CONNECTION TO EQUIPMENT.
	LOCATION OF CORE DRILLING FOR ELECTRICAL SERVICES TO LAB BENCHES. EXACT LOCATION TO BE DETERMINED ON SITE. SEAL ALL PENETRATIONS WITH FIRE SEALANT.
S	A/V SPEAKER.
	PANELBOARD.

SUBSCRIPTS

- E – INDICATES EXISTING TO REMAIN.
- ER – INDICATES EXISTING TO BE REMOVED.
- RL – INDICATES EXISTING TO BE RELOCATED.
- NL – INDICATES EXISTING IN NEW LOCATION.

GENERAL ELECTRICAL NOTES

1. ALL ELECTRICAL ISOLATIONS SHALL BE PERFORMED IN ACCORDANCE WITH MUN ZERO ENERGY ISOLATION PROGRAM (ZEIP). ELECTRICAL CONTRACTORS ARE REQUIRED TO HAVE COMPLETED MUN ZEIP TRAINING PRIOR TO PERFORMING ELECTRICAL WORK.
2. CONTRACTORS SHALL PROVIDE ADVANCED NOTICE TO THE PROJECT COORDINATOR TO COORDINATE DE-ENERGIZING & RE-ENERGIZING OF ELECTRICAL EQUIPMENT WITH MUN ELECTRICAL SHOP. 48 HOURS NOTICE FOR CIRCUIT BREAKERS. 72 HOURS NOTICE FOR PANELS.
3. BOTH THE ELECTRICAL CONTRACTOR AND MUN ELECTRICAL SHALL BE PRESENT TO PERFORM LOCK OUT/TAG OUT AND VERIFY ZERO ENERGY STATE BEFORE WORK BEGINS. ENERGIZED ELECTRICAL WORK IS STRICTLY PROHIBITED.
4. PERFORM DEMOLITION WORK SHOWN AND/OR REQUIRED TO COMPLETE THE WORK. DO NOT ASSUME DEMOLITION DRAWINGS SHOW THE FULL EXTENT OF DEMOLITION WORK REQUIRED.
5. ELECTRICAL CONTRACTOR MUST REFER TO ARCHITECTURAL, MECHANICAL AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR EXTENT OF WORK AND COORDINATE OTHER TRADES AND GENERAL CONTRACTOR PRIOR TO THE COMMENCEMENT OF ANY WORK.
6. REVIEW DEMOLITION PLAN IN CONJUNCTION WITH ALL OTHER PLANS AND DETAILS. FURTHER DEMOLITION REQUIRED FOR NEW MECHANICAL AND ELECTRICAL CAN BE DETERMINED BASED ON NEW FLOOR PLAN LAYOUT AND SITE CONDITIONS. CHECK SITE DIMENSIONS AND CONDITIONS AND REPORT UNACCEPTABLE CONDITIONS TO PROJECT COORDINATOR FOR REMEDIAL INSTRUCTIONS PRIOR TO PROCEEDING WITH THE WORK.
7. ALL CIRCUIT BREAKER/PANEL SHUTDOWNS WILL REQUIRE MUN ELECTRICIAN PRESENT TO PROVIDE LOCK OUT/TAG OUT. CONTRACTOR SHALL CONTACT PROJECT COORDINATOR 48 HOURS IN ADVANCE TO SCHEDULE MUN ELECTRICIAN. LIVE ELECTRICAL WORK IS NOT PERMITTED. CONTRACTOR TO VERIFY ELECTRICAL CIRCUITS PRIOR TO START OF WORK.
8. ALL DATA DROPS NOTED TO BE REMOVED SHALL BE DISCONNECTED BY MUN FORCES PRIOR TO DEMOLITION WORK BY ELECTRICAL SUB-TRADE. CONTRACTOR SHALL CONTACT PROJECT COORDINATOR 48 HOURS IN ADVANCE TO NOTIFY/SCHEDULE DATA DROP DISCONNECTION. DO NOT CUT, OR DISCONNECT DATA CABLES.
9. REMOVE ALL WIRING BACK AND CONDUIT BACK TO NEAREST JUNCTION BOXES FOR RECEPTACLES, SWITCHES, ETC. THAT ARE INDICATED TO BE REMOVED, OR RELOCATED, UNLESS OTHERWISE NOTED.
10. ELECTRICAL CONTRACTOR IS RESPONSIBLE TO VERIFY INDICATED CIRCUITS AND TRACE OUT ANY UNKNOWN POWER AND LIGHTING CIRCUITS PRIOR TO START OF WORK.
11. REUSE EXISTING POWER AND LIGHTING CIRCUITS AS INDICATED. RE-ROUTE, EXTEND OR MODIFY POWER FEEDS AS REQUIRED TO FACILITATE ALL NEW LOCATIONS OF LIGHT FIXTURES, ILLUMINATED EXIT SIGNS, LINE VOLTAGE DIMMER SWITCHES AND LOW VOLTAGE SWITCHES.
12. REUSE EXISTING POWER CIRCUITS AND RELAY CIRCUITS TO ENSURE SEPARATE LIGHT SWITCHING CONTROL IN INDIVIDUAL ROOM, OR MULTIPLE SWITCHING CONTROL AS INDICATED.
13. CONTRACTOR TO ENSURE THAT ALL EXISTING OR NEW CONDUIT PENETRATIONS THROUGH THE FLOOR AND WALLS ARE APPROPRIATELY FIRE STOPPED.
14. SUPPLY AND INSTALL NEW STAINLESS STEEL TYPE COVER PLATES THROUGHOUT FOR ALL NEW AND EXISTING RECEPTACLES, SWITCHES AND JUNCTION BOXES.

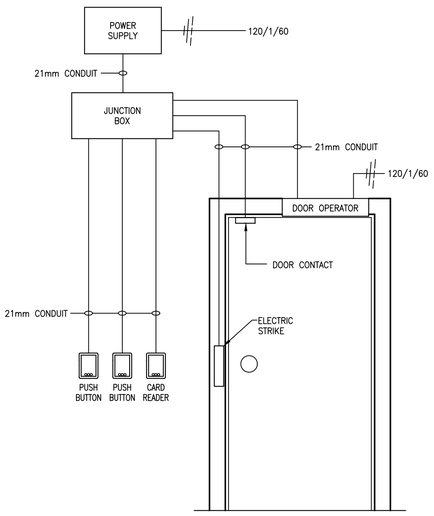


NOTES:
2. RUN AND RIGIDLY SUPPORT 4C #300 MCM TECK90 IN CEILING SPACE FROM ELECTRICAL ROOM 2059 TO NEW PANEL IN CLOSET 2079. TECK TO PENETRATE MECHANICAL 2075 ROOM WALL IN CEILING SPACE NEAR EXISTING CONDUITS TO ACCESS CORRIDOR 2C02A CEILING. EXACT LOCATION TO BE VERIFIED ON SITE.
3. SUPPLY AND INSTALL POWER SUPPLY FOR NEW DDC PANEL IN EN-2075 AS INDICATED. SUPPLY AND INSTALL DUAL DATA OUTLET C/W 27mm CONDUIT c/w PULL ROPE BACK TO EN-2078. CABLING BY OTHERS. SEE KEY PLAN FOR LOCATION.

KEY PLAN – LEVEL 2

SCALE : 1:750

0m 10m 20m 30m 40m 50m 60m 70m 80m 90m 100m

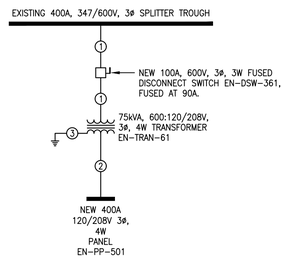


ELECTRICAL CONTRACTOR TO SUPPLY AND INSTALL OUTLET BOXES FOR CARD READERS AND PUSHBUTTONS, CONDUIT (C/W PULL ROPE) FOR ALL LOW VOLTAGE WIRING AND CONDUIT AND WIRING FOR ALL LINE VOLTAGE. COORDINATE EXACT REQUIREMENTS WITH DOOR HARDWARE SUPPLIER PRIOR TO ROUGH-IN.

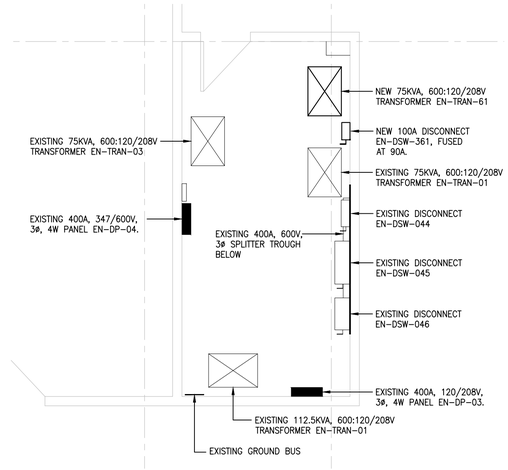
DOOR EN-2078 HARDWARE ROUGH-IN DETAIL

FEEDER SCHEDULE

① 3 #3 RW90 COPPER CONDUCTORS + #8 TW BOND IN 35mm CONDUIT.
② 4C#300 MCM CU TECK 90 CABLE.
③ 1-#6 AWG BARE COPPER GROUND IN 21mm CONDUIT BACK TO EXISTING GROUND BUS IN ELECTRICAL ROOM EN-2059.



PART ELECTRICAL SINGLE LINE DIAGRAM



ENLARGED ELECTRICAL ROOM EN-2059

SCALE: 1:50

0m 1m 2m 3m 4m 5m

A - DETAIL
B - LOCATION/DRAWING No.
C - DRAWING No.

No.	REVISION	DATE (Y/M/D)
0	ISSUED FOR TENDER	2025/11/28

GENERAL NOTES

1. DRAWINGS TO BE READ AS A SET.
2. DO NOT SCALE FROM DRAWINGS.
3. THE CONTRACTOR IS TO VERIFY ALL DIMENSIONS AND SITE CONDITIONS PRIOR TO SUBMISSION OF TENDERS.
4. ALL DEFICIENCIES FOUND IN THIS DRAWING IS TO BE BROUGHT TO THE ATTENTION OF THE FACILITIES ENGINEERING AND DEVELOPMENT OFFICE OF THE DEPARTMENT OF FACILITIES MANAGEMENT, MEMORIAL UNIVERSITY OF NEWFOUNDLAND, PRIOR TO THE SUBMISSION OF THE TENDERS.

PERMITS REQUIRED FOR ELECTRICAL WORK AT MEMORIAL UNIVERSITY OF NEWFOUNDLAND SHALL BE OBTAINED FROM SERVICE NL EFFECTIVE FEBRUARY 1, 2020 AND MADE AVAILABLE TO MUN REPRESENTATIVES UPON REQUEST. SEE STIPULATED PRICE CONTRACT GENERAL CONDITIONS SECTION 2.18.0 LAWS, NOTICES, PERMITS AND FEES.

MECHANICAL & ELECTRICAL CONSULTANT:

CORE ENGINEERING INC.

57 Pippy Place
St. John's, NL, Canada A1B 4H8

Tel (709) 722-8613
Fax (709) 722-0910

CORE PROJECT #: 25-3595

REGISTERED PROFESSIONAL ENGINEERS NEWFOUNDLAND & LABRADOR
PEGL Newfoundland and Labrador PROFESSIONAL ENGINEER IN GEOLOGY
GREGORY S. TUCKER
SIGNATURE
2025/11/28
DATE

PROVINCE OF NEWFOUNDLAND
pegnl PROFESSIONAL ENGINEERS AND GEOSCIENTISTS NEWFOUNDLAND & LABRADOR
PERMIT HOLDER
This Permit Allows
CORE ENGINEERING INC.
MIRC: 04896
To practice Professional Engineering in Newfoundland and Labrador.
Permit No. as issued by PEGNL D0209 which is valid for the year 2025.

MEMORIAL UNIVERSITY

Department of Facilities Management

This University was raised by the people of Newfoundland as a memorial to the fallen in the great wars, 1914-1918, 1939-1945, that in freedom of learning, their cause and sacrifice might not be forgotten.

- Dedication plaque, Arts & Administration Building, St. John's Campus

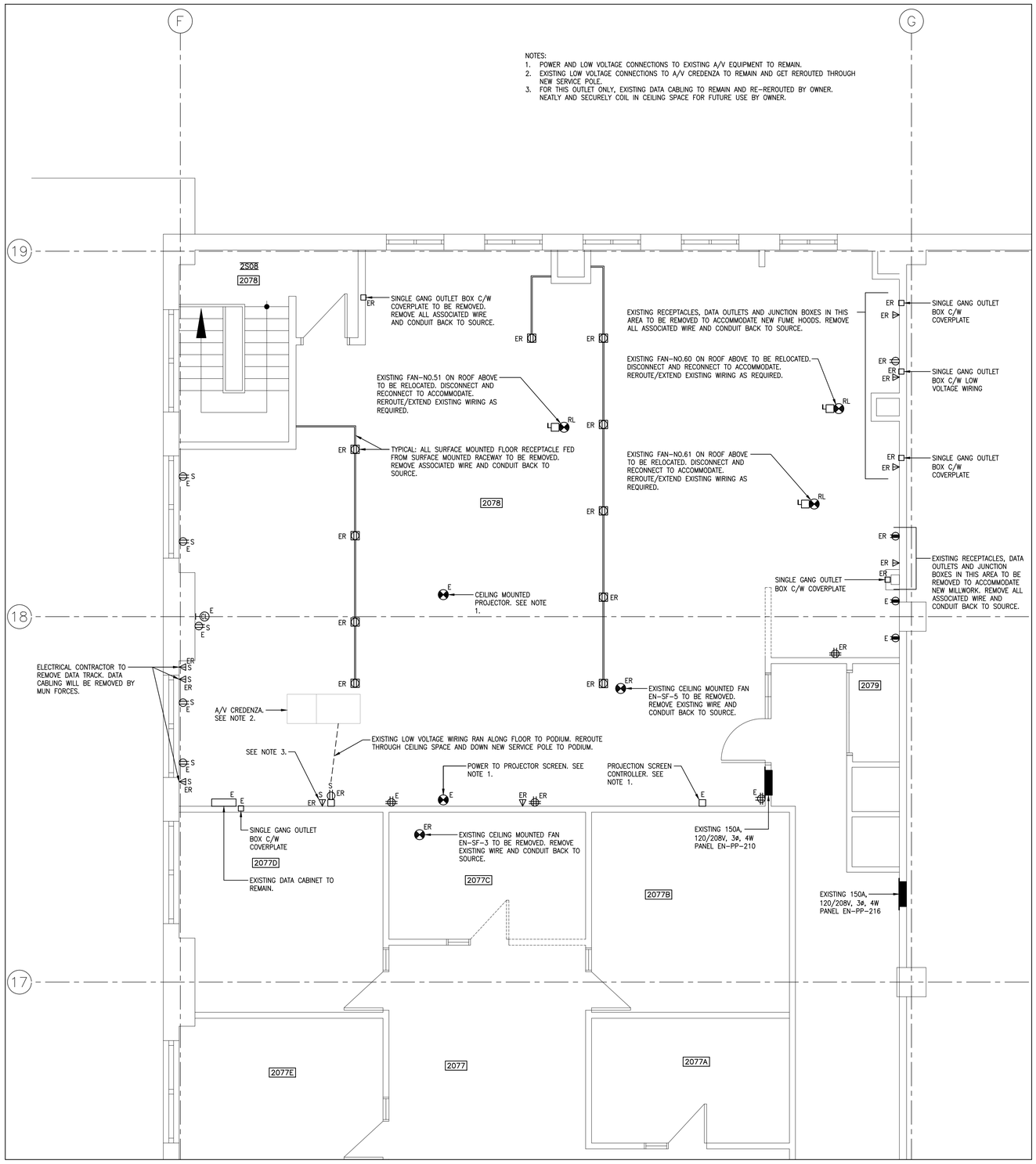
PROJECT NAME:

S.J. CAREW BUILDING (FACULTY OF ENGINEERING & APPLIED SCIENCE) RENOVATIONS TO EN-2078 Project #: EN-164-21

DRAWING TITLE:

ELECTRICAL LEGEND, KEY PLAN, PART PLAN, PART SINGLE LINE AND DETAILS

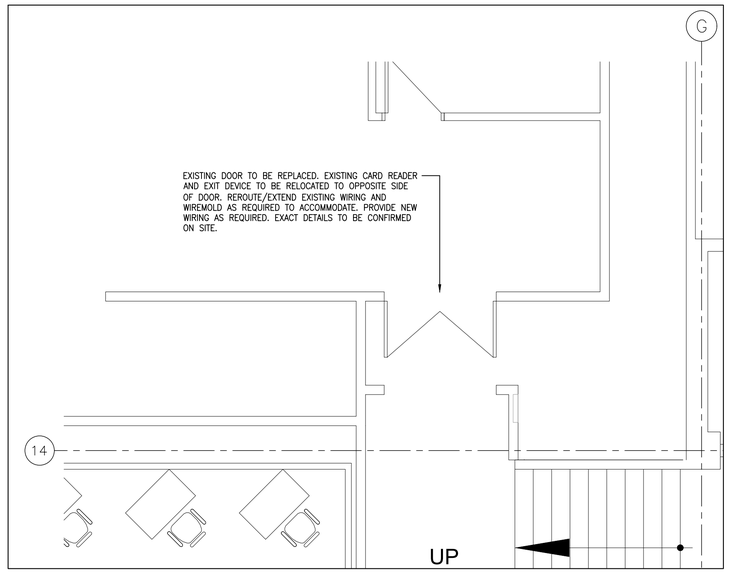
DESIGNED: GT	DRAWN: RG
REVIEWED: GT	APPROVED: GT
SCALE: AS NOTED	DATE: NOVEMBER 2025
PROJECT No. **EN-164-21**	DRAWING No. E-0



POWER AND MISC SYSTEMS DEMOLITION FLOOR PLAN

SCALE: 1:50

0m 1m 2m 3m 4m 5m



DOOR HARDWARE PART PLAN

SCALE: 1:50

0m 1m 2m 3m 4m 5m

A - DETAIL
B - LOCATION/DRAWING No.
C - DRAWING No.

