MEMORIAL UNIVERSITY

FACILITIES MANAGEMENT

OPEN CALL FOR BIDS

FOR

CORE SCIENCES BUILDING
CERC FIT UP
LEVEL 5 – PAVILION C

Request for Open Call Number: **TFM-031-25**

Issued**:** **July 23, 2025**

Submission Deadline: **Thursday, August 28, 2025**
@ 3:00PM NDT

REQUEST FOR OPEN CALL FOR BIDS INFORMATION SHEET

Request for Open Call			
Title:	**CORE SCIENCES BUILDING CERC FIT UP LEVEL 5 – PAVILION C**		
Open Call #:	**TFM-031-25**	Issue Date:	**July 23, 2025**
Site Visit:	**Location:** **5th floor Elevator Lobby, Pavilion C**		**Thursday August 7, 2025 @ 3:00 pm NDT**
Questions Deadline:	**Eight (8) days prior to closing time, at 3:00pm (NDT).**	Closing Date & Time: Bid Submission Format: Opening Date, Time & Location:	**Thursday, August 28, 2025 @ 3:00 pm NDT** **opencalls@mun.ca** **Thursday, August 28, 2025 @ 3:30 pm NDT** **Via Conference line: 1-416-915-6530 (toll free) Access Code: 2774 564 7817 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-031-25 CORE SCIENCES BUILDING CERC FIT UP LEVEL 5 – PAVILION C			
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-031-25 CORE SCIENCES BUILDING CERC FIT UP LEVEL 5 – PAVILION C 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

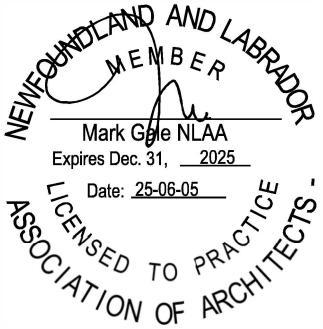
The management, administration and control of the property, revenue, business and affairs of the University are vested in a Board of Regents. The Board is appointed under the *Memorial University Act* and is responsible for the management, administration, and control of the property, revenue, business 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.*

Architectural



Mechanical

Electrical

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PROCUREMENT AND CONTRACTING DOCUMENTS GROUP

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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 Bidder

This procurement process is subject to the *Access to Information and Protection of Privacy Act, 2015* (*ATIPPA, 2015*). A bidder must identify any information in its bid 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. Bidders are advised that their bids will, as necessary, be disclosed, on a confidential basis, to advisers retained by the Owner to advise or assist with the Open Call process, including the evaluation of bids.

The Bidder 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*. The Bidder acknowledges that contracting with the Owner is a public process and any information provided through this process and any records the Bidder supplies to the Owner, including the terms and conditions of any Agreement entered into, may be subject to requests under the *ATIPPA, 2015*. In the event of a request to Memorial for third party business information in its custody and control, information can be withheld only if it meets all parts of the 3-part harms test for non-disclosure as stated in section 39 of 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 bidder has any questions about the collection and use of personal information pursuant to this Open Call, questions are to be submitted to the Open Call 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 .

- 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:

The scope of work for Price A, Price B and Price C is outlined in the contract documents - see specification section 01 11 00 Summary of Works. The Owner reserves the right to delete any or all parts of this tender and award individual and/or combined parts.		
	Contract Bid (HST Excluded)	
Price A: Subtotal		HST EXCLUDED
Price B: Sum of Allowances (Section 01 21 00)	$40,000.00	HST EXCLUDED
Price C: Total: [$(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:

CORE SCIENCES BUILDING CERC FIT UP
LEVEL 5 – PAVILION C
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

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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
Demolition	
Concrete Coring	
Metal Stud & Gypsum Board	
Doors & Frames	
Windows	
Flooring	
Plaster & Paint	
Specialties	
Fire Suppression	
HVAC	
Controls	
Electrical	
Communications	
Fire Alarm	

APPENDIX E – PROJECT REFERENCE (ROOFING PROJECTS ONLY)

<PAGE INTENTIONALLY LEFT BLANK, APPENDIX NOT USED>

APPENDIX F – MEMORIAL UNIVERSITY INTERIOR SIGNAGE MANUAL 2.0

APPENDIX F LOCATED AT THE END OF THIS DOCUMENT

APPENDIX G – MUNET SPECIFICATION
REVISION B – 19 MARCH 1997

APPENDIX G LOCATED AT THE END OF THIS DOCUMENT

APPENDIX H – CORE SCIENCE FACILITY RENOVATIONS TO CSF-5109, BUILDING CODE ANALYSIS

APPENDIX H LOCATED AT THE END OF THIS DOCUMENT

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

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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

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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^{o} 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 SECTION INCLUDES

.1 Documents and terminology.

.2 Associated requirements.

.3 Work expectations.

.4 Description of work.

.5 Contractors use of premises.

.6 Occupancy and premises usage.

1.2 RELATED REQUIREMENTS

.1 Section 01 21 00 - Allowances.

.2 01 33 00 - Submittal Procedures

.3 Section 01 78 00 - Closeout Submittals.

.4 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 WORDS AND TERMS

.1 Refer to and acknowledge other words, terms, and definitions in CCDC 2 Definitions. Additional words and terms are cited in Section 00 71 00.

1.4 COMPLEMENTARY DOCUMENTS

.1 Drawings, specifications, and schedules are complementary each to the other and what is called for by one to be binding as if called for by all. Should any discrepancy appear between documents that leave doubt as to the intent or meaning, abide by priority of documents established in the General Conditions or obtain direction from the Consultant.

.2 Drawings indicate general location and route of building services. Install building services not shown or indicated diagrammatically in schematic or riser diagrams to provide an operational assembly or system.

.3 Examine all discipline drawings, specifications, and schedules and related Work to ensure that Work can be satisfactorily executed. Conflicts or additional work beyond work described to be brought to attention of Consultant.

1.5 DESCRIPTION OF THE WORK

.1 Work of this Contract comprises of, but not limited to, the renovating of approximately 370 m^2, located at the Core Science Facility Level 5 Pavilion C, Memorial University Campus, St. John's, NL. The scope of work will include the interior fit-up of the CERC Lab and associated mechanical and electrical work that will tie into the buildings existing systems.

1.6 DOCUMENTS PROVIDED

.1 Owner will supply the Contractor with:

.1 Electronic documents, in electronically deliveredAdobe PDF formats.

.2 An electronic set of documents will be provided near the end of the Project for purposes of transferring changed information recorded on as-built documents to the electronic Record Documents.

1.7 CONTRACTOR USE OF PREMISES

.1 Contractor has unrestricted use of site until Substantial Performance of the Work.

.2 Limit use of site and premises to allow:

.1 Owner and public occupancy.

.2 Work by Owner.

.3 Coordinate use of premises under direction of the Departmental Representative.

.4 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.

.5 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.

.6 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by the Departmental Representative.

.7 Contractor shall maintain a safe public access to all existing facilities on the surrounding site.

1.8 OWNER OCCUPANCY

.1 Owner will occupy premises during entire construction period for execution of normal operations.

.2 Cooperate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage.

.3 Maintain fire and life safety systems and public access to exits during all stages of the Work.

1.9 CONTRACT DOCUMENTS

.1 Legends and schedules in the Issued for Tender Drawings take precedence over the Technical Specifications with respect to products and materials identified.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 32 16.19 Construction Progress Schedule-Bar (Gantt) Chart.

.2 Section 01 56 00 - Temporary Barriers and Enclosures.

1.2 ACCESS AND EGRESS

.1 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.

1.3 USE OF SITE AND FACILITIES

.1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Departmental Representative to facilitate work as stated.

.2 Maintain existing services to building and provide for personnel and vehicle access.

.3 Where security is reduced by work provide temporary means to maintain security.

.4 Departmental Representative will assign sanitary facilities for use by Contractor's personnel. Keep facilities clean.

.5 Use only elevators, existing in building for moving workers and material.

.1 Protect walls of passenger elevators, to approval of Departmental Representative prior to use.

.2 Accept liability for damage, safety of equipment and overloading of existing equipment.

.6 Closures: protect work temporarily until permanent enclosures are completed.

1.4 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

.1 Execute work with least possible interference or disturbance to building operations, occupants, and public and normal use of premises. Arrange with Departmental Representative to facilitate execution of work.

.2 Any work requiring concrete coring or other loud disruptive work will be required to be completed after hours.

1.5 EXISTING SERVICES

.1 Notify, Departmental Representative and utility companies of intended interruption of services and obtain required permission.

.2 Where Work involves breaking into or connecting to existing services, give Departmental Representative, 72 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.

.3 Provide for personnel and vehicular traffic.

.4 Construct barriers in accordance with Section 01 56 00 – Temporary Barriers and Enclosures.

1.6 SECURITY

.1 Where security has been reduced by Work of Contract, provide temporary means to maintain security.

.2 Security clearances:

.1 Personnel employed on this project will be subject to security check. Obtain clearance, as instructed, for each individual who will require to enter premises.

.2 Obtain requisite clearance, as instructed, for each individual required to enter premises.

.3 Personnel will be checked daily at start of work shift and provided with pass which must be worn at all times. Pass must be returned at end of work shift and personnel checked out.

1.7 BUILDING SMOKING ENVIRONMENT

.1 Comply with smoking restrictions. Smoking is not permitted.

PART 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCE STANDARDS

.1 Canadian Construction Documents Committee (CCDC)

.1 CCDC 2-2008, Stipulated Price Contract.

1.2 CASH ALLOWANCES

.1 Refer to CCDC 2, GC 4.1.

.2 Include in Contract Price specified cash allowances.

.3 Cash allowances, unless otherwise specified, cover net cost to Contractor of services, products, construction machinery and equipment, freight, handling, unloading, storage installation and other authorized expenses incurred in performing Work.

.4 Contract Price, and not cash allowance, includes Contractor's overhead and profit in connection with such cash allowance.

.5 Contract Price will be adjusted by written order to provide for excess or deficit to each cash allowance.

.6 Where costs under a cash allowance exceed amount of allowance, Contractor will be compensated for excess incurred and substantiated plus allowance for overhead and profit as set out in Contract Documents.

.7 Include progress payments on accounts of work authorized under cash allowances in Consultant's monthly certificate for payment.

.8 Prepare schedule jointly with Consultant and Contractor to show when items called for under cash allowances must be authorized by Consultant for ordering purposes so that progress of Work will not be delayed.

.9 List the amount of each allowance, for each work specified in each respective specification Section as follows:

.1 Control Integration Allowance:

.1 Include a cash allowance of **$40,000** for supply and installation of all project controls as outlined on the drawings and specifications.

.2 The controls cash allowance would also include integration and graphics development for the project controls into the campus wide Honeywell EBI control system.

.3 The controls cash allowance includes the cost of review and BACnet discovery and the review of naming convention and control point addressing.

.4 The controls cash allowance does not include any costing for low voltage controls wiring and conduit. The cost associated with supply and installation of low voltage controls wiring and conduit shall be carried by the electrical subcontractor as part of the electrical base tender bid.

PART 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCE STANDARDS

.1 Owner/Contractor Agreement.

.2 Canadian Construction Documents Committee (CCDC)

.1 CCDC 2-1994, Stipulated Price Contract.

1.2 APPLICATIONS FOR PROGRESS PAYMENT

.1 Refer to CCDC 2.

.2 Make applications for payment on account as monthly as Work progresses.

.3 Date applications for payment last day of agreed monthly payment period and ensure amount claimed is for value, proportionate to amount of Contract, of Work performed and Products delivered to Place of Work at that date.

.4 Submit to Consultant, at least 14 days before first application for payment. Schedule of values for parts of Work, aggregating total amount of Contract Price, to facilitate evaluation of applications for payment.

1.3 SCHEDULE OF VALUES

.1 Refer to CCDC 2.

.2 Provide schedule of values supported by evidence as Consultant may reasonably direct and when accepted by Consultant, be used as basis for applications for payment.

.3 Include statement based on schedule of values with each application for payment.

.4 Support claims for products delivered to Place of Work but not yet incorporated into Work by such evidence as Consultant may reasonably require to establish value and delivery of products.

1.4 PREPARING SCHEDULE OF UNIT PRICE TABLE ITEMS

.1 Submit separate schedule of unit price items of Work requested in Bid form.

.2 Make form of submittal parallel to Schedule of Values, with each line item identified same as line item in Schedule of Values. Include in unit prices only:

.1 Cost of material.

.2 Delivery and unloading at site.

.3 Sales taxes.

.4 Installation, overhead and profit.

.3 Ensure unit prices multiplied by quantities given equal material cost of that item in Schedule of Values.

1.5 PROGRESS PAYMENT

.1 Refer to CCDC 2.

.2 Consultant will issue to Owner, no later than 10 days after receipt of an application for payment, certificate for payment in amount applied for or in such other amount as Consultant determines to be due. If Consultant amends application, Consultant will give notification in writing giving reasons for amendment.

1.6 SUBSTANTIAL PERFORMANCE OF WORK

.1 Refer to CCDC 2.

.2 Prepare and submit to Consultant comprehensive list of items to be completed or corrected and apply for a review by Consultant to establish Substantial Performance of Work or substantial performance of designated portion of Work when Work is substantially performed if permitted by lien legislation applicable to Place of Work designated portion which Owner agrees to accept separately is substantially performed. Failure to include items on list does not alter responsibility to complete Contract.

.3 No later than 10 days after receipt of list and application, Consultant will review Work to verify validity of application, and no later than 7 days after completing review, will notify Contractor if Work or designated portion of Work is substantially performed.

.4 Consultant: state date of Substantial Performance of Work or designated portion of Work in certificate.

.5 Immediately following issuance of certificate of Substantial Performance of Work, in consultation with Consultant, establish reasonable date for finishing Work.

1.7 PAYMENT OF HOLDBACK UPON SUBSTANTIAL PERFORMANCE OF WORK

.1 Refer to CCDC 2.

.2 After issuance of certificate of Substantial Performance of Work:

.1 Submit application for payment of holdback amount.

.2 Submit sworn statement that accounts for labour, subcontracts, products, construction machinery and equipment, and other indebtedness which may have been incurred in Substantial Performance of Work and for which Owner might in be held responsible have been paid in full, except for amounts properly retained as holdback or as identified amount in dispute.

.3 After receipt of application for payment and sworn statement, Consultant will issue certificate for payment of holdback amount.

.4 Where holdback amount has not been placed in a separate holdback account, Owner will, 10 days prior to expiry of holdback period stipulated in lien legislation applicable to Place of Work, place holdback amount in bank account in joint names of Owner and Contractor.

.5 Amount authorized by certificate for payment of holdback amount is due and payable on day following expiration of holdback period stipulated in lien legislation applicable to Place of Work. Where lien legislation does not exist or apply, holdback amount is due and payable in accordance with other legislation, industry practice, or provisions which may be agreed to between parties. Owner may retain out of holdback amount sums required by law to satisfy liens against Work or, if permitted by lien legislation applicable

to Place of Work, other third party monetary claims against Contractor which are enforceable against Owner.

1.8 PROGRESSIVE RELEASE OF HOLDBACK

.1 Refer to CCDC 2.

.2 Where legislation permits, if Consultant has certified that Work of subcontractor or supplier has been performed prior to Substantial Performance of Work, Owner will pay holdback amount retained for such subcontract Work, or products supplied by such supplier, on day following expiration of holdback period for such Work stipulated in lien legislation applicable to Place of Work.

.3 In addition to provisions of preceding paragraph, and certificate wording, ensure that such subcontract Work or products is protected pending issuance of final certificate for payment and be responsible for correction of defects or Work not performed regardless of whether or not such was apparent when such certificates were issued.

1.9 FINAL PAYMENT

.1 Refer to CCDC 2, GC 5.7.

.2 Submit application for final payment when Work is completed.

.3 Consultant will, no later than 10 days after receipt of application for final payment, review Work to verify validity of application. Consultant will give notification that application is valid or give reasons why it is not valid, no later than 7 days after reviewing Work.

.4 Consultant will issue final certificate for payment when application for final payment is found valid.

PART 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 32 16.19 Construction Progress Schedule-Bar (Gantt_ Chart.

.2 Section 01 33 00 - Submittal Procedures

.3 Section 01 77 00 - Closeout Procedures

.4 Section 01 78 00 - Closeout Submittals

1.2 ADMINISTRATIVE

.1 Schedule and administer project meetings throughout the progress of the work at the call of Departmental Representative.

.2 Prepare agenda for meetings.

.3 Distribute written notice of each meeting four days in advance of meeting date to Departmental Representative.

.4 Provide physical space and make arrangements for meetings.

.5 Preside at meetings.

.6 Record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.

.7 Reproduce and distribute copies of minutes within three days after meetings and transmit to meeting participants and, affected parties not in attendance.

.8 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.3 PRECONSTRUCTION MEETING

.1 Within 15 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.

.2 Departmental Representative, Contractor, major Subcontractors, field inspectors and supervisors will be in attendance.

.3 Establish time and location of meeting and notify parties concerned minimum 5 days before meeting.

.4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.

.5 Agenda to include:

.1 Appointment of official representative of participants in the Work.

.2 Schedule of Work: in accordance with Section 01 32 16.19 – Construction Progress Schedule-Bar (Gantt) Chart.

.3 Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 – Submittal Procedures.

.4 Site security in accordance with Section 01 56 00 – Temporary Barriers and Enclosures.

.5 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.

.6 Owner provided products.

.7 Record drawings in accordance with Section 01 33 00 – Submittal Procedures.

.8 Maintenance manuals in accordance with Section 01 78 00 – Closeout Submittals.

.9 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 – Closeout Submittals.

.10 Monthly progress claims, administrative procedures, photographs, hold backs.

.11 Appointment of inspection and testing agencies or firms.

.12 Insurances, transcript of policies.

1.4 PROGRESS MEETINGS

.1 During course of Work and 3 weeks prior to project completion, schedule progress meetings monthly.

.2 Contractor, major Subcontractors involved in Work and Departmental Representative are to be in attendance.

.3 Notify parties minimum 7 days prior to meetings.

.4 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within 5 days after meeting.

.5 Agenda to include the following:

.1 Review, approval of minutes of previous meeting.

.2 Review of Work progress since previous meeting.

.3 Field observations, problems, conflicts.

.4 Problems which impede construction schedule.

.5 Review of off-site fabrication delivery schedules.

.6 Corrective measures and procedures to regain projected schedule.

.7 Revision to construction schedule.

.8 Progress schedule, during succeeding work period.

.9 Review submittal schedules: expedite as required.

.10 Maintenance of quality standards.

.11 Review proposed changes for affect on construction schedule and on completion date.

.12 Other business.

PART 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section includes:

.1 Preparation and submission of construction progress schedules using bar (Gantt) charts and other documentation related to tracking construction progress.

.2 The intent of submission and maintenance of the construction progress schedule is to:

.1 inform the Owner and Departmental Representative of actual progress in relation to planned progress.

.2 Proactively identify and address scheduling issues in a timely manner and verify that the planned progress is being closely maintained.

1.2 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures

.2 Section 01 78 00 - Closeout Submittals

.3 Section 01 91 13 General Commissioning Requirements

1.3 DEFINITIONS

.1 Activity: Element of work performed during course of project. Activity normally has expected duration, expected cost, and expected resource requirements. Activities may be subdivided into tasks.

.2 Bar (Gantt) chart: Graphic display of schedule-related information typically derived from a commercially available computerized project management system, with activities or other project elements listed down left side of chart, dates shown across the top, and activity durations shown as date-placed horizontal bars.

.3 Baseline: Original approved plan (for the Project, work package, and each activity), adjusted by approved changes to the Work caused by a Change Order or Change Directive.

.4 Duration: Number of work periods (not including holidays or other non-working periods) required to complete activity or other project element. Usually expressed as workdays or workweeks.

.5 Master plan: Summary-level schedule that identifies major activities and key milestones.

.6 Milestone: Significant event in project, usually completion of major deliverable.

.7 Project schedule: Planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy project objectives. Monitoring and control process involves using project schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.

1.4 REQUIREMENTS

.1 Prepare master plan with detailed schedules that are practical and that remain within the specified contract time.

.2 Plan to complete the Work in accordance with the prescribed milestones and time frame.

.3 Limit activity durations to maximum of approximately 10 Working Days to allow for progress reporting.

.4 Award of Contract or time of beginning, rate of progress, Interim Certificate , and Final Certificate as defined times of completion, are of essence to this Contract.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit bar (Gantt) chart as a master plan within 10 Working Days of award of Contract for planning, monitoring and reporting of project progress.

.3 Submit project schedule within 5 Working Days of receipt of acceptance of master plan.

1.6 MASTER PLAN

.1 Structure schedule to allow orderly planning, organizing, and execution of Work as bar (Gantt) chart.

.2 The Departmental Representative will review and return reviewed schedules within 5 Working Days.

.3 Revise schedule and resubmit within 5 Working Days.

.4 Accepted revised schedule will become masterplan and be used as baseline for updates.

1.7 PROJECT SCHEDULE

.1 Prepare detailed Project Schedule derived from master plan.

.2 Detailed project schedule: Includes at a minimum, the following milestone and activity types:

- .1 Award of Contract.
- .2 Shop Drawing submittals.
- .3 Permits.
- .4 Mobilization.
- .5 Interior architecture (walls, floors and ceilings).
- .6 Plumbing.
- .7 Lighting.
- .8 Electrical.
- .9 Piping.
- .10 Controls.
- .11 Heating, ventilating, and air conditioning.
- .12 Fire systems.

.13 Testing and commissioning.

.14 Supplied equipment with long delivery times.

.15 Required by dates for engineered equipment.

.16 Correction of deficiencies.

.17 Demobilization.

.18 Site cleaning.

1.8 PROJECT SCHEDULE REPORTING

.1 Update project schedule on a monthly basis, reflecting activity changes and completions, and activities in progress.

.2 Include as part of project schedule, narrative report identifying work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays, and impact with possible mitigation.

1.9 PROJECT MEETINGS

.1 Discuss project schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.

.2 Discuss weather related delays with their remedial measures.

PART 2 PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 EXECUTION

3.1 NOT USED

.1 Not used.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 32 16.19 - Construction Progress Schedule-Bar

.2 Section 01 45 00 - Quality Control

.3 Section 01 78 00 - Closeout Submittals

1.2 SECTION INCLUDES

.1 Shop drawings and product data.

.2 Samples.

.3 Certificates and transcripts.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.

.2 Do not proceed with Work affected by submittal until review is complete.

.3 Present shop drawings, product data, samples and mock-ups in SI Metric units.

.4 Where items or information is not produced in SI Metric units converted values are acceptable.

.5 Review submittals before submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.

.6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

.7 Verify site measurements and affected adjacent Work are coordinated.

.8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.

.9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.

.10 Keep one reviewed copy of each submission on site.

1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 Refer to CCDC 2 GC 3.11.

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

.3 Submit drawings stamped and signed by professional engineer registered or licensed in Province of NL, Canada.

.4 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to Contract drawings and specifications.

.5 Allow 14 days for Departmental Representative's review of each submission.

.6 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative before to proceeding with Work.

.7 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.

.8 Accompany submissions with transmittal letter,in duplicate, containing:

.1 Date.

.2 Project title and number.

.3 Contractor's name and address.

.4 Identification and quantity of each shop drawing, product data, and sample.

.5 Other pertinent data.

.9 Submissions to include:

.1 Date and revision dates.

.2 Project title and number.

.3 Name and address of:

.1 Subcontractor.

.2 Supplier.

.3 Manufacturer.

.4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of site measurements and compliance with Contract Documents.

.5 Details of appropriate portions of Work as applicable:

.1 Fabrication.

.2 Layout, showing dimensions, including identified site dimensions and clearances.

.3 Setting or erection details.

.4 Capacities.

.5 Performance characteristics.

.6 Standards.

.7 Operating weight.

.8 Wiring diagrams.

.9 Single line and schematic diagrams.

.10 Relationship to adjacent work.

.10 After Departmental Representative's review, distribute copies.

.11 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.

.12 Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.

.13 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.

.2 Testing must have been within 3 years of date of Contract award for project.

.14 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.

.2 Certificates must be dated after award of Contract complete with project name.

.15 Submit electronic copies of manufacturers instructions for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Pre-printed material describing installation of product, system or material, including special notices and Safety Data Sheets concerning impedances, hazards and safety precautions.

.16 Submit electronic copies of Manufacturer's Site Reports for requirements requested in specification Sections and as requested by Departmental Representative.

.17 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

.18 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.

.19 Delete information not applicable to project.

.20 Supplement standard information to provide details applicable to project.

.21 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

1.5 SAMPLES

.1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.

.2 Deliver samples prepaid to Consultant's and Departmental Representative's.

.3 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.

.4 Where colour, pattern or texture is criterion, submit full range of samples.

.5 Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative before proceeding with Work.

.6 Make changes in samples which Departmental Representative may require, consistent with Contract Documents.

.7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.6 MOCK-UPS

.1 Erect mock-ups in accordance with section 01 43 00 – Quality Assurance.

1.7 CERTIFICATES AND TRANSCRIPTS

.1 Immediately after award of Contract, submit Workers' Compensation Board status.

.2 Submit transcription of insurance immediately after award of Contract.

PART 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 35 43 - Environmental procedures.

.3 Section 01 41 00 - Regulatory Requirements.

.4 Section 02 81 00 – Hazardous Materials

.5 Section 31 23 16.26 – Rock Removal

1.2 REFERENCE STANDARDS

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

.2 Province of Newfoundland and Labrador

.1 Occupational Health and Safety Act, R.S.N.-Updated 2012.

.3 Canadian Standards Association (CSA)

.1 CSA Z317-13, Infection Control During Construction, Renovation, and Maintenance of Health Care Facilities

.4 National Building Code of Canada

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:

.1 Results of site specific safety hazard assessment.

.2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.

.3 Submit 2 copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative and authority having jurisdiction,.

.4 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.

.5 Submit copies of incident and accident reports.

.6 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 10 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 5 days after receipt of comments from Departmental Representative.

.7 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.

.8 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Departmental Representative.

1.4 SAFETY ASSESSMENT

.1 Perform site specific safety hazard assessment related to project.

1.5 MEETINGS

.1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work.

1.6 REGULATORY REQUIREMENTS

.1 Do Work in accordance with Section 01 41 00 – Regulatory Requirements.

1.7 GENERAL REQUIREMENTS

.1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.

.2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

1.8 RESPONSIBILITY

.1 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.

.2 Contractor will be responsible and assume the role Constructor as described in the Ontario Occupational Health and Safety Act and Regulations for Construction Projects.