No.	REVISION	DATE (Y/M/D)
0	ISSUED FOR TENDER	2025/11/28

GENERAL NOTES

1. DRAWINGS TO BE READ AS A SET.
2. DO NOT SCALE FROM DRAWINGS.
3. THE CONTRACTOR IS TO VERIFY ALL DIMENSIONS AND SITE CONDITIONS PRIOR TO SUBMISSION OF TENDERS.
4. ALL DEFICIENCIES FOUND IN THIS DRAWING IS TO BE BROUGHT TO THE ATTENTION OF THE FACILITIES ENGINEERING AND DEVELOPMENT OFFICE OF THE DEPARTMENT OF FACILITIES MANAGEMENT, MEMORIAL UNIVERSITY OF NEWFOUNDLAND, PRIOR TO THE SUBMISSION OF THE TENDERS.

PERMITS REQUIRED FOR ELECTRICAL WORK AT MEMORIAL UNIVERSITY OF NEWFOUNDLAND SHALL BE OBTAINED FROM SERVICE NL EFFECTIVE FEBRUARY 1, 2020 AND MADE AVAILABLE TO MUN REPRESENTATIVES UPON REQUEST. SEE STIPULATED PRICE CONTRACT GENERAL CONDITIONS SECTION 2.18.0 LAWS, NOTICES, PERMITS AND FEES.

MECHANICAL & ELECTRICAL CONSULTANT:

CORE ENGINEERING INC.

57 Pippy Place
St. John's, NL, Canada A1B 4H8

Tel (709) 722-8613
Fax (709) 722-0910

CORE PROJECT #: 25-3595

REGISTERED PROFESSIONAL ENGINEER — NEWFOUNDLAND & LABRADOR
PEGNL Newfoundland and Labrador
GREGORY S. TUCKER
SIGNATURE
2025/11/28
DATE

PROVINCE OF NEWFOUNDLAND
pegnl
PERMIT HOLDER
This Permit Allows
CORE ENGINEERING INC.
MIRC: 04896
To practice Professional Engineering in Newfoundland and Labrador.
Permit No. as issued by PEGNL D0209
which is valid for the year 2025.

MEMORIAL UNIVERSITY

Department of Facilities Management

This University was raised by the people of Newfoundland as a memorial to the fallen in the great wars, 1914-1918, 1939-1945, that in freedom of learning, their cause and sacrifice might not be forgotten.

- Dedication plaque, Arts & Administration Building, St. John's Campus

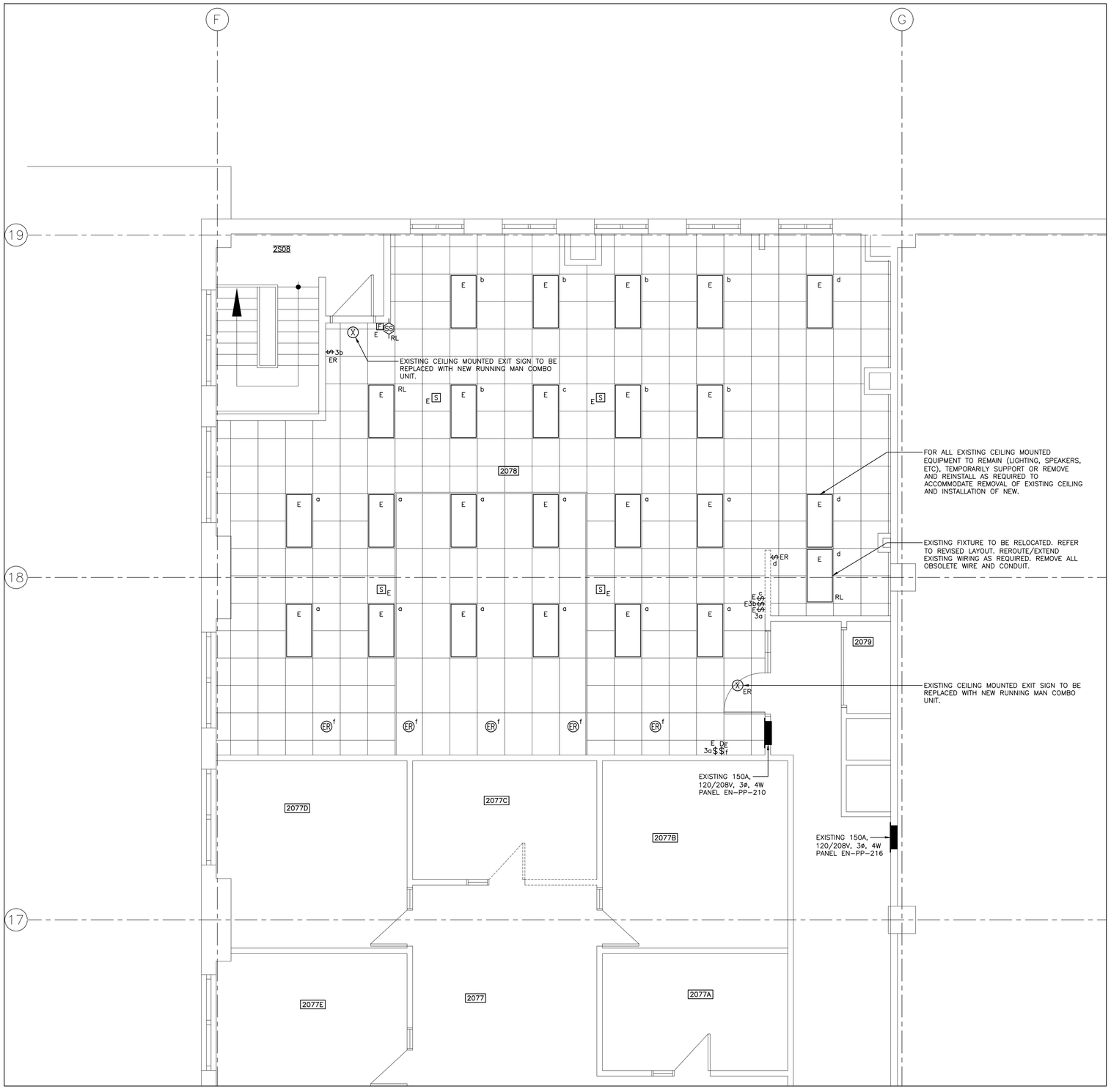
PROJECT NAME:

S.J. CAREW BUILDING (FACULTY OF ENGINEERING & APPLIED SCIENCE) RENOVATIONS TO EN-2078 Project #: EN-164-21

DRAWING TITLE:

POWER AND MISC SYSTEMS DEMOLITION FLOOR PLAN

DESIGNED:	DRAWN:
GT	RG
REVIEWED:	APPROVED:
GT	GT
SCALE:	DATE:
AS NOTED	NOVEMBER 2025
PROJECT No.	DRAWING No.
EN-164-21	E-1.0



SCALE: 1:50

0m 1m 2m 3m 4m 5m

A - DETAIL
B - LOCATION/DRAWING No.
C - DRAWING No.

No.	REVISION	DATE (Y/M/D)
0	ISSUED FOR TENDER	2025/11/28

GENERAL NOTES

1. DRAWINGS TO BE READ AS A SET.
2. DO NOT SCALE FROM DRAWINGS.
3. THE CONTRACTOR IS TO VERIFY ALL DIMENSIONS AND SITE CONDITIONS PRIOR TO SUBMISSION OF TENDERS.
4. ALL DEFICIENCIES FOUND IN THIS DRAWING IS TO BE BROUGHT TO THE ATTENTION OF THE FACILITIES ENGINEERING AND DEVELOPMENT OFFICE OF THE DEPARTMENT OF FACILITIES MANAGEMENT, MEMORIAL UNIVERSITY OF NEWFOUNDLAND, PRIOR TO THE SUBMISSION OF THE TENDERS.

PERMITS REQUIRED FOR ELECTRICAL WORK AT MEMORIAL UNIVERSITY OF NEWFOUNDLAND SHALL BE OBTAINED FROM SERVICE NL EFFECTIVE FEBRUARY 1, 2020 AND MADE AVAILABLE TO MUN REPRESENTATIVES UPON REQUEST. SEE STIPULATED PRICE CONTRACT GENERAL CONDITIONS SECTION 2.18.0 LAWS, NOTICES, PERMITS AND FEES.

MECHANICAL & ELECTRICAL CONSULTANT:

CORE ENGINEERING INC.
57 Pippy Place
St. John's, NL, Canada A1B 4H8
Tel (709) 722-8613
Fax (709) 722-0910

CORE PROJECT #: 25-3595

REGISTERED PROFESSIONAL ENGINEER — PEGNL Newfoundland and Labrador — GREGORY S. TUCKER — SIGNATURE — 2025/11/28 — DATE — NEWFOUNDLAND & LABRADOR

PROVINCE OF NEWFOUNDLAND
pegnl
PERMIT HOLDER
This Permit Allows
CORE ENGINEERING INC.
MIRC: 04896
To practice Professional Engineering in Newfoundland and Labrador.
Permit No. as issued by PEGNL D0209
which is valid for the year 2025.

MEMORIAL UNIVERSITY
Department of Facilities Management

This University was raised by the people of Newfoundland as a memorial to the fallen in the great wars, 1914-1918, 1939-1945, that in freedom of learning, their cause and sacrifice might not be forgotten.

- Dedication plaque, Arts & Administration Building, St. John's Campus

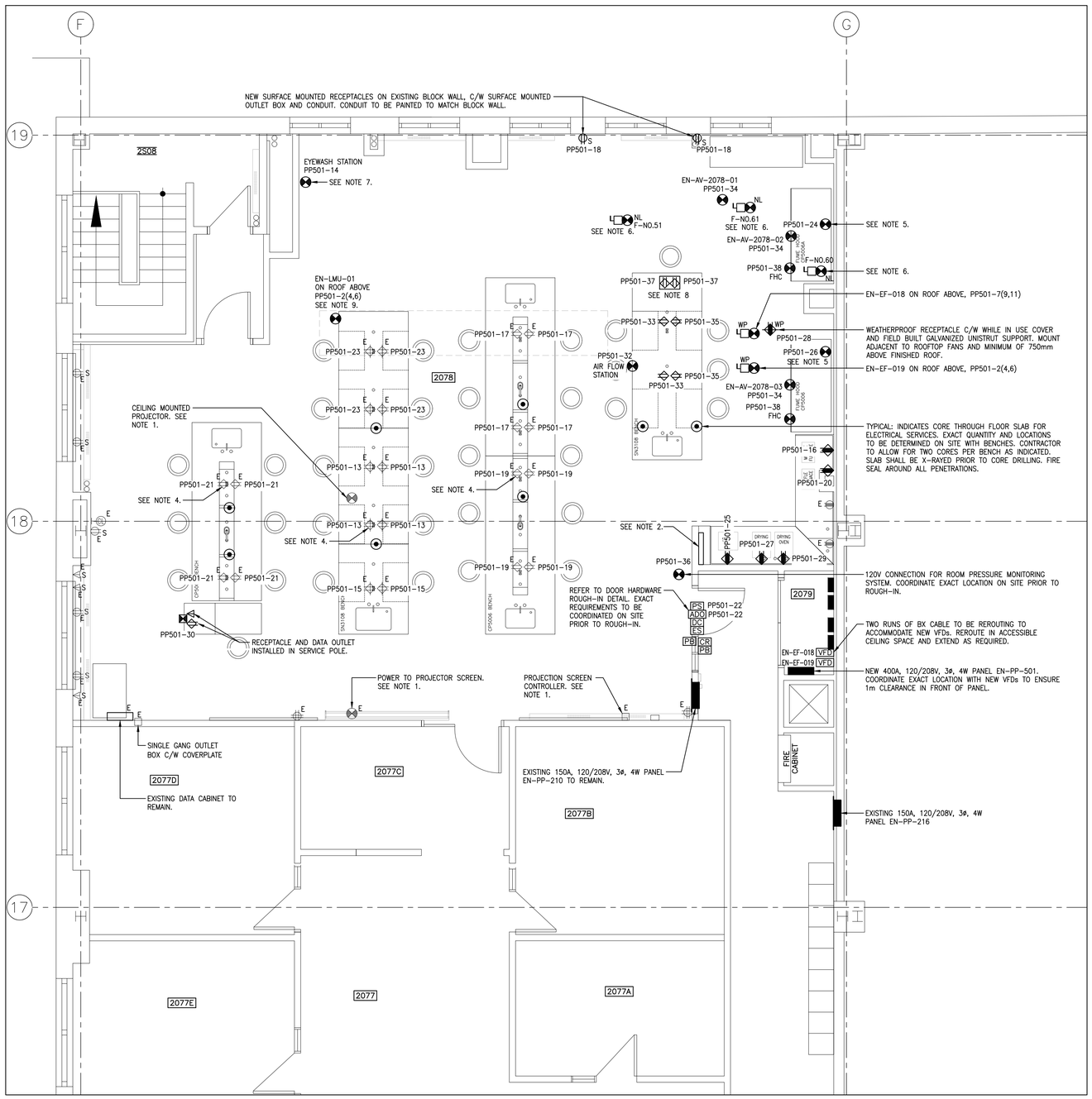
PROJECT NAME:

S.J. CAREW BUILDING (FACULTY OF ENGINEERING & APPLIED SCIENCE) RENOVATIONS TO EN-2078 Project #: EN-164-21

DRAWING TITLE:

LIGHTING AND FIRE ALARM SYSTEMS DEMOLITION FLOOR PLAN

DESIGNED:	DRAWN:
GT	RG
REVIEWED:	APPROVED:
GT	GT
SCALE:	DATE:
AS NOTED	NOVEMBER 2025
PROJECT No.	DRAWING No.
EN-164-21	E-2.0



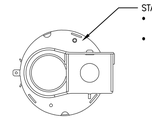
REVISED POWER AND MISC SYSTEMS FLOOR PLAN

SCALE: 1:50

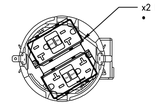
0m 1m 2m 3m 4m 5m

NOTES:
1. POWER AND LOW VOLTAGE CONNECTIONS TO EXISTING A/V EQUIPMENT TO REMAIN.
2. OUTLINE OF CHASE FOR POWER CONDUITS SERVING LAB BENCHES. SUPPLY AND INSTALL THE FOLLOWING CORES AND CONDUITS:
   - 1 x 21mm POWER CONDUIT TO FLOOR BOX BELOW HEIGHT ADJUSTABLE DESK (FEEDING TWO DUPLEX 20A RECEPTACLES, REFER TO FLOOR BOX DETAILS).
   - 8 x 27mm POWER CONDUITS FOR LAB BENCH POWER (2 PER BENCH AS INDICATED).
3. REFER TO LEVEL 2 KEY PLAN ON DWG E-0 FOR LOCATION OF NEW DDC PANEL AND ASSOCIATED 120V CIRCUIT.
4. BENCH TO BE C/W RECEPTACLES AS SHOWN.
5. GENERAL CONTRACTOR IS RESPONSIBLE TO DISASSEMBLE FUME HOODS AND CABINETS IN EXISTING LOCATIONS (CHEMISTRY PHYSICS BUILDING, C-5006 AND C-5006A) AND TRANSPORT FUME HOODS AND CABINETS TO NEW LOCATION (EN-2078) AS SHOWN. ELECTRICAL SERVICES WILL BE DISCONNECTED BY MUN FORCES. ELECTRICAL CONTRACTOR TO PROVIDE HARDWIRED POWER AND LIGHTING FEEDS TO FUME HOODS IN NEW LOCATION AS INDICATED.
6. NEW LOCATION OF EXISTING ROOFTOP FANS BEING RELOCATED. DISCONNECT AND RECONNECT TO ACCOMMODATE. REROUTE/EXTEND EXISTING WIRING AS REQUIRED.
7. GENERAL CONTRACTOR IS RESPONSIBLE TO DISASSEMBLE COMBO SHOWER/EYEWASH STATION IN EXISTING LOCATION (SCIENCE BUILDING, SN-3123) AND TRANSPORT THE COMBO SHOWER/EYETWASH STATION TO NEW LOCATION (EN-2078) AS SHOWN. ELECTRICAL SERVICES WILL BE DISCONNECTED BY MUN FORCES. ELECTRICAL CONTRACTOR TO PROVIDE ALL 120V INTERCONNECTING WIRING FOR STROBE AND HORN.
8. FIRE RATED POKE THROUGH FLOOR BOX BELOW HEIGHT ADJUSTABLE DESK. SEE FLOOR BOX DETAIL, THIS DRAWING. EXACT LOCATION TO BE COORDINATED WITH DESK.
9. EXISTING STRUCTURE BEING REVISED TO ACCOMMODATE NEW ROOFTOP UNIT. ELECTRICAL CONTRACTOR IS RESPONSIBLE TO REROUTE EXISTING CONDUITS TO ACCOMMODATE.

BOTTOM FEED PLATES AND HOUSING ASSEMBLIES



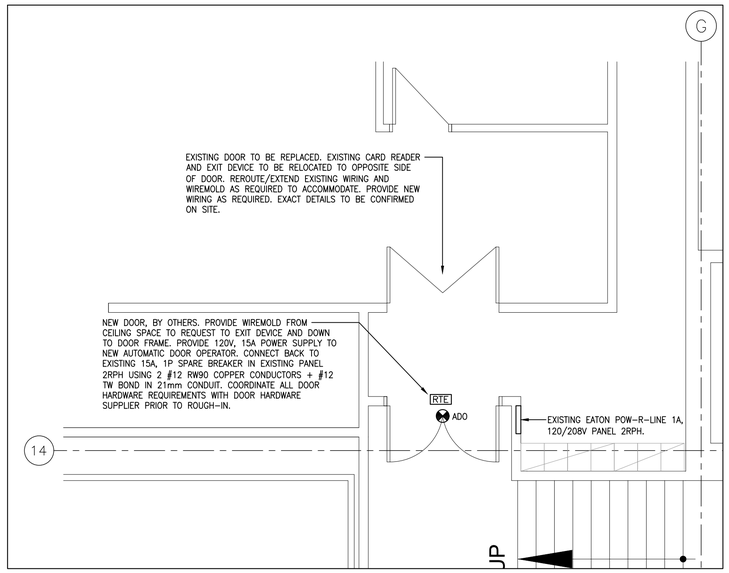
TOP FEED PLATES AND HOUSING ASSEMBLIES



CONTRACTOR TO SUPPLY AND INSTALL 'LEGRAND EVOLUTION SERIES 4" POKE-THRU DEVICE'; MODEL NUMER 4ATCP4RGY. SUBMIT SHOP DRAWINGS FOR APPROVAL.

DEVICE TO COME COMPLETE WITH THE COVER AND STEM PRE-ASSEMBLED TOGETHER. CONTRACTOR TO SUPPLY AND INSTALL ALL MOUNTING PLATES, HOUSING ASSEMBLIES, RECEPTACLES, CONDUIT, FASTENERS, AND HARDWARE UNLESS NOTED OTHERWISE.

DEVICE TO BE UL FIRE RATED FOR UP TO 2HR RATED FLOORS.



DOOR HARDWARE PART PLAN

SCALE: 1:50

0m 1m 2m 3m 4m 5m

A - DETAIL
B - LOCATION/DRAWING No.
C - DRAWING No.

No.	REVISION	DATE (Y/M/D)
0	ISSUED FOR TENDER	2025/11/28

GENERAL NOTES

1. DRAWINGS TO BE READ AS A SET.
2. DO NOT SCALE FROM DRAWINGS.
3. THE CONTRACTOR IS TO VERIFY ALL DIMENSIONS AND SITE CONDITIONS PRIOR TO SUBMISSION OF TENDERS.
4. ALL DEFICIENCIES FOUND IN THIS DRAWING IS TO BE BROUGHT TO THE ATTENTION OF THE FACILITIES ENGINEERING AND DEVELOPMENT OFFICE OF THE DEPARTMENT OF FACILITIES MANAGEMENT, MEMORIAL UNIVERSITY OF NEWFOUNDLAND, PRIOR TO THE SUBMISSION OF THE TENDERS.

PERMITS REQUIRED FOR ELECTRICAL WORK AT MEMORIAL UNIVERSITY OF NEWFOUNDLAND SHALL BE OBTAINED FROM SERVICE NL EFFECTIVE FEBRUARY 1, 2020 AND MADE AVAILABLE TO MUN REPRESENTATIVES UPON REQUEST. SEE STIPULATED PRICE CONTRACT GENERAL CONDITIONS SECTION 2.18.0 LAWS, NOTICES, PERMITS AND FEES.

MECHANICAL & ELECTRICAL CONSULTANT:

CORE ENGINEERING INC.

57 Pippy Place
St. John's, NL, Canada A1B 4H8

Tel (709) 722-8613
Fax (709) 722-0910

CORE PROJECT #: 25-3595

PROFESSIONAL ENGINEER REGISTERED PEGNL Newfoundland and Labrador GREGORY S. TUCKER SIGNATURE 2025/11/28 DATE NEWFOUNDLAND & LABRADOR

PROVINCE OF NEWFOUNDLAND
pegnl
PERMIT HOLDER
This Permit Allows
CORE ENGINEERING INC.
MIRC: 04896
To practice Professional Engineering in Newfoundland and Labrador.
Permit No. as issued by PEGNL D0209
which is valid for the year 2025.

MEMORIAL UNIVERSITY

Department of Facilities Management

This University was raised by the people of Newfoundland as a memorial to the fallen in the great wars, 1914-1918, 1939-1945, that in freedom of learning, their cause and sacrifice might not be forgotten.

- Dedication plaque, Arts & Administration Building, St. John's Campus

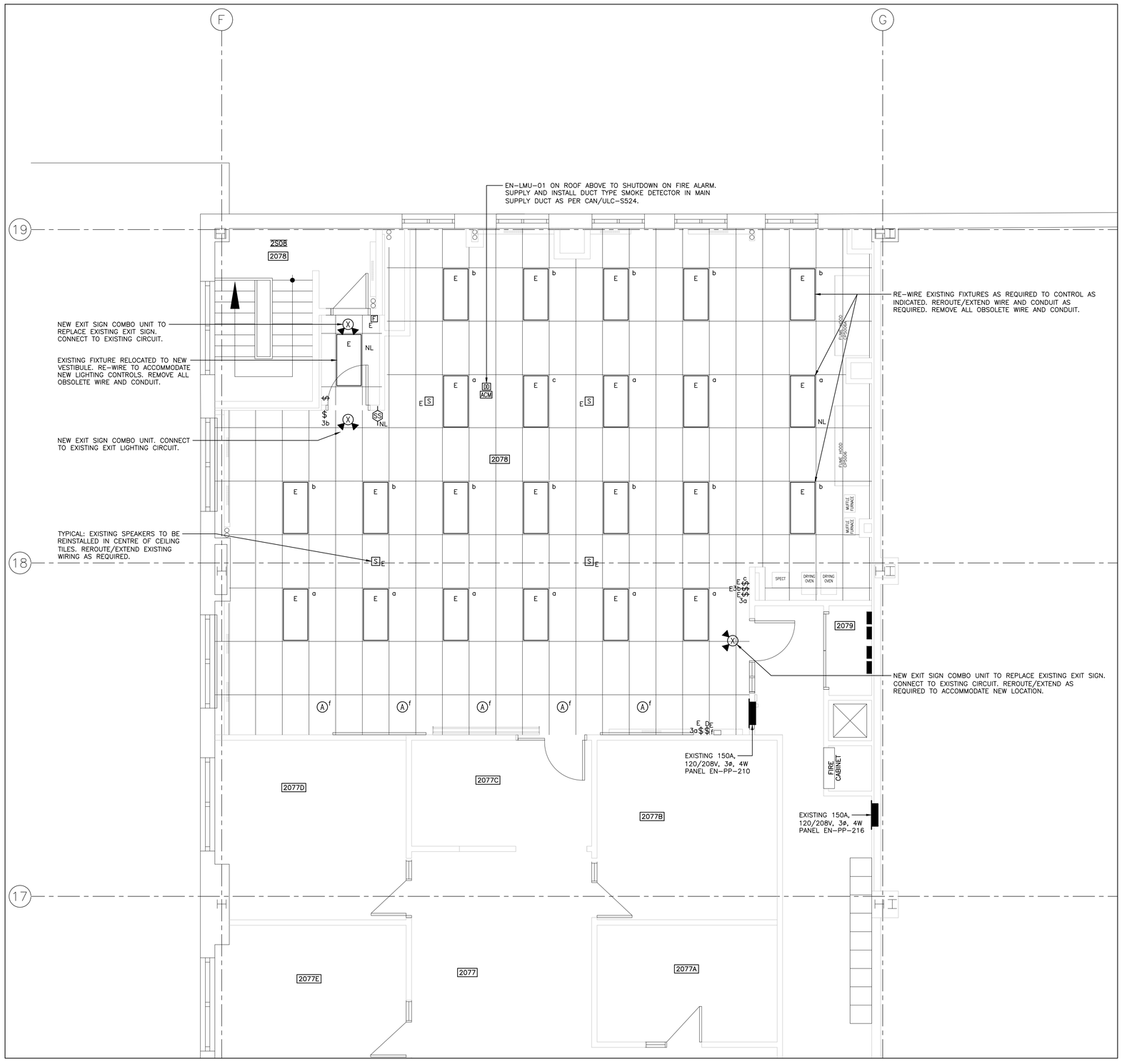
PROJECT NAME:

S.J. CAREW BUILDING (FACULTY OF ENGINEERING & APPLIED SCIENCE) RENOVATIONS TO EN-2078
Project #: EN-164-21

DRAWING TITLE:

REVISED POWER AND MISC SYSTEMS FLOOR PLAN

DESIGNED:	DRAWN:
GT	RG
REVIEWED:	APPROVED:
GT	GT
SCALE:	DATE:
AS NOTED	NOVEMBER 2025
PROJECT No.	DRAWING No.
EN-164-21	E-3.0



A - DETAIL
B - LOCATION/DRAWING No.
C - DRAWING No.

No.	REVISION	DATE (Y/M/D)
0	ISSUED FOR TENDER	2025/11/28

GENERAL NOTES

1. DRAWINGS TO BE READ AS A SET.
2. DO NOT SCALE FROM DRAWINGS.
3. THE CONTRACTOR IS TO VERIFY ALL DIMENSIONS AND SITE CONDITIONS PRIOR TO SUBMISSION OF TENDERS.
4. ALL DEFICIENCIES FOUND IN THIS DRAWING IS TO BE BROUGHT TO THE ATTENTION OF THE FACILITIES ENGINEERING AND DEVELOPMENT OFFICE OF THE DEPARTMENT OF FACILITIES MANAGEMENT, MEMORIAL UNIVERSITY OF NEWFOUNDLAND, PRIOR TO THE SUBMISSION OF THE TENDERS.

PERMITS REQUIRED FOR ELECTRICAL WORK AT MEMORIAL UNIVERSITY OF NEWFOUNDLAND SHALL BE OBTAINED FROM SERVICE NL EFFECTIVE FEBRUARY 1, 2020 AND MADE AVAILABLE TO MUN REPRESENTATIVES UPON REQUEST. SEE STIPULATED PRICE CONTRACT GENERAL CONDITIONS SECTION 2.18.0 LAWS, NOTICES, PERMITS AND FEES.

MECHANICAL & ELECTRICAL CONSULTANT:

CORE ENGINEERING INC.
57 Pippy Place
St. John's, NL, Canada A1B 4H8
Tel (709) 722-8613
Fax (709) 722-0910

CORE PROJECT #: 25-3595

REGISTERED PROFESSIONAL ENGINEER
PEGNL Newfoundland and Labrador
GREGORY S. TUCKER
SIGNATURE
2025/11/28
DATE
NEWFOUNDLAND & LABRADOR

PROVINCE OF NEWFOUNDLAND
pegnl
PERMIT HOLDER
This Permit Allows
CORE ENGINEERING INC.
MIRC: 04896
To practice Professional Engineering in Newfoundland and Labrador.
Permit No. as issued by PEGNL D0209
which is valid for the year 2025.

MEMORIAL UNIVERSITY
Department of Facilities Management

This University was raised by the people of Newfoundland as a memorial to the fallen in the great wars, 1914-1918, 1939-1945, that in freedom of learning, their cause and sacrifice might not be forgotten.

- Dedication plaque, Arts & Administration Building, St. John's Campus

PROJECT NAME:

S.J. CAREW BUILDING (FACULTY OF ENGINEERING & APPLIED SCIENCE) RENOVATIONS TO EN-2078
Project #: EN-164-21

DRAWING TITLE:

REVISED LIGHTING AND FIRE ALARM SYSTEMS FLOOR PLAN

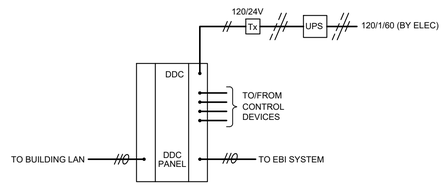
DESIGNED:	DRAWN:
GT	RG
REVIEWED:	APPROVED:
GT	GT
SCALE:	DATE:
AS NOTED	NOVEMBER 2025
PROJECT No.	DRAWING No.
EN-164-21	E-4.0

CONTROL LEGEND

TS	TEMPERATURE SENSOR DUCT MOUNTED/PIPE MOUNTED. PROVIDE IMMERSION WELL FOR PIPE MOUNTED APPLICATION. PROVIDE CORRECT LENGTH ELEMENT FOR AVERAGING (AVG) APPLICATION.
VFD	VARIABLE FREQUENCY MOTOR DRIVE BY CONTROLS CONTRACTOR, ULC LABELED WITH FULL GRAPHIC INTERFACE, PROGRAMMABLE GENERAL ALARM OUTPUT, RATED FOR +/- 10% OF MOTOR VOLTAGE, SIZED TO SUIT MOTOR LOAD, BACNET INTERFACE NEMA 1 ENCLOSURE, C/W BUILT-IN DISC. SWITCH, HAND-OFF-AUTO CONTROL WITH MANUAL SPEED ADJUSTMENT. MOUNT 1400mm AFF.
Tx	CONTROL TRANSFORMER - PROVIDE 120/24 VAC CONTROL TRANSFORMERS AS REQUIRED, 'MARCUS' OR EQUAL, SIZE TO SUIT LOADS
UPS	UNINTERRUPTIBLE POWER SUPPLY WITH MIN. 10 MINUTES BATTERY BACKUP AND TRUE GRID POWER ISOLATION WITH ALL POWER TO DEVICES FROM BATTERY AND TRUE SIN WAVE INVERTER. SIZE TO SUIT LOAD.
DDC	DDC PANEL, MOUNT IN EEMAC1 ENCLOSURE C/W CONTROL TRANSFORMER. DDC SYSTEM TO MATCH EXISTING.
DPS	DIFFERENTIAL STATIC PRESSURE SENSOR. SIZE TO SUIT APPLICATION. RANGE: 0-500 Pa ACCURACY +/- 2%, 4-20mA OUTPUT, AND FIELD CALIBRATION C/W LCD DISPLAY FOR FIELD MONITORING. WHERE MOUNTED ON BUILDING EXTERIOR TO BE IN WEATHERTIGHT ENCLOSURE.
RPS	ROOM PRESSURE SENSOR FOR ALL SPACES MONITORED (SEE FLOOR PLAN/SCHEMATICS FOR LOCATIONS). MOUNT 2200mm A.F.F. PRICE MODEL SRPS OR EQUAL. COORDINATE EXACT LOCATION AND HEIGHT ON SITE.
DSW	MAGNETIC DOOR SWITCH. ANTEC MODEL DCS
PMT	TOUCH SCREEN ROOM PRESSURE MONITOR WITH 127X93 PIXEL SCREEN, AUDIBLE/VISUAL ALARM, BACNET CONNECTION. ANTEC LUME PMT OR APPROVED EQUAL. MOUNT 1200mm A.F.F.
AF	AIRFLOW MEASURING STATION SIZED TO SUIT DUCT AND AIRFLOW. ACCURACY: +/- 1% 4-20mA OUTPUT. EBTRON OR APPROVED EQUAL. CALIBRATE DURING COMMISSIONING.
RSS	REMOTE START STOP WITH PILOT LIGHT
	NON-FUSED DISC. SWITCH BY ELECTRICAL TRADE UNLESS OTHERWISE NOTED.
	SHIELDED WIRE - PROVIDE SHIELDED WIRE WHERE SHOWN AND WHERE NECESSARY
	INDICATES # OF WIRES - CONTRACTOR TO VERIFY AND INCLUDE ADEQUATE WIRING IN PRICING TO SUIT DEVICE/APPLICATION
DO	DIGITAL OUTPUT SIGNAL FROM THE DDC PANEL
DI	DIGITAL INPUT SIGNAL TO THE DDC PANEL
AO	ANALOG OUTPUT SIGNAL FROM THE DDC PANEL
AI	ANALOG INPUT SIGNAL TO THE DDC PANEL
T E	EXISTING PNEUMATIC THERMOSTAT TO REMAIN
T S	NON- ADJUSTABLE DDC ROOM TEMPERATURE SENSOR, C/W STAINLESS STEEL PLATE. MOUNT 1200mm A.F.F.
FHC	FUME HOOD CONTROLLER TOUCHSCREEN WITH HYBRID SENSING THAT COMBINES BOTH SASH POSITION AND SIDEWALL SENSING. LOCAL AUDIBLE / VISUAL ALARMS WITH EMERGENCY BUTTON; BACnet MS / TP INTERGRATION TO BAS; 24 VAC CLASS 2 POWER. EXPOSE STATUS/ ALARMS / FACE-VELOCITY POINTS TO DDC. ACCEPTABLE PRODUCT. ANTEC CONTROLS CAVA FUME HOOD CONTROLLER.