.3 Contractor shall be the Principal Contractor as described in the Quebec Act Respecting Health and Safety code for the Construction for only their scope and areas of work as defined and described this project specification.

.4 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.

1.9 COMPLIANCE REQUIREMENTS

.1 Comply with Occupational Health and Safety Act, Occupational Health and Safety Regulations, C. Nfld. Reg., 5/12.

.2 Comply with Occupational Health and Safety Regulations, 1996.

.3 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

1.10 UNFORSEEN HAZARDS

.1 When unforeseen or peculiar safety-related factor, hazard, or condition occur 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 and advise Departmental Representative verbally and in writing.

.2 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, advise Health and Safety co-ordinator and follow procedures in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing.

1.11 HEALTH AND SAFETY CO-ORDINATOR

.1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:

.1 Have working knowledge of occupational safety and health regulations.

.2 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.

.3 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.

.4 Be on site during execution of Work and report directly to and be under direction of site supervisor.

1.12 POSTING OF DOCUMENTS

.1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province having jurisdiction, and in consultation with Departmental Representative.

1.13 CORRECTION OF NON-COMPLIANCE

.1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.

.2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.

.3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

1.14 WORK STOPPAGE

.1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

PART 2 PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 EXECUTION

3.1 NOT USED

.1 Not used.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 35 29.06 - Health and Safety Requirements.

.3 Section 01 74 19 - Waste Management and Disposal.

1.2 DEFINITIONS

.1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humans; or degrade environment aesthetically, culturally and/or historically.

.2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction.

1.3 REFERENCE STANDARDS

.1 Canadian Society of Landscape Architects (CSLA) / Canadian Nursery Landscape Association (CNLA):

.1 Canadian Landscape Standard 2016, First Edition

.2 Canadian Nursery Stock Standard 2017, Ninth Edition

.2 United States Environmental Protection Agency (EPA), Office of Water:

.1 EPA-833-R-06-004, Developing Your Stormwater Pollution Prevention Plan: A Guide for Construction Sites

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for Departmental Representative and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit WHMIS Safety Data Sheets (SDS) in accordance with Section 01 47 15 – Sustainable Requirements: Construction and Section 02 81 00 – Hazardous Materials.

.3 Submit Environmental Protection Plan (EPP) for review and approval by Departmental Representative before delivering materials to site or commencing construction activities.

.4 EPP shall include comprehensive overview of known or potential environmental issues to be addressed on site during construction.

.5 Address topics at level of detail commensurate with environmental issue and required construction task s.

.6 Include in Environmental Protection Plan (EPP):

.1 Name s of person s responsible for ensuring adherence to EPP.

.2 Name s and qualifications of person s responsible for manifesting hazardous waste to be removed from site.

.3 Name s and qualifications of person s responsible for training site personnel.

.4 Descriptions of environmental protection personnel training program.

.5 Submit a site-specific Stormwater Pollution Prevention Plan (SPPP) in accordance with EPA-833-R-06-004. Include the site-specific Erosion and Sediment Control Plan (ESCP) identifying the type and location of erosion and sediment control measures to be provided on site. Include monitoring and reporting requirements to ensure that ESC control measures are in compliance with erosion and sediment control plan, Federal and Provincial regulations, and Municipal by-laws.

.6 Submit drawings indicating locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.

.7 Submit a Site Work Plan (SWP) showing work areas for proposed activities in each portion of area and identifying areas of limited use or non-use.

.1 SWP to include measures for marking limits of use areas and methods for protection of features to be preserved within authorized work areas.

.8 Submit a Solid Waste Disposal Plan (SWDP) for non-hazardous solid wastes identifying methods and locations for solid waste disposal including clearing debris.

.9 Submit a site-specific Contaminant Prevention Plan (CPP) identifying the proper procedures and actions to be implemented to prevent potentially or expected hazardous substances due to the presence of any hazardous substances within the project site. The intent of the CPP is to:

.1 Prevent introduction of designated substances (DS) into air, water, or ground;

.2 Detail provisions for storage and handling of these materials in compliance with Federal, Provincial, and Municipal laws.

.10 Submit a Wastewater Management Plan (WMP) identifying methods and procedures for management and discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.

.11 Submit an Identification and Protection Plan (IPP) that defines procedures for identiying and protecting historical, archaeological, cultural and biological resources and wetlands.

.12 Submit a Pesticide Treatment Plan (PTP) identifying the presence of any pesticides within the site. PTP to be updated as required.

1.5 FIRES

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

.2 Where fires or burning is permitted, prevent staining or smoke damage to structures, materials or vegetation which is to be preserved.

.1 Restore, clean and return to new condition stained or damaged work.

.3 Provide supervision, attendance and fire protection measures as directed.

1.6 DRAINAGE

.1 Ensure that the ESCP measures are provided and that its recommendations are followed on site, in accordance with the site-specific SPPP, at all times during construction.

.2 Provide temporary drainage and pumping as required to keep excavations on site free of standing water.

.1 Obtain Departmental Representative approval before pumping standing water, which is free of suspended materials, into waterways, sewer or drainage systems.

.2 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with the site-specific SPPP in compliance with the requirements of authorities having jurisdiction.

1.7 NOTIFICATION

.1 Departmental Representative will notify Contractor in writing of observed noncompliance with Federal, Provincial environmental laws and regulations or Municipal environmentals bylaws, permits, and other elements of site-specific plans, such as EPP, SPPP, TCP, SCP, SWDP, APCP, CPP, WMP, PTP and IPP as applicable.

.2 Contractor after receipt of such notice, shall inform Departmental Representative of proposed corrective action and take such action to obtain the approval of Departmental Representative.

.1 Take action only after receipt of written approval by Departmental Representative.

.3 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.

.4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

PART 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 EXECUTION

3.1 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 – Cleaning.

.1 Leave Work area clean at end of each day.

.2 Bury rubbish and waste materials on site is nor permitted unless approved in writing by Departmental Representative.

.3 Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.

.4 Proceed with final cleaning upon completion and removal of surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 – Cleaning.

.5 Waste Management: separate waste materials for reuse in accordance with Section 01 74 19 – Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 This Section references laws, bylaws, ordinances, rules, regulations, codes, orders of Authority Having Jurisdiction (AHJ), and other legally enforceable requirements applicable to the Work and that are or become enforced during performance of the Work.

1.2 DEFINITIONS

.1 Reference Standards: Means consensus standards, trade association standards, guides, and other publications expressly referenced in the Contract Documents.

1.3 REFERENCE STANDARDS AND REFERENCE DOCUMENTS

.1 If specified referenced standards do not indicate an edition or version, the latest edition or revision issued by the publisher at the time of bid closing shall apply, except as follows:

.1 If a particular edition or revision date of a specified standard is referenced in an applicable code or other regulatory requirement, the edition or version in the regulatory reference shall apply.

.2 The specified reference standards establish minimum requirements. If Contract Documents indicate requirements that conflict with a reference standard, the more stringent requirements shall apply.

.3 If multiple reference standards are specified and the standards establish different requirements, the most stringent requirement shall apply.

.4 In case of discrepancy or uncertainties, refer to Departmental Representative for interpretation or clarification.

1.4 CODES

.1 Building Code: Perform Work in accordance with the National Building Code of Canada (NBC) including amendments up to the time of bid closing and other codes of provincial or local application.

.2 Fire Code: Perform Work in accordance with the National Fire Code of Canada (NFC) 2020 including amendments up to the time of bid closing and other codes of provincial or local application.

.3 Energy Code: Perform Work in accordance with the National Energy Code of Canada for Buildings (NECB) 2020 including amendments up to the time of bid closing and other codes of provincial or local application.

.4 Plumbing Code: Perform Work in accordance with National Plumbing Code of Canada (NPC) 2020 including amendments up to the time of bid closing and other codes of provincial or local application.

.5 If there is a conflict or discrepancy between codes, the most stringent requirements shall apply.

.6 Specific design and performance requirements listed in Specifications and indicated on Drawings may exceed minimum requirements established by referenced Codes; these requirements will govern over the minimum requirements listed in the referenced Codes.

1.5 LAWS

.1 National Parks Act: Perform Work in accordance with the National Parks Act.

1.6 FEES

.1 Regulatory Requirements: Except as otherwise specified, Contractor shall apply for, obtain, and pay fees associated with permits, licenses, certificates, and approvals required by regulatory requirements and Contract Documents, based on General Conditions of Contract and the following:

.1 Regulatory requirements and fees in force at the time of bid closing, and

.2 A change in regulatory requirements or fees scheduled to become effective after the time of bid closing and of which public notice has been given before the time of bid closing.

PART 2 PRODUCTS

2.1 EASEMENTS AND NOTICES

.1 Owner will obtain permanent easements and rights of servitude that may be required for performance of the Work.

.2 Contractor shall give notices required by regulatory requirements.

PART 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 DEFINITIONS

.1 Mock-up: A full-size physical example that demonstrates materials, finishes, interrelationship of materials and assemblies, aesthetic effects, and execution. A mock-up may demonstrate coordination of multiple Subcontractors' work. A mock-up establishes a standard by which the Work will be judged. Mock-ups are not samples.

.2 Quality Assurance: Procedures for preventing defects and deficiencies before and during execution of the Work.

.3 Quality Audit: Systematic and independent examination to determine whether quality requirements have been fulfilled as planned. A quality audit will examine processes, products and services to determine if they have been implemented effectively to achieve their specified objective.

1.2 REFERENCE STANDARDS

.1 ASTM International (ASTM):

.1 ASTM E329-20Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection

1.3 SECTION INCLUDES

.1 This Section describes administrative and procedural requirements for proactive Contractor activities to assure the quality of construction before and during execution of the Work.

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Contractor is responsible for self-performed testing and inspections and submittal of test reports to Departmental Representative, Owner.

.2 Owner will employ and pay for quality audit services performed through third-party observation and testing to validate the Contractor's performance of the Work and perform whole building testing at completion of project.

.3 Contractor to provide a Quality Management System that establishes a standardized approach to managing quality of materials and workmanship during the execution of Work in accordance with ISO 9001. Quality Management System will describe Contractor 's contributions for testing and inspection programs as necessary for a successful Work.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit a detailed testing and inspections schedule to Departmental Representative in accordance with the Contractor 's Quality Management System.

.3 Submit certificates for products , process and system for approval by Departmental Representative.

.4 Submit formal testing and inspections reports per ASTM E329as indicated in technical specification Sections to Departmental Representative in accordance with contractual agreement.

.5 Submit one digital copy of each quality assurance inspection and test report to Departmental Representative, except where a technical specification Section indicates otherwise.

.6 Submit mill test certificates as required in technical specification Sections and as indicated on Drawings.

1.6 QUALIFICATIONS

.1 Manufacturers' Qualifications:

.1 specializes in manufacturing the products specified in the technical Section of the Project's construction specification.

.2 minimum 3 years documented experience with a record of successful performance

.2 Suppliers' Qualifications:

.1 authorized to distribute manufacturer's products

.2 has capacity to supply required products without delaying the Project

.3 Fabricators' Qualifications:

.1 experienced in producing products required for this Project

.2 successful record of in-service performance

.3 sufficient production capacity to fabricate required products without delaying the Project

.4 Installer Qualifications:

.1 firm or individual experienced in design and installation, application, and erection of materials to the extent required for this Project

.2 successful record of in-service performance

.5 Testing and Inspecting Agency Qualifications:

.1 accredited organizations by the Standards Council of Canada for testing and inspection

.2 capable of reliably performing testing of building products and inspections of construction activities in accordance with ASTM E329.

.6 Licensed Professionals Qualifications:

.1 individual registered or licensed to practice their respective design profession as defined by the statutory requirements of the professional registration laws of the state or jurisdiction in which the project is to be constructed.

1.7 CERTIFICATIONS

.1 Ensure that certification of products, processes, and systems includes physical and examination testing as specified in ASTM E329 to confirm compliance with Specifications requirements.

1.8 COORDINATION

.1 Coordinate and schedule tests and inspections with accredited testing agencies as indicated in Contract Documents and in accordance with ASTM E329 requirements.

.2 Coordinate Contractor's Quality Management System with Departmental Representative for reporting, scheduling access and incidental labour required by Quality Auditor's reports if required.

.3 Obtain Departmental Representative approval before proceeding with tests and inspections, and additional tests and inspections as may be reasonably requested by Departmental Representative, Owner.

.4 Coordinate testing and inspections schedule with SubContractor, testing agencies, and other affected parties.

1.9 SITE SAMPLES

.1 Obtain Departmental Representative's acceptance to proceed with the sampling process.

.1 Testing agency is responsible for obtaining representative samples of those materials required to be tested and evaluated as directed by Departmental Representative, Owner in accordance with the Contractual Documents.

.2 Ensure testing agency performs sampling in accordance with ASTM E329.

.1 When sampling collection is required by testing agency, ensure proper protection, handling and storing of samples.

.3 Testing agency to document procedures and appropriate techniques to select samples.

.4 Record details of environmental conditions present during the sampling, such as rain or freezing weather that may affect testing of sample or interpretation of test results.

1.10 MOCK-UPS

.1 Mock-ups can be used as a reference for assessing quality of workmanship and site-applied finishes as requested in the project's Contract Documents.

.2 Obtain Departmental Representative's acceptance of mock-ups installation before beginning to install those portions of the Work represented by the mock-up.

.3 Assemble mock-ups at the Place of the Work in locations acceptable to Departmental Representative, or where location is indicated in the technical specification Section.

.4 Schedule mock-ups ready for Departmental Representative's review and in orderly sequence, to avoid delays in Work.

.1 Failure to prepare mock-ups in ample time is not considered sufficient reason to request an extension of Contract Time. Claims for extension of Contract Time by reason of such default will not be considered.

.5 If requested, Departmental Representative will assist in scheduling dates for construction of mock-ups.

.6 Construct mock-ups using materials, finishes, colours, and methods proposed for the completed Work. Mock-ups to demonstrate proposed workmanship and range of aesthetic appearance.

.7 Where a mock-up represents or affects multiple specification Sections, coordinate activities of these Subcontractors to ensure mock-ups are complete.

.8 Modify or replace mock-ups when unacceptable to Departmental Representative.

.9 Maintain acceptable mock-ups in an undisturbed condition as a standard for judging the completed Work.

PART 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 This Section describes administrative and procedural requirements for reactive activities to verify that completed Work conforms to Contract Documents requirements.

.2 Having inspection and testing agencies by Contractor or Owner does not relieve the Contractor of their responsibility to perform Work in accordance with Contract Documents.

1.2 RELATED REQUIREMENTS

.1 Section 01 21 00 - Allowances.

.2 Section 01 33 00 - Submittal Procedures.

.3 Section 01 78 00 0 Closeout Submittals.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Cash Allowances for independent inspection and testing services to be retained and paid for by the Contractor as described in Section 01 21 00 – Allowances. This Cash Allowance(s) excludes any inspection and testing that is for the Contractor's own quality control, and excludes inspection and testing required by authority having jurisdiction.

.2 Allow and coordinate access to Work on site, manufacturing off site, and fabrication off site with inspection and testing agencies.

.3 Retain and pay for inspection and testing that are designated for Contractor's own quality control plan, and when testing and inspection are required by AHJ..

.4 Give advanced notice to Departmental Representative and to each inspection/testing agency for inspection and testing required by Contract Documents or by AHJ.

.5 In advance of each test, notify appropriate agency and Departmental Representative in the order that attendance arrangements can be made.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit schedule of testing and inspection activities to Departmental Representative, Owner, applicable Subcontractors, testing agencies, and other affected parties. Include the following:

.1 List each testing and inspection agency

.2 Identify types of tests and inspections for each agency, and cross reference to applicable specification Section number-title in Contract Documents

.3 Description of test and inspection

.4 Identify applicable reference standard

.5 Identify test and inspection method

.6 Indicate number of each test and inspection required

.3 Submit one digital copy of each quality assurance inspection and test report to Departmental Representative, except where a technical specification Section indicates otherwise.

.4 Submit reports for inspection and testing required by Contract Documents or by AHJ and performed by Contractor-retained inspection and testing agencies within ten days after inspection or test is completed, except where a technical specification Section indicates a different time period.

.5 Submit one digital copy and one hardcopy of each quality control inspection and test report to Departmental Representative, except where a technical specification Section indicates otherwise.

.6 Deliver copies of quality control reports to Subcontractor of work being inspected or tested.

1.5 SITE QUALITY CONTROL PROCEDURES

.1 Provide labour, Construction Equipment, and temporary facilities to obtain and handle test samples and materials on site. Arrange for sufficient space to store and cure test samples.

.2 Deliver samples and materials required for testing, as requested in technical specification Sections. Submit with reasonable promptness and in an orderly sequence to avoid delays in Work.

1.6 TESTING AND INSPECTION SERVICES

.1 Owner will retain and pay for independent inspection and testing agencies to inspect, test, or perform other quality control reviews of parts of the work, except where indicated otherwise.

.2 Provide equipment required for executing inspection and testing by appointed agencies.

.3 Correct defects and deficiencies when they are revealed during inspection or testing as advised by Departmental Representative at no change to Contract Price or Contract Time. Pay costs for retesting and re-inspection. Appointed agency will request additional inspections or tests to ensure full degree of defects or deficiencies are revealed and corrected.

.4 Quality control testing and inspection reports to include the following:

.1 Project name and number

.2 Testing/Inspection agency's name, address, telephone number, and website

.3 Date of issuing report

.4 Dates and locations of tests, inspections, or samples

.5 Description of the Work and test and inspection method

.6 Numbers and titles of associated specification Sections

.7 Test and inspection data and interpretation of test results (e.g., pass or fail)

.8 Ambient conditions at time of test, inspection, or sampling

.9 Recommendations on re-testing and re-inspecting, if applicable

PART 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 32 16.19 - Construction Progress Schedule-Bar (Gantt) Chart.

.2 Section 01 33 00 - Submittal Procedures.

1.2 REFERENCE STANDARDS

.1 Canadian General Standards Board (CGSB)

.1 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.

.2 CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.

.2 CSA Group (CSA)

.1 CSA-O121-M1978(R2003), Douglas Fir Plywood.

1.3 INSTALLATION AND REMOVAL

.1 Provide temporary controls in order to execute Work expeditiously.

.2 Remove from site all such work after use.

1.4 HOARDING

.1 All temporary Hoarding and access required in egress corridors, atriums, foyers, and stairwells to be of non-combustible fire rated construction as per the NBCC latest edition.

.2 Erect temporary site enclosures using 38 x 89 mm construction grade lumber framing at 600 mm centres and 1200 x 2400 x 13 mm exterior grade fir plywood to CSA O121.

.1 Apply plywood panels vertically flush and butt jointed.

.3 Erect interior temporary hoarding enclosures using 92mm metal studs @ 600 o.c. with 13mm gypsum board on each side of the hoarding wall, filled with with batt insulation.

.1 Contractor to ensure that a minimum of 1100mm clear width is provide for pedestrian and public travel.

.2 For the Atrium side of the hoarding wall. If gypsum board can't be installed, a fire resistant reinforced poly sheeting is acceptable.

.1 Standard of acceptance: White fire resistant reinforced poly sheeting by Hazmasters, Part # P268FR. Tested to CAN/ULC-S109

.4 All site hoarding plans to be submitted to Department Representative for final approval. Construction will not be permitted to start until the hoarding plans have been approved and the hoarding walls have been erected.

.5 Departmental Representative to provide locksets and keying for hoarding wall doors. Locksets have a 70mm (2.75") backset.

.6 Contractor to submit Hoarding Plan to Departmental Representative for approval before proceeding with work on site.

1.5 GUARD RAILS AND BARRICADES

.1 Provide secure, rigid guard rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors and roofs, and openings.

.2 Provide as required by governing authorities.

1.6 WEATHER ENCLOSURES

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

.2 Close off floor areas where walls are not finished; seal off other openings; enclose building interior work for temporary heat.

.3 Design enclosures to withstand wind pressure and snow loading.

1.7 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.

.2 Maintain and relocate protection until such work is complete.

.3 Provide non-ducted, self contained air filtration units with 3 stage filtration system for air scrubbing and air filtration. Pre-filter, carbon filter, and HEPA filter is required to remove dust, pollen, smoke, and odors while capturing 99.9% of particles as small as 0.3 microns.

1.8 DUST CONTROL

.1 Provide dust control adhesive-surface walk-off mats at all doorways and transitions from existing to new construction. Mats to be a minimum of 914x914mm.

1.9 ACCESS TO SITE

.1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work.

1.10 FIRE ROUTES

.1 Maintain access to property including overhead clearances for use by emergency response vehicles.

1.11 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 Confirm with Departmental Representative locations and installation schedule 3 days prior to installation.

.4 Be responsible for damage incurred due to lack of or improper protection.

PART 2 PRODUCTS

2.1 NOT USED

PART 3 EXECUTION

3.1 INSTALLATION

.1 Prevent Dust, Fumes, and doors from entering occupied areas.

.2 Prior to commencing work, isolate the HVAC system in area where work is to be preformed. Coordinate with Departmental Representative.

.3 Disconnect Supply and return ductwork in work are from HVAC system services occupied areas.

.4 Maintain negative air pressure within work area using HEPA equipment air filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is completed at the discretion of the Departmental Representative.

.1 Non-ducted, self-contained air filtration units are permitted to be used for dust control.

.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.

.6 Preform daily construction cleanup and final cleanup using approved, HEPA-filter equipped vacuum equipment.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 45 00 - Quality Control.

.2 Section 01 73 00 - Execution.

1.2 REFERENCE STANDARDS

.1 Canadian Construction Documents Committee (CCDC)

.1 CCDC 2-94, Stipulated Price Contract.

1.3 QUALITY

.1 Refer to CCDC 2.

.2 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.

.3 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.

.4 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.

.5 Should disputes arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.

.6 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.

.7 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.4 AVAILABILITY

.1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify Departmental Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.

.2 In event of failure to notify Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.5 STORAGE, HANDLING AND PROTECTION

.1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.

.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.

.3 Store products subject to damage from weather in weatherproof enclosures.

.4 Store cementitious products clear of earth or concrete floors, and away from walls.

.5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.

.6 Store sheet materials, lumber and on flat, solid supports and keep clear of ground. Slope to shed moisture.

.7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.

.8 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.

.9 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.6 TRANSPORTATION

.1 Pay costs of transportation of products required in performance of Work.

.2 Transportation cost of products supplied by Owner will be paid for by Departmental Representative. Unload, handle and store such products.

1.7 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 Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions, so that Departmental Representative will establish course of action.

.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Departmental Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

1.8 QUALITY OF WORK

.1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.

.2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.

.3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

1.9 CO-ORDINATION

.1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.

.2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.10 CONCEALMENT

.1 In finished areas conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.

.2 Before installation inform Departmental Representative if there is interference. Install as directed by Departmental Representative.

1.11 LOCATION OF FIXTURES

.1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.

.2 Inform Departmental Representative of conflicting installation. Install as directed.

1.12 FASTENINGS

.1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.

.2 Prevent electrolytic action between dissimilar metals and materials.

.3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.

.4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.

.5 Keep exposed fastenings to a minimum, space evenly and install neatly.

.6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

1.13 FASTENINGS-EQUIPMENT

.1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.

.2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.

.3 Bolts may not project more than one diameter beyond nuts.

.4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

1.14 PROTECTION OF WORK IN PROGRESS

.1 Prevent overloading of parts of building. Do not cut, drill or sleeve load bearing structural member, unless specifically indicated without written approval of Departmental Representative.

1.15 EXISTING UTILITIES

.1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and/or building occupants.

.2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

PART 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit the following before work begins at the Place of the Work:

.1 Service locations: Document locations and extents of service lines in the work area.

.3 Submit the following informational submittals as work progresses:

.1 Test reports: For manufacturer-recommended pre-installation site tests.

.1 Indicate test results meet manufacturer's requirements and recommendations.

.2 When manufacturer's requirements are not met, submit manufacturer's corrective recommendations for review.

.2 Submit the following when requested by the Departmental Representative:

.1 Site quality control submittals: Documentation to verify accuracy of site work.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 – Closeout Submittals.

1.4 QUALIFICATION ASSURANCE

.1 Surveyor Qualifications: Registered land surveyor, licensed to practice at the Place of the Work.

PART 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Existing Services:

.1 Confirm locations and extent of service lines in work area before beginning work on site. Submit findings.

.2 Immediately notify the Departmental Representative if unknown services are encountered. Confirm findings in writing.

.3 Record locations of maintained, re-routed, and abandoned service lines after completion of the Work. Submit findings.

.2 Verify substrate and other conditions are acceptable for installation of materials, assemblies, and systems in accordance with required tolerances and manufacturer's instructions and recommendations.

.1 Examine conditions, with installers, for defects affecting performance of the Work. Where work of one Section depends on work of other Sections being properly completed, verify that work is complete and suitable to receive the subsequent work.

.2 Verify substrate surfaces are clean, dimensionally-stable, cured, and free of contaminants.

.3 Proceed with installation after unacceptable conditions are remedied.

.4 Starting to cut, patch, or install work will be considered Contractor's acceptance of existing conditions.

.5 Monitor conditions as Work proceeds, including items subject to damage or movement during cutting and patching.

.3 Perform manufacturer-recommended pre-installation site tests.

3.2 PREPARATION

.1 Protection of In-Place Conditions:

.1 Protect Work and items to remain from damage.

.2 Do not load, or permit to be loaded, anything with a weight or force that may endanger the safety or integrity of the Work or items to remain.

.3 Support structural integrity of surroundings.

.4 Protect exposed work from weather and other potentially damaging conditions. Keep excavations free of water in accordance with Section 01 35 43 – Environmental Procedures.

.5 Promptly remove, replace, clean, or repair elements damaged due to inadequate protection, as acceptable to the Departmental Representative, and at no change to the Contract Price or Contract Time.

.2 Surface Preparation:

.1 Clean surfaces thoroughly before installation.

.2 Prepare surfaces using manufacturer-recommended methods to achieve acceptable substrates under project conditions.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 11 00 - Summary of Work.

.2 Section 01 33 00 - Submittal Procedures.

1.2 SECTION INCLUDES

.1 Common requirements for installing, applying, and erecting products. Includes procedures and submittals for cutting and patching to existing conditions, and required repairs arising from tests and destructive inspections.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit proof of anchor and fastener load carrying capacity for a work result, when requested.

.3 Submit written request before cutting or altering to existing conditions which may affect the following:

- .1 structural integrity of existing elements: Submit structural details and calculations performed by a professional structural engineer registered or licensed in Province of NL, Canada. Include evidence of unsatisfactory structural integrity of the elements according to Departmental Representative.
- .2 integrity of weather-exposed and moisture-resistant elements
- .3 efficiency, maintenance, safety, or accessibility of operational elements
- .4 visual qualities of sight-exposed elements.
- .5 Work of Owner

.4 Submit a request for cutting or altering which includes:

- .1 identification of the Project; and
- .2 location and description of affected existing conditions including changes to structural elements, function of elements, and visual appearance of existing elements; and the location and identification of utilities that will be temporarily out of service during cutting and patching activities.

.5 Submit site plan drawings indicating relative location of various services and equipment upon the request of Departmental Representative.

.6 Submit a work plan including:

- .1 a statement why cutting or altering is unavoidable and describe alternatives to cutting and patching if available;
- .2 a description of proposed work and proposed Products;
- .3 the effect of cutting or altering on work by Owner or other contractors;

.4 written acknowledgement by other contractors affected by cutting or altering, if applicable; and

.5 proposed date(s) and time(s) work will be executed.

1.4 QUALIFICATIONS

.1 Licensed Professionals: Engage a structural engineer licensed at the Place of the Work, to submit details and calculations when altering existing structural elements.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Patching Materials: If possible, use the same materials found in the existing conditions, except in fire-resistance rated materials and assemblies.

.2 Materials Visible from the Floor Area: Use materials that visually match existing adjacent surfaces, and match existing functional performance.

PART 3 EXECUTION

3.1 COMMON INSTALLATION/APPLICATION/ERECTION REQUIREMENTS

.1 Fit several parts together, to integrate with other Work.

.2 Remove and replace defective and non-conforming Work.

.3 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.

.4 Notify Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions, so that Departmental Representative will establish course of action.

.5 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Departmental Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

.6 Provide openings in non-structural elements for penetrations of mechanical and electrical work.

.7 Conceal pipes, ducts and wiring in floor, wall, partition, and ceiling assemblies in finished areas, except where indicated otherwise.

.8 In addition to the manufacturer's recommendations for safety, access, accessibility, and maintenance, locate equipment, fixtures, and distribution systems where it shall provide minimal interference and shall maximize on usable space.

.1 Location of equipment, fixtures, and outlets indicated on Drawings and specifications are approximate.

.2 Notify Departmental Representative of impending installation and obtain approval for actual locations.

3.2 CUTTING AND PATCHING

.1 Proceed with cutting and patching after the review and acceptance by the Departmental Representative of all submittals listed in Article 1.03, Actions and Informational Submittals.

.2 Perform cutting, fitting, and patching including excavation and fill, to complete Work in accordance with related technical specification Sections.

.3 Use special techniques to avoid damaging existing conditions that will remain, and which will result in proper surfaces to receive patching and finishing.

.4 Employ original installer to perform cutting and patching for weather-exposed elements, moisture-resistant elements, and surfaces exposed to view.

.5 Cut rigid materials using masonry saw, core drill, or other tool recommended by the product manufacturer or applicable industry association. Pneumatic or impact tools are not allowed on masonry work without the approval of Departmental Representative.

.6 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

.7 Refinish surfaces to match adjacent finishes. Refinish continuous surfaces to nearest intersection (e.g., edges of partition). Refinish assemblies by refinishing entire unit. Provide entire surface with uniform finish, colour, and texture.

3.3 ADJUSTING

.1 Remove and replace patching that is visually unsatisfactory to Departmental Representative.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 77 00 - Closeout Procedures.

.2 Section 23 01 05 – Operation and Maintenance of HVAC Systems During Construction

.3 Section 23 01 31 – Air Duct Cleaning for HVAC Systems

.4 Section 23 05 00 – Common Work Results for HVAC

.5 Section 23 08 16 – Cleaning and Start-up of HVAC Piping Systems

1.2 REFERENCE STANDARDS

.1 CSA Group / International Organization for Standardization (CSA ISO):

.1 CSA ISO 14024:20, Environmental labels and declarations – Type 1 – environmental labelling – Principles and procedures

.2 United States Environmental Protection Agency (EPA):

.1 EPA's Safer Choice Standard, 2009

.3 Green Seal, Inc. (GS):

.1 GS-34-2017, Green Seal Standard for Cleaning and Degreasing Agents

.2 GS-37-2022, Green Seal Standard for Cleaning Products for Industrial and Institutional Use

.3 GS-40-2020, Green Seal Standard for Floor-Care Products for Industrial and Institutional Use

.4 GS-52-2022, Green Seal Standard for Specialty Cleaning Products for Household Use

.5 GS-53-2022, Green Seal Standard for Specialty Cleaning Products for Industrial and Institutional Use

.4 Underwriters' Laboratories Inc. (UL):

.1 UL 2759-2011, Standard for Sustainability for Hard Surface Cleaners

.2 UL 2767-2011, Standard for Paint and Varnish Remover

.3 UL 2777-2011, Standard for Sustainability for Hard Floor Care Products

.4 UL 2791-2012, Standard for Sustainability for Drain and/or Grease Trap Additives

.5 UL 2792-2012, Standard for Sustainability for Cleaning and Degreasing Compounds: Biologically-based

.6 UL 2795-2012, Standard for Sustainability for Carpet and Upholstery Care Products

.7 UL 2796-2012, Standard for Sustainability for Odor Control Products

.8 UL 2798-2012, Standard for Sustainability for Biological Digestion Additives for Cleaning and Odour Control

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Coordination:

.1 Coordinate with Section 23 01 31 – Air Duct Cleaning for HVAC Systems for related cleaning requirements.

.2 Notify the Departmental Representative if cleaning is required due to actions of the Owner or other contractors.

.2 Scheduling: Schedule cleaning operations so resulting dust and other contaminants will not fall on recently painted surfaces or contaminate building ventilation systems.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

PART 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 EXECUTION

3.1 PREPARATION

.1 Provide adequate temporary ventilation during use of volatile or noxious cleaning substances.

3.2 GENERAL REQUIREMENTS

.1 Use cleaning products recommended by, or acceptable to, the manufacturer of surfaces to be cleaned. Use cleaning products that will not void installed products' warranties.

.1 Sustainability characteristics:

.1 Use cleaning products certified to one or more of the following standards:

.1 A type 1 environmental labelling program in accordance with CSA ISO 14024;

.2 EPA's Safety Choice Standard;

.3 GS-34, GS-37, CS-40, GS-52, GS-53; or

.4 UL 2759, UL 2767, UL 2777, UL 2791, UL 2792, UL 2795, UL 2796, or UL 2798.

.2 Use cleaning products in accordance with manufacturer's instructions.

.3 Test each cleaning product and procedure in a small inconspicuous area to verify no adverse reaction occurs with surface before proceeding with cleaning remainder of surface.

.4 Clean stained surfaces as soon as possible.

3.3 PROGRESS CLEANING

.1 Maintain the Work in a tidy and safe condition, free from accumulation of waste materials and debris, including when caused by the Owner or other contractors.

.2 Remove dust, debris, and other contaminants from wall and other cavities before enclosing.

.3 Clean interior areas before start of finish work. Maintain areas free of dust and other contaminants during finishing operations.

.4 Clean dirt or mud tracked onto paved or surfaced roadways.

3.4 FINAL CLEANING

.1 Remove surplus products, tools, construction machinery, and equipment not required for performance of remaining Work before Departmental Representative's final review.

.2 Replace broken, scratched, or otherwise disfigured glass and mirrors.

.3 Clean and polish exposed glass-, mirror-, stainless steel-, and chrome-surfaces.

.4 Clean hardware, wall tile, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures.

.5 Remove stains, spots, marks, and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors.

.6 Remove dust and vacuum interior building surfaces, behind grilles, louvres, and screens.

.7 Wax, seal, or otherwise apply treatments to floor finishes as recommended by each flooring manufacturer.

.8 Remove paint from:

.1 mechanical nameplates;

.2 electrical nameplates; and

.3 permanent labels required by authorities having jurisdiction or regulatory agencies, such as CSA, cUL, NFPA, ULC, WHI, etc.

.9 Clean plumbing fixtures to a sanitary condition.

.10 Clean permanent filters and replace disposable filters for plumbing and HVAC equipment used during construction.

.11 Remove dust and other contaminants from lighting reflectors, lenses, lamps, bulbs, and other lighting surfaces.

.12 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.

.13 Remove dirt and other disfiguration from exterior building surfaces.

.14 Re-clean areas soiled by workers before Owner occupancy.

.15 Clean landscaped areas of construction-related waste and leaves.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 This Section includes requirements for management of construction waste and disposal, which forms the Contractor 's commitment to reduce and divert waste materials from landfill and includes the following:

.1 Preparation of a Draft Construction Waste Management Plan that will be used to track the success of the Construction Waste Management Plan against actual waste diversion from landfill.

.2 Preparation of a Construction Waste Management Plan that provides guidance on a logical progression of tasks and procedures to be followed in a pollution prevention program to reduce or eliminate the generation of waste, the loss of natural resources, and process emissions through source reduction, reuse, recycling, and reclamation.

.3 Preparation of monthly progress reports indicating cumulative totals representing progress towards achieving diversion and reduction goals of waste materials away from landfill and identifying any special programs, landfill options or alternatives to landfill used during construction.

.4 Preparation of a Construction Waste Management Report containing detailed information indicating total waste produced by the Project, types of waste material and quantity of each material, and total waste diverted and diversion rates indicated as a percentage of the total waste produced.

.2 Owner has established that this Project shall generate the least amount of waste possible and that processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors be employed by the Contractor.

1.2 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 35 29.06 Health and Safety Requirements.

1.3 DEFINITIONS

.1 Clean Waste: Untreated and unpainted; not contaminated with oils, solvents, sealants or similar materials.

.2 Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, re-modeling, repair and demolition operations.

.3 Hazardous: Exhibiting the characteristics of hazardous substances including properties such as ignitability, corrosiveness, toxicity, or reactivity.

.4 Non-hazardous: Exhibiting none of the characteristics of hazardous substances, including properties such as ignitability, corrosiveness, toxicity, or reactivity.

.5 Non-toxic: Not poisonous to humans either immediately or after a long period of exposure.

.6 Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

.7 Recycle: To remove a waste material from the Project site to another site for remanufacture into a new product for reuse by others.

.8 Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form; recycling does not include burning, incinerating, or thermally destroying waste.

.9 Return: To give back reusable items or unused products to vendors for credit.

.10 Reuse: To reuse a construction waste material in some manner on the Project site.

.11 Salvage: To remove a waste material from the Project site to another site for resale or reuse by others.

.12 Sediment: Soil and other debris that has been eroded and transported by storm or well production run off water.

.13 Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

.14 Toxic: Poisonous to humans either immediately or after a long period of exposure.

.15 Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

.16 Volatile Organic Compounds (VOC's): Chemical compounds common in and emitted by many building products over time through outgassing:

.1 Solvents in paints and other coatings;

.2 Wood preservatives; strippers and household cleaners;

.3 Adhesives in particleboard, fiberboard, and some plywood; and foam insulation.

.4 When released, VOC's can contribute to the formation of smog and can cause respiratory tract problems, headaches, eye irritations, nausea, damage to the liver, kidneys, and central nervous system, and possibly cancer.

.17 Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

.18 Construction Waste Management Plan: A project related plan for the collection, transportation, and disposal of the waste generated at the construction site; the purpose of the plan is to ultimately reduce the amount of material being landfilled.

1.4 REFERENCE STANDARDS

.1 ASTM International (ASTM)

.1 ASTM E1609 01, Standard Guide for Development and Implementation of a Pollution Prevention Program

.2 Recycling Certification Institute (RCI)

.1 RCI Certification Construction and Demolition Materials Recycling

1.5 ADMINISTRATIVE REQUIREMENTS

.1 Coordination: Coordinate waste management requirements with all Divisions of the Work for the Project, and ensure that requirements of the Construction Waste Management Plan are followed.

.2 Preconstruction Meeting: Arrange a pre-construction meeting in accordance with Section 01 31 19 – Project Meetings before starting any Work of the Contract attended by the Owner, Contractor, affected Subcontractor 's and Departmental Representative to discuss the Contractor 's Construction Waste Management Plan and to develop mutual understanding of the requirements for a consistent policy towards waste reduction and recycling.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit required information in accordance with Section 01 33 00 – Submittal Procedures.

.2 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Draft Construction Waste Management Plan (Draft CWM Plan): Submit to Departmental Representative a preliminary analysis of anticipated site generated waste by listing a minimum of five (5) construction or demolition waste streams that have potential to generate the most volume of material indicating methods that will be used to divert construction waste from landfill and source reduction strategies; Departmental Representative will provide commentary before development of Contractor 's Construction Waste Management Plan.

1.7 QUALITY ASSURANCE

.1 Resources for Development of Construction Waste Management Report (CWM Report): The following sources may be useful in developing the Draft Construction Waste Management Plan:

.1 Recycling Haulers and Markets: Investigate local haulers and markets for recyclable materials, and incorporate into CWM Plan.

.2 Waste-to-Energy Systems: Investigate local waste-to-energy incentives where systems for diverting materials from landfill for reuse or recycling are not available.

.2 Certifications: Provide proof of the following during the course of the Work:

.1 Compliance Certification: Provide proof that recycling center is third party verified and is listed as a Certified Facility through the registration and certification requirements of the Recycling Certification Institute.

1.8 DELIVERY, STORAGE, AND HANDLING

.1 Storage Requirements: Implement a recycling/reuse program that includes separate collection of waste materials as appropriate to the Project waste and the available recycling and reuse programs in the Project area.

.2 Handling Requirements: Clean materials that are contaminated before placing in collection containers and ensure that waste destined for landfill does not get mixed in with recycled materials:

.1 Deliver materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to recycling process.

.2 Arrange for collection by or delivery to the appropriate recycling or reuse facility.

.3 Hazardous Waste and Hazardous Materials: Handle in accordance with applicable regulations.

PART 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 EXECUTION

3.1 (CWM PLAN) IMPLEMENTATION

.1 Manager: Contractor is responsible for designating an on site party or parties responsible for instructing workers and overseeing and documenting results of the CWM Plan for the Project.

.2 Distribution: Distribute copies of the CWM Plan to the job site foreman, each Subcontractor, the Owner, the Departmental Representative and other site personnel as required to maintain CWM Plan.

.3 Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, composting and return methods being used for the Project to Subcontractor 's at appropriate stages of the Project.

.4 Separation Facilities: Lay out and label a specific area to facilitate separation of materials for potential recycling, salvage, reuse, composting and return:

.1 Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination of materials.

.2 Hazardous wastes shall be separated, stored, and disposed of in accordance with local regulations.

.5 Progressive Documentation: Submit a monthly summary of waste generated by the Project to ensure that waste diversion goals are on track with Project requirements:

.1 Submittal of waste summary can coincide with application for progress payment, or similar milestone event as agreed upon between the Owner, Contractor and Departmental Representative.

.2 Monthly waste summary shall contain the following information:

.1 The amount in tonnes or m^3 and location of material landfilled,

.2 The amount in tonnes or m^3 and location of materials diverted from landfill, and

.3 Indication of progress based on total waste generated by the Project with materials diverted from landfill as a percentage.

3.2 SUBCONTRACTOR'S RESPONSIBILITY

.1 Subcontractor 's shall cooperate fully with the Contractor to implement the CWM Plan.

.2 Failure to cooperate may result in the Owner not achieving their environmental goals, and may result in penalties being assessed by the Contractor to the responsible Subcontractor 's.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures

.2 Section 01 74 11 - Cleaning.

.3 Section 01 78 00 - Closeout Submittals.

.4 Section 01 91 13 General Commissioning Requirements.

1.2 REFERENCE STANDARDS

.1 Environment and Climate Change Canada (ECCC):

.1 SOR/2008-197, Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations

.2 ULC Standards (ULC):

.1 CAN/ULC-S1001-11, Standard for Integrated Systems Testing of Fire Protection and Life Safety Systems

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Acceptance of Work Procedures:

.1 Contractor's inspection: Conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.

.1 Notify the Departmental Representative in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.

.2 Request Departmental Representative's review.

.2 Departmental Representative's review:

.1 Departmental Representative and Contractor to review Work and identify deficiencies and defects.

.2 Contractor to correct Work as directed.

.3 Completion tasks: Submit written certificates in English that tasks have been performed as follows:

.1 Work: Completed and inspected for compliance with Contract Documents.

.2 Defects: Corrected.

.3 Deficiencies: Completed.

.4 Certificates required by Fire Commissioner: Submitted.

.5 Verification letter required to confirm integrated systems testing for fire protection and life safety systems has been successfully completed in accordance with CAN/ULC-S1001.

.6 Operation of systems: Demonstrated to Owner's personnel.

.7 Work: Complete and ready for final review.

.4 Final review:

.1 When completion tasks are done, request final review of Work by the Departmental Representative, and Contractor.

.2 When Work is incomplete according to the Departmental Representative, and authorized agencies, complete outstanding items and request an additional review.

.5 Declaration of Substantial Performance: When the Departmental Representative considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.

.6 Commencement of lien and warranty periods: The date of Owner's acceptance of submitted declaration of Substantial Performance will be the date for commencement of warranty period and commencement of lien period, unless otherwise required by the lien statute at the Place of the Work.

.7 Final payment:

.1 When the Departmental Representative considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment.

.2 When the Work is deemed incomplete by the Departmental Representative, complete outstanding items and request an additional review.

.8 Payment of holdback: After issuance of Certificate of Substantial Performance of Work, submit application for payment of holdback amount in accordance with the contractual agreement.

PART 2 PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 EXECUTION

3.1 NOT USED

.1 Not used.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 45 00 - Quality Control

.3 Section 01 71 00 - Examination and Preparation.

.4 Section 01 77 00 - Closeout Procedures.

.5 Section 01 91 13 - General Commissioning Requirements.

1.2 REFERENCE STANDARDS

.1 Canadian Environmental Protection Act (CEPA):

.1 SOR/2008-197, Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Pre-warranty Meeting:

.1 Convene meeting one week before Contract completion with Departmental Representative, in accordance with Section 01 31 19 – Project Meetings to:

.1 Verify Project requirements.

.2 Review manufacturer's installation instructions and warranty requirements.

.2 Departmental Representative to establish communication procedures for:

.1 Notifying construction warranty defects.

.2 Determine priorities for type of defects.

.3 Determine reasonable response time.

.3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.

.4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Two weeks before Substantial Performance of the Work, submit to the Departmental Representative, four final copies of operating and maintenance manuals in English.

.3 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.

.4 Provide evidence, if requested, for type, source and quality of products supplied.

1.5 FORMAT

.1 Organize data as instructional manual.

.2 Binders: Vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.

.3 When multiple binders are used correlate data into related consistent groupings.

.1 Identify contents of each binder on spine.

.4 Cover: Identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.

.5 Arrange content by systems, under Section numbers and sequence of Table of Contents.

.6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

.7 Text: manufacturer's printed data, or typewritten data.

.8 Drawings: Provide with reinforced punched binder tab.

.1 Bind in with text; fold larger drawings to size of text pages.

.9 Provide 1:1 scaled CAD files in dwg format on USB Drive.

1.6 CONTENTS-PROJECT RECORD DOCUMENTS

.1 Table of Contents for Each Volume: provide title of project;

.1 Date of submission; names.

.2 Addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.

.3 Schedule of products and systems, indexed to content of volume.

.2 For each product or system:

.1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

.3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.

.4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

.5 Typewritten Text: As required to supplement product data.

.1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 – Quality Control.

1.7 AS-BUILT DOCUMENTS AND SAMPLES

.1 Maintain, in addition to requirements in General Conditions, one record copy of:

.1 Contract Drawings.

.2 Specifications.

.3 Addenda.

.4 Change Orders and other modifications to Contract.

.5 Reviewed shop drawings, product data, and samples.

.6 Site test records.

.7 Inspection certificates.

.8 Manufacturer's certificates.

.2 Store record documents and samples in site office apart from documents used for construction.

.1 Provide files, racks, and secure storage.

.3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.

.1 Label each document "PROJECT RECORD" in neat, large, printed letters.

.4 Maintain record documents in clean, dry and legible condition.

.1 Do not use record documents for construction purposes.

.5 Keep record documents and samples available for inspection by Departmental Representative.

1.8 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

.1 Record information on set of black line opaque drawings, and in copy of Project Manual, provided by Departmental Representative.

.2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.

.3 Record information concurrently with construction progress.

.1 Do not conceal Work until required information is recorded.

.4 Contract Drawings and shop drawings: mark each item to record actual construction, including:

.1 Measured depths of elements of foundation in relation to finish first floor datum.

.2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

.3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.

.4 Site changes of dimension and detail.

.5 Changes made by change orders.

.6 Details not on original Contract Drawings.

.7 Referenced Standards to related shop drawings and modifications.

.5 Specifications: mark each item to record actual construction, including:

.1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.

.2 Changes made by Addenda and change orders.

.6 Other Documents: Maintain manufacturer's certifications, required by individual specifications Sections.

.7 Provide digital photos, if requested, for site records.

1.9 EQUIPMENT AND SYSTEMS

.1 For each item of equipment and each system include description of unit or system, and component parts.

.1 Give function, normal operation characteristics and limiting conditions.

.2 Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

.2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.

.3 Include installed colour coded wiring diagrams.

.4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences.

.1 Include regulation, control, stopping, shut-down, and emergency instructions.

.2 Include summer, winter, and any special operating instructions.

.5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

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

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

.8 Include sequence of operation by controls manufacturer.

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

.10 Provide installed control diagrams by controls manufacturer.

.11 Provide Contractor's coordination drawings, with installed colour coded piping diagrams.

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

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

.14 Include test and balancing reports as specified in Section 01 45 00 – Quality Control and Section 01 91 13 – General Commissioning Requirements.

.15 Additional requirements: As specified in individual specification Sections.

1.10 MATERIALS AND FINISHES

.1 Building products, applied materials, and finishes: Include product data, with catalogue number, size, composition, and colour and texture designations.

.1 Provide information for re-ordering custom manufactured products.

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

.3 Moisture-protection and weather-exposed products: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.4 Additional requirements: As specified in individual specifications Sections.

1.11 MAINTENANCE MATERIALS

.1 Spare Parts:

.1 Provide spare parts, in quantities specified in individual specification Sections.

.2 Provide items of same manufacture and quality as items in Work.

.3 Deliver to site; place and store.

.4 Receive and catalogue items.

.1 Submit inventory listing to Departmental Representative.

.2 Include approved listings in Maintenance Manual.

.5 Obtain receipt for delivered products and submit before final payment.

.2 Extra Stock Materials:

.1 Provide maintenance and extra materials, in quantities specified in individual specification Sections.

.2 Provide items of same manufacture and quality as items in Work.

.3 Deliver to site; place and store.

.4 Receive and catalogue items.

.1 Submit inventory listing to Departmental Representative.

.2 Include approved listings in Maintenance Manual.

.5 Obtain receipt for delivered products and submit before to final payment.

.3 Special Tools:

.1 Provide special tools, in quantities specified in individual specification Section.

.2 Provide items with tags identifying their associated function and equipment.

.3 Deliver to site; place and store.

.4 Receive and catalogue items.

.1 Submit inventory listing to Departmental Representative.

.2 Include approved listings in Maintenance Manual.

1.12 DELIVERY, STORAGE, AND HANDLING

.1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.

.2 Store in original and undamaged condition with manufacturer's seal and labels intact.

.3 Store components subject to damage from weather in weatherproof enclosures.

.4 Store paints and freezable materials in a heated and ventilated room.

.5 Remove and replace damaged products at own expense and for review by Departmental Representative.

1.13 WARRANTIES AND BONDS

.1 Develop warranty management plan to contain information relevant to Warranties.

.2 Submit warranty management plan, 30 days before planned pre-warranty conference, to Departmental Representative approval.

.3 Warranty management plan to include required actions and documents to assure that Departmental Representative receives warranties to which it is entitled.

.4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.

.5 Submit, warranty information made available during construction phase, to Departmental Representative for approval before each monthly pay estimate.

.6 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:

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

.2 List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

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

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

.5 Co-execute submittals when required.

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

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

.8 Conduct joint 4 month and 9 month warranty inspection, measured from time of acceptance, by Departmental Representative.

.9 Include information contained in warranty management plan as follows:

.1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, Subcontractors, manufacturers, or suppliers involved.

.2 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include HVAC balancing, and commissioned systems such as fire protection, alarm systems, sprinkler systems, lightning protection systems,.

.3 Provide list for each warranted equipment, item, feature of construction or system indicating:

.1 Name of item.

.2 Model and serial numbers.

.3 Location where installed.

.4 Name and phone numbers of manufacturers or suppliers.

.5 Names, addresses and telephone numbers of sources of spare parts.

.6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.

.7 Cross-reference to warranty certificates as applicable.

.8 Starting point and duration of warranty period.

.9 Summary of maintenance procedures required to continue warranty in force.

.10 Cross-Reference to specific pertinent Operation and Maintenance manuals.

.11 Organization, names and phone numbers of persons to call for warranty service.

.12 Typical response time and repair time expected for various warranted equipment.

.4 Contractor's plans for attendance at 4 and 9 month post-construction warranty inspections.

.5 Procedure and status of tagging of equipment covered by extended warranties.

.6 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

.10 Respond in timely manner to oral or written notification of required construction warranty repair work.

.11 Written verification to follow oral instructions.

.1 Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

1.14 WARRANTY TAGS

.1 Tag, at time of installation, each warranted item. Provide durable, oil-and water-resistant tag approved by Departmental Representative.

.2 Attach tags with copper wire and spray with waterproof silicone coating.

.3 Leave date of acceptance until project is accepted for occupancy.

.4 Indicate the following information on tag:

.1 Type of product/material.

.2 Model number.

.3 Serial number.

.4 Contract number.

.5 Warranty period.

.6 Inspector's signature.

.7 Construction Contractor.

PART 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 This Section includes general requirements relating to commissioning (Cx) of project components and systems, specifying general requirements for performance verification (PV) of components, equipment, sub-systems, systems, and integrated systems.

1.2 RELATED REQUIREMENTS

.1 Section 01 45 00 - Quality Control.

.2 Section 01 77 00 - Closeout Procedures.

.3 Section 01 78 00 - Closeout Submittals.

.4 Section 01 91 13.13 - Commissioning Plan.

.5 Section 01 91 13.16 - Commissioning Forms.