NOTES:

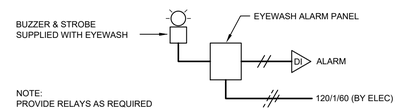
1. ALL CONTROL DEVICES AND ASSOCIATED LOW VOLTAGE WIRING SHALL BE SUPPLIED AND INSTALLED BY THE MECHANICAL TRADE UNLESS OTHERWISE NOTED.
2. MAIN DDC CONTROLLER TO BE MOUNTED IN NEMA1 ENCLOSURE OF SIZE TO SUIT.
3. PROVIDE LAMECOID LABELS FOR ALL EQUIPMENT.
4. ALL DAMPERS AND ACTUATORS SHOWN WITHIN AIR HANDLING UNITS TO BE SUPPLIED WITH UNITS.
5. ALL EXISTING CONTROL SYSTEM IS HONEYWELL CONTROLS. PROVIDE ALL SOFTWARE & HARDWARE AS REQUIRED



NOTES:
1. PROVIDE CONTROL TRANSFORMERS, RELAYS AS REQ'D FOR ALL CONTROL DEVICES.
2. LOCATE PANELS, TRANSFORMERS, RELAYS, ETC IN EEMAC1 ENCLOSURES.
3. ALL COMMUNICATION NETWORKS SHALL BE SEPARATED BY SPEED AND COMMUNICATION PROTOCOLS. PROVIDE SWITCHES, GATEWAYS, AND CONTROLLERS TO CONNECT.

DDC SYSTEM ARCHITECTURE

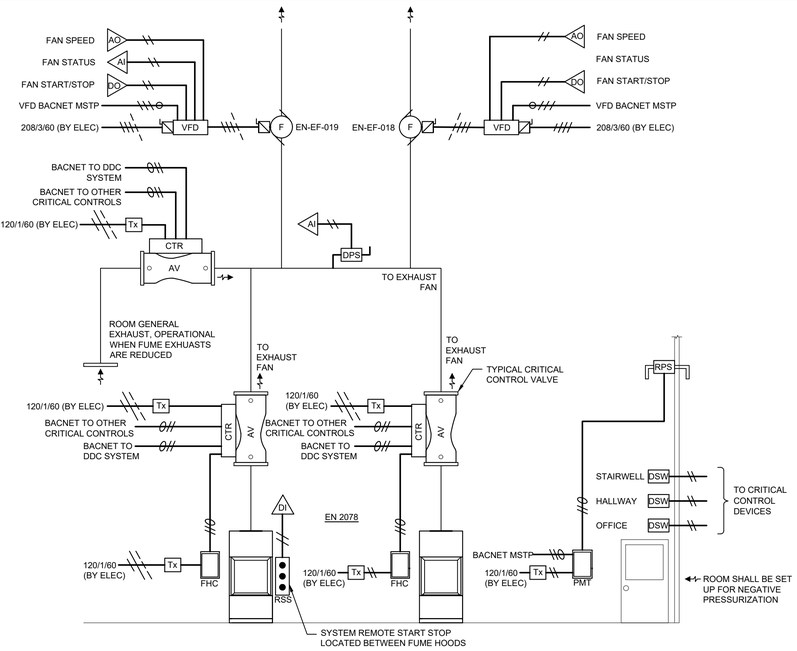
SCALE: N.T.S.



NOTE:
PROVIDE RELAYS AS REQUIRED

EYEWASH ALARM SCHEMATIC

SCALE: N.T.S.



ROOM CRITICAL CONTROL

SCALE: N.T.S.

NEW

PANEL EN-PP-501 — **PANEL SCHEDULE**

TYPE CIRCUIT BREAKER

RATING 120/208V, 3ø, 4W, 400A

STANDARD OF ACCEPTANCE EATON PRL3a

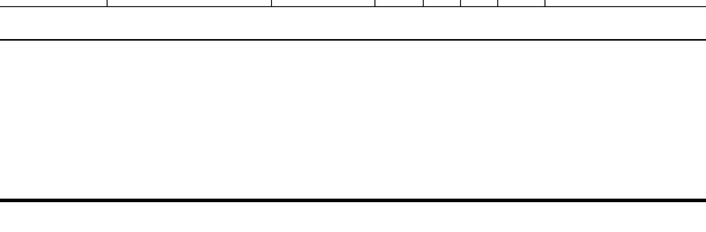
MINIMUM INTERUPTING CAPACITY ____ R.M.S. SYMM AMPERES

NOTES * LOCK ON DEVICE + INDICATES GFCI FLUSH MOUNT

CIRCUIT DESCRIPTION	LOAD WATTS	WIRE SIZE	BRKR SIZE	CIRCUIT NO.		BRKR SIZE	WIRE SIZE	LOAD WATTS	CIRCUIT DESCRIPTION
EN-LMU-01	14000		150	1	2	25		1275	
	14000	1/0	A	3	4	A	10	1275	EN-EF-019
	14000		3P	5	6	3P		1275	
EN-EF-018	1275		25	7	8	15			
	1275	10	A	9	10	A			SPARE
	1275		3P	11	12	3P			
LAB BENCH RECEPTACLES	400	12	20	13	14	15	12	100	EYEWASH STATION
LAB BENCH RECEPTACLES	400	12	20	15	16	20	12	1450	COUNTER RECEPTACLE
LAB BENCH RECEPTACLES	400	12	20+	17	18	15	12	400	RECEPT - RM 2078
LAB BENCH RECEPTACLES	400	12	20+	19	20	20	12	1450	COUNTER RECEPTACLE
LAB BENCH RECEPTACLES	400	12	20+	21	22	15	12	400	AUTOMATIC DOOR OPERATOR/DOOR HARDWARE
LAB BENCH RECEPTACLES	400	12	20	23	24	20	12	1000	FUME HOOD RECEPTACLE
COUNTER RECEPTACLE	1200	12	20	25	26	20	12	1000	FUME HOOD RECEPTACLE
COUNTER RECEPTACLE	1200	12	20	27	28	20	12	200	ROOFTOP RECEPTACLE
COUNTER RECEPTACLE	1200	12	20	29	30	20	12	200	SERVICE POLE RECEPTACLE
DDC PANEL	200	12	15	31	32	15	12	100	AIR FLOW SWITCHES
LAB BENCH RECEPTACLES	400	12	20	33	34	15	12	100	EN-AV-2078-01/02/03
LAB BENCH RECEPTACLES	400	12	20	35	36	15	12	100	ROOM PRESSURE SENSOR
FLOOR BOX RECEPTACLES	400	12	20	37	38	15	12	100	FUME HOOD CONTROLLERS
SPARE			15	39	40	15			SPARE
SPARE			15	41	42	15			SPARE
SPARE			15	43	44	15			SPARE
SPARE			15	45	46	15			SPARE
SPARE			15	47	48	15			SPARE
SPARE			15	49	50	15			SPARE
SPARE			15	51	52	15			SPARE
SPARE			15	53	54	15			SPARE
SPARE			20	55	56	15			SPARE
SPARE			20	57	58	15			SPARE
SPARE			20	59	60	15			SPARE

PANEL LOCATION: ADJACENT EN-2078
FED FROM: EN-2059 (EN-TRAN-61)

CONNECTED LOAD (W): 63650
DEMAND LOAD (W): 48000



EN-LMU-1 AHU CONTROL DETAIL

SCALE: N.T.S.

LIGHTING FIXTURE SCHEDULE

TYPE	DESCRIPTION	STANDARD OF ACCEPTANCE	MOUNTING	VOLTS	LAMPS			REMARKS
					QUAN.	WATTS	TYPE	
A	LED DOWN LIGHT	EELIGHTING: UTP-R4283	CEILING RECESSED	120	1	12	LED	NEW TO REPLACE EXISTING. CONNECT TO EXISTING CIRCUITRY AND CONTROL. ENSURE COMPATIBILITY WITH EXISTING DIMMER OR PROVIDE NEW TO ACCOMMODATE NEW FIXTURES.
E	EXISTING LIGHTING FIXTURE TO REMAIN.							
ER	EXISTING LIGHTING FIXTURE TO BE REMOVED AND REPLACED WITH NEW. CONNECT NEW LIGHTING TO EXISTING CIRCUITRY AND CONTROL.							

A - DETAIL
B - LOCATION/DRAWING No.
C - DRAWING No.

No.	REVISION	DATE (Y/M/D)
0	ISSUED FOR TENDER	2025/11/28

GENERAL NOTES

1. DRAWINGS TO BE READ AS A SET.
2. DO NOT SCALE FROM DRAWINGS.
3. THE CONTRACTOR IS TO VERIFY ALL DIMENSIONS AND SITE CONDITIONS PRIOR TO SUBMISSION OF TENDERS.
4. ALL DEFICIENCIES FOUND IN THIS DRAWING IS TO BE BROUGHT TO THE ATTENTION OF THE FACILITIES ENGINEERING AND DEVELOPMENT OFFICE OF THE DEPARTMENT OF FACILITIES MANAGEMENT, MEMORIAL UNIVERSITY OF NEWFOUNDLAND, PRIOR TO THE SUBMISSION OF THE TENDERS.

PERMITS REQUIRED FOR ELECTRICAL WORK AT MEMORIAL UNIVERSITY OF NEWFOUNDLAND SHALL BE OBTAINED FROM SERVICE NL EFFECTIVE FEBRUARY 1, 2020 AND MADE AVAILABLE TO MUN REPRESENTATIVES UPON REQUEST. SEE STIPULATED PRICE CONTRACT GENERAL CONDITIONS SECTION 2.18.0 LAWS, NOTICES, PERMITS AND FEES.

MECHANICAL & ELECTRICAL CONSULTANT:

CORE ENGINEERING INC.
57 Pippy Place
St. John's, NL, Canada A1B 4H8
Tel (709) 722-8613
Fax (709) 722-0910

CORE PROJECT #: 25-3595

PROFESSIONAL ENGINEER — REGISTERED — PEGNL Newfoundland and Labrador — GREGORY S. TUCKER — SIGNATURE — 2025/11/28 — DATE — NEWFOUNDLAND & LABRADOR

PROVINCE OF NEWFOUNDLAND
pegnl
PERMIT HOLDER
This Permit Allows
CORE ENGINEERING INC.
MIRC: 04896
To practice Professional Engineering in Newfoundland and Labrador. Permit No. as issued by PEGNL D0209 which is valid for the year 2025.

MEMORIAL UNIVERSITY
Department of Facilities Management

This University was raised by the people of Newfoundland as a memorial to the fallen in the great wars, 1914-1918, 1939-1945, that in freedom of learning, their cause and sacrifice might not be forgotten.

- Dedication plaque, Arts & Administration Building, St. John's Campus

PROJECT NAME:

S.J. CAREW BUILDING (FACULTY OF ENGINEERING & APPLIED SCIENCE) RENOVATIONS TO EN-2078
Project #: EN-164-21

DRAWING TITLE:

CONTROL SCHEMATICS AND ELECTRICAL SCHEDULES

DESIGNED:	DRAWN:
GT	RG
REVIEWED:	APPROVED:
GT	GT
SCALE:	DATE:
AS NOTED	NOVEMBER 2025
PROJECT No.	DRAWING No.
EN-164-21	E-5.0

ELECTRICAL SPECIFICATION

1.0 GENERAL:

1.1 COMPLETE ELECTRICAL INSTALLATION SHALL CONFORM TO THE CANADIAN ELECTRICAL CODE C22.1–24 AND LOCAL BYLAWS CURRENTLY IN FORCE IN THE PROVINCE AND MUNICIPALITY.

1.2 ALL WORK SHALL BE PERFORMED BY PERSONNEL HAVING QUALIFICATIONS AS REQUIRED BY AN AUTHORITY HAVING JURISDICTION WHO ARE COMPETENT IN THEIR TRADE.

1.3 BEFORE SUBMITTING A PROPOSAL FOR THE WORK COVERED BY THE SPECIFICATIONS, EACH BIDDER SHALL VISIT AND INSPECT THE SITE OF THE PROPOSED WORK IN ORDER THAT THEY MAY BE THOROUGHLY FAMILIAR WITH THE SITE AND LOCAL CONDITIONS, WITH THE CHARACTER AND DETAIL OF THE BUILDING CONSTRUCTION AND WITH ALL MATTERS WHICH CAN, IN ANY WAY, AFFECT THE WORK COVERED BY THE SPECIFICATIONS. MAKE ALLOWANCE FOR REMOVAL OF EXISTING POWER/LIGHTING AND SYSTEMS THAT INTERFERES WITH NEW WORK. NO CLAIM WILL BE ENTERTAINED FOR ANY LABOR, MATERIALS OR OTHER EXTRAS THAT MAY BE REQUIRED FOR THE PROPER EXECUTION AND COMPLETION OF THE CONTRACT WHICH COULD HAVE BEEN DETERMINED BY SITE EXAMINATION.

1.4 PAYMENT FOR PERMITS AND DEPOSITS FOR THE WORK SHALL BE INCLUDED IN THE TENDER PRICE.

1.5 USE ONLY NEW CSA APPROVED MATERIALS EXCEPT WHERE SPECIFICALLY NOTED.

1.6 THE CONTRACTOR SHALL GUARANTEE ALL NEW MATERIALS AND WORKMANSHIP FOR A PERIOD OF ONE (1) YEAR FROM DATE OF COMPLETION OF THE WORK AND FINAL ACCEPTANCE BY THE OWNER.

1.7 SHOP DRAWINGS SHOWING THE DESIGN AND CONSTRUCTION OF ALL APPARATUS SHALL BE PROVIDED. ELECTRONIC COPIES OF DRAWINGS SHALL BE SUBMITTED FOR EXAMINATION. ALL SHOP DRAWINGS TO INCLUDE ELECTRICAL SUBCONTRACTORS REVIEW STAMP, NAME OF PROJECT AND SIGNATURE INDICATING ITEM HAS BEEN REVIEWED BY ELECTRICAL SUBCONTRACTOR PRIOR TO SUBMISSION. IF CORRECTIONS ARE REQUIRED, COPIES WILL BE RETURNED WITH CORRECTIONS NOTED. INCLUDE SHOP DRAWINGS FOR THE FOLLOWING:

.1 PANEL BOARDS
.2 TRANSFORMERS
.3 DISCONNECTS
.4 WIRING DEVICES
.5 EXIT SIGNS
.6 LIGHTING
.7 FLOOR BOXES

1.8 PROVIDE "AS–BUILT" DRAWINGS TO INDICATE ACTUAL CIRCUIT NUMBERS TO ALL ELECTRICAL EQUIPMENT SHOWN ON THE DRAWINGS AND ALL EXISTING REMAINING EQUIPMENT.

1.9 THIS CONTRACTOR SHALL PROVIDE PROPER PROTECTION FOR ALL EQUIPMENT, FIXTURES, MATERIALS, ETC. DURING THE CONSTRUCTION PERIOD. UPON COMPLETION OF THE WORK ALL PROTECTIVE MATERIALS, DIRT, RUBBISH AND DEBRIS DUE TO THE WORK SHALL BE REMOVED FROM THE SITE.

1.10 CONTRACTOR SHALL SUPPLY AND INSTALL ALL MATERIALS EXCEPT AS OTHERWISE SPECIFIED.

1.11 IDENTIFY ELECTRICAL EQUIPMENT WITH LAMACOID NAMEPLATES 3mm THICK PLASTIC ENGRAVING SHEET, BLACK FACE, WHITE CORE, MECHANICALLY ATTACHED WITH SELF TAPPING SCREWS. WORDING ON NAMEPLATES AND LABELS TO BE APPROVED BY ENGINEER BEFORE MANUFACTURE.

1.12 CSA AND MANUFACTURERS LABELS MUST BE VISIBLE AND LEGIBLE AFTER EQUIPMENT IS INSTALLED.

2.0 COORDINATION

2.1 COORDINATE WORK WITH WORK OF OTHER DIVISIONS TO AVOID CONFLICT.

2.2 LOCATE DISTRIBUTION SYSTEMS, EQUIPMENT AND MATERIALS TO PROVIDE MINIMUM INTERFERENCE AND MAXIMUM USABLE SPACE.

2.3 WHERE INTERFERENCE OCCURS, OWNER MUST APPROVE RELOCATION OF EQUIPMENT AND MATERIALS REGARDLESS OF INSTALLATION ORDERS.

2.4 NOTWITHSTANDING THE REVIEW OF SHOP DRAWINGS, THIS DIVISION MAY BE REQUIRED TO RELOCATE ELECTRICAL EQUIPMENT WHICH INTERFERES WITH THE EQUIPMENT OF OTHER TRADES, DUE TO LACK OF COORDINATION BY THIS DIVISION. THE COST OF THIS RELOCATION SHALL BE THE RESPONSIBILITY OF THIS DIVISION. THE OWNER SHALL DECIDE THE EXTENT OF THE RELOCATION REQUIRED.

3.0 SAFETY

3.1 NO WORK SHALL BE CARRIED OUT ON ANY LIVE EQUIPMENT. DISCONNECT POWER COMPLETELY TO ALL EQUIPMENT BEFORE PROCEEDING WITH WORK ON THAT EQUIPMENT. UTILIZE LOCK–OUTS & TAG–OUTS ON ALL EQUIPMENT WHICH IS BEING WORKED ON.

4.0 WORK IN EXISTING AREAS:

4.1 THE CONTRACTOR SHALL DISCONNECT AND REMOVE ALL ELECTRICAL DEVICES NOT BEING REUSED, AND TURN OVER TO OWNER'S REPRESENTATIVE ON SITE.

4.2 IN AREAS WHERE EXISTING DEVICES ARE BEING REMOVED, THE CONTRACTOR SHALL ENSURE THAT A SAFE AND WORKING SYSTEM IS MAINTAINED TO ALL REMAINING DEVICES.

4.3 THE ELECTRICAL CONTRACTOR SHALL CLEAN AND REFURBISH ALL EXISTING DEVICES THAT ARE TO REMAIN AND/OR BE RELOCATED. EXTEND CONDUIT AND WIRE TO SUIT.