1.3 ABBREVIATIONS

.1 AFD: Alternate Forms of Delivery, service provider

.2 BMM: Building Management Manual

.3 Cx: Commissioning

.4 EMCS: Energy Monitoring and Control Systems

.5 O&M: Operation and Maintenance

.6 PI: Product Information

.7 PV: Performance Verification

.8 TAB: Testing, Adjusting and Balancing

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Coordination:

.1 Departmental Representative and Consultant's will observe some or all commissioning activities at their discretion.

.2 Owner's Performance Testing: Performance testing of equipment or systems by Departmental Representative will not relieve Contractor from compliance with specified start-up and testing procedures.

.3 Cooperate fully with Departmental Representative and Consultant's during stages of acceptance and occupancy of facility.

.4 Coordination with Authorities Having Jurisdiction (AHJ):

.1 Where specified start-up, testing or commissioning procedures duplicate verification requirements of AHJ, arrange for authority to witness procedures to avoid duplication of tests and to facilitate an earlier acceptance of facility.

.2 Obtain certificates of approval, acceptance, and compliance with rules and regulations of AHJ.

.3 Submit copies to Consultant within 5 days of test and with Cx report.

.2 Commissioning Meetings:

.1 Hold Cx meetings after project meetings in accordance with Section 01 32 16.19 – Construction Progress Schedule-Bar (Gantt) Chart and as indicated in this Section.

.2 Use Cx meetings to resolve issues, monitor progress, and identify defects and deficiencies relating to Cx.

.3 Continue Cx meetings on a regular basis, including during equipment start-up period, and functional testing period until commissioning deliverables have been addressed.

.4 At 60% construction completion stage: Departmental Representative will request a separate Cx scope meeting to review progress, discuss schedule of equipment start-up activities and prepare for Cx. Agenda topics include the following:

.1 Review duties and responsibilities of Contractor and Subcontractors, addressing delays and potential problems.

.2 Determine the degree of involvement of Subcontractors and manufacturer's representatives in the Cx process.

.5 Meeting will be chaired by the Contractor, who will record and distribute minutes.

.6 Ensure Subcontractors and relevant manufacturer representatives are present at 60% construction completion stage, at subsequent Cx meetings, and when otherwise required.

.3 Observation of Starting and Testing:

.1 Give 14 days notice before beginning commissioning.

.2 Departmental Representative and Consultant will observe start-up and testing.

.3 Owner's Cx Agent to be present at tests performed and documented by Subcontractors, suppliers, and equipment manufacturers.

.4 Conflicts:

.1 Report conflicts between requirements of this Section and other Sections to Departmental Representative and Consultant and obtain interpretation or clarification before starting commissioning work.

.2 Failure to report conflicts and obtain interpretation or clarification will result in application of the more stringent requirement.

.5 Excess Administration:

.1 Contractor shall pay the Owner costs related to Consultant 's excess contract administration if third and subsequent verifications occur where:

.1 Verification of reported results fail to receive Consultant 's acceptance.

.2 Repetition of second verification again fails to receive acceptance.

.3 Consultant deems Contractor's request for second verification was premature.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

.1 Submit no later than 4 weeks after award of Contract:

.1 name of Owner's Cx agent,

.2 draft Cx documentation, and

.3 preliminary Cx schedule.

.2 Request changes to submittals in writing to Departmental Representative and obtain written acceptance or rejection at least 8 weeks before start of Cx.

.3 Where Cx procedures are not specified, submit proposed ones to Departmental Representative and Consultant and obtain written acceptance or rejection at least 8 weeks before start of Cx.

.4 Submit additional documentation relating to Cx process as required by Departmental Representative and Consultant.

.5 If instruments installed in Contract will be used for Cx of TAB and PV, then submit TAB and PV instrument calibration certificates for review and acceptance.

.6 Submit EMCS sensor calibration certificates.

.2 Commissioning Schedule:

.1 Create and submit detailed Cx schedule as part of construction schedule in accordance with Section 01 32 16.19 – Construction Progress Schedule-Bar (Gantt) Chart.

.2 Allow in the schedule adequate time for Cx activities prescribed in technical specification Sections and commissioning Sections including:

.1 acceptance of Cx reports

.2 verification of reported results

.3 repairs, retesting, re-commissioning, and re-verification

.4 training

.3 Start-Up Documentation:

.1 Assemble start-up documentation and submit to Departmental Representative for review and acceptance before beginning commissioning.

.2 Start-up documentation to include:

.1 Factory and on-site test certificates for specified equipment.

.2 Pre-start-up inspection reports.

.3 Signed installation/start-up checklists.

.4 Start-up reports.

.5 Step-by-step description of complete start-up procedures so Departmental Representative can repeat start-up at any time.

.4 Submit for review and acceptance:

.1 Complete list of proposed instruments and equipment to perform commissioning.

.2 List data including, serial number, current calibration certificate, calibration date, calibration expiry date and calibration accuracy.

.5 Commissioning Documentation:

.1 Refer to Section 01 91 13.16 – Commissioning Forms for requirements and instructions for use.

.2 Submit completed Cx documentation to Consultant for review and acceptance.

1.6 MAINTENANCE MATERIALS SUBMITTALS

.1 Supply and document maintenance materials, spare parts, and special tools as specified in other specification Sections.

1.7 SITE CONDITIONS

.1 Where Cx of weather-dependent, occupancy-dependent, or seasonally-dependent equipment or systems cannot be conducted under near-rated or near-design conditions, extrapolate part-load results to design conditions if acceptable to Departmental Representative with manufacturer's assistance in accordance with equipment manufacturer's instructions, data, and approved formulae.

PART 2 PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 EXECUTION

3.1 GENERAL

.1 Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Perform Cx after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved.

.1 Objectives: Verify that installed equipment, systems and integrated systems operate in accordance with Contract Documents and design criteria and intent.

.2 Perform Cx throughout various seasons to calibrate and optimize systems under changing conditions.

.3 Ensure appropriate documentation is compiled into the BMM.

.4 Effectively train O&M staff.

.2 Contractor shall assist in Cx process, operating equipment and systems, troubleshooting, and making adjustments as required.

.1 Operate systems at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems should interact with each other as intended in accordance with Contract Documents and design criteria.

.2 Make adjustments as needed, during these checks, to enhance performance and meet environmental or user requirements.

.3 Design Criteria: In accordance with Owner's requirements or as determined by Consultant. To meet Project functional and operational requirements.

3.2 COMMISSIONING OVERVIEW

.1 Refer to Section 01 91 13.13 – Commissioning Plan for additional Cx responsibilities.

.2 Include Cx as a line item in Contractor's cost breakdown.

.3 Cx activities supplement the site quality control and testing procedures described in relevant technical specification Sections.

.4 Conduct Cx at the same time as other activities during the construction stage.

.5 Cx identifies issues in the Design stages, which are addressed during Construction and Cx stages. This step ensures the built facility meets functional and operational requirements while operating as intended under weather, environmental and occupancy conditions. Cx activities include the transfer of critical knowledge to the Owner's facility operations personnel.

.6 Departmental Representative will issue Interim Acceptance Certificate only after:

.1 Cx documentation has been received, reviewed for suitability, and reviewed and accepted by Consultant,

.2 equipment, components and systems have been commissioned, and

.3 O&M training has been completed.

3.3 PRE-COMMISSIONING REVIEW

.1 Before Construction:

.1 Review Contract Documents and confirm in writing to Departmental Representative and Consultant the following:

.1 Adequacy of provisions for Cx.

.2 Aspects of design and installation pertinent to success of Cx.

.2 During Construction:

.1 Coordinate provision, location, and installation of provisions for Cx.

.3 Before Beginning Cx:

.1 Verify Cx Plan and schedules are up-to-date.

.2 Verify installation of related components, equipment, systems, and sub-systems are complete.

.3 Review Cx requirements and procedures.

.4 Verify documentation used for the Cx process is shelf-ready (bound, organized, indexed, etc.).

.5 Review design criteria and intent, and special features to ensure full understanding.

.6 Submit complete start-up documentation to Departmental Representative and Consultant.

.7 Verify systems have been cleaned thoroughly.

.8 Complete TAB procedures on systems and submit TAB reports to Departmental Representative and Consultant for review and acceptance.

.9 Verify "As-Built" system schematics are available.

.4 Inform Departmental Representative and Consultant in writing of defects and deficiencies in installed Work.

3.4 STARTING AND TESTING

.1 Contractor to provide and pay costs of the following:

.1 inspections, including disassembly and re-assembly after approval, and for starting, testing, adjusting, and;

.2 temporary testing equipment.

3.5 PERFORMANCE VERIFICATION TOLERANCES

.1 Application Tolerances:

.1 A specified range of acceptable deviations of measured values from specified values or specified design criteria except for special areas that shall be within +/- 10% of specified values.

.2 Instrument Accuracy Tolerances:

.1 To be of higher order of magnitude than equipment or system being tested.

.3 Measurement Tolerances During Verification:

.1 Unless otherwise specified, actual values shall be within +/-2% of recorded values.

3.6 MANUFACTURER SERVICES

.1 During factory testing, manufacturer to:

.1 Coordinate time and location of testing.

.2 Arrange for Departmental Representative and Consultant to observe testing.

.3 Submit testing documentation for review and acceptance by Consultant.

.4 Obtain written acceptance of test results and documentation from Consultant before delivery to site.

.2 Obtain manufacturer's installation, start-up and operations instructions before start-up of components, equipment and systems, and review with Departmental Representative and Consultant.

.1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.

.2 Modify procedures that may be detrimental to equipment performance and review with manufacturer before start-up.

.3 Integrity of warranties:

.1 Use manufacturer's trained start-up personnel where specified in other divisions or where required to maintain integrity of warranty.

.2 Verify with manufacturer that testing as specified will not void warranties.

.4 Qualifications of manufacturer's personnel:

.1 Experienced in design, installation and operation of equipment and systems.

.2 Ability to interpret test results accurately.

.3 Report results in clear, concise, logical manner.

3.7 COMMISSIONING PROCEDURES

.1 Verify that equipment and systems are complete, clean, and operating in a normal and safe manner before conducting start-up, testing and Cx.

.2 Conduct start-up and testing in the following distinct phases:

.1 Included in delivery and installation:

.1 Verification of conformity to specification, reviewed and accepted shop drawings and completion of PI report forms.

.2 Visual inspection of quality of installation.

.2 Start-up: Follow accepted start-up procedures.

.3 Operational testing: Document equipment performance.

.4 System PV: Include repetition of tests after correcting deficiencies.

.5 Post-Substantial Performance Verification: To include fine-tuning.

.3 Correct deficiencies and obtain acceptance from Consultant after distinct phases have been completed and before beginning the next phase.

.4 Document required tests on approved PV forms.

.5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by Departmental Representative and Consultant. If evaluation report indicates that equipment start-up procedure was deficient and resulted in equipment damage, perform the following:

.1 Minor equipment/systems: Perform corrective measures acceptable to Consultant.

.2 Major equipment/systems: If evaluation report indicates that equipment damage is minor, perform corrective measures acceptable to Consultant.

.3 If evaluation report indicates that major equipment damage has occurred, Consultant will reject equipment.

.1 Remove rejected equipment from site and replace with new equipment.

.2 Perform specified start-up procedures on new equipment/systems.

3.8 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS

.1 After start-up, operate and maintain equipment and systems as directed or recommended by equipment/system manufacturer.

.2 With manufacturer's assistance, develop written maintenance program and submit to Departmental Representative and Consultant for review and acceptance before implementation.

.3 Operate and maintain systems for length of time required for commissioning to be completed.

.4 After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.

3.9 TEST RESULTS

.1 If start-up, testing, or PV produce unacceptable results, repair, replace or repeat specified starting or PV procedures until acceptable results are achieved.

.2 Provide labour and materials, and assume costs for re-commissioning.

3.10 START OF COMMISSIONING

.1 Notify Departmental Representative and Consultant at least 21 days before start of Cx.

.2 Start Cx after elements of building affecting start-up and performance verification of systems have been completed.

3.11 TEMPORARY INSTRUMENTS AND EQUIPMENT

.1 Provide the following instruments and equipment as required:

.1 2-way radios

.2 ladders

.3 other instruments and equipment required to complete commissioning

3.12 COMMISSIONING PERFORMANCE VERIFICATION

.1 Carry out Cx:

.1 under actual operating conditions, over entire operating range, and in all modes, and

.2 on independent systems and interacting systems.

.2 Cx procedures to be repeatable and reported results are to be verifiable.

.3 Follow equipment manufacturer's operating instructions.

.4 Make EMCS trending information available as supporting documentation for performance verification.

3.13 EXTENT OF VERIFICATION

.1 Laboratory areas:

.1 Provide labour and instrumentation to verify up to 100% of reported results.

.2 Elsewhere:

.1 Provide labour and instrumentation to verify up to 30% of reported results, unless otherwise specified in other specification Sections.

.3 Number and location to be at discretion of Departmental Representative.

.4 Conduct tests repeated during verification under same conditions as original tests, using same test equipment, and instrumentation.

.5 Review and repeat commissioning of systems if inconsistencies found in more than 20% of reported results.

.6 Perform additional commissioning until results are acceptable to Departmental Representative and Consultants.

3.14 INSTALLED INSTRUMENTATION

.1 Use instruments installed under Contract for TAB and PV if:

.1 Accuracy complies with this specification Section.

.2 Calibration certificates have been submitted to Consultant.

.2 Calibrated EMCS sensors may be used to obtain performance data if sensor calibration has been completed and accepted.

3.15 PROCEDURES FOR DEFICIENCIES DISCOVERED DURING COMMISSIONING

.1 Correct defects and deficiencies found during the Cx process. Re-verify equipment and components within the defective or deficient system to verify proper performance, including related systems if requested by Consultant.

.2 Costs associated with re-commissioning defective and deficient work is the responsibility of Contractor. Above costs to be in the form of progress payment reductions or hold-back assessments.

3.16 COMMISSIONING CONSTRAINTS

.1 Since access into secure or sensitive areas will be very difficult after occupancy it is necessary to complete Cx of occupancy, weather, and seasonal sensitive equipment and systems in these areas before issuance of the Interim Certificate, using, if necessary, simulated thermal loads.

3.17 MISCELLANEOUS CHECKS AND ADJUSTING

.1 Make adjustments and changes which become apparent as Cx proceeds.

.2 Perform static and operational checks as applicable and as required.

3.18 DEFICIENCIES AND DEFECTS

.1 Correct deficiencies and defects found during start-up and Cx to satisfaction of Departmental Representative and Consultant.

.2 Report concerns, deficiencies, and defects affecting Cx to Departmental Representative and Consultant in writing. Stop Cx until problems are rectified. Proceed with written acceptance from Departmental Representative and Consultant.

3.19 CLOSEOUT ACTIVITIES

.1 Completion of Commissioning:

.1 Upon completion of Cx, leave systems in normal operating mode.

.2 Except for warranty and seasonal verification activities specified in Cx specifications, complete Cx before issuance of Interim Certificate of Completion.

.3 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by Departmental Representative.

.2 Activities Upon Completion of Commissioning:

.1 When changes are made to baseline components or system settings established during Cx process, provide updated Cx form for affected item.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Description of overall structure of Plan and roles and responsibilities of commissioning team.

.2 Related Requirements

.1 Section 01 33 00 - Submittal Procedures.

.2 01 91 13 - Commissioning Requirements.

1.2 REFERENCE STANDARDS

.1 National Fire Protection Association (NFPA)

.1 NFPA-13-02, Installation of Sprinkler Systems Handbook.

.2 NFPA-13-02, Automatic Sprinkler Systems Handbook.

.3 NFPA-20-03, Standard for the Installation of Stationary Fire Pumps for Fire Protection.

1.3 GENERAL

.1 Provide a fully functional facility:

.1 Systems, equipment and components meet user's functional requirements before date of acceptance, and operate consistently at peak efficiencies and within specified energy budgets under normal loads.

.2 Facility user and O&M personnel have been fully trained in aspects of installed systems.

.3 Optimized life cycle costs.

.4 Complete documentation relating to installed equipment and systems.

.2 Term "Cx" in this section means "Commissioning".

.3 Use this Cx Plan as master planning document for Cx:

.1 Outlines organization, scheduling, allocation of resources, documentation, pertaining to implementation of Cx.

.2 Communicates responsibilities of team members involved in Cx Scheduling, documentation requirements, and verification procedures.

.3 Sets out deliverables relating to O&M, process and administration of Cx.

.4 Describes process of verification of how built works meet design requirements.

.5 Produces a complete functional system prior to issuance of Certificate of Occupancy.

.6 Management tool that sets out scope, standards, roles and responsibilities, expectations, deliverables, and provides:

.1 Overview of Cx.

.2 General description of elements that make up Cx Plan.

.3 Process and methodology for successful Cx.

.4 Acronyms:

.1 Cx-Commissioning.

.2 BMM-Building Management Manual.

.3 EMCS-Energy Monitoring and Control Systems.

.4 WHMIS Safety Data Sheets (SDS).

.5 PI-Product Information.

.6 PV-Performance Verification.

.7 TAB-Testing, Adjusting and Balancing.

.8 WHMIS-Workplace Hazardous Materials Information System.

.5 Commissioning terms used in this Section:

.1 Bumping: short term start-up to prove ability to start and prove correct rotation.

.2 Deferred Cx-Cx activities delayed for reasons beyond Contractor's control due to lack of occupancy, weather conditions, need for heating/cooling loads.

1.4 DEVELOPMENT OF 100% CX PLAN

.1 Cx Plan to be completed by the Contractor.

.1 Contractor to submit Cx Plan to consultants for approval.

.2 Contractor to lead the Cx Process.

.2 Cx Plan to be 100% completed within 8 weeks of award of contract to take into account:

.1 Approved shop drawings and product data.

.2 Approved changes to contract.

.3 Contractor's project schedule.

.4 Cx schedule.

.5 Contractor's, sub-contractor's, suppliers' requirements.

.6 Project construction team's and Cx team's requirements.

.3 Submit completed Cx Plan to Departmental Representative and obtain written approval.

1.5 COMPOSITION, ROLES AND RESPONSIBILITIES OF CX TEAM

.1 Departmental Representative to maintain overall responsibility for project and is sole point of contact between members of commissioning team.

.1 This portion of work will be completed by MUN's Facilities Managements Project Coordinator in coordination with the Consultant Team.

.2 Cx Team to consist of the following members:

.1 Department Representative is responsible for:

.1 Organizing Cx.

.2 Monitoring operations of Cx.

.3 Witnessing, certifying accuracy of reported results.

.4 Witnessing and certifying TAB and other tests.

.5 Developing BMM.

.6 Ensuring implementation of final Cx Plan.

.7 Performing verification of performance of installed systems and equipment.

.8 Implementation of Training Plan.

.2 Consultant is responsible for:

.1 Monitoring operations of Cx.

.2 Witnessing, certifying accuracy of reported results.

.3 Witnessing and certifying TAB and other tests.

.3 Construction Team is responsible for:

.1 Commissioning Schedule Bar (Gantt) chart

.2 Testing.

.3 TAB.

.4 Performance of Cx activities.

.5 Delivery of training and Cx documentation.

.6 Assigning one person as point of contact with Consultant and Departmental Representative for administrative and coordination purposes.

.4 Contractors Cx Agent implements specified Cx activities including:

.1 Demonstrations.

.2 Training.

.3 Testing.

.4 Preparation, submission of test reports.

1.6 CX PARTICIPANTS

.1 Employ the following Cx participants to verify performance of equipment and systems:

.1 Installation contractor/subcontractor:

.1 Equipment and systems except as noted.

.2 Equipment manufacturer: equipment specified to be installed and started by manufacturer.

.1 To include performance verification.

.3 Specialist subcontractor: equipment and systems supplied and installed by specialist subcontractor.

.4 Specialist Cx agency:

.1 Possessing specialist qualifications and installations providing environments essential to client's program but are outside scope or expertise of Cx specialists on this project.

.5 Client: responsible for intrusion and access security systems.

.6 Ensure that Cx participant:

.1 Could complete work within scheduled time frame.

.2 Available for emergency and troubleshooting service during first year of occupancy by user for adjustments and modifications outside responsibility of O&M personnel, including:

.1 Changes to heating or cooling loads beyond scope of EMCS.

.2 Changes to EMCS control strategies beyond level of training provided to O&M personnel.

.3 Redistribution of electrical services.

.4 Modifications of fire alarm systems.

.5 Modifications to voice communications systems.

.7 Provide names of participants to Departmental Representative and details of instruments and procedures to be followed for Cx 3 months prior to starting date of Cx for review and approval.

1.7 EXTENT OF CX

.1 Cx Structural and Architectural Systems:

.1 Architectural and structural:

.1 Accessibility and operational safety:

.1 Door Operators.

.2 Doors, windows, related hardware:

.1 new door and window hardware.

.2 Commission mechanical systems and associated equipment:

.1 HVAC and exhaust systems:

.1 HVAC Systems

.2 General exhaust systems

.3 Exhaust systems and related systems.

.2 Fire and life safety systems:

.1 Wet pipe sprinkler systems.

.2 Fire extinguishers.

.3 Window Sprinkler Systems.

.3 Noise and vibration control systems for mechanical systems.

.4 Building Automation System for mechanical Systems:

.3 Commission electrical systems and equipment:

.1 Low voltage below 750 V:

.1 Panel boards

.2 Receptacles

.3 Audio/Visual Systems

.4 Voice communications systems.

.2 Lighting systems:

.1 Lighting equipment.

.2 Lighting Controls

.3 Emergency lighting systems.

.4 Exit emergency signage.

.3 Fire alarm systems, equipment:

.1 Initiation Devices

.2 Notification Devices

.3 System updates and verification

.4 Other systems and equipment:

.1 Access Security System

.2 Video camera systems

1.8 DELIVERABLES RELATING TO O&M PERSPECTIVES

.1 General requirements:

.1 Compile English documentation.

.2 Documentation to be computer-compatible format ready for inputting for data management.

.2 Provide deliverables:

.1 Warranties.

.2 Project record documentation.

.3 Inventory of spare parts, special tools and maintenance materials.

.4 Maintenance Management System (MMS) identification system used.

.5 WHMIS information.

.6 WHMIS Safety Data Sheets (SDS).

.7 Electrical Panel inventory containing detailed inventory of electrical circuitry for each panel board. Duplicate of inventory inside each panel.

1.9 DELIVERABLES RELATING TO THE CX PROCESS

.1 General:

.1 Start-up, testing and Cx requirements, conditions for acceptance and specifications form part of relevant technical sections of these specifications.

.2 Definitions:

.1 Cx as used in this section includes:

.1 Cx of components, equipment, systems, subsystems, and integrated systems.

.2 Factory inspections and performance verification tests.

.3 Deliverables: provide:

.1 Cx Specifications.

.2 Startup, pre-Cx activities and documentation for systems, and equipment.

.3 Completed installation checklists (ICL).

.4 Completed product information (PI) report forms.

.5 Completed performance verification (PV) report forms.

.6 Results of Performance Verification Tests and Inspections.

.7 Description of Cx activities and documentation.

.8 Description of Cx of integrated systems and documentation.

.9 Tests performed by Owner/User.

.10 Training Plans.

.11 Cx Reports.

.12 Prescribed activities during warranty period.

.4 Consultant to witness and certify tests and reports of results provided to Departmental Representative.

.5 Departmental Representative and Consultant to participate.

1.10 PRE-CX ACTIVITIES AND RELATED DOCUMENTATION

.1 Items listed in this Cx Plan include the following:

.1 Pre-Start-Up inspections: by Consultant prior to permission to start up and rectification of deficiencies to Consultant's satisfaction.

.2 Consultant to use approved check lists.

.3 Departmental Representative and Consultant will monitor some of these pre-start-up inspections.

.4 Include completed documentation with Cx report.

.5 Conduct pre-start-up tests: conduct pressure, static, flushing, cleaning, and "bumping" during construction as specified in technical sections. To be witnessed and certified by Consultant and does not form part of Cx specifications.

.6 Consultant will monitor some of these inspections and tests.

.7 Include completed documentation in Cx report.

.2 Pre-Cx activities-ARCHITECTURAL AND STRUCTURAL:

.1 Slab and beam deflection test: test after removal of temporary supports and concrete has cured to ensure adequacy for raised floors.

.2 Exterior walls: conduct thermographic surveys to ensure appropriate level of tightness after exterior envelope has been completed. Permanent HVAC systems

are able to provide appropriate negative or positive pressure, a temperature of at 20 degrees C can be maintained between inside and outside and wind speed is less than 10 kph.

.3 Doors, windows, related hardware:

.1 Door and window hardware: as indicated in contractor documents.

.3 Pre-Cx activities-MECHANICAL:

.1 All systems and equipment in subsection 1.7 to be checked and verified by the contractor prior to calling for final inspection and commissioning.

.2 HVAC equipment and systems:

.1 "Bump" each item of equipment in its "stand-alone" mode.

.2 At this time, complete pre-start-up checks and complete relevant documentation.

.3 After equipment has been started, test related systems in conjunction with control systems on a system-by-system basis.

.4 Perform TAB on systems. TAB reports to be approved by Consultant.

.3 EMCS:

.1 EMCS trending to be available as supporting documentation for performance verification.

.2 Perform point-by-point testing in parallel with start-up.

.3 Carry out point-by-point verification.

.4 Demonstrate performance of systems, to be witnessed by Consultant prior to start of 30 day Final Acceptance Test period.

.5 Perform final Cx and operational tests during demonstration period and 30 day test period.

.6 Only additional testing after foregoing have been successfully completed to be "Off-Season Tests".

.4 Pre-Cx activities-LIFE SAFETY SYSTEMS

.1 Complete pre-start up checks and complete relevant documentation.

.2 After equipment has been started, test related systems in conjunction with control systems on a system-by-system basis.

.3 Include equipment and systems identified above.

.4 Reports of test results to be witnessed and certified by Consultant before verification.

.5 Pre-Cx activities-ELECTRICAL:

.1 All systems and equipment in subsection 1.7 to be checked and verified by the Contractor prior to calling for final inspection and commissioning.

.2 Fire alarm systems: test after other safety and security systems are completed. Testing to include a complete verification in accordance with ULC requirements. Consultant has witnessed and certified report, demonstrate devices and zones to Departmental Representative.

1.11 START-UP

.1 Start up components, equipment and systems.

.2 Equipment manufacturer, supplier, installing specialist sub-contractor, as appropriate, to start-up, under Contractor's direction, following equipment, systems:

.3 Consultant to monitor some of these start-up activities.

.1 Rectify start-up deficiencies to satisfaction of Consultant.

.4 Performance Verification (PV):

.1 Approved Cx Agent to perform.

.1 Repeat when necessary until results are acceptable to Consultant.