4.4 IF ANY CIRCUITS ARE DAMAGED OR INTERRUPTED DURING CONSTRUCTION, CIRCUITS SHALL BE EXTENDED AND RECONNECTED AS REQUIRED TO MAINTAIN EXISTING DEVICES AND EQUIPMENT IN SERVICE.

4.5 RELOCATE ALL EXISTING JUNCTION BOXES, CONDUITS, DEVICES, ETC. AS REQUIRED TO ACCOMMODATE DEMOLITION OF EXISTING AND CONSTRUCTION OF NEW WALL & CEILING ASSEMBLIES.

GENERAL CONTROL NOTES:

1. ALL CONTROL WIRING 50 VOLTS & LESS TO BE SUPPLIED AND INSTALLED BY MECHANICAL.
2. MECHANICAL CONTRACTOR TO PROVIDE ALL CONTROL TRANSFORMERS AND RELAYS AS REQUIRED TO COMPLETE ALL CONTROLS.

5.0 DEMOLITION:

5.1 PERFORM ALL REQUIRED DEMOLITION. DO NOT LEAVE POWERED WIRING EXPOSED IN DEMOLISHED AREAS.

5.2 VISIT SITE TO DETERMINE FULL EXTENT OF DEMOLITION WORK.

5.3 REMOVE ALL ELECTRICAL EQUIPMENT DEEMED OBSOLETE BY RENOVATION.

5.4 OWNER TO HAVE FIRST RIGHT OF REFUSAL FOR ALL EQUIPMENT BEING REMOVED. ALL OTHER OBSOLETE ELECTRICAL EQUIPMENT TO BE REMOVED FROM SITE BY DIVISION 26.

5.5 REMOVE WIRING ASSOCIATED WITH OBSOLETE ELECTRICAL EQUIPMENT BACK TO SOURCE.

6.0 FIRE RATING PENETRATIONS:

6.1 MAINTAIN FIRE RATING AROUND CONDUITS PASSING THROUGH WALLS AND CEILINGS.

6.2 USE 3M BRAND, OR EQUAL, FIRE BARRIER PRODUCTS AT EACH PENETRATION.

6.3 STANDARD OF ACCEPTANCE FOR FIRE BARRIER PRODUCTS SHALL BE 3M #CP25 FIRE BARRIER CAULK, #303 PUTTY, #FS195 WRAP AND #CS195 SHEET.

7.0 WIRING METHODS:

7.1 FOR GENERAL PURPOSE WIRING: RW90 COPPER CONDUCTORS IN EMT CONDUIT UNLESS OTHERWISE NOTED. TECK90 SHALL BE PERMISSIBLE ONLY AS NOTED.

7.2 UTILIZE CONCRETE OR MASONRY BOXES AS APPROPRIATE.

7.3 USE TYPE TW INSULATED GREEN GROUND/BOND CONDUCTOR IN ALL CONDUITS FOR CIRCUITS OPERATING AT OVER 30 VOLTS.

7.4 THE ELECTRICAL WIRING SYSTEM AND VARIOUS ELECTRICAL EQUIPMENT TO BE GROUNDED IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE C22.1–24. PROVIDE GROUND WIRE IN ALL CONDUITS.

7.5 EXCEPT AS NOTED RUN ALL CONDUIT PARALLEL AND PERPENDICULAR TO BUILDING LINES. SUPPORT ALL CONDUIT USING APPROVED STRAPS AND HANGARS. TIE WIRE IS NOT ACCEPTABLE FOR SUPPORTING CONDUIT.

7.6 WIRE AND CABLES TO BE RUN CONCEALED AT ALL TIMES, UNLESS OTHERWISE STATED.

7.7 MINIMUM WIRE SIZE: #12 AWG. MINIMUM CONDUIT SIZE: 21mm.

7.8 PERFORM SPLICES ON #8 AWG AND SMALLER WIRES USING 3M–SCOTHLOC OR IDEAL–WIRENUT CONNECTORS.

7.9 LUGS, TERMINALS AND SCREWS USED FOR TERMINATION OF WIRING TO BE SUITABLE FOR EITHER COPPER OR ALUMINUM CONDUCTORS.

8.0 WIRING DEVICES:

8.1 120V RECEPTACLES: SPEC GRADE 15 AND 20 AMP DUPLEX U–GROUND TYPE. STANDARD OF ACCEPTANCE: HUBBELL BR SERIES.

8.2 COVER PLATE: WHITE NYLON OR AS INDICATED.

9.0 OUTLET BOXES

9.1 BOXES ARE TO BE FLUSH MOUNTED, UNLESS NOTED OTHERWISE.

9.2 WHERE DEVICES ARE SHOWN GROUPED, MOUNT BOXES WITH MAXIMUM 50mm SPACING. PROVIDE ADDITIONAL BLOCKING AS REQUIRED.

9.3 DO NOT INSTALL OUTLETS BACK TO BACK IN WALL. ALLOW MINIMUM 150mm HORIZONTAL CLEARANCE BETWEEN BOXES.

10.0 DISCONNECT SWITCHES

10.1 HEAVY DUTY DISCONNECT SWITCHES ABLE TO BE PADLOCKED INTO ON OR OFF POSITION WITH 3 LOCKS, LEVER HANDLE.

10.2 ENCLOSURE: NEMA 1 FOR INTERIOR, NEMA 3R FOR EXTERIOR.

10.3 FUSIBLE OR NON–FUSIBLE AS INDICATED.

10.4 IDENTIFICATION AS PER 1.11.

10.5 MECHANICALLY INTERLOCKED DOOR.

11.0 LIGHTING:

11.1 PROVIDE FIXTURES AS INDICATED IN SCHEDULE COMPLETE WITH ALL LAMPS, DRIVERS, LENS, SUSPENSION HARDWARE AND ALL OTHER ACCESSORIES REQUIRED TO COMPLETE INSTALLATION.

11.2 PROVIDE NEW SWITCHING AS INDICATED. DO NOT INSTALL SWITCHES BACK TO BACK IN WALL. ALLOW MINIMUM 150mm HORIZONTAL CLEARANCE BETWEEN BOXES.

11.3 PROVIDE NEW EXIT LIGHTING FIXTURES C/W REMOTE HEADS AS FOLLOWS:
.1 MOUNTING: WALL/CEILING
.2 SELF POWERED WITH INTERNAL BATTERY
.3 120/347VAC OPERATION
.4 CONSTRUCTION TO CANC860–01 STANDARD
.5 STANDARD OF ACCEPTANCE: REFER TO ELECTRICAL LEGEND

12.0 PANEL BOARDS – BREAKER TYPE

12.1 PANEL BOARDS
.1 ALL PANEL BOARDS MUST BE AS PER CSA C22.2 NO.29, AND PRODUCT OF ONE MANUFACTURER.
.2 ALL NEW PANEL BOARDS IN THE WORK AREA TO BE PAINTED AS FOLLOWS. CONFIRM COLORS WITH OWNER PRIOR TO PAINTING. PROVIDE NEW LAMACOID LABELS FOR ALL PANEL BOARDS:

EQUIPMENT SYSTEM	COLOR	PANTONE
12500+ V NORMAL	BRIGHT YELLOW	12–0752 BUTTERCUP
4160V ESSENTIAL	DARK ORANGE	17–1461 ORANGEADE
480 TO 600V NORMAL	LIGHT BLUE	13–5410 ICED AQUA
480 TO 600V ESSENTIAL	DARK BLUE	17–4530 BARRIER REEF
120 TO 240V NORMAL	LIGHT GREEN	14–0425 BEACHNUT
120 TO 240V ESSENTIAL	DARK GREEN	18–0430 AVOCADO
FIRE ALARM	BRIGHT RED	–

.3 SEQUENCE THE PHASE BUSSING WITH THE ODD NUMBERED BREAKERS ON THE LEFT AND THE EVEN NUMBERED BREAKERS ON THE RIGHT, WITH EACH BREAKER BEING IDENTIFIED BY A PERMANENT NUMBER IDENTIFICATION AS TO THE CIRCUIT NUMBER AND PHASE.
.4 PROVIDE THE PANEL BOARDS WITH THE MAINS RATINGS, THE NUMBER OF CIRCUITS, AND THE NUMBER AND SIZE OF THE BRANCH CIRCUIT BREAKERS AS INDICATED.
.5 PROVIDE TWO (2) KEYS FOR EACH PANEL BOARD WITH A DOOR.
.6 PROVIDE A COPPER MAIN BUS OF THE VOLTAGE AND AMPERE RATINGS AS INDICATED.
.7 PROVIDE A FULL SIZE NEUTRAL FOR 600V BOARDS WHERE IT IS REQUIRED ON THE DRAWING.
.8 PROVIDE BOLT–ON BRANCH BREAKERS AS INDICATED.
.9 PROVIDE COPPER GROUND BUS.
.10 HOT–DIP GALVANIZE THE PANEL BOARD TUBS AFTER FABRICATION OR ACID ETCH, PRIME AND APPLY TWO (2) FINISH COATS OF AIR DRIED ASA 61 GREY ENAMEL TO THEM.
.11 ACID ETCH, PRIME AND APPLY TOW (2) FINISH COATS OF AIR DRIED ASA 61 GREY ENAMEL TO THE PANEL BOARD TRIMS AND DOORS EXCEPT AS OTHERWISE INDICATED.
.12 PROVIDE DOORS WITH CONCEALED HINGES, LOCKS AND HARDWARE FOR ALL PANEL BOARDS, EXCEPT FOR DISTRIBUTION PANEL BOARDS UNLESS OTHERWISE INDICATED. FOR RECESSED PANEL BOARDS, PROVIDE CHROME PLATED HARDWARE WHERE EXPOSED.

12.2 BREAKERS
.1 PROVIDE MOLDED CASE CIRCUIT BREAKER (BOLT–ON OR PLUG–ON CONNECTION AS INDICATED), QUICK–MAKE–QUICK–BREAK TYPE, FOR MANUAL AND AUTOMATIC OPERATION WITH TEMPERATURE COMPENSATION FOR 40 DEGREE CELSIUS AMBIENT AS INDICATED.
.2 PROVIDE MULTI–POLE BREAKERS WITH A COMMON–TRIP DEVICE AND SINGLE HANDLE.
.3 PROVIDE A SEPARATELY MOUNTED MAIN BREAKER, WHERE INDICATED, AT THE TOP OR THE BOTTOM OF THE PANEL BOARD TO SUIT THE CABLE ENTRY. WHEN MOUNTED VERTICALLY, THE HANDLE'DOWN' POSITION SHOULD BE THE "OPEN" POSITION.
.4 PROVIDE PADLOCKING DEVICES ON CIRCUIT BREAKERS WHERE NOTED TO LOCK THE HANDLE OF A BREAKER IN THE "ON" OR "OFF" POSITION WITH THE TRIP UNITS TO REMAIN FREE TO FUNCTION AND PROTECT THE CIRCUIT FROM BOTH OVERLOAD AND SHORT CIRCUIT CONDITIONS.
.5 PROVIDE LOCK–ON DEVICES FOR BRANCH BREAKERS CONTROLLING FIRE ALARM, CLOCK OUTLET, EMERGENCY, DOOR SUPERVISORY, INTERCOM, STAIRWAY, EXIT, SHUNT TRIP AND NIGHT LIGHT CIRCUITS AND AS INDICATED.
.6 PROVIDE MOLDED CASE CIRCUIT BREAKERS TO OPERATE AUTOMATICALLY BY MEANS OF THERMAL AND MAGNETIC TRIPPING DEVICES TO PROVIDE AN INVERSE TIME VS. CURRENT TRIPPING CHARACTERISTICS.
.7 WHERE A 15A OR 20A CIRCUIT BREAKER IS USED AS THE ONLY SWITCHING DEVICE FOR LUMINARIES, THE CIRCUIT BREAKER SHALL BE SUITABLE FOR SWITCHING DUTY AND SHALL BE MARKED "SWD".

12.3 EQUIPMENT IDENTIFICATION
.1 PROVIDE A SIZE 8 NAMEPLATE FOR EACH PANEL BOARD ENGRAVED AS INDICATED.
.2 PROVIDE A SIZE 8 NAMEPLATE FOR EACH CIRCUIT IN DISTRIBUTION PANEL BOARDS ENGRAVED AS INDICATED. PROVIDE A COMPLETE TYPEWRITTEN CIRCUIT DIRECTORY WITH A CLEAR PLASTIC COVER SHOWING THE LOCATION AND LOAD OF EACH CIRCUIT FOR ALL OTHER PANEL BOARDS.
.3 FOR DISTRIBUTION PANEL BOARDS, PROVIDE LAMACOID NAMEPLATES NEXT TO EACH CIRCUIT BREAKER, ENGRAVED WITH THE NAME OF THE LOADS SUPPLIED BY THE CIRCUIT BREAKER.

12.4 INSTALLATION
.1 LOCATE PANEL BOARDS AS INDICATED AND MOUNT SECURELY, PLUMB, TRUE AND SQUARE, TO ADJOINING SURFACES.
.2 INSTALL SURFACE MOUNTED PANEL BOARDS ON PLYWOOD BACKBOARDS. WHERE PRACTICAL, GROUP PANEL BOARDS, AND OTHER ELECTRICAL EQUIPMENT IF PRESENT ON COMMON BACKBOARD
.3 MOUNT THE PANEL BOARDS 60" (1500MM) ABOVE THE FINISHED FLOOR LEVEL TO THE PANEL BOARD CENTERLINE UNLESS OTHERWISE INDICATED. WHERE TWO (2) OR MORE DIFFERENT SIZE PANEL BOARDS ARE INSTALLED ADJACENT TO EACH OTHER, ALIGN THE TOPS OF THE PANEL BOARDS TO SUIT THE TALLEST PANEL BOARD.
.4 CONNECT THE LOADS TO THE BRANCH BREAKERS AS INDICATED.
.5 CONNECT THE NEUTRAL CONDUCTORS TO THE COMMON NEUTRAL BUS.
.6 CONNECT THE ISOLATED GROUND CONDUCTORS TO THE ISOLATED GROUND BUS, IF PROVIDED.
.7 CONNECT THE MAIN FEEDER TO THE MAIN LUGS OR TO THE MAIN BREAKER AND TO THE NEUTRAL BUS AND THE ISOLATED GROUND BUS, IF PROVIDED

13.0 DRY TYPE TRANSFORMERS:

13.1 DRY TYPE TRANSFORMERS TO BE ALUMINUM WINDING, THREE–CORE DESIGN TO LATEST EDITION OF CSA C802.2, TYPE ANN.

13.2 RATING: KVA AS INDICATED; 3 PHASE; 600Vac DELTA PRIMARY; 120/208Vac WYE SECONDARY C/W STANDARD TAPS.

13.3 ENCLOSURE: SPRINKLER PROOF.

13.4 INSULATION: CLASS H, 150°C TEMPERATURE RISE.

13.5 COLOR TO BE AS PER 11.1.2, BASED ON PRIMARY VOLTAGE.

14.0 EXECUTION

14.1 INSTALL MATERIALS IN STRICT ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS.

14.2 PROVIDE INSPECTION CERTIFICATE UPON COMPLETION OF THIS WORK.

14.3 FIELD QUALITY CONTROL:
.1 CONDUCT THE FOLLOWING TESTS:
.1 POWER DISTRIBUTION SYSTEM INCLUDING PHASING, VOLTAGE GROUNDING AND LOAD BALANCE.
.2 CIRCUITS ORIGINATING FROM BRANCH DISTRIBUTION PANELS.
.3 MOTORS AND ASSOCIATED CONTROLS EQUIPMENT. INCLUDE SEQUENCED OPERATION OF SYSTEMS WHERE APPLICABLE.

.2 FURNISH MANUFACTURERS CERTIFICATE OR LETTER CONFIRMING THAT THE INSTALLATION, AS IT PERTAINS TO EACH SYSTEM, HAS BEEN INSTALLED TO MANUFACTURERS INSTRUCTIONS.

.3 INSTALLATION RESISTANCE TESTING:
.1 MEGGER CIRCUITS, FEEDERS AND EQUIPMENT UP TO 350V WITH 500V INSTRUMENT, UP TO 600V WITH 1000V INSTRUMENT.
.2 CHECK RESISTANCE TO GROUND BEFORE TESTING.
.3 CARRY OUT CHECK IN PRESENCE OF ENGINEER.
.4 PROVIDE INSTRUMENTS, METERS, EQUIPMENT AND PERSONAL REQUIRED TO CONDUCT TESTS.
.5 SUBMIT TEST RESULTS FOR ENGINEER'S REVIEW.

15.0 STANDARD OF ACCEPTANCE

15.1 THE ITEMS NAMED MEET IN ALL RESPECT PERFORMANCE, QUALITY AND WORKMANSHIP AND ARE ACCEPTABLE TO THE OWNER WITHOUT QUALIFICATIONS.

15.2 EQUIPMENT PROPOSED SHALL MEET THE SAME STANDARDS OF PERFORMANCE, QUALITY AND WORKMANSHIP.

16.0 FIRE ALARM

16.1 EXISTING FIRE ALARM PANEL IS EDWARDS.

16.2 PROVIDE RE–VERIFICATION OF SYSTEM ONCE COMPLETED. INCLUDE ALL COSTS IN TENDER PRICE.

16.3 WIRING METHOD TO BE FAS 105 FT4 RATED FIRE ALARM CABLE IN EMT THROUGHOUT FOR INITIATION AND SIGNAL CCTS.

A - DETAIL
B - LOCATION/DRAWING No.
C - DRAWING No.