.2 Use procedures modified generic procedures to suit project requirements.

.3 Consultant to witness and certify reported results using approved PI and PV forms.

.4 Consultant to approve completed PV reports and provide to Departmental Representative.

.5 Failure of randomly selected item shall result in rejection of PV report or report of system startup and testing.

1.12 CX ACTIVITIES AND RELATED DOCUMENTATION

.1 Perform Cx by specified Cx agency using procedures developed by Consultant and approved by Departmental Representative.

.2 Consultant to monitor Cx activities.

.3 Upon satisfactory completion, Cx agency performing tests to prepare Cx Report using approved PV forms.

.4 Consultant to witness, certify reported results of, Cx activities and forward to Departmental Representative.

.5 Departmental Representative reserves right to verify a percentage of reported results at no cost to contract.

1.13 INSTALLATION CHECK LISTS (ICL)

.1 Refer to Section 01 91 13.16 – Commissioning Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms.

1.14 PRODUCT INFORMATION (PI) REPORT FORMS

.1 Refer to Section 01 91 13.16 – Commissioning Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms.

1.15 PERFORMANCE VERIFICATION (PV) REPORT

.1 Refer to Section 01 91 13.16 – Commissioning Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms.

1.16 DELIVERABLES RELATING TO ADMINISTRATION OF CX

.1 General:

.1 Because of risk assessment, complete Cx of occupancy, weather and seasonal-sensitive equipment and systems in these areas before building is occupied.

1.17 CX SCHEDULES

.1 Prepare detailed critical path Cx Schedule and submit to Departmental Representative and Consultant for review and approval same time as project Construction Schedule. Include:

.1 Milestones, testing, documentation, training and Cx activities of components, equipment, subsystems, systems and integrated systems, including:

.1 Design criteria, design intents.

.2 Pre-TAB review: 28 days after contract award, and before construction starts.

.3 Cx agents' credentials: 60 days before start of Cx.

.4 Cx procedures: 3 months after award of contract.

.5 Cx Report format: 3 months after contract award.

.6 Discussion of heating/cooling loads for Cx: 3 months before start-up.

.7 Submission of list of instrumentation with relevant certificates: 21 days before start of Cx.

.8 Notification of intention to start TAB: 21 days before start of TAB.

.9 TAB: after successful start-up, correction of deficiencies and verification of normal and safe operation.

.10 Notification of intention to start Cx: 14 days before start of Cx.

.11 Notification of intention to start Cx of integrated systems: after Cx of related systems is completed 14 days before start of integrated system Cx.

.12 Identification of deferred Cx.

.13 Implementation of training plans.

.14 Cx of smoke management/control systems: after Cx of related systems is completed and 7 days before proposed date of Cx these systems.

.15 Cx reports: immediately upon successful completion of Cx.

.16 Emergency evacuation exercises: after 80% occupancy and at same time as Cx of stair shaft pressurization systems.

.2 After approval, incorporate Cx Schedule into Construction Schedule.

.3 Consultant, Contractor, Contractor's Cx agent, and Departmental Representative will monitor progress of Cx against this schedule.

1.18 CX REPORTS

.1 Submit reports of tests, witnessed and certified by Consultant to Departmental Representative who will verify reported results.

.2 Include completed and certified PV reports in properly formatted Cx Reports.

.3 Before reports are accepted, reported results to be subject to verification by Departmental Representative.

1.19 ACTIVITIES DURING WARRANTY PERIOD

.1 Cx activities must be completed before issuance of Interim Certificate, it is anticipated that certain Cx activities may be necessary during Warranty Period, including:

.1 Fine tuning of HVAC systems.

.2 Adjustment of ventilation rates to promote good indoor air quality and reduce deleterious effects of VOCs generated by off-gassing from construction materials and furnishings.

.3 Full-scale emergency evacuation exercises.

1.20 TESTS TO BE PERFORMED BY OWNER/USER

.1 None is anticipated on this project.

1.21 FINAL SETTINGS

.1 Upon completion of Cx to satisfaction of Departmental Representative lock control devices in their final positions, indelibly mark settings marked and include in Cx Reports.

PART 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Commissioning forms to be completed for equipment, system and integrated system.

.2 Related Requirements

.1 Section 01 33 00 - Submittal Procedures.

.2 01 91 13 - General Commissioning Requirements.

.3 Section 01 91 13.13 - Commissioning Plan

1.2 INSTALLATION/START-UP CHECK LISTS

.1 Include the following data:

.1 Product manufacturer's installation instructions and recommended checks.

.2 Special procedures as specified in relevant technical sections.

.3 Items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.

.2 Equipment manufacturer's installation/start-up check lists are acceptable for use. As deemed necessary by Consultant supplemental additional data lists will be required for specific project conditions.

.3 Use check lists for equipment installation. Document check list verifying checks have been made, indicate deficiencies and corrective action taken.

.4 Installer to sign check lists upon completion, certifying stated checks and inspections have been performed. Return completed check lists to Consultant. Check lists will be required during Commissioning and will be included in Building Maintenance Manual (BMM) at completion of project.

.5 Use of check lists will not be considered part of commissioning process but will be stringently used for equipment pre-start and start-up procedures.

1.3 PRODUCT INFORMATION (PI) REPORT FORMS

.1 Product Information (PI) forms compiles gathered data on items of equipment produced by equipment manufacturer, includes nameplate information, parts list, operating instructions, maintenance guidelines and pertinent technical data and recommended checks that is necessary to prepare for start-up and functional testing and used during operation and maintenance of equipment. This documentation is included in the BMM at completion of work.

.2 Contractor to provide start up Performance Information (PI) forms.

.3 Prior to Performance Verification (PV) of systems complete items on PI forms related to systems and obtain Consultant's approval.

1.4 PERFORMANCE VERIFICATION (PV) FORMS

.1 PV forms to be used for checks, running dynamic tests and adjustments carried out on equipment and systems to ensure correct operation, efficiently and function independently and interactively with other systems as intended with project requirements.

.2 PV report forms include those developed by Contractor records measured data and readings taken during functional testing and Performance Verification procedures.

.3 PV form requirements:

.1 Contractor to provide and develope PV forms.

.2 Contractor to provide a job specific PV forms.

.3 Contractor will provide required shop drawings information and verify correct installation and operation of items indicated on these forms.

.4 Confirm operation as per design criteria and intent.

.5 Identify variances between design and operation and reasons for variances.

.6 Verify operation in specified normal and emergency modes and under specified load conditions.

.7 Record analytical and substantiating data.

.8 Verify reported results.

.9 Form to bear signatures of recording technician and reviewed and signed off by Consultant.

.10 Submit immediately after tests are performed.

.11 Reported results in true measured SI unit values.

.12 Provide consultant with originals of completed forms.

.13 Maintain copy of site during start-up, testing and commissioning period.

1.5 COMMISSIONING FORMS

.1 Use Commissioning forms to verify installation and record performance when starting equipment and systems.

.2 Strategy for Use:

.1 Commissioning forms will be created and completed by consultant with copies provide when completed. Commissioning forms will not be provided until the final Commissioning stage.

1.6 LANGUAGE

.1 To suit the language profile of the awarded contract.

PART 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 This Section includes the following:

.1 Demolition and removal of selected portions of interior building components and finishes.

.2 Repair procedures for selective demolition operations.

.2 This section does not include the following:

.1 Removal of hazardous materials or asbestos abatement.

.2 Demolition of exterior building components or structural elements.

.3 Mechanical or electrical equipment, except as required to make minor modifications to allow the work to be completed.

1.2 RELATED REQUIREMENTS

.1 Section 09 21 16 – Gypsum Board Assemblies

.2 Section 09 51 13 – Acoustical Panel Ceilings

.3 Section 09 65 16 – Resilient Sheet Flooring

.4 Divisions 22

.5 Division 23

.6 Division 26

1.3 DEFINITIONS

.1 Demolish: 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 Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

.3 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed, removed and salvaged, or removed and reinstalled.

.4 Waste Management Coordinator (WMC): Contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.

.5 Draft Construction Waste Management Plan (Draft CWM Plan): Detailed inventory of materials in building indicating estimated quantities of reuse, recycling and landfill, prepared in accordance with Section 01 74 19 – Waste Management and Disposal and as follows:

.1 Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project.

.6 Construction Waste Management Plan (CWM Plan): Written plan addressing opportunities for reduction, reuse, or recycling of materials prepared in accordance with Section 01 74 19 – Waste Management and Disposal

.7 Construction Waste Management Report (CWM Report): Written report identifying actual materials that formed CWM Plan for reduction, reuse, or recycling of materials prepared in accordance with Section 01 74 19 – Waste Management and Disposal

.8 Hazardous Substances: Dangerous substances, dangerous goods, hazardous commodities and hazardous products may include asbestos, mercury and lead, PCB's, poisons, corrosive agents, flammable substances, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly as defined by the Federal Hazardous Products Act (RSC 1985) including latest amendments.

1.4 REFERENCE STANDARDS

.1 American National Standards Institute (ANSI)

.1 ANSI A10.8 2011, Safety Requirements for Scaffolding

.2 ASTM International (ASTM)

.1 ASTM C475/C475M-15, Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board

.3 CSA Group (CSA)

.1 CSA S350 M1980 (R2003), Code of Practice for Safety in Demolition of Structures

.4 Department of Justice Canada (Jus)

.1 Canadian Environmental Assessment Act (CEAA), 2012

.2 Canadian Environmental Protection Act (CEPA), 2012

.1 SOR/2003-2, On-Road Vehicle and Engine Emission Regulations

.2 SOR/2006-268, Regulations Amending the On-Road Vehicle and Engine Emission Regulations

.3 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34

.4 Motor Vehicle Safety Act (MVSA), 1995

.5 Hazardous Materials Information Review Act, 1985

.5 National Fire Protection Association (NFPA)

.1 NFPA 241 13, Standard for Safeguarding Construction, Alteration, and Demolition Operations

1.5 ADMINISTRATIVE REQUIREMENTS

.1 Coordination: Coordinate with Departmental Representative for the material ownership as follows:

.1 Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Departmental Representative's property, demolished materials shall become Contractor's property and shall be removed from Project site.

.2 Coordinate selective demolition work so that work of this Section adheres to aesthetic criteria established by the Drawings and specified dimensions with all elements in planes as drawn, maintaining their relationships with all other building elements.

.2 Pre Demolition Meeting: Convene pre-installation meeting 1 week prior to beginning work of this Section and on-site installation, with Contractor and Departmental Representative in accordance with Section 01 31 19 – Project Meetings to:

.1 Confirm extent of salvaged and demolished materials

.2 Review Contractor's demolition plan

.1 Verify existing site conditions adjacent to demolition work

.2 Coordination with other construction sub trades

.3 Hold project meetings every month.

.4 Ensure key personnel attend.

.5 WMC must provide written report on status of waste diversion activity at each meeting.

.6 Departmental Representative will provide written notification of change to meeting schedule established upon contract award 24 hours prior to scheduled meeting.

1.6 ACTION AND INFORMATION SUBMITTALS

.1 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Demolition Plan: Submit a plan of demolition area indicating extent of temporary facilities and supports, methods of removal and demolition prepared by a professional engineer in accordance with requirements of Authority Having Jurisdiction, and as follows:

.1 Proposed Dust Control and Noise Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Departmental Representative reserves the right to make modifications where proposed methods interfere with the Departmental Representative's ongoing operation

.2 Inventory: Submit a list of items that have been removed and salvaged after selective demolition is complete.

.3 Pre demolition Photographs: Submit photographs indicating existing conditions of adjoining construction and site improvements prior to starting Work. Include finish surfaces that may be misconstrued as damage caused by selective demolition operations.

.2 Informational Submittals: Provide the following submittals when requested by the Departmental Representative:

.1 Qualification Data: Submit information for companies and personnel indicating their capabilities and experience to perform work of this Section including; but not limited to, lists of completed projects with project names and addresses, names and addresses of architects and owners, for work of similar complexity and extent.

1.7 QUALITY ASSURANCE

.1 Regulatory Requirements: Perform work as follows; use most restrictive requirements where differences occur between the municipal, provincial and federal jurisdictions:

.1 Provincial and Federal Requirements: Perform work in accordance with governing environmental notification requirements and regulations of the Authority Having Jurisdiction.

.2 Municipal Requirements: Perform hauling and disposal operations in accordance with regulations of Authority Having Jurisdiction.

.2 Qualifications: Provide proof of qualifications when requested by Departmental Representative:

.1 Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project:

.1 Conform to the provincial Occupational Health and Safety Act and Regulation.

.2 Conform to Workers' Compensation Board Regulations.

.3 Conform to City of local municipal bylaws and regulations governing this type of work.

1.8 SITE CONDITIONS

.1 Departmental Representative will occupy portions of building immediately adjacent to selective demolition area:

.1 Conduct selective demolition so that Departmental Representative's operations will not be disrupted.

.2 Provide not less than 72 hours notice to Departmental Representative of activities that will affect Departmental Representative's operations.

.2 Maintain access to existing means of egress, walkways, corridors, exits, and other adjacent occupied or used facilities:

.1 Do not close or obstruct means of egress, walkways, corridors, exits, or other occupied or used facilities without written acceptance from authorities having jurisdiction.

.3 Departmental Representative assumes no responsibility for condition of areas to be selectively demolished:

.1 Conditions existing at time of Pre Bid Site Review will be maintained by Departmental Representative as far as practical.

.2 Departmental Representative will remove the following items prior to selective demolition:

.1 Insert items to be removed by Departmental Representative.

.4 Discovery of Hazardous Substances: It is not expected that Hazardous Substances will be encountered in the Work; immediately notify Departmental Representative if materials suspected of containing hazardous substances are encountered and perform the following activities:

.1 Refer to Section 01 41 00 – Regulatory Requirements for directives associated with specific material types.

.2 Hazardous materials will be as defined in the Hazardous Materials Act.

PART 2 PRODUCTS

2.1 TEMPORARY SUPPORT STRUCTURES

.1 Design temporary support structures required for demolition work and underpinning and other foundation supports necessary for the project using a qualified professional engineer registered or licensed in province of the Work.

2.2 DESCRIPTION

.1 This section of the Work includes, but is not necessarily limited to, the following:

.1 Demolition, removal completely from site, and disposal of all identified components, materials, equipment and debris

.2 Selective demolition to allow new walls, bulkheads, ceilings and other materials to meet existing construction as indicated

.3 All material from demolition shall be removed from site immediately with no salvage, selling, sorting or burning permitted on site

.4 Retain items indicated on drawings for re use in new construction

2.3 DEBRIS

.1 Make all arrangements for transport and disposal of all demolished materials from the site.

2.4 EQUIPMENT

.1 Provide all equipment required for safe and proper demolition of the building interiors indicated.

2.5 REPAIR MATERIALS

.1 Use repair materials identical to existing materials:

.1 If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.

.2 Use a material whose installed performance equals or surpasses that of existing material.

.3 Comply with material and installation requirements specified in individual Specification Sections.

.2 Floor Patching and Levelling Compounds: Cement based, trowelable, self levelling compounds compatible with specified floor finishes; gypsum based products are not acceptable for work of this Section.

.3 Concrete Unit Masonry: Lightweight concrete masonry units, and mortar, cut and trimmed to fit existing opening to be filled. Provide standard hollow core units, square end units and bond beam units as indicated on drawings.

.4 Prefinished Sheet Steel: Prefinished sheet steel, colour to match existing radiation cabinets, bent and profiled to match existing radiation cabinets.

.5 Gypsum Board Patching Compounds: Joint compound to ASTM C475/C475M, bedding and finishing types thinned to provide skim coat consistency to patch and prepare existing gypsum board walls ready for new finishes in accordance with Section 09 21 16 – Gypsum Board Assemblies

.6 Hoarding and Dust Screens: Refer to Section 01 56 00 – Temporary Barriers and Enclosures for stud framing and gypsum board sheathing materials

2.6 EXISTING MATERIALS

.1 Items to be retained for re use in new construction include, but are not limited to the following:

.1 Lockers and cabinets

.2 Ceiling components

.3 Paper towel dispensers and other miscellaneous items identified on drawings

.4 Vertical blind vanes, and curtains and tracks

.5 Confirm with Departmental Representative any materials that appear to be in re usable condition prior to disposal.

.6 Confirm with Departmental Representative any materials scheduled for re use that are not in re usable condition prior to installation.

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 Notify the Departmental Representative where existing mechanical, electrical, or structural elements conflict with intended function or design:

.1 Investigate and measure the nature and extent of conflict and submit a written report to Departmental Representative.

.2 Departmental Representative will issue additional instructions or revise drawings as required to correct conflict.

.5 Perform surveys as the work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES

.1 Coordinate existing services indicated to remain and protect them against damage during selective demolition operations.

.2 Locate, identify, disconnect, and seal or cap off indicated utilities serving areas to be selectively demolished.

.1 Arrange to shut off affected utilities with utility companies.

.2 If utility services are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary utilities that bypass area of selective demolition and that maintain continuity of service 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.

.4 Cut off pipe or conduit to a minimum of 25 mm below slab, and remove concrete mound. Patch concrete using cementitious grout.

.3 Coordinate with Mechanical and Electrical Divisions for shutting off, disconnecting, removing, and sealing or capping utilities.

.4 Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.3 PREPARATION

.1 Identify and mark all equipment and materials identified to be retained by Departmental Representative or to be re used in subsequent construction. Separate and store items to be retained in an area away from area of demolition and protect from accidental disposal.

.2 Post warning signs on electrical lines and equipment that must remain energized to serve other areas during period of demolition.

.3 Confirm that all electrical and telephone service lines entering buildings are not disconnected.

.4 Do not disrupt active or energized utilities crossing the demolition site.

.5 Provide and maintain barricades, warning signs, protection for workmen and the public during the full extent of the Work. Read drawings carefully to ascertain extent of protection required.

.6 Mark all materials required to be re used, store in a safe place until ready for re installation.

.7 Adjust all junction boxes, receptacles and switch boxes flush with new wall construction where additional layers to existing construction are indicated.

.8 Remove permanent marker lines used or found on exposed surfaces and at surfaces indicated for subsequent finish materials. Mechanically remove permanent marker lines and associated substrates where permanent marker lines occur and patch surface. Sealing or priming over permanent marker lines is not acceptable.

3.4 SELECTIVE DEMOLITION

.1 Demolish and dismantle work in a neat and orderly manner and in strict accordance with all regulations.

.2 At end of each day's work, leave Work in safe condition so that no part is in danger of toppling or falling.

.3 Demolish in a manner to minimize dusting and to prevent migration of dust.

.4 Selling or burning of materials on the site is not permitted.

.5 Remove concrete bases by cutting and chipping, take precautions against slab cracking and degradation. Grind edges smooth, fill and make level with self levelling grout.

.6 Fill all openings in concrete block walls with concrete masonry units, coursing to match existing, prepare ready to receive new finishes to match existing.

.1 Provide bond beams in new openings cut into existing concrete masonry unit walls.

.2 Provide finished end masonry units to patch and repair for new jamb sections in existing concrete masonry unit walls.

.7 Fill all openings in gypsum board walls with gypsum board and steel framing to match existing, skim coat to make wall smooth and even.

.8 Demolish existing carpet, resilient flooring and adhesive remnants as follows:

.1 Vacuum existing carpet thoroughly, prior to removal, using vacuum equipped with power head/sweeper.

.2 Apply fine mist water spray to carpet as required to minimize dust generation during removal. Avoid spraying near electrical outlets.

.3 Demolish existing carpet and resilient floor finishes, remove and dispose of off site.

.4 Remove adhesive to the greatest extent possible using scrapping tools and as follows:

.1 Do not use solvent based cleaners to remove adhesive remnants.

.2 Lightly shot blast or grind floor using machine designed for purpose to remove adhesive remnants.

.3 Vacuum floor ready for application of skim coating.

.4 Repair all slab depressions and damage with cementitious patching compound.

.5 Skim coat floor with minimum 1 mm thick cementitious floor underlayment compatible with new flooring materials.

.5 Floor substrate shall be smooth, free from ridges and depressions, and adhesive remnants that could telegraph through resilient flooring materials and carpets.

.6 Recycle materials in accordance with Section 01 74 19 – Waste Management and Disposal

.9 Demolish existing ceramic tile finishes. Remove setting bed or adhesive to the greatest extent possible using mechanical scrapping tools and as follows:

.1 Saw cut edge of tile for clean and even transition joint between existing tile to remain and new flooring materials

.2 Lightly shot blast or grind floor to remove remnants of setting materials

.3 Vacuum floor ready for application of skim coating

.4 Repair all slab depressions and damage with cementitious patching compound. Skim coat floor with minimum 1 mm thick cementitious floor underlayment compatible with new flooring materials

.10 Demolish completely all ceiling panels and grid as indicated.

.11 Remove all wall coverings scheduled for demolition. Patch and repair wall surfaces with skim coat of gypsum board joint compound leaving wall surfaces smooth and even ready for new wall finishes.

.12 Patch and repair all walls, floor and ceilings damaged during demolition with material matching adjacent walls, prepare ready for new finishes.

.13 Patch and repair all radiation cabinets, mechanical equipment and electrical fixtures damaged or exposed during demolition to match adjacent finished surfaces.

3.5 PATCHING AND REPAIRING

.1 Floors and Walls:

.1 Where walls or partitions that are demolished extend from one finished area into another, patch and repair floor and wall surfaces in the new space.

.2 Provide a level and smooth surface having uniform finish colour, texture, and appearance.

.3 Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform colour and appearance.

.4 Patch with durable seams that are as invisible as possible.

.5 Provide materials and comply with installation requirements specified in other Sections of these Specifications.

.6 Where patching occurs in a painted surface, apply primer and intermediate paint coats over patch and apply final paint coat over entire unbroken surface containing patch. Provide additional coats until patch blends with adjacent surfaces.

.7 Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

.2 Ceilings: patch, repair, or re hang existing ceilings as necessary to provide an even plane surface of uniform appearance.

3.6 PROTECTION

.1 Prevent debris from blocking drainage inlets and systems and ground draining, and protect material and electrical systems and services that must remain in operation.

.2 Arrange demolition and shoring work so that interference with the use of adjoining areas by the Departmental Representative and users is minimized.

.3 Maintain safe access to and egress from occupied areas adjoining.

.4 Provide and maintain fire prevention equipment and alarms accessible during demolition.

3.7 CLEANING

.1 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section 01 74 19 – Waste Management and Disposal.

.2 Divert excess materials from landfill to site approved Departmental Representative.

.3 Promptly as the Work progresses, and on completion, clean up and remove from the site all rubbish and surplus material. Remove rubbish resulting from demolition work daily.

.4 Maintain access to exits clean and free of obstruction during removal of debris.

.5 Keep surrounding and adjoining roads, lanes, sidewalks, municipal rights of way clean and free of dirt, soil or debris that may be a hazard to vehicles or persons.

.6 Dispose of materials not designated for alternate disposal in accordance with applicable regulations.

.1 Disposal facilities must be those approved of and listed in CWM Plan.

.2 Written authorization from Departmental Representative is required to deviate from disposal facilities listed in CWM Plan.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 45 00 - Quality Control.

.3 Section 01 61 00 - Common Product Requirements.

.4 Section 07 92 00 - Joint Sealants.

.5 Section 09 21 16 - Gypsum Board Assembles.

.6 Section 26 05 00 – Common Work Results for Electrical

1.2 DEFINITIONS:

.1 Environmental Product Declaration (EPD): Third-party verified documentation with the supporting Product Category Rule (PCR) and LCA information including at least a cradle-to-date scope. Prepared in accordance with ISO 14025, 14040, 14044, and EN 15804 or ISO 21930.

.1 Industry-wide (generic) EPD with third-party certification (Type III), including external verification where the manufacturer is explicitly recognized as the participant by the program operator

.2 Product-specific Type III EPD with third-party certification (Type III), including external verification where the manufacturer is explicitly recognized as the participant by the program operator.

1.3 REFERENCE STANDARDS

.1 ASME International (ASME):

.1 ASME B18.6.1-1981, Wood Screws (Inch Series)

.2 ASTM International (ASTM):

.1 ASTM A307-21, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength

.2 ASTM C954 18, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness

.3 ASTM D7612-21, Standard Practice for Categorizing Wood and Wood-Based Products According to their Fiber Sources

.4 ASTM F1667-13, Standard Specification for Driven Fasteners: Nails, Spikes and Staples

.3 CSA Group (CSA)

.1 CSA O86 Consolidation-14, Engineering Design in Wood

.2 CSA O121-08, Douglas Fir Plywood

.3 CSA O141-05, Softwood Lumber.

.4 CSA O151-09, Canadian Softwood Plywood

.5 CSA-O325-07, Construction Sheathing

.6 CSA O437 Series-93, Standards on OSB and Waferboard

.7 CSA T530-99, Commercial Building Standard for Telecommunications Pathways and Spaces (Adopted ANSI/TIA/EIA 569-A)

.8 CAN/CSA-Z809-16, Sustainable Forest Management

.4 National Lumber Grades Authority (NLGA):

.1 NLGA Standard Grading Rules for Canadian Lumber 2017

.5 Telecommunications Industry Association (TIA):

.1 ANSI/TIA/EIA 569 B, Commercial Building Standard for Telecommunications Pathways and Spaces

1.4 SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

.2 Action Submittals (to be submitted before starting any work of this Section):

.1 Product Data:

.1 submit manufacturer's instructions, printed product literature and data sheets for rough carpentry work and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Informational Submittals (to be provided during the course of Work):

.1 Material Certificates:

.1 submit certificates for machine-graded and finger-jointed dimensional lumber indicating species and grade selected for each use and design values approved by the NLGA.

1.5 MAINTENANCE MATERIAL SUBMITTALS

.1 Extra Stock Materials:

.1 provide electrical equipment backboards for mounting electrical equipment as indicated. Use 19-mm thick plywood on 19 x 38-mm furring around spacing, perimeter and at maximum 305 mm intermediate

1.6 QUALITY ASSURANCE

.1 Regulatory Approvals: Wood products used for sheathing and framing must clearly indicate on the face or edge the manufacturer of material, standard to which it was produced, grade of material including whether grade is visually graded or machine-stress rated, and exterior use where applicable, in accordance with listed reference standard.

.2 Lumber Identification: Identified by grade with a stamp of an agency certified by the Canadian Lumber Standards Accreditation Board.

.3 Plywood Identification: Identified by grade mark in accordance with applicable CSA standards.

.4 Plywood, OSB and Wood-Based Composite Panel Construction Sheathing Identification: Identified by grade mark in accordance with applicable CSA standards.

.5 Sustainable Standards Certification:

.1 Certified Wood: Submit listing of wood products and materials used in accordance with CAN/CSA-Z809 or FSC or SFI

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Delivery and Acceptance Requirements: Protect materials from weather while in transit and on the jobsite.

.2 Storage and Handling Requirements:

.1 Store materials at least 150 mm above the ground on pallets or blocks

.2 Cover with protective waterproof sheets allowing for air circulation and ventilation under the covering

.3 Protect edges and corners of sheet materials from damage during handling and storage

.4 Protect kiln dried and seasoned wood materials under conditions that will not cause an increase to moisture content

.5 Stack, lift, brace, cut and notch engineered lumber products in accordance with manufacturer's instructions and recommendations

.6 Store separated reusable wood waste convenient to cutting station and work areas

PART 2 PRODUCTS

2.1 DESCRIPTION

.1 Regulatory Requirements:

.1 Lumber Grades: Provide lumber products that are all sides finished (S4S) in nominal dimensions required for the project, grade-marked by accredited agencies of the Canadian Lumber Standards Accreditation Board, that conform to National Grading Rules published by the National Lumber Grades Authority, and that have the following characteristics:

.1 Grading: Machine Grading, Visual Grading, or Both

.2 Moisture Content: Kiln Dry, 19% or less

.3 Structural Design Properties: Strength and related properties in accordance with CSA O86

.4 Sizes: Nominal dressed dimensions described in CSA O141 for surfaced dry conditions and wood species

.2 Panel Grades: Provide panel products that are grade-marked by agencies recognized by CSA O325 and the National Institute of Standards and Technology, Voluntary Product Standard PS 2 04 Performance Standard for Wood-Based Structural-Use Panels as modified by other listed CSA panel standards.

.2 Sustainability Characteristics:

.1 Environmental Product Declaration (EPD): Submit an Industry-wide EPD or Product-specific EPD for each lumber specified. Provide EPD with at least a cradle-to-gate scope identifying the following impact categories:

.1 Global Warming Potential (GWP): All GWP information submitted in the form of $kgCO_2$ eq/kg.

.2 Ozone Depletion Potential (ODP): All ODP information submitted in the form of kgCFC-11/kg.

.3 Acidification Potential (AP): All AP information submitted in the form of $kgSO_2$ /kg.

.4 Eutrophication Potential (EP): All EP information submitted in the form of kg N/kg.

.5 Photochemical Ozone Creation/Smog Formation Potential (SFP): All SFP information submitted in the form of kgO_3 /kg.

.2 Certified Wood Sourcing: Extract and source wood products (dimensional lumber, plywood, and similar materials) used for the Project from US Green Building Council (USGBC) recognized sustainable forestry certification agencies. Responsibly source wood products demonstrating compliance to legal extraction methods with proof of chain of custody from one of the following agencies:

.1 American Tree Farm System (ATFS)

.2 Canadian Standards Association (CSA Group)

.3 Forest Stewardship Council (FSC)

.4 Programme for the Endorsement of Forest Certification (PEFC)

.5 Sustainable Forestry Initiative (SFI)

.3 Alternative to Certified Sourcing Requirements: Consultant will consider the use of an alternate compliance path (ACP) based on certification requirements described in ASTM D7612, using defined third party certified sourcing categories as follows:

.1 Legally Compliant (Non controversial) Sources

.2 Responsible Sources

.3 Certified Sources (Chain of Custody)

.4 Material Toxicity:

.1 Low Emitting Materials: Materials must demonstrate volatile organic compound (VOC) emissions equal to or less than the maximum permitted for the materials described in this Section, meeting formaldehyde emissions for composite wood products for ultra-low emitting formaldehyde or no added formaldehyde in accordance with California Air Resources Board ATCM.

2.2 PERFORMANCE CRITERIA

.1 Lumber Grades: Provide lumber products as described in Paragraph 2.1.1.1 in accordance with Regulatory Requirements.

.2 Panel Grades: Provide panel products as described in Paragraph 2.1.1.2 in accordance with Regulatory Requirements.

2.3 MATERIALS

.1 Light Framing – construction grade or better with the following minimum properties:

.1 Sizes: Maximum 38 mm width by maximum 89 mm depth

.2 Finger-Jointed Materials: Not allowed

.3 Species Group: Spruce-Pine-Fir (SPF)

.2 Miscellaneous Framing, Blocking and Strapping – standard grade or better with the following minimum properties:

.1 Sizes: Maximum 38 mm width by maximum 89 mm depth

.2 Finger-Jointed Materials: Not allowed

.3 Species Group: Spruce-Pine-Fir (SPF).

.3 Plywood Blocking and Backing Panels:

.4 DF and Canadian Softwood Plywood (CSP) using exterior grade adhesives meeting requirements of CSA O121 or CSA O151

.1 Kiln dry plywood to moisture content of 15% or less

.2 Concealed Blocking: Select Grade (SEL) CSP

.3 Exposed Panels and Panel Boards: Good One Side (G1S) Douglas Fir Plywood

.5 Sheathing:

.1 Plywood sheathing or oriented strandboard (OSB) at choice of Constructor

.6 Thickness as required by span rating and meeting requirements of CSA O325

.1 Plywood: Exterior rated, sheathing grade square-edged DF or CSP meeting requirements of CSA O121 or CSA O151

.2 Span Rated OSB: Exterior rated, sheathing grade OSB or waferboard meeting requirements of CSA O437 span rating (SR) of 32/16

2.4 ACCESSORIES

.1 Driven Fasteners – steel nails, spikes, brads and staples meeting requirements of ASTM F1667:

.1 Ensure length is sufficient to penetrate connecting solid wood materials

.2 Exterior work: hot-dipped galvanized

.3 Interior high humidity work: hot-dipped galvanized

.4 Interior work: electroplated zinc plated, or cadmium plated

.2 Rough Hadware: manufacturer recommended fastening devices and anchors, including bolts, nuts, and washers meeting requirements of ASTM A307:

.1 Ground contact materials: stainless steel

.2 Exterior work: hot-dipped galvanized

.3 Interior high humidity work: hot-dipped galvanized

.4 Interior work: electroplated zinc plated, or cadmium plated

.3 Wood Screws – use steel screws meeting requirements of ASME B18.6.1:

.1 Exterior work: galvanized, ceramic coated or stainless steel

.2 Interior work: galvanized

.4 Screws for Fastening to Cold-Formed Metal Framing: Steel screws meeting requirements of ASTM C954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

.5 Proprietary Fasteners: Toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, explosive actuated fastening devices, recommended for purpose by manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: Verify conditions of substrates previously installed under other Sections or Contracts are acceptable for rough carpentry installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

.1 Treat surfaces of material with wood preservative, before installation.

.2 Apply preservative by dipping, or by brush to completely saturate and maintain wet film on surface for minimum 3 minute soak on lumber and 1 minute soak on plywood.

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

3.3 INSTALLATION

.1 Blocking, Furring and Grounds:

.1 Set miscellaneous rough carpentry to required levels and lines with members plumb, true-to-line, cut, and fitted

.2 Fit miscellaneous rough carpentry to other construction

.3 Scribe and cope as needed for accurate fit

.4 Locate furring, nailers, blocking, grounds, and similar supports as required and attach to other construction

.2 Backing in Metal Stud Assemblies – coordinate installation and locations with Drawings and in accordance with the following:

.1 Install 19 mm CSP G1S plywood between metal stud assemblies on all walls receiving wall-mounted equipment

.2 Minimum 2 stud spaces or 1220-mm wide x 1200-mm long panels

.3 Fit plywood between metal studs

.4 Kerf front of plywood panels to fit plywood face flush with front face of metal studs

.3 Telecommunications and Data Panel Boards:

.1 Install 19 mm DFP G1S plywood on all walls in telephone and data rooms receiving wiring and equipment

.2 Minimum 1220 mm x 2440 mm panels on periphery walls over 300 mm wide, mounted 150 mm off of finished floor

.3 Coordinate installation and locations with Section 26 05 00 – Common Work Results for Electrical

3.4 CLEANING

.1 Progress Cleaning: Clean in accordance with Section 01 74 00 – Cleaning.

.1 Leave Work area clean at end of each day

.2 Final Cleaning: Upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 – Cleaning.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal procedures..

.2 Section 06 08 99 - Rough Carpentry for Minor Works.

.3 Section 09 21 16 Gypsum Board Assemblies.

1.2 DEFINITIONS

.1 Environmental Product Declaration (EPD): Third-party verified documentation with the supporting Product Category Rule (PCR) and Life cycle assessment information. Prepared in accordance with ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope.

.1 Industry-wide (generic) EPD with third-party certification (Type III), including external verification in which the manufacturer is explicitly recognized as the participant by the program operator.

.2 Product-specific Type III EPD--Products with third-party certification (Type III), including external verification in which the manufacturer is explicitly recognized as the participant by the program operator.

1.3 REFERENCE STANDARDS

.1 ASTM International (ASTM):

.1 ASTM C167-18, Standard Test Methods for Thickness and Density of Blanket or Batt Thermal Insulations

.2 ASTM C423-17 Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method

.3 ASTM C553-19, Standard Specification for Mineral Fibre Blanket Thermal Insulation for Commercial and Industrial Applications

.4 ASTM C665-17, Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

.5 ASTM C1320-20, Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction

.6 ASTM E90-09, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

.7 ASTM E413-16, Classification for Rating Sound Insulation

.8 ASTM F1667-18a, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples

.2 CSA Group (CSA):

.1 CSA B111-1974, Wire Nails, Spikes and Staples

.2 CSA B149 PACKAGE-20, Consists of B149.1, Natural Gas and Propane Installation Code and B149.2, Propane Storage and Handling Code

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS):

.1 Safety Data Sheets (SDS)

.4 Underwriters Laboratories of Canada (ULC):

.1 ULC 102-18, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies (CAN/ULC S102)

.2 ULC 114-18, Standard Method of Test for Determination of Non-Combustibility in Building Materials

.3 ULC 604, Standard for Factory-Built Type A Chimneys (CAN/ULC-S604-16)

.4 ULC 702, Standard for Mineral Fibre Insulation for Buildings (CAN/ULC-S702-15)

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Coordination: Coordinate building envelope commissioning with Section 01 91 13 – General Commissioning Requirements.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data: Submit manufacturer's instructions, product literature and data sheets for blanket insulation. Include product characteristics, performance criteria, physical sizes, and limitations.

.3 Certificates: When requested, submit manufacturer's product certificates certifying materials comply with specified performance characteristics and criteria and physical requirements.

.4 Test Reports: When requested, submit certified test reports showing compliance with specified performance characteristics and physical properties.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Perform in accordance with Section 01 61 00 – Common Product Requirements

.2 Storage and Handling Requirements:

.1 Store materials off ground and in accordance with manufacturer's recommendations.

PART 2 PRODUCTS

2.1 INSULATION

.1 Batt and blanket mineral fibre: Non-combustible, stone wool batt insulation to ASTM C665.

.1 Type: 1.

.2 Fire performance:

.1 Non-combustibility: To CAN/ULC S114.

.1 Flame spread: 0

.2 Smoke developed: 5

.2 Surface Burning Characteristics: To CAN/ULC S102.

.1 Flame spread: 0

.2 Smoke developed: 0

.3 Thermal Resistance: as indicated

.4 Thickness: as indicated.

2.2 ACCESSORIES

.1 Insulation clips:

.1 Impale type, perforated 50 x 50 mm cold rolled carbon steel 0.8 mm thick, adhesive back, spindle of 2.5 mm diameter annealed steel, length to suit insulation, 25 mm diameter washers of self locking type.

.2 Nails: galvanized steel, length to suit insulation plus 25 mm, to CSA B111

.3 Staples: minimum 12 mm leg.

.4 Tape: as recommended by manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: Verify that conditions of substrate previously installed are acceptable for blanket insulation application in accordance with manufacturer's instructions.

.1 Verify all in wall construction is complete.

.2 Verify building substrates are dry.

.3 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.4 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSULATION INSTALLATION

.1 Install insulation to maintain continuity of thermal protection to building elements and spaces and to ASTM C1320.

.2 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.

.3 Fill stud space of exterior framed walls with insulation full depth of stud only where no insulation/vapour retardant indicated on exterior face of stud walls.

.4 Do not compress insulation to fit into spaces.

.5 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures, and minimum 50 mm from CSA B149.1 and CSA B149.2 Type B and L vents.

.6 Do not enclose insulation until it has been reviewed and is acceptable by Departmental Representative.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 This Section specifies fire stop and smoke seal systems and materials intended to fill gaps between fire separations, between fire separations and other construction assemblies, or used in or around items which fully or partially penetrate a fire separation, to restrict the spread of fire and smoke thus maintaining the integrity of a fire separation.

.2 This Section includes requirements for:

.1 Through-penetration fire stops:

.1 For openings created to allow a penetrating item such as piping, conduits, raceways, ducts, cable trays, cables, tubing or structural components to pass completely through a fire separation or fire-resistance rated assembly.

.2 Membrane penetration fire stops:

.1 For openings where penetrating items such as piping, conduits, raceways, ducts, cable trays, cables, tubing, recessed components (e.g., panels, electric boxes, devices) or structural components pass through only one membrane of a fire separation or fire-resistance rated assembly.

.3 Blank opening fire stops:

.1 For openings created in a fire separation where the penetrating item has not yet been installed or has been removed.

.4 Construction joint fire stops:

.1 For locations where adjacent fire separations or components of fire separations meet. Locations include: ceiling/wall and roof/wall joints, wall/wall joints at corners or in the same plane, wall/floor joints, floor/floor joints and ceiling/ceiling joints.

.2 Includes fire stops for seismic joints, vertical control joints, expansion joints, and joints which occur at the tops and bottoms of fire separation walls.

.3 Includes fire stops for head-of-wall to non-rated roof or floor assemblies.

.5 Building perimeter fire stops:

.1 For the space between a fire-resistance rated floor assembly and the curtain wall (e.g.: safing slot gaps).

.3 This Section includes fire stopping and smoke seal work for the entire Project including selection, installation and inspection of all required fire stops.

1.2 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 45 00 - Quality Control.

1.3 DEFINITIONS

.1 Fire Blocking: materials, components or system installed in a concealed space in the building to restrict the spread of fire and smoke in that concealed space or from that concealed space to an adjacent space.

.2 Fire Compartment: spaces within a building that are enclosed by exterior walls or separated from other parts of the building by enclosing Fire Separations having a Fire-Resistance Rating.

.3 Fire-Resistance Rating: time in minutes or hours that a material or assembly of materials will withstand the passage of flame and transmission of heat when exposed to fire, meeting the requirements of CAN/ULC-S101 or as determined by formal testing of material or assembly of materials, meeting requirements of CAN/ULC-S115, or an interpretation of information derived from formal testing in accordance with requirements of the Building Code and acceptable to the Authority Having Jurisdiction (AHJ).

.4 Fire Separation: assembly that acts as a barrier against the spread of fire, smoke and noxious gases resulting from combustion as defined by the Building Code and includes the following assemblies having a Fire-Resistance Rating requiring Fire Stopping as follows:

.1 Penetration-Type Fire Stop systems located within loadbearing walls and partitions.

.2 Penetration-Type Fire Stop systems located within non-loadbearing walls and partitions.

.3 Penetration-Type located within floor assemblies.

.4 Building Perimeter-Type located between floor assemblies and exterior wall and roof construction.

.5 Construction Joint-Type and other assemblies having a Fire-Resistance Rating indicated on Drawings or Schedules.

.5 Fire Stop: material, component or system, and its means of support, used to protect gaps between fire separations, between fire separations and other construction assemblies, or used in openings where penetrating items wholly or partially penetrate fire separations, to restrict the spread of fire and smoke thus maintaining the fire-resistance continuity of a fire separation.

.6 Fire Stop System: a specific site erected construction consisting of the assembly, fire stop materials, any penetrating items and their means of support which have met the requirements for an F, FT, FH, FTH and/or L rating when tested in a fire-resistance rated assembly in accordance with CAN/ULC-S115.

.1 F-Rating: the amount of time a fire stop system can remain in place without the passage of flame through the opening or the occurrence of flaming on the unexposed face of the fire stop.

.2 FT-Rating: a fire stop system with an F-Rating for the required time period which can also resists the transmission of heat through the fire stop during the same period and limit the rise in temperature on the unexposed face and/or penetrating item of the fire stop.

.3 FH-Rating: a fire stop system with an F-Rating for the required time period which can also resist the force of a hose stream without developing openings for a prescribed period.

.4 FTH-Rating: a fire stop system with an FT-Rating for the required time period which also passes the hose stream test for a prescribed period.

.5 L-Rating: largest test sample leakage rate, determined in accordance with the optional air leakage test in CAN/ULC-S115.

.7 Multi-penetration: two or more service penetrations through an opening in the fire separation.

.8 Non-rated Fire Separation: fire separation acting as a barrier to the spread of smoke until a response is initiated such as the activation of a fire suppression system.

.9 Single-penetration: single service penetration through an opening in the fire separation.

.10 System Design Listing: document providing proof of testing with technical details, specifications and requirements that leads to the application of a specific listed fire stop system.

1.4 REFERENCE STANDARDS

.1 ASTM International (ASTM):

.1 ASTM A1008/A1008M-13 Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable

.2 ASTM C719-14, Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle)

.3 ASTM C920-14, Standard Specification for Elastomeric Joint Sealants

.4 ASTM E84-21, Standard Test Method for Surface Burning Characteristics of Building Materials

.5 ASTM E119-20, Standard Test Methods for Fire Tests of Building Construction and Materials

.6 ASTM E136-19A, Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 degrees

.7 ASTM E595-15, Standard Test Method for Total Mass Loss and Collected Volatile Condensable Materials from Outgassing in a Vacuum Environment

.8 ASTM E814-13a, Standard Test Method for Fire Tests of Penetration Firestop Systems

.9 ASTM E1966 15, Standard Test Method for Fire Resistive Joint Systems

.10 ASTM E2032-09, Standard Guide for Extension of Data From Fire Resistance Tests Conducted in Accordance with ASTM E 119.

.11 ASTM E2174-20A, Standard Practice for On-Site Inspection of Installed Firestops.

.12 ASTM E2393-20A, Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers

.2 Firestop Contractors International Association (FCIA):

.1 FCIA Firestop Manual of Practice, 6th Edition 2015

.3 Factory Mutual Approvals (FM):

.1 FM 4990-2009, Approval Standard for Fire stopping

.2 FM 4991-2013, Approval Standard for Firestop Contractors

.4 International Accreditation Service (IAS):

.1 IAS AC291-19, Accreditation Criteria for Special Inspection Agencies

.5 International Firestop Council (IFC)

.1 IFC Guidelines for Evaluating Engineering Judgments

.2 IFC Guidelines for Evaluating Engineering Judgments-Perimeter Fire Barrier Systems

.3 IFC Inspection Guidelines for Penetration Firestop Systems and Fire Resistive Joint Systems in Fire Resistance Rated Construction, 5th Edition

.6 National Fire Protection Agency (NFPA):

.1 NFPA 251-2006, Standard Methods of Tests of Fire Endurance of Building Construction and Materials

.7 National Research Council Canada (NRC):

.1 National Building Code of Canada (NBC) 2015

.2 Best Practice Guide on Fire Stops and Fire Blocks and Their Impact on Sound Transmission 2007

.8 ULC Standards (ULC):

.1 CAN/ULC-S101-14, Standard Method of Fire Endurance Tests of Building Construction and Materials

.2 CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies

.3 CAN/ULC-S114-05, Standard Method of Test for Determination of Non-Combustibility in Building Materials

.4 CAN/ULC-S115-11, Standard Method of Fire Tests of Firestop Systems

.9 Underwriters Laboratories Inc. (UL):

.1 UL 1479-2015, Fire Tests of Penetration Firestops

.2 UL Qualified Firestop Contractor Program

1.5 ADMINISTRATIVE REQUIREMENTS

.1 Pre-Installation Meetings:

.1 Hold pre-installation meeting one week before beginning Work of this Section, with Contractor, Subcontractor Departmental Representative in accordance with Section 01 31 19 – Project Meetings to:

.1 Verify Project requirements.

.2 Review sustainable requirements.

.3 Review installation and substrate conditions.

.4 Discuss coordination with other Subcontractors.

.5 Review system design listings, manufacturer's installation instructions and warranty requirements.

.6 Review quantity and location of mock-ups.

.2 Hold pre-installation meetings with other trades to review:

.1 Installation procedures and precautions.

.2 Location, scheduling and sequencing of other work around fire stops that can affect the outcome of the installation.

.3 Requirements for annular opening sizes.

.4 Requirements and preparations for wall/floor single and multi-penetrations.

.5 Requirements for construction and perimeter joints.

.6 Mock-up requirements.

.3 Submit copies of applicable listed fire stop system details to each trade for opening preparation. Include installation details required for the listed system.

.4 Meeting minutes: Contractor to take minutes of pre-installation meetings and distribute to Departmental Representative, Consultant and each affected trade.

.2 Sequencing:

.1 Proceed with installation only when submittals have been reviewed by Departmental Representative.

.2 Install fire stops located in floor assemblies before interior partition erections.

.3 Metal deck bonding: Unless otherwise noted on system design listing and manufacturer's installation instructions, fire stopping to precede spray-applied fireproofing to ensure required bonding.

.4 Pipe and duct insulation: Certified fire stop system component.

.1 Ensure pipe and duct insulation installation precedes fire stopping.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

.2 Qualification Statement:

.1 Submit contractor qualification statements and certificates demonstrating compliance with the qualification requirements of this Section, as described in PART 1-QUALITY ASSURANCE, within Ten working days after award of contract and before starting Work.

.3 Product Data:

.1 Submit manufacturer's product data for each type of fire stopping and smoke seal. Submit complete product data for each individual component and include:

.1 Product name and product number

.2 Product characteristics and performance criteria

.3 Physical size, finish and limitations

.4 Technical data on out-gassing, off-gassing and age testing

.5 Curing time

.6 Chemical compatibility to other construction materials

.7 Shelf life

.8 Life expectancy

.9 Temperature range for installation

.10 Humidity range for installation

.11 Sound attenuation STC-Rating

.2 Manufacture Product Certification:

.1 Submit manufacturer certification certifying products supplied comply with local regulations controlling use of Volatile Organic Compounds (VOC's) and are non-toxic to building occupants.

.2 Submit test reports showing compliance to ASTM E595.

.3 Submit one copy of WHMIS Safety Data Sheets (SDS) for each individual component in accordance with Section 02 81 00 – Hazardous Materials

.4 Submit a comprehensive list of all products and components included in submittal.

.4 Shop Drawings:

.1 Submit shop drawings showing system design listings for Project including proposed materials, reinforcement, anchorage, fastenings and method of installation.

.2 Construction details to accurately reflect actual job conditions for each product and assembly.

.3 Submit details for materials and prefabricated devices.

.4 Submit electronic copy of shop drawings and include:

.1 List of each proposed listed fire stop system and corresponding service penetration type or joint type in a matrix spreadsheet schedule, indicating floor and wall system, including rating for each.

.2 Location of penetrations:

.1 Drawings showing the location of each penetration with a unique penetration identification number and associated listing number.

.2 Schedules listing each penetration with a unique identification number, their associated listing number, organized by floor, wall and ceiling area and indicating each room number.

.3 System Design Listings:

.1 Submit design listings for each listed fire stop system and each application identified in accordance with CAN/ULC-S115

.2 When more than one product is specified for the listed fire stop system or more than one packing/damming material is indicated, identify the item that will be used on this Project.

.4 Certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Samples: Submit to Departmental Representative a minimum one week before beginning site work:

.1 Submit two 300 x 300-mm samples of each system showing actual fire stop materials proposed for Project including anchors/fasteners and damming materials.

.2 Submit two samples of each type of label proposed for the identification of fire stops.

.6 Quality Assurance Submittals: Submit the following in accordance with Section 01 43 00 – Quality Assurance:

.1 Test reports in accordance with CAN/ULC-S101, CAN/ULC-S102, and CAN/ULC-S115.

.1 Submit certified test reports from approved independent testing laboratories, indicating compliance of applied fire stopping with specifications for specified performance characteristics and physical properties.

.2 Document from Engineer of Record showing compliance of alternative fire stopping solution with CAN/ULC-S115 and the EJ guidelines provided by the National Research Council, Best Practice Guide on Fire Stops and Fire Blocks and Their Impact on Sound Transmission.

.3 Certificates: Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.4 Manufacturer's Instructions: Submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

.5 Manufacturer's Site Reports: Submit manufacturer's reports within three days of review, verifying compliance of Work, as described in SITE QUALITY CONTROL in Part 3 of this Section.

.7 Engineering Judgments(EJ):

.1 Where there is no specific tested listed fire stop system available from the manufacturer for a particular fire stop configuration, review systems from other manufacturers to obtain a listed fire stop system.

.2 Submit an EJ from the system manufacturer if there are no listed systems available from other manufacturers.

.3 Prepare and submit an EJ in accordance with best practices established in the following documents:

.1 IFC Guidelines for Evaluating Engineering Judgments.

.2 IFC Guidelines for Evaluating Engineering Judgments-Perimeter Fire Barrier Systems.

.4 For each EJ submitted, include:

.1 Project name, number and location.

.2 A description of the proposed system with detailed drawing.

.3 Installation instructions.

.4 Complete descriptions of critical elements for the fire stop configuration.

.5 Copies of all referenced system design listings which EJ is based on.

.6 EJ issuer name and contact information.

.7 Date of issue of EJ with authorization signature of issuer.

.5 EJ shall only be issued by fire stop manufacturer's qualified technical personnel or in collaboration with the manufacturer by a knowledgeable registered Professional Engineer, a Fire Protection Engineer or an independent testing

agency that provides testing and listing services for fire stop systems similar to the EJ being contemplated.

.6 EJ shall be based upon interpolations of previously tested fire stop systems that are either sufficiently similar in nature or clearly bracket the conditions upon which the EJ is to be given. Additional knowledge and technical interpretations based upon accepted engineering principles, fire science and fire testing guidelines (e.g., ASTM E2032) may also be used as further support data.

.7 EJ shall be based upon knowledge of the elements of the construction to be protected and understanding of the probable behaviour of that construction and the recommended fire stop system protecting it were they to be subjected to the adequate standard fire test method for the required fire rating duration.

.8 EJ shall be limited to the specific conditions and configurations for which it was created and should be based upon reasonable performance expectations for the recommended fire stop system under those conditions.

.9 EJ shall be accepted only for a single specific job and location and should not be transferred to any other job or location without thorough and appropriate review of all aspects of the next job or location's circumstances.