No.	REVISION	DATE (Y/M/D)
0	ISSUED FOR TENDER	2025/11/28

GENERAL NOTES

1. DRAWINGS TO BE READ AS A SET.
2. DO NOT SCALE FROM DRAWINGS.
3. THE CONTRACTOR IS TO VERIFY ALL DIMENSIONS AND SITE CONDITIONS PRIOR TO SUBMISSION OF TENDERS.
4. ALL DEFICIENCIES FOUND IN THIS DRAWING IS TO BE BROUGHT TO THE ATTENTION OF THE FACILITIES ENGINEERING AND DEVELOPMENT OFFICE OF THE DEPARTMENT OF FACILITIES MANAGEMENT, MEMORIAL UNIVERSITY OF NEWFOUNDLAND, PRIOR TO THE SUBMISSION OF THE TENDERS.

PERMITS REQUIRED FOR ELECTRICAL WORK AT MEMORIAL UNIVERSITY OF NEWFOUNDLAND SHALL BE OBTAINED FROM SERVICE NL EFFECTIVE FEBRUARY 1, 2020 AND MADE AVAILABLE TO MUN REPRESENTATIVES UPON REQUEST. SEE STIPULATED PRICE CONTRACT GENERAL CONDITIONS SECTION 2.18.0 LAWS, NOTICES, PERMITS AND FEES.

MECHANICAL & ELECTRICAL CONSULTANT:

CORE ENGINEERING INC.
57 Pippy Place
St. John's, NL, Canada A1B 4H8
Tel (709) 722-8613
Fax (709) 722-0910

CORE PROJECT #: 25-3595

REGISTERED PROFESSIONAL ENGINEERS NEWFOUNDLAND & LABRADOR
PEGNL Newfoundland and Labrador
GREGORY S. TUCKER
SIGNATURE
2025/11/28
DATE

PROVINCE OF NEWFOUNDLAND
pegnl
PERMIT HOLDER
This Permit Allows
CORE ENGINEERING INC.
MIRC: 04896
To practice Professional Engineering in Newfoundland and Labrador.
Permit No. as issued by PEGNL D0209 which is valid for the year 2025.

MEMORIAL UNIVERSITY
Department of Facilities Management

This University was raised by the people of Newfoundland as a memorial to the fallen in the great wars, 1914-1918, 1939-1945, that in freedom of learning, their cause and sacrifice might not be forgotten.

- Dedication plaque, Arts & Administration Building, St. John's Campus

PROJECT NAME:

S.J. CAREW BUILDING (FACULTY OF ENGINEERING & APPLIED SCIENCE) RENOVATIONS TO EN-2078 Project #: EN-164-21

DRAWING TITLE:

ELECTRICAL SPECIFICATION

DESIGNED:	DRAWN:
GT	RG
REVIEWED:	APPROVED:
GT	GT
SCALE:	DATE:
AS NOTED	NOVEMBER 2025
PROJECT No.	DRAWING No.
EN-164-21	E-6.0

STRUCTURAL STEEL AND DECK NOTES

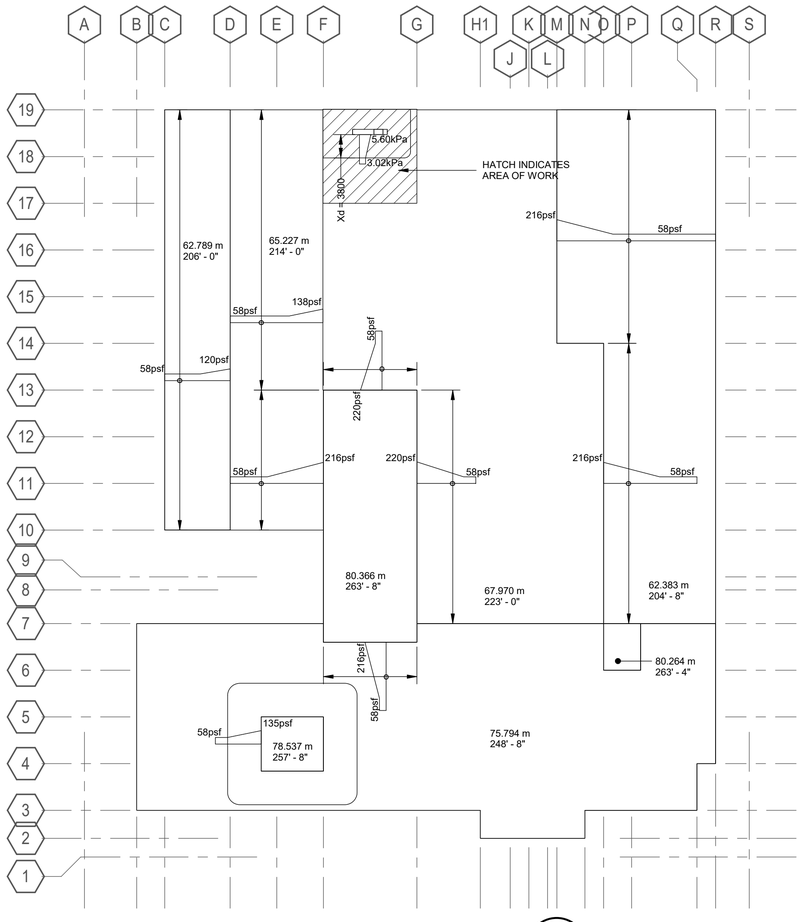
1. ALL STRUCTURAL STEEL SHALL CONFORM TO CSA G40.21 - 350W, EXCEPT 300W FOR CHANNELS AND ANGLES. HSS SECTIONS 350W, CLASS C OR ASTM 500 GRADE C.
2. ALL STRUCTURAL STEEL SHALL BE FABRICATED, ERECTED, AND INSTALLED IN ACCORDANCE WITH CSA S16 LATEST EDITION.
3. ALL WELDING SHALL BE CARRIED OUT IN ACCORDANCE WITH CSA W59 BY A FABRICATOR FULLY APPROVED UNDER CSA W47.1.
4. FABRICATOR TO CONFIRM ALL DIMENSIONS AND ELEVATIONS ON SITE BEFORE FABRICATING.
5. MOMENT CONNECTION DETAILS TO BE SHOWN ON ERECTION DRAWINGS SUBMITTED FOR REVIEW. THESE ERECTION DRAWINGS ARE TO BE STAMPED BY A PROFESSIONAL ENGINEER LICENSED TO PRACTICE IN NEWFOUNDLAND.
6. DO NOT PAINT STEEL ENCASED IN CONCRETE ENCLOSURE.
7. ALL BOLTS IN BEARING TYPE JOINTS TO BE SNUG TIGHT. BOLTS IN SLIP CRITICAL JOINTS TO BE TENSIONED TO THE VALUE GIVEN IN TABLE 7 OF CSA-16.1 FOR THE GIVEN BOLT SIZE.
8. ALL BOLTS TO BE ASTM A325 UNLESS OTHERWISE NOTED. JOINTS TO BE BEARING TYPE EXCEPT WIND BRACE AND MOMENT CONNECTION JOINTS WHICH ARE TO BE SLIP CRITICAL TYPE.
9. AT SLIP JOINTS PLACE BOLTS IN CENTRE OF HOLE. HAND TIGHTEN AND TACK WELD NUT TO BOLT.
10. O.W.S.J. SHALL HAVE SEAT SHOES SECURED AS REQUIRED BY DESIGN WITH A MINIMUM OF 5mm FILLET WELDS 40mm LONG EACH SIDE OF SHOE.
11. a. UNLESS NOTED OTHERWISE, OPEN WEB STEEL JOIST SHOES AT DIAPHRAGM BOUNDARIES ARE TO BE DESIGNED FOR A FACTORED ROLLOVER FORCE = 7kN.
    b. FOR JOIST SPANS EXCEEDING 15.0m, HSS SHEAR CONNECTORS, PER TYPICAL DETAILS, ARE REQUIRED BETWEEN EACH JOIST AND JOIST SHOE TO BE A MINIMUM OF 127mm DEEP.
12. INSTALL JOIST IN ACCORDANCE WITH CSA S-16. BRIDGING LINES AT PERIMETER WALL SHALL BE CROSSED. BRIDGING LINES SHOWN ARE A MINIMUM REQUIREMENT.
13. UNLESS NOTED OTHERWISE ROOF DECK SHALL BE 38mm DECK THICKNESS AS REQUIRED TO SUIT DESIGN LOADS. DECK TO HAVE ZF75 FINISH UNLESS NOTED OTHERWISE. PROVIDE MINIMUM 3 SPAN CONDITION EXCEPT WHERE RESTRICTED BY FRAMING.
14. ALL METAL DECK TO BE FASTENED TO PERIMETER BEAMS AND BEAMS AT BRACED BAYS WITH A 19mm DIAMETER WELD PLACED PER CANAM FASTENING PATTERN 36/7 (EVERY FLUTE). ALL REMAINING METAL DECK TO BE FASTENED TO STEEL BEAMS AND JOISTS WITH 19mm DIAMETER WELD PLACED PER CANAM FASTENING PATTERN 36/4 (EVERY SECOND FLUTE).
15. BUTTON PUNCH SIDELAPS OF ALL DECK AT 600 o.c. MINIMUM.
16. WELDING QUALIFICATIONS - FABRICATION AND ERECTION COMPANIES MUST BE CERTIFIED BY THE CANADIAN WELDING BUREAU (CWB) UNDER CSA W47.1, CERTIFICATION OF COMPANIES FOR FUSION WELDING OF STEEL STRUCTURES. WELDING OPERATORS MUST BE QUALIFIED BY CWB FOR STRUCTURAL STEEL AND DECK WELDING.
17. TOUCH-UP - WHEN STEEL DECK IS WELDED IN PLACE, ALL TOPSIDE AREAS WHERE THE METALLIC COATING HAS BEEN DESTROYED SHALL BE COVERED BY A SUITABLE PRIMER.
18. MINIMUM BEARING OF DECK IS 50mm.
19. FOR SIZE AND LOCATION OF MECHANICAL AND ELECTRICAL EQUIPMENT AND OPENINGS SEE MECHANICAL AND ELECTRICAL DRAWINGS. VERIFY SIZE AND LOCATION WITH THE MECHANICAL AND ELECTRICAL SHOP DRAWINGS. FINAL LOCATIONS AND WEIGHTS OF ALL ROOF TOP UNITS TO BE CONFIRMED/ COORDINATED WITH MECHANICAL TRADES.
20. OPENINGS IN STEEL ROOF DECK.
    .1 LESS THAN 150mm, NO REINFORCING REQUIRED.
    .2 150mm TO 300mm ACROSS THE FLUTES, PROVIDE A 51x51x4.8 ANGLE TO FRAME ACROSS EACH SIDE OF OPENING IN A DIRECTION PERPENDICULAR TO THE FLUTES. WELD OR SCREW ANGLE TO AT LEAST 2 FLUTES ON EACH SIDE OF THE OPENING.
    .3 OPENINGS WITH ANY ONE DIMENSION GREATER THAN 300mm PROVIDE 102x102x4.8 ANGLE BETWEEN OWSJ/BEAMS TO FRAME OPENING - UNLESS INDICATED OTHERWISE ON DWGS.
21. PREPARE SURFACES AND PRIME PAINT STEEL WITH ONE COAT CISC/CPMA 1-73A UNLESS NOTED OTHERWISE.
22. UNLESS OTHERWISE NOTED ALL HSS COLUMNS TO HAVE 6.4mm CAP PLATES WELDED TO THE TOP OF THE COLUMN.
23. PROVIDE 20mm (3/4") DRAINAGE HOLES IN CLOSED SECTIONS TO PREVENT WATER BUILD-UP DURING ERECTION. ENSURE DRAINAGE HOLES REMAIN FREE TO DRAIN THROUGHOUT CONSTRUCTION AND ARE NOT PLUGGED BY SUBSEQUENT CONSTRUCTION ACTIVITIES.
24. ALL STRUCTURAL STEEL IN FULL OR IN PART, OUTSIDE OF THE BUILDING VAPOR BARRIER IS TO BE HOT DIPPED GALVANIZED.
25. ALL STRUCTURAL STEEL IN OR INTERRUPTING THE CONTINUITY OF THE FIRE SEPARATION NOTED ON THE ARCHITECTURAL DRAWINGS TO HAVE ULC RATED INTUMESCENT PAINT AND ULC RATED SEALANT TO MAINTAIN CONTINUITY OF THE NOTED FIRE RATING. SEE ALSO ARCHITECTURAL DRAWINGS FOR FIRE RATINGS.
26. UNLESS OTHERWISE NOTED, DEAD LOAD AS INDICATED ON PLANS INCLUDES LOADS OF SPRINKLER PIPING, AND STONE PAVERS.

ABBREVIATIONS

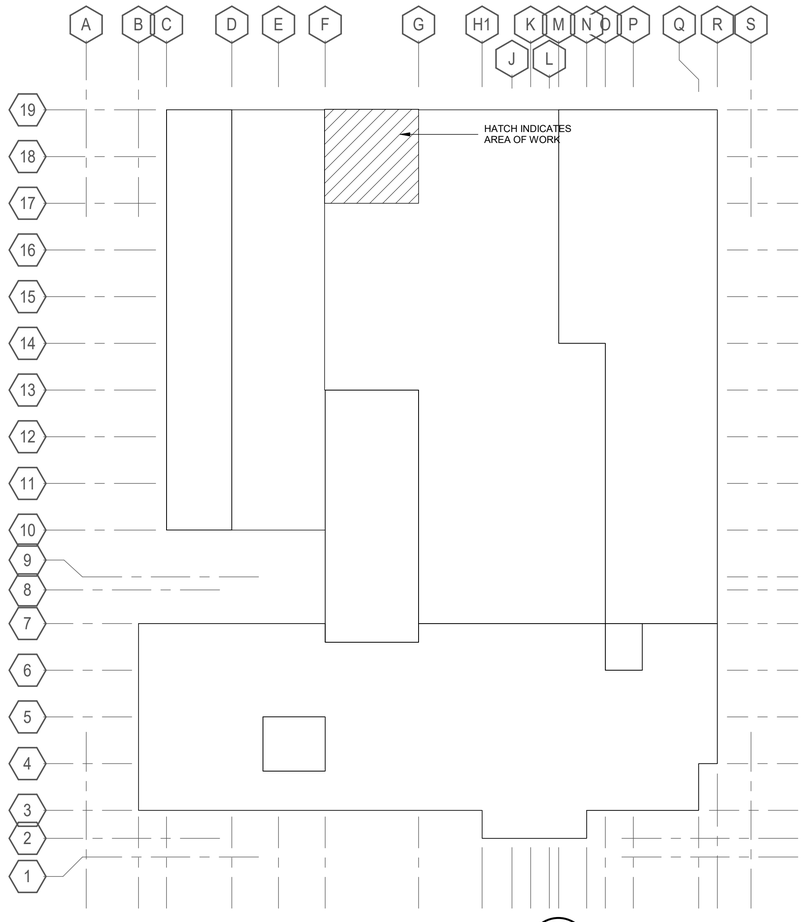
∠	ANGLE	LLH	LONG LEG HORIZONTAL
(E)	EXISTING	LLV	LONG LEG VERTICAL
@	SPACED AT	m	METER
A.B.	ANCHOR BOLT	MAX	MAXIMUM
ALT	ALTERNATE	Mc	MOMENT CONNECTION
APPROX	APPROXIMATELY	MECH	MECHANICAL
ARCH	ARCHITECTURAL	MIN.	MINIMUM
B/F	BOTTOM FACE	MISC	MISCELLANEOUS
BLK	BLOCK	mm	MILLIMETERS
BM	BEAM	MPa	MEGA PASCAL
BOTT	BOTTOM	NIC	NOT IN CONTRACT
B.P.	BASEPLATE	NTS	NOT TO SCALE
C.J.	CONTROL JOINT	o.c.	ON CENTER
C.O.J.	CHECK ON JOB	O. DR.	OVERHEAD DOOR
C/W	COMPLETE WITH	O.H.	OPPOSITE HAND
cf	FACTORED COMPRESSION FORCE	OWSJ	OPEN WEB STEEL JOIST
COL	COLUMN	P#	PIER DETAIL NUMBER (SEE DETAIL)
CONC	CONCRETE	PL	PLATE
CONN	CONNECTION	P.T.	PRESSURE TREATED
CONT	CONTINUOUS	RB	ROOF BEAM
DEMO	DEMOLITION	RC	REINFORCED CONCRETE
DET	DETAIL	RD	ROOF DRAIN
DIA	DIAMETER	REF	REFERENCE
DIM	DIMENSION	REINF	REINFORCEMENT
DP	DEEP	REQ'D	REQUIRED
DWGS	DRAWINGS	SC	SAWCUT
DWL	DOWEL	SCH	SCHEDULE
EA	EACH	SECT	SECTION
EF	EACH FACE	SLS	SERVICEABILITY LIMIT STATE
EJ	EXPANSION JOINT	SOG	SLAB-ON-GRADE
ELEV	ELEVATION	SPEC	SPECIFICATION
EOD	EDGE OF DECK	SS	STAINLESS STEEL
EQ	EQUAL	STIFF	STIFFENER
ES	EACH SIDE	STL	STEEL
EW	EACH WAY	STRUCT	STRUCTURAL
F#	FOOTING NUMBER	T.O.	TOP OF
FB	FLOOR BEAM	T.O.P.	TOP OF PIER
FF	FACE TO FACE	T.O.W.	TOP OF WALL
FIN	FINISHED	Tf	FACTORED TENSION FORCE
FLR	FLOOR	TYP	TYPICAL
FDN	FOUNDATION	U/S	UNDERSIDE
FTG	FOOTING	ULS	ULTIMATE LIMIT STATE
GA	GAUGE	VEF	VERTICAL EACH FACE
GALV	GALVANIZED	VERT	VERTICAL
GC	GENERAL CONTRACTOR	VIF	VERTICAL INSIDE FACE
HSS	HOLLOW STRUCTURAL STEEL	VOF	VERTICAL OUTSIDE FACE
kN	KILO NEWTON	W/	WITH
kPa	KILOPASCAL	W/I	WITHIN
LG	LONG	W/O	WITHOUT
		WWM	WELDED WIRE MESH