.1 Manufacturer letter stating their opinion, with supporting justification, that the EJ will perform as a fire stop system when subjected to the appropriate standard fire test method for the required fire rating duration.

.10 Once the EJ has been reviewed, submit to the AHJ for final approval.

.8 Closeout Submittals:

.1 Submit in accordance with Section 01 78 00 – Closeout Submittals.

.9 Operation and Maintenance Data: Submit maintenance data for incorporation into manual, including:

.1 WHMIS Safety Data Sheets (SDS),

.2 product data and manufacturer's installation and maintenance instructions for each product/system used on this project,

.3 approved system design listings and EJs, and

.4 matrix schedule listing all system design listings and EJs with a description of their penetration or joint type.

.5 Certifications:

.1 Provide proof of training for each worker that performed installation on the Project.

.2 Provide proof of company installing fire stopping and smoke sealsis a Member in Good Standing with FCIA.

.3 Certification of company as a ULC Qualified or FM 4991 Approved Firestop Contractor, including the Designated Responsible Individual (DRI) certificate.

.4 Accreditation of third-party inspection firm.

.6 Manufacturer's field reports.

.7 Warranty information on fire stop installations.

.8 Life expectancy of each product installed as part of Project. For each system, list the installation date of products and the expected expiration date (month/year).

.10 Record Documentation:

.1 Maintain a daily log of all activities on site during the course of construction. Submit a copy of all daily logs after completion of fire stopping work.

.2 As-built Drawings:

.1 Submit a marked-up set of Drawings to provide referencing system identifying the location of each fire stop.

.2 Identify each penetration type fire stop with their penetration identification number.

.3 Provide detailed Drawings of system design listings for each type of fire stop (i.e., through-penetration, membrane penetration, blank opening, construction joint, building perimeter).

.4 Fire Stop Schedules:

.1 Submit complete fire stop schedules for floors, walls and ceilings.

.2 Indicate all penetration fire stops and joint fire stops through each reference wall, floor and ceiling in the schedules.

.3 Cross-reference firestop schedules with as-built drawings and indicate design listing numbers associated to each penetration fire stop and joint fire stop.

1.7 QUALITY ASSURANCE

.1 Regulatory Requirements: Use materials and methods of determining required thickness of application that have the full acceptance of AHJ and that are tested in accordance with CAN/ULC-S115, and form a part of a ULC or cUL listed system, Engineered Judgement or Equivalent Fire Resistance Rated Assembly.

.2 Provide systems selection and analysis, installation and inspection of fire stop systems in accordance with the recommended practices detailed in the following guides:

.1 FCIA Firestop Manual of Practice (MOP).

.3 Qualifications:

.1 Contractor specializing in selection and installation of fire stops with five years documented experience. Submit a list of five successfully completed projects of similar scale and type.

.2 The installers are recognized as a Member in Good Standing with the Firestop Contractors International Association (FCIA). Submit proof of current membership.

.3 Training: Workers, including site supervisor, to complete:

.1 Manufacturer training on the products/systems installed as part of this Section.

.2 Training under the FCIA Firestop Containment Worker Education Program.

.4 Certified Firestop Contractor: company certified with one of the following programs:

.1 ULC Qualified Firestop Contractor Program. Submit signed copy of certificate.

.2 FM 4991 Approved Firestop Contractor. Submit signed copy of FM Approval certificate.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Perform in accordance with Section 01 61 00 – Common Product Requirements.

.2 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name, manufacturer, ULC markings, manufacturing date, shelf life expiry date.

.2 Storage and Protection:

.1 Store materials in a well-ventilated, dry indoor location and in accordance with manufacturer's instructions.

.2 Coordinate delivery of materials with scheduled installation dates to allow minimum storage time on site.

.3 Comply with recommended procedures, precautions and measures described in WHMIS Safety Data Sheets (SDS).

.3 Waste Management and Disposal:

.1 Perform in accordance with Section 01 74 19 – Waste Management and Disposal.

1.9 WARRANTY

.1 Extend 12 month warranty period to 24 months for Work of this Section.

.2 Manufacturers shall warrant work of this Section against defects and deficiencies in the product material for a period of 24 months. Promptly correct any defects or deficiencies which become apparent within warranty period at no expense.

.3 Contractor warrants workmanship on materials and installation for a period of 24 months. Promptly correct any defects or deficiencies which become apparent within warranty period at no expense.

PART 2 PRODUCTS

2.1 MANUFACTURERS

.1 Provide products from a single manufacturer, to the greatest extent possible, to perform all fire stopping work. Materials of different manufacturers will not be permitted without authorization from Departmental Representative.

.2 Provide a listed system from an alternative where there is no specific tested listed fire stop system available from the manufacturer for a particular fire stopping application to avoid providing an Engineering Judgment.

2.2 PERFORMANCE/DESIGN CRITERIA

.1 Fire stop and smoke seal systems consisting of a material or combination of materials installed to maintain the integrity of the fire-resistance rating of a fire separation in accordance with the requirements of the NBC.

.2 Performance Requirements: Manufacturer shall design proprietary assemblies to withstand the listed ratings in accordance with the NBC, ULC Standards, and AHJ, and as follows:

.1 Non-rated fire separations: Provide L-Rated smoke protection fire stop system for application on both sides of separation.

.2 Provide through-penetration fire stop and joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of penetrated assembly, such as:

.1 Fire-resistance rated loadbearing walls, including partitions, with fire protection rated openings.

.2 Fire-resistance rated non-loadbearing walls, including partitions with fire protection rated openings.

.3 Fire-resistance rated floor assemblies.

.3 "F" Rated Systems: Provide through-penetration fire stop systems with F-ratings indicated, as determined by CAN/ULC-S115 or ASTM E814, and equal to or exceeding the fire-resistance rating of the penetrations created during construction.

.4 "T" Rated Systems: Where fire stop systems protect penetrating items from potential contact with adjacent materials, provide through-penetration fire stop systems with T-ratings and F-ratings indicated, as determined by CAN/ULC-S115 or ASTM E814, for the following conditions:

.1 Penetrations located outside wall cavities.

.2 Penetrations located outside fire resistive shaft enclosures.

.3 Penetrations located in a construction containing fire protection rated openings.

.4 Penetrating items larger than a 100-mm-diameter nominal pipe or 100 cm^2 in overall cross-sectional area.

.5 Fire stopping and Smoke Seal Systems Exposed to View: Provide products that after curing do not deteriorate when exposed to view, traffic, moisture, and physical damage both during and after construction, and as follows:

.1 Provide moisture resistant through-penetration fire stop systems for piping penetrations for plumbing and wet pipe sprinkler systems.

.2 Provide fire stopping and smoke seal systems capable of supporting anticipated floor loads either by installing floor plates or by other means for floor penetrations with annular spaces exceeding 100 mm in width and exposed to possible loading and traffic.

.3 Provide fire stopping and smoke seal systems not requiring removal of insulation for penetrations involving insulated piping.

.4 Provide products with flame-spread ratings of less than 25 and smoke-developed ratings of less than 50 for fire stopping, smoke seal, and joint systems exposed to view.

.5 Architectural considerations: When fire stop system is exposed to view, consider architectural finish, potential traffic, and exposure to moisture and heat.

.6 Fire Resistance of Joint Systems: Assembly ratings and movement capabilities shall be as indicated with assembly ratings equal to or exceeding the fire-resistance rating of constructions in which joints are located.

.3 Acoustic insulation properties as indicated on drawings.

.4 Dynamic Joints: Where required, design fire stop and smoke seal systems to accommodate a defined amount of movement in structural elements, construction joints and mechanical piping caused by expansion or contraction. Systems should also accommodate movement and sound and vibration control in mechanical installations.

.5 Insulated Pipes and Ducts: Design and test listed fire stop system with the actual insulation materials penetrating the fire separation, as indicated on the system design listing.

.6 Use in Wet Areas: water-based products are unacceptable in wet areas or areas that may be subject to occasional water exposure or flooding during and after construction.

.7 Environment Considerations: Select materials taking into consideration the environment in which they will be used during and after curing, as well as the intended use of the space. Confirm compatibility of the proposed materials/products with fire stop manufacturer for the following situations:

.1 Spaces requiring resistance to infection and biological spread through assemblies.

.2 Spaces containing sensitive electronic equipment.

.3 Preventing contamination of laboratory and manufacturing environments.

2.3 MATERIALS

.1 Compatibility: Under conditions of service and application, provide fire stopping and smoke seal systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating the systems, as demonstrated by fire stopping and smoke seal system manufacturer based on testing and site experience, and as follows:

.1 Asbestos-free materials and systems capable of maintaining an effective barrier against the passage of flame, smoke and water and the transmission of heat in compliance with requirements of CAN-ULC-S115 and not to exceed opening sizes for which they are intended, as indicated on System Design Listing.

.2 Fire Stop System Rating: ULC-S115. To match fire-resistance rating of fire separation as indicated on Drawings.

.3 Service penetration assemblies and fire stop components: Certified by testing laboratory to CAN/ULC-S115.

.4 Provide elastomeric seal or non-shrink foam cement mortar for fire and smoke stop systems at openings intended for re-entry, such as cables. Do not use cementitious or rigid seal at such locations.

.5 Provide elastomeric protection for fire and smoke stop systems at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control. Do not use a cementitious or rigid seal at such locations. Exemption for fire dampers.

.6 Provide elastomeric seal for fire and smoke seals behind and around mechanical and electrical boxes within wall, floor, and ceiling assemblies.

2.4 FILL MATERIALS

.1 General:

.1 Provide fire stopping and smoke seal systems containing the types of fill materials indicated in SCHEDULE in Part 3 of this Section by reference to the types of materials described in this Article. Fill materials are those referred to in directories of the referenced testing and inspecting agencies as fill, void, or cavity materials.

.2 Fire stopping and smoke seal systems shall be tested in accordance with CAN/ULC-S115 and be comprised of asbestos free materials and systems capable of maintaining an effective barrier against flame, smoke and gases. Fire stopping and smoke seal systems not to exceed opening sizes for which they are intended for the ratings as indicated on Drawings.

.2 Cast-in-Place Fire Stopping and Smoke Seal Devices: Factory assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

.3 Latex Sealants: Single component latex formulations that after curing do not re-emulsify during exposure to moisture.

.4 Fire Stopping and Smoke Seal Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrating item.

.5 Cable Penetration Devices:

.1 Pre-manufactured intumescent blocks

.2 Pre-manufactured sleeves, consisting of an adjustable core

.3 Pre-manufactured cable management system, consisting of a system of intumescent inserts and adjustable cores

.6 Intumescent Composite Sheets: Rigid panels consisting of aluminum foil faced elastomeric sheet bonded to galvanized steel sheet.

.7 Intumescent Putties: Non-hardening dielectric, water resistant putties containing no solvents, inorganic fibres, or silicone compounds.

.8 Intumescent Spray Foam: Expanding spray-in-place intumescent foam sealant.

.9 Intumescent Wrap Strips: Single component intumescent elastomeric sheets with aluminum foil on one side.

.10 Intumescent, Latex Sealant: Single-component, intumescent, latex formulation.

.11 Job-Mixed Vinyl Compound: Prepackaged vinyl-based powder product for mixing with water at Project site to produce a paintable compound, passing ASTM E136, with flame-spread and smoke-developed ratings of zero per ASTM E84.

.12 Solvent-Release-Curing Intumescent Sealant: Solvent-release-curing, single-component, synthetic-polymer-based sealant of grade indicated below:

.1 Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces. Non-sag formulation for openings in vertical and other surfaces requiring a non-slumping/gunnable sealant, unless indicated fire stop system limits use non-sag grade.

.13 Mortars: Pre-packaged, dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a non-shrinking, homogeneous mortar.

.14 Pillows/Bags: Reusable, heat-expanding pillows/bags consisting of glass fibre cloth cases filled with a combination of mineral fibre, water insoluble expansion agents and fire-retardant additives.

.15 Silicone Foams: Multi-component, silicone based liquid elastomers that, when mixed, expand and cure in-place to produce a flexible, non-shrinking foam.

.16 Silicone Sealants: Moisture curing, single component, silicone based, neutral curing elastomeric sealants of grade indicated below:

.1 Grade for Horizontal Surfaces: Pourable (self-levelling) formulation for openings in floors and other horizontal surfaces.

.2 Grade for Vertical Surfaces: Non-sag formulation for openings in vertical and other surfaces.

.17 Ceramic-Fibre and Mastic Coating: Ceramic fibres in bulk form formulated for use with mastic coating, and ceramic fibre manufacturer's mastic coating.

.18 Ceramic-Fibre Sealant: Single-component formulation of ceramic fibres and inorganic binders.

2.5 MIXING

.1 For those products requiring mixing before application, comply with fire stopping and smoke seal system manufacturer's instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

2.6 FIRE-RESISTIVE ELASTOMERIC JOINT SEALANTS

.1 Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer that comply with ASTM C920 requirements, including those referenced for Type, Grade, Class, and Uses, and requirements specified in this Section applicable to fire-resistive joint sealants.

.2 Single-Component, Neutral-Curing Silicone Sealant: Type S; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, G, A, and (as applicable to joint substrates indicated) O.

.1 Additional Movement Capability: When tested for adhesion and cohesion under maximum cyclic movement per ASTM C719, provide sealant with the capability to withstand the changes in joint width existing at the time of installation, and remain in compliance with other requirements of ASTM C920.

.3 Multicomponent, Non-sag, Urethane Sealant: Type M; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, A, and (as applicable to joint substrates indicated) O.

.1 Additional Movement Capability: When tested for adhesion and cohesion under maximum cyclic movement per ASTM C719, provide sealant with the capability to withstand the change in joint width existing at the time of installation, and remain in compliance with other requirements of ASTM C920.

.4 Single-Component, Non-sag, Urethane Sealant: Type S; Grade NS; Class 25; and Uses NT, M, A, and (as applicable to joint substrates indicated) O.

2.7 FIRE STOP IDENTIFICATION

.1 Identification Labels and Markings: Permanent for the expected service life of the installation.

.2 Fire Stopped Penetrations:

.1 Provide identification labels at each penetration.

.2 Identification labels: embossed with metal fastening device with the following information:

.1 penetration number

.2 floor number

.3 room number

.4 product name and number

.5 system design number

.6 fire rating required in hours.

.7 fire stop contractor's name and phone number

.8 installer's name

.9 date of installation

.10 re-penetrated by: company, installer and date

.3 Indicate on label that fill material around the penetration is a fire stop system and shall not be disturbed except by authorized personnel.

.3 Fire Separation (Barrier) Markings:

.1 Provide identification for all vertical fire separations.

.2 Identification markings: stencil painted with lettering at least 75 mm in height with a minimum 10-mm stroke in contrasting colour.

.3 Incorporate assembly's fire-resistance rating and the following suggested wording, "FIRE AND/OR SMOKE BARRIER-PROTECT ALL OPENINGS", or other accepted wording.

.4 Include horizontal red painted line, 75 mm in width, between identification markings.

.5 For occupied areas with exposed ceilings: Use 50-mm without horizontal painted lines.

2.8 ACCESSORIES

.1 Provide components for each fire stopping and smoke seal system needed to install fill materials. Use only components specified by fire stopping and smoke seal system manufacturer and approved by the qualified testing and inspecting agency for fire stopping and smoke seal systems indicated on Drawings.

.2 Primers: To manufacturer's recommendation for specific material, substrate, and end use.

.3 Water (if applicable): Potable, clean and free from harmful amounts of deleterious substances.

.4 Metal Fire Stop: Commercial galvanized steel, to ASTM A1008/A1008M, zinc coating 260 g/m^2, minimum metal core thickness 0.912 mm.

.5 Steel Deck Moulded Flute Inserts: One-piece moulded mineral fibre flute inserts, sized for steel deck profiles, for placement at top of fire-rated wall assemblies

.6 Packing/Damming Materials, Supports and Anchoring Devices: To manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to AHJ.

.7 Fire Stop Insulation: Pre-formed, semi-rigid, non-combustible mineral wool, pre-cut in 1220-mm lengths to required depth and width.

.8 Junction Box/Outlet Sealing Putty: Intumescent putty, pre-formed in pads.

.9 Sealants: Good adhesion without use of primer, high visibility safety colours.

.1 Flame-spread rating: Maximum 25

.2 Smoke development classification: Maximum 50

.3 For vertical joints: Non-sagging

.4 For horizontal joints: Single component, self-levelling

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verify that conditions of substrates previously installed are acceptable for product installation in accordance with manufacturer's instructions and approved system design listings for each condition.

.2 Verify each opening/annular space to ensure it does not exceed the maximum and minimum dimensions indicated on the approved system design listing.

.3 Verify that all joints, service penetrating elements and supporting devices/hangers have been properly installed as indicated on approved system design listings. Remove all temporary lines and markings to meet the approved system design listings.

.4 Verify that proposed fire stop system consists of components that are compatible with each other, with substrates forming the openings, and with items, if any, penetrating the fire stop under conditions of application and service, as demonstrated by the fire stop manufacturer based on testing and site experience.

.5 Pipe and Duct Insulation: Confirm that proposed fire stop system has been tested with the actual insulation penetrating the fire separation on site, as indicated in the approved system design listing. Maintain insulation around pipes and ducts penetrating the fire separation.

.6 Ensure no additional items have been installed through opening that does not appear on the approved system design listing.

.7 Ensure fire stopped areas are accessible for proper application and that conditions are suitable for installation of the fire stop system. Areas to remain accessible for inspection.

.8 Report in writing to Departmental Representative any defective surfaces or conditions affecting the fire stop system installation immediately and before commencing any installations.

.9 Proceed only once defected surfaces or conditions have been corrected.

.10 Proceed with installation only after unacceptable conditions have been remedied.

3.2 PREPARATION

.1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials.

.1 Ensure that substrates and surfaces are clean, dry and frost free.

.2 Ensure substrates and surfaces are free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.

.2 Prepare surfaces in contact with fire stop and smoke stop materials to manufacturer's instructions.

.3 Maintain insulation around pipes and ducts penetrating fire separation without interruption to vapour barrier.

.4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

.5 Protect adjacent work areas and finish surfaces from damage during product installation.

.6 Prime surfaces as required.

.7 Ensure multi-penetration openings have been framed and boarded out around annular openings, as indicated in the system design listing before prepping the opening.

3.3 INSTALLATION

.1 Install fire stop and smoke seal materials and components in accordance with manufacturer's certified tested system listing.

.2 Coordinate with other sub-trades to ensure that all pipes, conduits, cables, and other items, which penetrate fire separations, have been permanently installed before installation of fire stop systems.

.3 Schedule work to ensure that fire separations and all other construction that conceals penetrations are not erected before installation of fire and smoke seal systems

.4 Seal holes or voids made by through-penetrations, poke-through termination devices, and un-penetrated openings or joints to ensure that both continuity and integrity of fire separation are maintained.

.5 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing per manufacturer's instructions.

.6 Tool or trowel exposed surfaces to neat finish.

.7 Remove excess compound promptly as work progresses and upon completion.

.8 Protect gaps around recessed components (e.g., panels, electrical boxes, outlets) with sealing putty in accordance with manufacturer's instructions.

.9 Do not use damaged or expired material.

3.4 INSTALLATION-JOINT FIRE STOPS

.1 For sealant applications, install joint fillers to support fire stop materials during application. Position joint fillers to ensure fire stop material cross-sectional shape and thickness relative to the joint width allows for optimum sealant movement, while developing the required fire-resistance rating.

.2 Install fire stops using techniques recommended by the manufacturer:

.1 Fully wetting joint substrates to optimize adhesion.

.2 Completely filling recesses provided for each joint configuration.

.3 Tool non-sag fire stop materials immediately after their application and before the time skinning begins. Form smooth, uniform beads of configuration indicated or required to

.1 provide required fire-resistance rating,

.2 eliminate air pockets, and

.3 ensure contact and adhesion with sides of joint.

.4 Joint Systems and Perimeter Fire Containment Systems:

.1 For systems with dynamic joints, ensure movement capabilities of the installation meet or exceed the movement expectations of the system design listing and manufacturer's installation instructions.

3.5 INSTALLATION – THROUGH PENETRATION JOINT SEALANTS

.1 Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position required to achieve fire ratings of designated through-penetration fire stop systems.

.2 Install fill materials for through-penetration fire stop systems by techniques recommended by the manufacturer to produce the following results:

.1 Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.

.2 Apply materials so they contact and adhere to substrates formed by openings and penetrating items.

.3 For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

.3 Remove combustible forming materials and other accessories not indicated as permanent components of fire stop systems.

3.6 IDENTIFICATION

.1 General:

.1 Clean substrate before applying identification.

.2 Determine final location of identification on site.

.3 Identification is not required on both sides of the fire separation.

.4 Refer to Drawings for locations of fire separations and rating required.

.2 Fire Stopped Penetrations:

.1 Install identification label adjacent to each fire stopped wall/floor service penetration. Provide one identification label per single opening or per grouping cluster.

.2 Securely apply identification to substrate by providing adequate adhesive

.3 Secure tags with metal fasteners or hang with metal chain or wire.

.4 Identification shall be completely filled out and installed before requesting substantial performance.

.3 Fire Separations (Barriers):

.1 Position identification at least 4500 mm from end of each wall and at intervals not exceeding 9000 mm along wall/floor joint fire stops.

.2 Install markings within ceiling spaces, 600 mm below horizontal fire separation or roof structure unless otherwise indicated on Drawings.

.3 Review location of identification with Departmental Representative for occupied areas with exposed ceilings before proceeding.

3.7 REPAIRS AND MODIFICATIONS

.1 Identify damaged or re-entered seals requiring repair or modification.

.2 Remove loose or damaged materials. If adding penetrating items, remove sufficient material to insert new elements and to avoid damaging the balance of the seal.

.3 Ensure sealed surfaces are clean and dry.

.4 Use only materials that are suitable for repair of original seal, as approved by manufacturer. Do not mix products from different manufacturers.

3.8 SITE QUALITY CONTROL

.1 Inspections: Notify Departmental Representative when ready for inspection and before concealing or enclosing fire stop materials and service penetration assemblies.

.2 Manufacturer's Field Services:

.1 Mock-ups: Manufacturer to provide confirmation that the fire stop system installed meets or exceeds the system design listing requirements for each mock-up application.

.2 Obtain report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Site Reports as described in SUBMITTALS in Part 1 of this Section.

.3 Provide manufacturer's site services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.9 CLEANING

.1 Perform cleaning in accordance with Section 01 74 00 – Cleaning.

.2 Remove equipment, excess materials and debris and clean adjacent surfaces immediately after application. Use methods and cleaning materials approved by manufacturer.

.3 Protect fire stops during and after curing period from contact with contaminating substances

.4 Remove temporary dams after initial set of fire stop and smoke seal materials.

3.10 SCHEDULE

.1 Provide fire stop and L-Rated smoke-resistant fire stop systems at locations shown on Drawings and as indicated on Drawing schedules and details.

.2 Design and provide through-penetration fire stopping and smoke seals as follows:

.1 Systems with no penetrating items, select one or more of the following fill materials:

.1 latex sealant

.2 silicone sealant

.3 intumescent putty

.4 intumescent foam blocks or boards

.5 intumescent spray foam

.2 Systems for metallic pipes, conduit, or tubing, select one or more of the following fill materials:

.1 latex sealant

.2 silicone sealant

.3 intumescent putty

.4 intumescent foam blocks or boards

.5 intumescent spray foam

.3 Systems for non-metallic pipe, conduit, or tubing, select one or more of the following fill materials:

.1 latex sealant

.2 silicone sealant

.3 intumescent putty

.4 intumescent foam blocks or boards

.5 intumescent spray foam

.4 Re-enterable and cable managed systems for electrical, and data and communications cables:

.1 prefabricated fire stop sleeve cp653 (hilti)

.2 preformed intumescent blocks cfs-bl (hilti)

.3 preformed intumescent blocks (roxtec)

.4 prefabricated cable pathways (ez-path)

.5 Systems for electrical, and data and communications cables, select one or more of the following fill materials:

.1 latex sealant

.2 silicone sealant

.3 intumescent putty

.4 silicone foam

.5 prefabricated fire stop sleeve cp 653 (hilti)

.6 preformed intumescent blocks cfs-bl (hilti)

.7 preformed intumescent blocks (roxtec)

.8 prefabricated cable pathways (ez-path)

.9 intumescent foam blocks or boards

.10 intumescent spray foam

.6 Systems for cable trays, select one or more of the following fill materials:

.1 latex sealant

.2 intumescent putty

.3 silicone foam

.4 pillows/bags

.5 intumescent foam blocks or boards

.7 Systems for insulated pipes, select one or more of the following fill materials:

.1 latex sealant

.2 intumescent putty

.3 silicone foam

.4 intumescent wrap strips

.5 intumescent foam blocks or boards

.6 intumescent spray foam

.8 Systems for miscellaneous electrical penetrations, select one or more of the following fill materials:

.1 latex sealant

.2 intumescent putty

.3 intumescent foam blocks or boards

.4 intumescent spray foam

.9 Systems for miscellaneous mechanical penetrations, select one or more of the following fill materials:

.1 latex sealant

.2 intumescent foam blocks or boards

.3 intumescent spray foam

.10 Systems for groupings of penetrations, select one or more of the following fill materials:

.1 latex sealant

.2 intumescent wrap strips

.3 fire stopping and smoke seal device

.4 intumescent composite sheet

.5 intumescent foam blocks or boards

.6 intumescent spray foam

.3 Design and provide joint fire stopping and smoke seals as follows for:

.1 Floor-to-Floor, Fire-Resistive Joint System: Provide materials to meet the following criteria:

.1 assembly rating: as indicated

.2 nominal joint width: as indicated

.3 movement capabilities: compression and extension

.2 Floor-to-Wall, Fire-Resistive Joint System: Provide materials to meet the following criteria:

.1 assembly rating: as indicated

.2 nominal joint width: as indicated

.3 movement capabilities: to be confirmed, compression, extension, or horizontal shear

.3 Head-of-Wall, Fire-Resistive Joint System: Provide materials to meet the following criteria:

.1 assembly rating: as indicated

.2 nominal joint width: as indicated

.3 movement capabilities: compression and extension

.4 Wall-to-Wall, Fire-Resistive Joint System: Provide materials to meet the following criteria:

.1 assembly rating: as indicated

.2 nominal joint width: as indicated

.3 movement capabilities: compression and extension

.4 Design and provide perimeter fire containment fire stopping and smoke seals as follows for:

.1 Perimeter Fire Containment System: Provide materials to meet the following criteria:

.1 integrity rating: as indicated

.2 insulation rating: as indicated

.3 linear opening width: as indicated

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 45 00 - Quality Control.