GENERAL NOTES

1. READ STRUCTURAL DRAWINGS IN CONJUNCTION WITH ARCHITECTURAL DRAWINGS AND OTHER CONTRACT DOCUMENTS.
2. REFER TO ARCHITECTURAL, MECHANICAL AND ELECTRICAL DRAWINGS FOR EXACT LOCATION OF PITS, DEPRESSIONS, TRENCHES AND ROOF MOUNTED OR SUSPENDED UNITS.
3. DO NOT IMPOSE CONSTRUCTION LOADS ON THE STRUCTURE IN EXCESS OF THE DESIGN LOAD.
4. DO NOT CUT HOLES IN BEARING WALLS WITHOUT CONSULTANT APPROVAL.
5. COMPLY WITH NATIONAL BUILDING CODES, LOCAL BY-LAWS, CANADIAN CONSTRUCTION SAFETY CODE AND ALL REGULATIONS SET BY AUTHORITIES HAVING JURISDICTION IN CASE OF CONFLICT OR DISCREPANCY, THE MORE STRINGENT REQUIREMENTS SHALL APPLY.
6. PROVIDE ALL ADEQUATE SHORING FOR THE SAFE COMPLETION OF THE WORK. ASSUME RESPONSIBILITY TO DESIGN AS WELL AS TO ERECT, MAINTAIN AND EVENTUALLY REMOVE ALL THE TEMPORARY WORKS NECESSARY FOR CARRYING OUT THIS CONTRACT.
7. MAKE ADEQUATE PROVISIONS FOR CONSTRUCTION STRESSES AND FOR SUFFICIENT TEMPORARY BRACING TO KEEP THE STRUCTURE PLUMB AND IN TRUE ALIGNMENT AT ALL PHASES OF WORK UNTIL COMPLETION (INCLUDING MASONRY WALLS, FLOOR AND ROOF DECK, ETC.) ANY BRACING MEMBERS SHOWN ON PLANS ARE THOSE REQUIRED FOR THE FINISHED STRUCTURE AND MAY NOT BE SUFFICIENT FOR ERECTION PURPOSES.
8. TRUCKS, CRANES, HOISTS, OR ANY HEAVY EQUIPMENT OR MATERIALS ARE NOT ALLOWED TO ENTER ANY STRUCTURAL FLOOR OR ROOF AREA UNLESS SPECIFICALLY INDICATED ON STRUCTURAL DRAWINGS.
9. THE CONTRACTOR SHALL HAVE THE SOLE RESPONSIBILITY FOR THE DESIGN, ERECTION, OPERATION, MAINTENANCE AND REMOVAL OF TEMPORARY SUPPORTS, TEMPORARY BRACING, SHORING SYSTEM, AND FACILITIES AND THE DESIGN AND EXECUTION OF CONSTRUCTION METHODS REQUIRED IN THEIR USE.
10. THE CONTRACTOR SHALL ENGAGE AND PAY FOR REGISTERED PROFESSIONAL ENGINEERING PERSONNEL SKILLED IN THE APPROPRIATE DISCIPLINES TO PERFORM THOSE FUNCTIONS REFERRED TO IN PARAGRAPH ABOVE OR IN ALL CASES WHERE SUCH TEMPORARY SUPPORTS, STRUCTURES, AND FACILITIES AND THEIR METHODS OF CONSTRUCTION ARE OF SUCH A NATURE THAT PROFESSIONAL ENGINEERING SKILL IS REQUIRED TO PRODUCE SAFE AND SATISFACTORY RESULTS.
11. SUBMIT SHOP DRAWINGS FOR ALL STRUCTURAL WORK AND ANY WORK AFFECTING THE STRUCTURE TO CONSULTANT. OBTAIN CONSULTANT APPROVAL BEFORE PROCEEDING WITH FABRICATION.
12. EACH OF THE FOLLOWING SHOP DRAWINGS MUST BEAR THE SIGNATURE AND STAMP OF QUALIFIED PROFESSIONAL ENGINEER REGISTERED IN THE PROVINCE OF PROJECT LOCATION.
    - DRAWINGS FOR ANY TEMPORARY WORK.
    - DRAWINGS FOR ANY STRUCTURAL PARTS DESIGNED BY THE CONTRACTOR.
13. THESE DESIGN DOCUMENTS ARE PREPARED SOLELY FOR USE BY THE PARTY WITH WHOM THE DESIGN PROFESSIONAL HAS ENTERED INTO A CONTRACT AND THERE ARE NO REPRESENTATIONS OF ANY KIND MADE BY THE DESIGN PROFESSIONAL TO ANY PARTY WITH WHOM THE DESIGN PROFESSIONAL HAS NOT ENTERED INTO A CONTRACT.
14. THE USE OF THIS DRAWINGS IS LIMITED TO THAT IDENTIFIED IN THE REVISION COLUMN OF THE TITLEBLOCK. DO NOT CONSTRUCT FROM THESE DRAWINGS UNLESS DRAWINGS ARE MARKED 'ISSUED FOR CONSTRUCTION' BY DBA.
15. DBA WILL PROVIDE GENERAL REVIEW OF CONSTRUCTION IN ACCORDANCE WITH THE PERFORMANCE STANDARDS OF PEGNL BY MEANS OF A RATIONAL SAMPLING PROCEDURE TO DETERMINE WHETHER THE CONSTRUCTION OF THAT WORK SHOWN ON THE DBA DRAWINGS IS IN GENERAL COMPLIANCE WITH THE CONTRACT DOCUMENTS. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR QUALITY CONTROL AND THE PERFORMANCE OF THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS. DBA SHALL NOT BE RESPONSIBLE FOR THE ACTS OR OMISSIONS OF THE CONTRACTOR, SUB-CONTRACTOR OR ANY OTHER PERSON PERFORMING ANY OF THE WORK OR FOR THE FAILURE OF ANY OF THEM TO CARRY OUT THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
16. IT IS THE RESPONSIBILITY OF THE OWNER AND THE CONTRACTOR TO NOTIFY THE ENGINEER OF THE CONSTRUCTION PROGRESS SO THE ENGINEER MAY COMPLETE GENERAL COMPLIANCE INSPECTIONS. THE CONTRACTOR SHOULD PROVIDE THE ENGINEER WITH AN ACCURATE CONSTRUCTION SCHEDULE PRIOR TO THE START OF WORK. IN GENERAL THE FOLLOWING INSPECTIONS ARE REQUIRED; REVIEW OF REBAR PRIOR TO PLACEMENT OF CONCRETE, REVIEW OF FOOTINGS AND FOUNDATIONS PRIOR TO BACKFILL AND REVIEW OF STRUCTURAL STEEL PRIOR TO PLACEMENT OF INSULATION AND INTERIOR FINISHES.



SNOW LOAD DIAGRAM — 1 : 500 — 2 / S1



KEY PLAN — 1 : 500 — 1 / S1

No.	REVISION	DATE (Y/M/D)
A	ISSUED FOR REVIEW	25/09/30
B	ISSUED FOR COORDINATION	25/11/13
0	ISSUED FOR TENDER	25/11/28

A - DETAIL
B - LOCATION/DRAWING No.
C - DRAWING No.

GENERAL NOTES

1. DO NOT SCALE FROM DRAWING.
2. CONTRACTOR MUST VERIFY ALL DIMENSIONS ON SITE BEFORE PROCEEDING WITH THIS WORK.
3. THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION UNLESS IT IS ISSUED FOR CONSTRUCTION AND STAMPED AND SIGNED BY THE PROJECT ENGINEER.
4. DRAWINGS PRINTED ON 11"x17" SHEETS ARE 50% OF SCALE SHOWN.

REGISTERED PROFESSIONAL ENGINEER — JOHN A. SINGLETON — SIGNATURE — 2025-11-28 DATE — PROVINCE OF NEWFOUNDLAND

PROVINCE OF NEWFOUNDLAND AND LABRADOR — PEGNL Professional Engineers and Geoscientists Newfoundland & Labrador — PERMIT HOLDER — This Permit Allows — DBA CONSULTING ENGINEERS LTD. — To practice Professional Engineering in Newfoundland & Labrador. Permit No. as issued by PEG 00189 which is valid for the year 2025.

MECHANICAL & ELECTRICAL CONSULTANT:

CORE ENGINEERING INC.
57 Pippy Place
St. John's, NL, Canada A1B 4H8
Tel (709) 722-8613
Fax (709) 722-0910

STRUCTURAL CONSULTANT:

DBA CONSULTING ENGINEERS LTD.
Structural and Civil Engineers Tel 709.739.5500 Fax 709.739.5560

MEMORIAL UNIVERSITY
Department of Facilities Management
This University was raised by the people of Newfoundland as a memorial to the fallen in the great wars, 1914-1918, 1939-1945, that in freedom of learning, their cause and sacrifice might not be forgotten.
- Dedication plaque, Arts & Administration Building, St. John's Campus

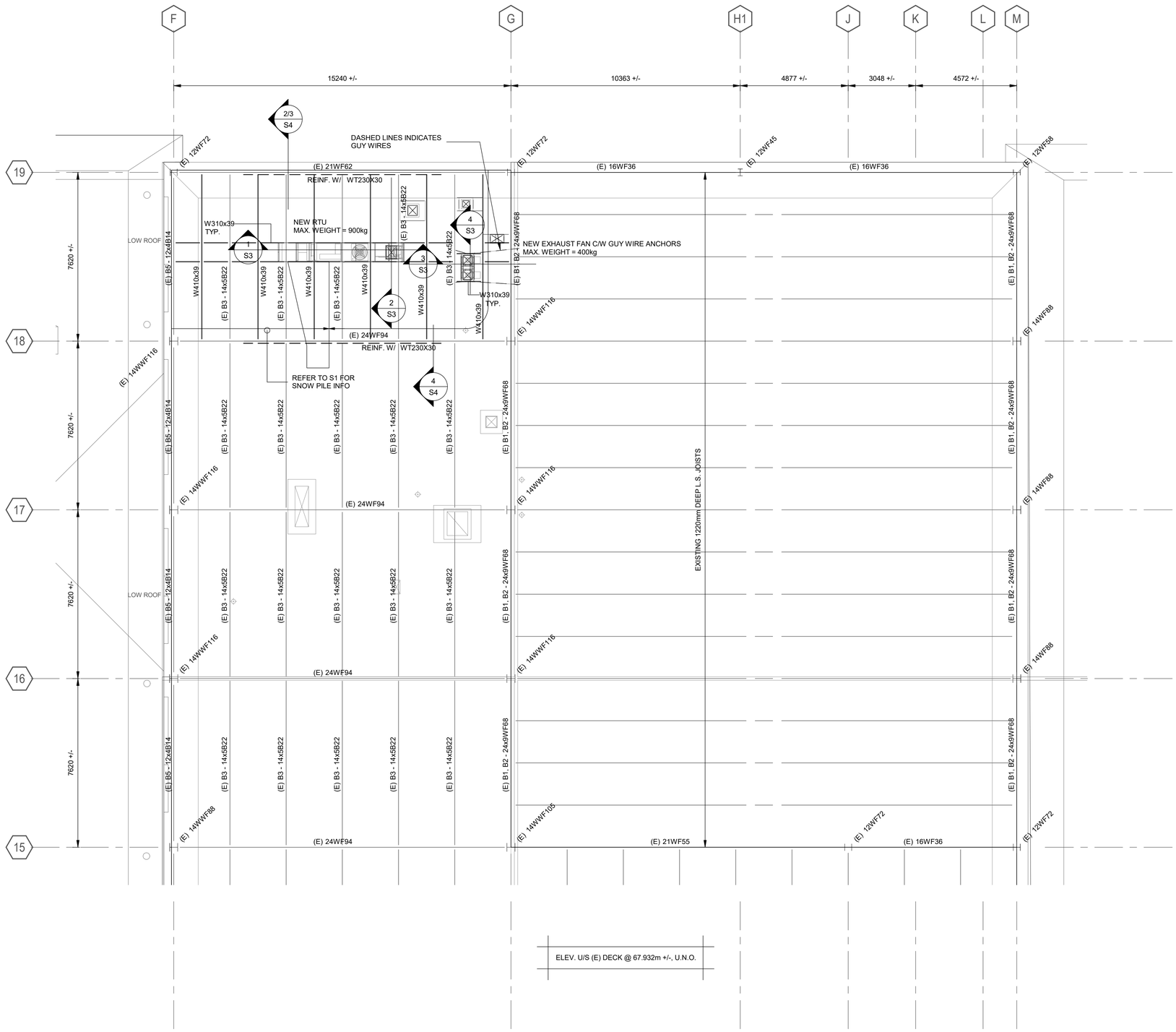
PROJECT NAME:

S.J. CAREW BUILDING
(FACULTY OF ENGINEERING & APPLIED SCIENCE)
RENOVATIONS TO EN-2078
Project #: EN-164-21

DRAWING TITLE:

GENERAL NOTES & KEY PLAN

DESIGNED:	DRAWN:
A.S.	C.R.
REVIEWED:	APPROVED:
A.S.	A.S.
SCALE:	DATE:
AS NOTED	AUG. 2025
PROJECT No.	DRAWING No.
25126	S1



ROOF FRAMING PLAN

1 : 100

1 / S2

A - DETAIL
B - LOCATION/DRAWING No.
C - DRAWING No.

No.	REVISION	DATE (Y/M/D)
A	ISSUED FOR REVIEW	25/09/30
B	ISSUED FOR COORDINATION	25/11/13
0	ISSUED FOR TENDER	25/11/28

GENERAL NOTES

1. DO NOT SCALE FROM DRAWING.
2. CONTRACTOR MUST VERIFY ALL DIMENSIONS ON SITE BEFORE PROCEEDING WITH THIS WORK.
3. THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION UNLESS IT IS ISSUED FOR CONSTRUCTION AND STAMPED AND SIGNED BY THE PROJECT ENGINEER.
4. DRAWINGS PRINTED ON 11"x17" SHEETS ARE 50% OF SCALE SHOWN.

REGISTERED PROFESSIONAL ENGINEER
JOHN A. SINGLETON
2025-11-28
DATE
PROVINCE OF NEWFOUNDLAND

PROVINCE OF NEWFOUNDLAND AND LABRADOR
PEGNL
PERMIT HOLDER
This Permit Allows
DBA CONSULTING ENGINEERS LTD.
To practice Professional Engineering in Newfoundland & Labrador.
Permit No. as issued by PEG 00189
which is valid for the year 2025.

MECHANICAL & ELECTRICAL CONSULTANT:

CORE ENGINEERING INC.
57 Pippy Place
St. John's, NL, Canada A1B 4H8
Tel (709) 722-8613
Fax (709) 722-0910

STRUCTURAL CONSULTANT:

DBA CONSULTING ENGINEERS LTD.
Structural and Civil Engineers Tel 709.739.5500 Fax 709.739.5560

MEMORIAL UNIVERSITY
Department of Facilities Management

This University was raised by the people of Newfoundland as a memorial to the fallen in the great wars, 1914-1918, 1939-1945, that in freedom of learning, their cause and sacrifice might not be forgotten.

- Dedication plaque, Arts & Administration Building, St. John's Campus

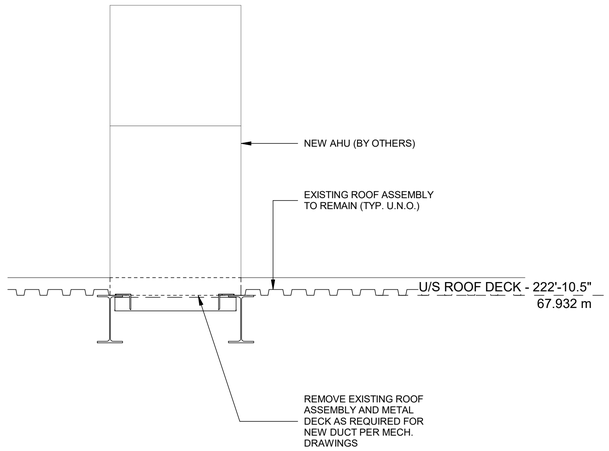
PROJECT NAME:

S.J. CAREW BUILDING
(FACULTY OF ENGINEERING
& APPLIED SCIENCE)
RENOVATIONS TO EN-2078
Project #: EN-164-21

DRAWING TITLE:

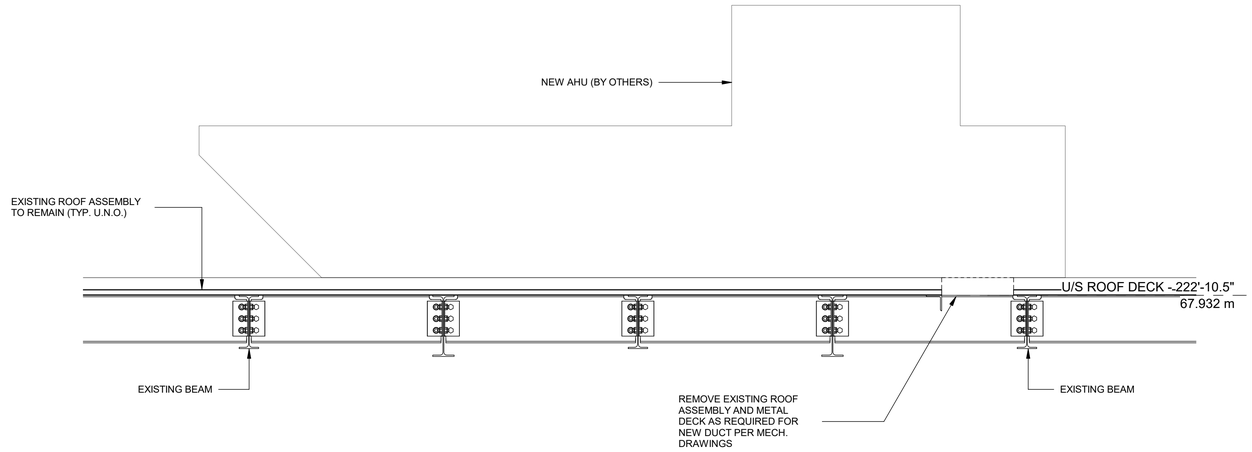
PART ROOF FRAMING PLAN

DESIGNED:	DRAWN:
A.S.	C.R.
REVIEWED:	APPROVED:
A.S.	A.S.
SCALE:	DATE:
AS NOTED	AUG. 2025
PROJECT No.	DRAWING No.
25126	S2



SECTION 2 / S3

1 : 20



SECTION 1 / S3

1 : 20

A - DETAIL
B - LOCATION/DRAWING No.
C - DRAWING No.

No.	REVISION	DATE (Y/M/D)
A	ISSUED FOR REVIEW	25/09/30
B	ISSUED FOR COORDINATION	25/11/13
0	ISSUED FOR TENDER	25/11/28

GENERAL NOTES

1. DO NOT SCALE FROM DRAWING.
2. CONTRACTOR MUST VERIFY ALL DIMENSIONS ON SITE BEFORE PROCEEDING WITH THIS WORK.
3. THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION UNLESS IT IS ISSUED FOR CONSTRUCTION AND STAMPED AND SIGNED BY THE PROJECT ENGINEER.
4. DRAWINGS PRINTED ON 11"x17" SHEETS ARE 50% OF SCALE SHOWN.

REGISTERED PROFESSIONAL ENGINEER
JOHN A. SINGLETON
SIGNATURE
2025-11-28
DATE
PROVINCE OF NEWFOUNDLAND

PROVINCE OF NEWFOUNDLAND AND LABRADOR
PEGNL Professional Engineers and Geoscientists Newfoundland & Labrador
PERMIT HOLDER
This Permit Allows
DBA CONSULTING ENGINEERS LTD.
To practice Professional Engineering in Newfoundland & Labrador. Permit No. as issued by PEG 00189 which is valid for the year 2025.

MECHANICAL & ELECTRICAL CONSULTANT:

CORE ENGINEERING INC.
57 Pippy Place
St. John's, NL, Canada A1B 4H8
Tel (709) 722-8613
Fax (709) 722-0610

STRUCTURAL CONSULTANT:

DBA CONSULTING ENGINEERS LTD.
Structural and Civil Engineers Tel 709.739.5500 Fax 709.739.5560

MEMORIAL UNIVERSITY
Department of Facilities Management
This University was raised by the people of Newfoundland as a memorial to the fallen in the great wars, 1914-1918, 1939-1945, that in freedom of learning, their cause and sacrifice might not be forgotten.
- Dedication plaque, Arts & Administration Building, St. John's Campus

PROJECT NAME:

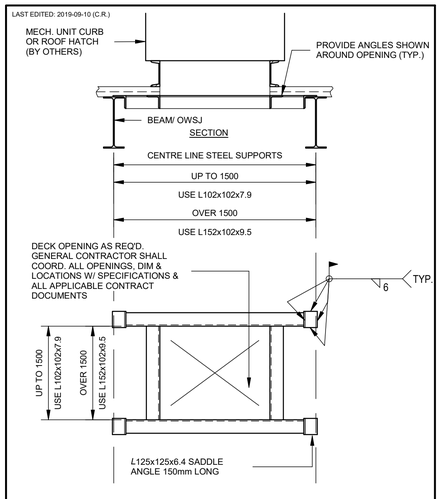
S.J. CAREW BUILDING
(FACULTY OF ENGINEERING & APPLIED SCIENCE)
RENOVATIONS TO EN-2078
Project #: EN-164-21

DRAWING TITLE:

SECTIONS & DETAILS

DESIGNED:	DRAWN:
A.S.	C.R.
REVIEWED:	APPROVED:
A.S.	A.S.
SCALE:	DATE:
AS NOTED	AUG. 2025
PROJECT No.	DRAWING No.
25126	**S3**

LAST EDITED: 2019-09-10 (C.R.)

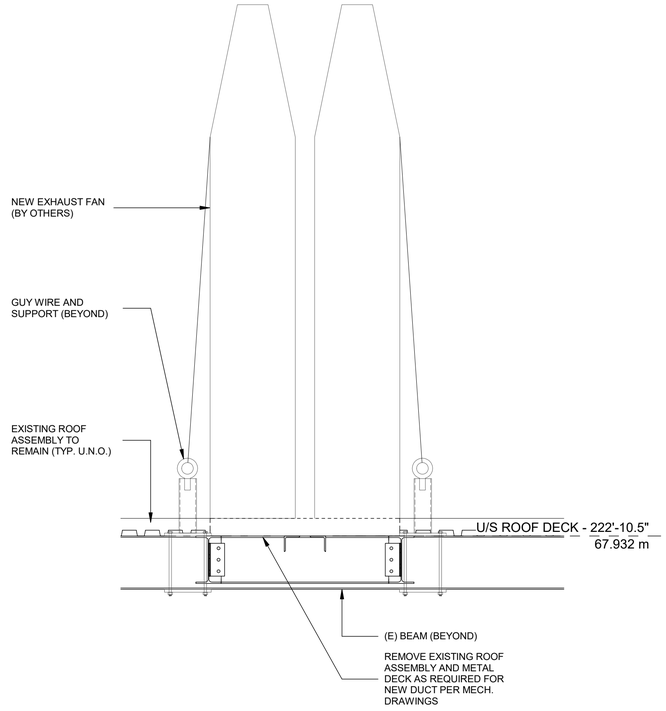


PLAN OF TYP. OPENING IN ROOF DECK/MECH UNIT (U.N.O.)

NOTES:

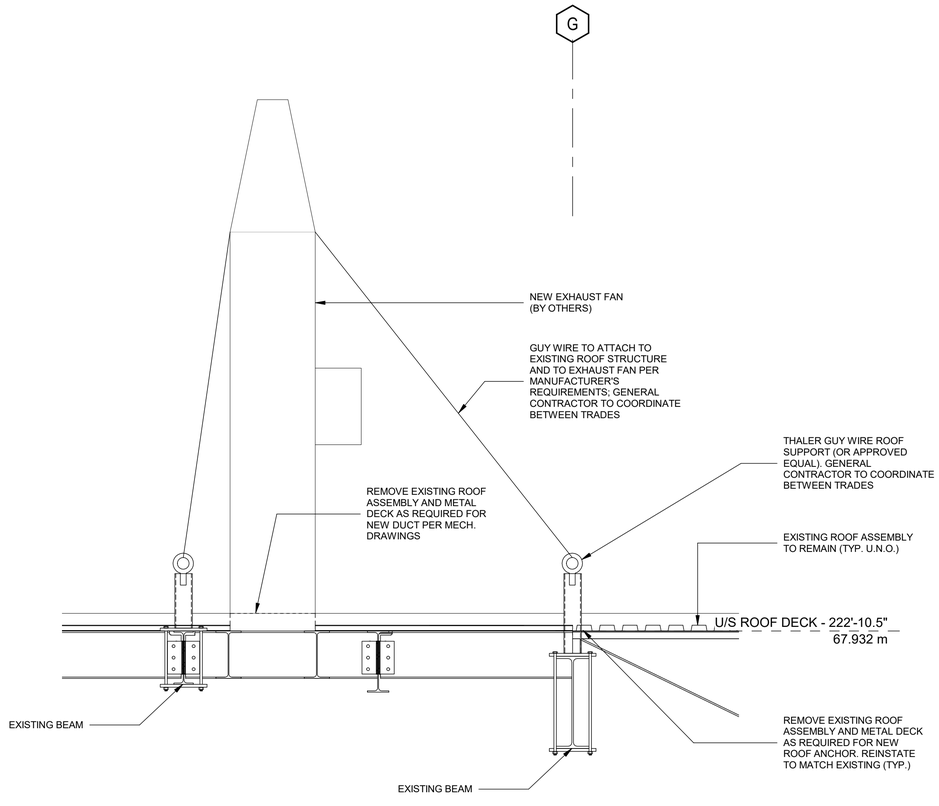
1. DETAIL TYPICAL AT ROOF DRAINS, EXHAUST FANS AND OTHER MECH. AND HVAC EQUIP. IF OPENING IS LARGER THAN 12" DIAMETER, OR CUTS MORE THAN (1) DECK RIB. FOR OPENINGS LESS THAN 12" DIAMETER, REINF. OPENING WITH 16Ga. MIN PL. LENGTH SHALL BE "D"+4". ENTEND AS REQUIRED FOR 2" MIN BRIDGING ON DECK RIB.
2. PROVIDE CONTINUOUS FULL DEPTH BLOCKING AT MECH. UNIT CURB.
3. FOR MECHANICAL ROOF TOP UNIT FRAMING EXTEND ANGLES FULL LENGTH OF CURB AND LOCATE DIRECTLY BELOW CURB, ADD WOOD BLOCKING IN DECK FLUTES AS REQUIRED.

SS 129	TYP. OPENING IN ROOF DECK	N.T.S.



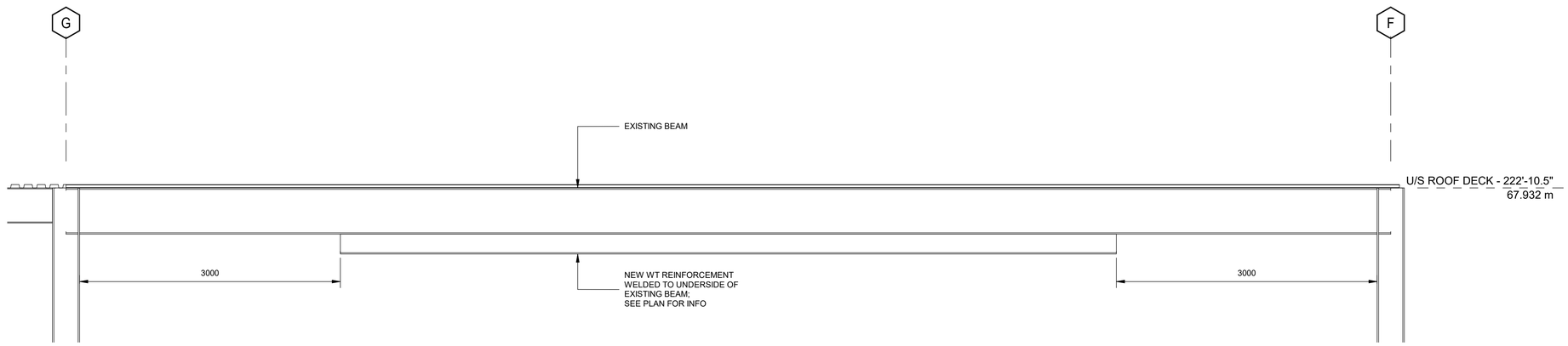
SECTION 4 / S3

1 : 20



SECTION 3 / S3

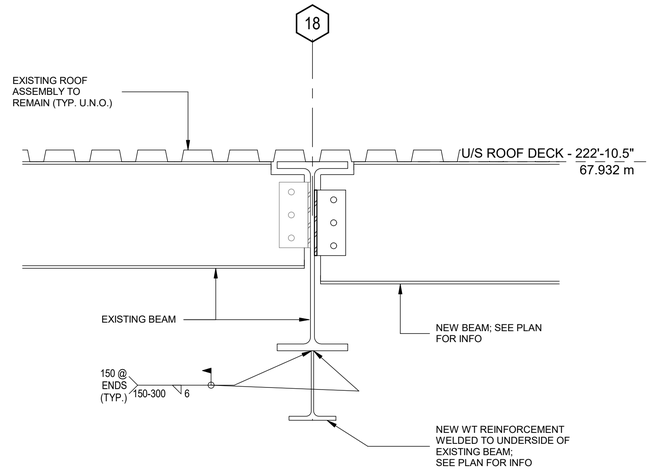
1 : 20



PART ELEVATION @ GRID 18 AND 19

1 : 30

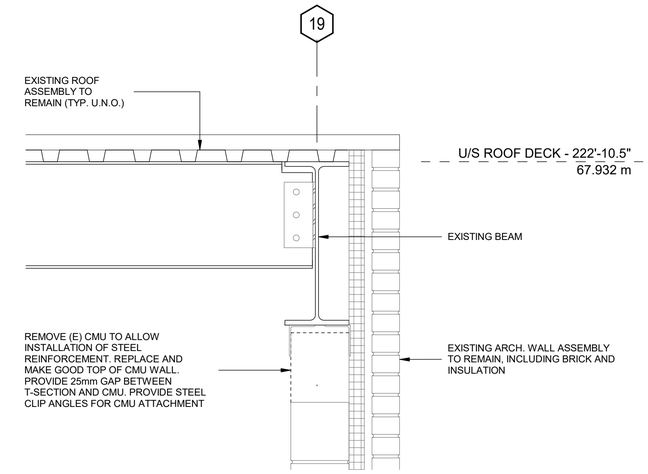
1 / S4



REINF. DETAIL @ GRID 18

1 : 10

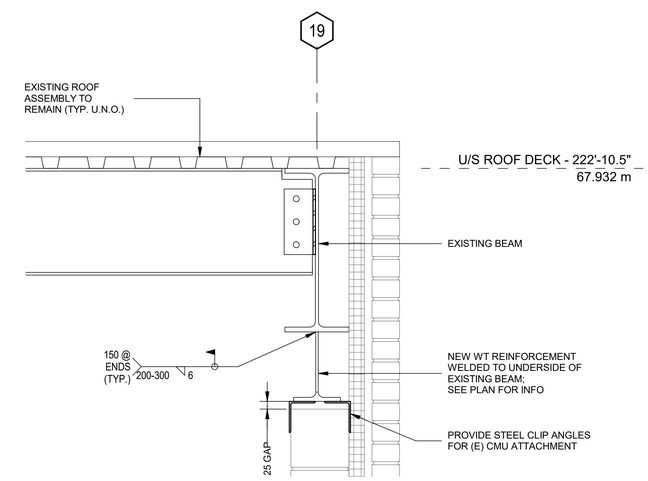
4 / S4



REINF. DETAIL @ GRID 19 - DEMO

1 : 10

2 / S4



REINF. DETAIL @ GRID 19 - NEW

1 : 10

3 / S4

A / B — A - DETAIL
B - LOCATION/DRAWING No.
C - DRAWING No.

A / B C

No.	REVISION	DATE (Y/M/D)
A	ISSUED FOR REVIEW	25/09/30
B	ISSUED FOR COORDINATION	25/11/13
0	ISSUED FOR TENDER	25/11/28

GENERAL NOTES

1. DO NOT SCALE FROM DRAWING.
2. CONTRACTOR MUST VERIFY ALL DIMENSIONS ON SITE BEFORE PROCEEDING WITH THIS WORK.
3. THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION UNLESS IT IS ISSUED FOR CONSTRUCTION AND STAMPED AND SIGNED BY THE PROJECT ENGINEER.
4. DRAWINGS PRINTED ON 11"x17" SHEETS ARE 50% OF SCALE SHOWN.

REGISTERED PROFESSIONAL ENGINEER
JOHN A. SINGLETON
2025-11-28
DATE
PROVINCE OF NEWFOUNDLAND

PROVINCE OF NEWFOUNDLAND AND LABRADOR
PEGNL Engineers and Geoscientists Newfoundland and Labrador
PERMIT HOLDER
This Permit Allows
DBA CONSULTING ENGINEERS LTD.
To practice Professional Engineering in Newfoundland & Labrador.
Permit No. as issued by PEG 00189
which is valid for the year 2025.

MECHANICAL & ELECTRICAL CONSULTANT:

CORE ENGINEERING INC.
57 Pippy Place
St. John's, NL, Canada A1B 4H8
Tel (709) 722-8613
Fax (709) 722-0910

STRUCTURAL CONSULTANT:

DBA CONSULTING ENGINEERS LTD.
Structural and Civil Engineers Tel 709.739.5500 Fax 709.739.5560

MEMORIAL UNIVERSITY
Department of Facilities Management

This University was raised by the people of Newfoundland as a memorial to the fallen in the great wars, 1914-1918, 1939-1945, that in freedom of learning, their cause and sacrifice might not be forgotten.

- Dedication plaque, Arts & Administration Building, St. John's Campus

PROJECT NAME:

S.J. CAREW BUILDING
(FACULTY OF ENGINEERING
& APPLIED SCIENCE)
RENOVATIONS TO EN-2078
Project #: EN-164-21

DRAWING TITLE:

SECTIONS & DETAILS

DESIGNED:	DRAWN:
A.S.	C.R.
REVIEWED:	APPROVED:
A.S.	A.S.
SCALE:	DATE:
AS NOTED	AUG. 2025
PROJECT No.	DRAWING No.
25126	S4