.3 Section 01 61 00 - Common Product Requirements.

.4 Section 07 84 00 – Fire Stopping

1.2 DEFINITIONS

.1 Environmental Product Declaration (EPD): Submit an Industry-wide EPD for each metal product outlined in the specification. Provide EPD with at least a cradle to gate scope, identifying the following impact categories (minimum):

.1 Global Warming Potential (GWP): Submit GWP information in the form of $kgCO_2$ eq.

.2 Ozone Depletion Potential (ODP): Submit ODP information in the form of kgCFC-11 eq.

.3 Acidification Potential (AP): Submit AP information in the form of $kgSO_2$ eq.

.4 Eutrophication Potential (EP): Submit EP information in the form of kgN eq.

.5 Smog Formation Potential (SFP): Submit SFP information in the form of kgO_3 eq. Also referred to as Photochemical ozone creation potential (POCP).

1.3 REFERENCE STANDARDS

.1 ASTM International (ASTM):

.1 ASTM C834-17, Standard Specification for Latex Sealants

.2 ASTM C919-19, Standard Practice for Use of Sealants in Acoustical Applications

.3 ASTM C920-18, Standard Specification for Elastomeric Joint Sealants

.4 ASTM C1193-16, Standard Guide for Use of Joint Sealants

.5 ASTM C1330-18, Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants

.6 ASTM C1481-12, Standard Guide for Use of Joint Sealants with Exterior Insulation and Finish Systems (EIFS)

.7 ASTM D1056– 20, Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber

.8 ASTM D2240-15e1, Standard Test Methods for Rubber Property, Durometer Hardness

.9 ASTM D2628-91, Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements

.2 Canadian General Standards Board (CGSB) 1330:

.1 CAN/CGSB-19.24-M90, Multi-component, Chemical Curing Sealing Compound

.3 Department of Justice Canada (Jus):

.1 Canadian Environmental Protection Act, 1999 (2018) (CEPA)

.4 General Services Administration (GSA)-Federal Specifications (FS):

.1 FS-SS-S-200-E(2)1993, Sealants, Joint, Two-Component, Jet-Blast-Resistant, Cold Applied, for Portland Cement Concrete Pavement

.5 Health Canada/Workplace Hazardous Materials Information System (WHMIS):

.1 Safety Data Sheets (SDS)

.2 Sealant, Waterproofing, and Restoration Institute (SWRI): Sealants: The Professionals' Guide 2013

.6 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards:

.1 SCAQMD Rule 1168-A2017, Adhesives and Sealants Applications

.7 Transport Canada (TC):

.1 Transportation of Dangerous Goods Act, 1992 (2019 amended.) (TDGA)

.8 ULC Standards/ UL Canada (ULC):

.1 CAN/ULC 115-2018, Standard Method of Fire Tests of Firestop Systems

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's product data for each type of primer,backer rod, and sealants and include product characteristics, performance criteria, available colours, compatibility warnings, compliance standards and limitations.

.2 Manufacturer's product to describe:

.3 Submit one electronic copy of WHMIS SDS.

.3 Samples:

.1 Submit two samples of each type of joint sealant material and colour.

.2 Submit two cured samples of exposed sealants of each colour to match adjacent material.

.4 Certificates: When requested by Departmental Representative, submit manufacturer's product certificates indicating proposed sealant is appropriate for each application on this Project.

.5 Manufacturer's Instructions:

.1 Submit instructions for each type of product.

1.5 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 – Closeout Submittals.

.2 Operation and Maintenance Data: Submit maintenance data for incorporation into manual.

1.6 QUALITY ASSURANCE

.1 Qualifications:

.1 Manufacturer: Obtain each type of joint sealant from a single manufacturer.

.2 Minimum three years successful experience in Work of similar size and complexity.

.2 Compatibility: Ensure sealants are compatible with adjacent materials and are approved by manufacture for use with adjacent materials.

.3 Mock-Ups:

.1 Construct mock up in accordance with Section 01 43 00 – Quality Assurance.

.2 Before performing sealant work do sample applications of each type of sealant forreview.

.3 Site locations for sample applications shall be designated by Departmental Representative.

.4 Construct joint sealant mock-ups in assemblies of other Sections with joint sealants, which are referenced in this Section.

.4 Comply with requirements of WHMIS regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Safety Data Sheets (SDS) acceptable to Health Canada.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Perform in accordance with Section 01 61 00 – Common Product Requirements.

.2 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging, with manufacturer's label.

.3 Storage and Handling Requirements:

.1 Store materials off ground in a ventilated dry indoor location and in accordance with manufacturer's recommendations.

.2 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.

.3 Do not dispose of unused sealant material into sewer system, streams, lakes, onto ground or in other location where it will pose health or environmental hazard.

.4 Divert unused joint sealing material from landfill to official hazardous material collections site approved by Departmental Representative.

1.8 WARRANTY

.1 Manufacturer's warranty: Provide manufacturer's standard warranty documentation.

.2 Warrant that sealant work will not leak, crack, crumble, melt, shrink, run, lose adhesion or stain adjacent surfaces in accordance with General Conditions, except for five years.

.3 Installer's Warranty: Provide an installation warranty, installer agrees to repair or replace joint sealants that do not comply with requirements of this Section for two years from Substantial Performance.

PART 2 PRODUCTS

2.1 SUSTAINABILITY CHARACTERISTICS

.1 When low toxicity sealants are not possible, confine usage to areas which off gas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off gas time.

.2 VOC emissions limits shall be as follows:

.1 Sealant Primers:

.1 for non-porous surfaces: 250 g/L

.2 for porous surfaces: 775 g/L

.3 for modified bituminous membranes: 500 g/L

.4 for marine deck: 760 g/L

.5 for other conditions: 420 g/L

.2 Sealants:

.1 architectural: 250 g/L

.2 marine deck: 760 g/L

.3 non-membrane roof: 300 g/L

.4 roadway: 250 g/L

.5 single-ply roof membrane: 450 g/L

.6 other conditions: 420 g/L

2.2 PERFORMANCE REQUIREMENTS

.1 Each sealant system shall meet the following requirements for warranty period:

.1 Waterproof, flexible, and compatible with substrate under applicable service conditions.

.2 Provide a weather-tight seal that does not allow moisture penetration.

.3 Shall not de-bond, crack, or craze.

.4 Shall not leak.

2.3 SEALANT MATERIALS

.1 In air handling units and supply air system, use sealants without strong odours, without toxic chemicals, and are mould-resistantWhen low toxicity sealants are not possible, confine usage to areas which off gas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off gas time.

.2 Provide primers in accordance with manufacturer recommendation.

2.4 SEALANT MATERIAL DESIGNATIONS

.1 Type S-1: Acrylic Latex One Part, Shore A Hardness 20,

.2 Type S-2: Silicone Sealant; mould and mildew resistant.

.1 To ASTM C920; type S; grade NS; class 50; use NT, G, and A.

.2 To ASTM C920; type S; grade NS; class 25; use NT, G, and A.

.3 Type S-3: Silicone Sealant; general construction and air-seal sealant.

.1 To ASTM C920: type S; grade NS; class 25; use NT, M, G, A, O.

.4 Type S-4: Silicone Sealant; structural glazing.

.1 To ASTM C920: type S; grade NS; class 25; use NT, A, G, O.

.5 Type S-5: Acoustical Sealant; interior, non-skimming, non-hardening, simple component synthetic rubber sealant, to ASTM C919.

.6 Type S-6: Multi-component polyurethane sealant; chemical curing, exterior wall sealant.

.1 To ASTM C920: type M; grade NS; class 50; use T, NT, M, A, O.

.7 Type S-7: One-component polyurethane sealant; non-sag, for general construction.

.1 To ASTM C920: type S; grade NS; class 25; use NT, M, A, O.

.8 Type S-8: Horizontal joint sealant; two component, self-levelling.

.1 To ASTM C920: type M; grade P; class 25; use T, M, O.

.9 Type S-9: One part moisture curing, low modulus polyurethane sealant for sealing joints in level and slightly slope surfaces conforming to CAN/CGSB-19.24, type S, grade P, class 50, use T, M, A,O, MC-1-25-B-N.

.10 Type S-10: Control joint sealant: two-component, epoxy-urethane, self-levelling, load bearing saw cut or preformed control joints.

.11 Type S-11 Control Joint Sealant: Two component, polyurea based, load bearing, self levelling sealant.

.12 Type S-12 Control Joint Sealant: Two component, semi-rigid epoxy, load bearing, self levelling sealant.

.13 Type S-13: One-component polyurethane sealant; medium-modulus, non-sag, low-VOC, UV stable, to CAN/CGSB-19.24.

.14 Type S-14: Polysulfide two part:

.1 Self-levelling to CAN/CGSB-19.24, Type 1, Class B.

.2 Non-sag: to CAN/CGSB-19.24, Type 2, Class B.

2.5 SEALANT SELECTION

.1 Where no specific type of sealant is scheduled, provide one of the sealants indicated in this Section appropriate for its application and consistent with manufacturer's recommendations and the recommendations of SWRI, Sealants: The Professionals' Guide.

.2 Make sealant selections consistent with manufacturer's recommendations.

.3 Use acrylic sealant Type S-1 only on the interior and only in situations where little or no movement can occur.

.4 Use mould & mildew resistant silicone sealant Type S-2 for nonmoving joints in washrooms and kitchens. Do not use on floors.

.5 Use silicone general construction sealant Type S-3 or Type S-6 and S-7 for all joints, interior and exterior, where no other specific sealant type specified.

.6 Use structural glazing silicone Type S-4 for sealing glass, interior and exterior.

.7 Use acoustical sealant Type S-5 and air seal sealant Type S-3 only where they will be fully concealed and only where no constant or consistent air pressure difference will exist across the joint.

.8 Use multi component sealant type S-6, primed penetration element surfaces other than concrete, for mechanical and electrical service penetrations in concrete foundation walls.

.9 Use multi component sealant Type S-8 for horizontal joint sealant of plaza, floors and decks, exterior areas only, subject to pedestrian and vehicular traffic.

.10 Use polyurethane, semi-self levelling sealant Type S-9 for in expansion joints in sidewalks, plazas, floors and other pedestrian and vehicular horizontal surfaces with slopes up to 6%.

.11 Use control joint sealant S-10 as filler for interior, horizontal saw cut or preformed control joints where joints are subject to load bearing conditions.

.12 Use control joint sealant S-10 as filler for interior only, horizontal saw cut or preformed control joints where joints are subject to load bearing conditions.

.13 Use control joint sealant S-11 as filler for interior, horizontal saw cut or preformed control joints, where joints are subject to low temperatures (freezer floors) and where joints require nosing support.

.14 Use control joint sealant S-12 as filler for interior, horizontal saw cut or preformed control joints where joints are subject to thermal shock conditions, traffic loops, and where a high bond strength is required.

.15 Use sealant S-13 for sealing exterior holes and penetrations around pipes and other services passing through concrete foundations and requiring greater movement capability.

2.6 ACCESSORIES

.1 Preformed compressible and non-compressible back-up materials that are non-staining, compatible with joint substrate, sealants, primers, and other joint fillers, and are approved for applications indicated by sealant manufacturer based on site experience and laboratory testing:

.1 Rod Type Sealant Backings:

.1 ASTM C1330, Type C (closed cell material with a surface skin), Type O (open cell material) or Type B (bi cellular material with a surface skin).

.2 Provide any of the preceding types, as approved in writing by joint sealant manufacturer for joint application indicated.

.3 Size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

.4 Non adhering to sealant, to maintain two sided adhesion across joint.

.2 High Density Foam:

.1 Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m^3 density, or neoprene foam backer, size as recommended by manufacturer.

.3 Elastomeric Tubing Joint Fillers: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D1056, non absorbent to water and gas, capable of

remaining resilient at temperatures down to 15 deg C. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth and otherwise contribute to optimum sealant performance.

.4 Bond Breaker Tape:

.1 Polyethylene bond breaker tape or other tape recommended by sealant manufacturer which will not bond to sealant.

.2 Preformed Sealants:

.1 Preformed Silicone Sealant System: Manufacturer's standard system consisting of pre-cured low modulus silicone extrusion, in sizes to fit joint widths indicated, combined with a neutral curing silicone sealant for bonding extrusions to substrates.

.2 Preformed Hollow Neoprene Gasket: Manufacturer's standard preformed polychloroprene elastomeric joint seal of the open cell compression type complying with ASTM D2628 and with requirements for size, profile and cross sectional design.

.3 Bond Breaker: Pressure-sensitive plastic tape that will not bond to sealants.

.4 Joint Cleaner: Provide a non-corrosive and non-staining type, compatible with joint forming materials and sealant in accordance with sealant manufacturer's recommendations

.5 Primer: Provide in accordance with sealant manufacturer's recommendations.

.6 Masking Tape: Non-absorbent type, non-staining, compatible with joint sealant and joint substrates.

2.7 COLOURS

.1 Sealant Colours: Match colour of adjacent materials where visible, as selected by Departmental Representative, from manufacturer's standard colour range.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed are acceptable for joint sealants installation in accordance with manufacturer's instructions.

.1 Visually inspect substrate.

.2 Verify joint surfaces are dry and frost free.

.3 Verify substrates are without contaminants capable of interfering with sealant adhesion. Remove contaminants where occurring.

.4 Examine joint sizes and conditions to establish acceptable depth to width ratio for installation of backup materials and application of sealants.

.5 Verify joint widths are within the limits recommended by joint sealant manufacturer for applications indicated.

.6 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.7 Proceed with installation only after unacceptable conditions have been remedied.

3.2 SURFACE PREPARATION

.1 Clean bonding joint surfaces of harmful contaminates including dust, rust, oil grease, and other matter which may impair adhesion.

.2 Do not apply sealants to joint substrates treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.

.3 Prepare surfaces in accordance with manufacturer's directions.

3.3 PRIMING

.1 Mask adjacent surfaces prior to priming and sealing where necessary to prevent staining.

.2 Prime sides of joints in accordance with sealant manufacturer's instructions immediately applying sealant, except when manufacturer's instructions explicitly state priming is not required.

.3 Prime all porous material (e.g. wood, masonry, concrete, ceramic or paver tile, etc).

3.4 BACKUP MATERIAL

.1 Provide backer rod as specified, to limit depth of sealant and to act as bond breaker at back of joint.

.2 Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.

.3 Apply paper masking tape to back of joint to act as bond break where depth of joint does not permit the use of backer rod.

.4 Ensure that no joints are formed which are bonded on adjacent sides where there is any possibility of movement.

3.5 MIXING

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

3.6 APPLICATION

.1 Sealant: Application: Apply sealants to recommendations of ASTM C1193, and of ASTM C1481 for EIFS systems, and in accordance with manufacturer's instructions, and as follows:

.1 Apply sealant within recommended temperature ranges. Consult manufacturer when sealant cannot be applied within recommended temperature range.

.2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.

.3 For joints where movement is possible, apply backer rod to achieve a joint depth of one half the joint width but not less than 9 mm; for joints larger than 25 mm use a depth of 13 mm

.4 Apply sealant in a continuous beads.

.5 Apply sealant using gun with proper size nozzle.

.6 Fill voids and joints solid.

.7 Form sealant surface with a smooth full bead, without from ridges, wrinkles, sags, air pockets, embedded impurities.

.8 Tool exposed surfaces before skinning begins to give slightly concave shape.

.9 Ensure bead is solid, filling entire space between sides and bedding material, exerting sufficient pressure to obtain maximum bond, by allowing sealant to bulge out in advance of nozzle.

.10 Apply sealant within recommended temperature ranges. Consult manufacturer when sealant cannot be applied within recommended temperature range.

.11 Seal at all locations where dissimilar material meet.

.2 Sealant Curing:

.1 Cure sealants in accordance with sealant manufacturer's instructions.

.2 Do not cover up sealants until after curing has completed.

3.7 CLEANING

.1 Progress Cleaning: Clean in accordance with Section 01 74 00 – Cleaning.

.1 Clean adjacent surfaces immediately of excess primers and sealants.

.2 Remove excess and droppings, using recommended cleaners as work progresses.

.3 Remove masking tape after initial set of sealant.

.2 Final Cleaning: Perform in accordance with Section 01 74 00 – Cleaning upon completion.

.3 Waste Management: Perform in accordance with Section 01 74 19 – Waste Management and Disposal.

.1 Do not dispose of unused sealant materials into sewer system, streams, lakes, onto ground, or other location where it might pose a health or environmental hazard.

.2 Divert unused sealants from landfill to a hazardous material collection site.

.3 Place materials defined as hazardous or toxic in designated containers.

.4 Dispose of hazardous materials in accordance with the CEPA, TDGA, regional and municipal regulations.

3.8 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by joint sealants installation.

3.9 SCHEDULE

.1 Use acrylic sealant Type S-1 only on the interior and only where little or no movement can occur.

.2 Use mould and mildew-resistant silicone sealant Type S-2 for non-moving joints in washrooms and kitchens. Do not use on floors.

.3 Use silicone general construction sealant Type S-3 or Type S-6 and S-7 for all joints, interior and exterior, where no other specific sealant type is specified.

.4 Use acoustical sealant Type S-5 only where they will be fully concealed and only where no constant or consistent air pressure difference will exist across the joint.

.5 Use multicomponent sealant type S-6, primed penetration element surfaces other than concrete, for mechanical and electrical service penetrations in concrete foundation walls.

.6 Use multicomponent sealant type S-6, at perimeters of exterior openings where frames meet exterior facade of building (e.g., brick, block, precast masonry).

.7 Use multicomponent sealant Type S-8 for horizontal joint sealant of plaza, floors and decks, exterior areas only, subject to pedestrian and vehicular traffic.

.8 Use sealant Type S-8 for exterior joints in horizontal wearing surfaces.

.9 Use polyurethane, semi-self-levelling sealant Type S-9 for in expansion joints in sidewalks, plazas, floors and other pedestrian and vehicular horizontal surfaces with slopes up to 6%.

.10 Use control joint sealant S-10 as filler for interior, horizontal saw cut or preformed control joints where joints are subject to load bearing conditions.

.11 Use control joint sealant S-11 as filler for interior, horizontal saw cut or preformed control joints, where joints are subject to low temperatures (freezer room floors) and where joints require nosing support.

.12 Use control joint sealant S-12 as filler for interior, horizontal saw cut, or preformed control joints where joints are subject to thermal shock conditions, traffic loops, and where a high bond strength is required.

.13 Use sealant S-13 for exterior holes and penetrations around pipes and other services passing through concrete foundations and requiring greater movement capability.

.14 Use sealant S-16 in pavement wherever fuel oils may be present

.15 In addition, provide joint sealants at the following conditions:

.16 Seal perimeters of hollow metal door frames on both sides.

.17 Seal control joints in gypsum board , except where prefabricated control joints are specified.

.18 Seal junctures between interior partitions with exterior walls.

.19 Seal joints in floors and walls and around service and mechanical and electrical fixture penetrations.

.20 Perimeter of bath fixtures (e.g., sinks, tubs, urinals, water closets, basins, vanities).

.21 Expansion and control joints in exterior surfaces of poured-in-place concrete walls.

.22 Expansion and control joints in exterior surfaces of precast architectural wall panels.

.23 Movement, control and expansion joints in exterior surfaces of unit masonry walls.

.24 Coping joints and coping-to facade joints.

.25 Cornice and wash (or horizontal surface joints).

.26 Seal interior perimeters of exterior openings as detailed on Drawings.

.27 Control and expansion joints on the interior of exterior cast-in place concrete walls.

.28 Expansion and control joints on the interior of exterior precast, architectural wall panels.

.29 Joints of underside of precast beams or planks.

.30 Movement, control and expansion joints on the interior of exterior surfaces of unit masonry walls.

.31 Interior control and expansion joints in floor surfaces.

.32 Perimeters of interior frames , as detailed.

.33 Movement, control and expansion joints in exterior surfaces of unit masonry walls.

.34 Joints at tops of non-load bearing masonry walls at the underside of poured concrete.

.35 Exposed interior control joints in gypsum board.

.36 Seal at all locations where dissimilar material meet.

.37 Refer to Section 07 84 00 – Fire Stopping for additional requirements.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 07 92 00 – Joint Sealants

.3 Section 08 71 00 – Door Hardware

.4 Section 09 91 23 – Interior Painting

1.2 REFERENCE STANDARDS

.1 American National Standards Institute/Steel Door Institute (ANSI/SDI):

.1 ANSI/SDI A250.7-1997, Nomenclature for Standard Steel Doors and Steel Frames

.2 ANSI/SDI A250.11-12, Recommended Erection Instructions for Steel Frames

.2 ASTM International (ASTM):

.1 ASTM A167-99, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip (Withdrawn)

.2 ASTM A653/A653M-18, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

.3 ASTM A780/A780M-20, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

.4 ASTM A879/A879M-12, Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface

.5 ASTM A924/A924M-20, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process

.6 ASTM B29-19, Standard Specification for Refined Lead

.7 ASTM B749-20, Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products

.8 ASTM D4726-18, Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Exterior-Profile Extrusions Used for Assembled Windows and Doors

.9 ASTM E90-09, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

.10 ASTM E413-16, Classification for Rating Sound Insulation

.11 ASTM E1425-14, Standard Practice for Determining the Acoustical Performance of Windows, Doors, Skylight, and Glazed Wall Systems

.12 ASTM F2247-18, Standard Test Method for Metal Doors Used in Blast Resistant Applications (Equivalent Static Load Method)

.3 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-1.132-M90, Zinc Chromate Primer, Low Moisture Sensitivity

.2 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating

.3 CGSB 41-GP-19Ma-84, Rigid Vinyl Extrusions for Windows and Doors

.4 CAN/CGSB 82.5-M88, Insulated Steel Doors

.4 CSA Group (CSA):

.1 CSA G40.20-13 /G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel

.2 CSA W59-18, Welded Steel Construction , Includes Errata (2020)

.5 Canadian Steel Door Manufacturers Association (CSDMA):

.1 Recommended Dimensional Standards for Commercial Steel Doors and Frames, 2000

.2 Recommended Specifications for Commercial Steel Doors and Frames, 2006

.3 Recommended Selection and Usage Guide for Commercial Steel Door and Frame Products, 2009

.4 Storage and Installation Guide, 2012

.6 Fenestration & Glazing Industry Alliance (FGIA) (formerly American Architectural Manufacturers Association (AAMA)):

.1 AAMA 812-19, Voluntary Practice for Assessment of Frame Deflection When Using One Component Polyurethane Foams for Air-Sealing Rough Openings of Fenestration Installations

.7 National Council on Radiation Protection and Measurements (NCRP):

.1 Report No. 049, Structural Shielding Design and Evaluation for Medical Use of X-Rays and Gamma Rays of Energies up to 10 MeV (1976)

.8 National Fire Protection Association (NFPA):

.1 NFPA 80-2013, Standard for Fire Doors and Other Opening Protectives

.2 NFPA 252-2022, Standard Methods of Fire Tests of Door Assemblies

.9 Steel Door Institute (SDI):

.1 SDI-108-18, Recommended Selection and Usage Guide for Standard Steel Doors

.2 SDI-111-09, Recommended Details for Standard Steel Doors, Frames, Accessories and Related Components

.3 SDI-122-15, Installation Troubleshooting Guide for Standard Steel Doors and Frames

.10 Underwriters Laboratories (UL):

.1 UL 2985-2015, Sustainability Standard for Thermal Insulation

.11 ULC Standards (ULC):

.1 CAN/ULC-S104-15, Standard Method for Fire Tests of Door Assemblies

.2 CAN/ULC-S105:2016, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN/ULC-S104

.3 CAN/ULC S106-15, Standard Method for Fire Tests of Window and Glass Block Assemblies

.4 CAN/ULC-S701.1:2017, Standard for Thermal Insulation, Polystyrene Boards

.5 CAN/ULC-S702-14, Standard for Mineral Fibre Thermal Insulation for Buildings

.6 CAN/ULC-S704-11, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate, Boards, Faced

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Coordination:

.1 Coordinate throat dimensions based on actual material used for wall and partition construction assemblies.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's product data for each type of door and frame. Indicate door designation, type and model, product characteristics, core description, fabrication details, dimensions, fire-protection rating, finishes, and limitations.

.2 Submit WHMIS Safety Data Sheet (SDS).

.3 Shop Drawings:

.1 For each type of door, indicate material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, openings, glazed, arrangement of hardware, fire-protection rating, and finishes.

.2 For each type of frame, indicate material, core metal thickness, reinforcements, glazing stops, location of anchors and exposed fastenings, fire-protection rating, and finishes.

.3 Include a schedule identifying each unit with door marks and numbers matching numbering on Drawings and door schedule.

.4 Certificates:

.1 Where fire-protection rated door and frame exceeds size limitations of fire labelled assemblies, submit evidence indicating compliance with fire labelling for door and frame assembly.

.2 Radiation Protection Compliance: For radiation protection assemblies, submit evidence of compliance in accordance with the requirements of the Cancer Agency, the provincial Occupational Health and Safety, Radiation Safety and Protection Branch, and the National Council on Radiation Protection and Measurement.

.5 Test and Evaluation Reports: Submit certified test reports showing compliance with specified performance characteristics and physical properties, as follows:

.1 Submit test and engineering data, and installation instructions for radiation shielding doors and frames.

.2 Submit test data indicating compliance with Sound Transmission Class (STC) requirements. Include laboratory name, test report number, and date of test.

1.5 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 – Closeout Submittals.

.2 Warranty Documentation: Submit manufacturer's material and fabrication warranty.

1.6 QUALITY ASSURANCE

.1 Qualifications:

.1 Manufacturer: A member in good standing of the Canadian Steel Door Manufacturers Association.

.2 Installers: Experienced with installation of hollow metal doors and frames of similar complexity and scope to that required for the Project.

.3 Testing Agencies: Provide doors and frames under label service program of a testing agency acceptable to authorities having jurisdiction (AHJ).

.2 Manufacturer: Obtain doors and frames from a single manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Perform in accordance with Section 01 61 00 – Common Product Requirements.

.2 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging with manufacturer's labels.

.1 Provide temporary protection during delivery and site storage to prevent distortion, surface damage, and rust.

.2 After arrival on site, remove wet wrapping materials, inspect doors and frames for damage, and notify delivery company and supplier if damage is found.

.3 Minor damage may be repaired if refinished products match new work, and are acceptable to Departmental Representative.

.3 Storage and Handling Requirements:

.1 Store materials off ground, in a dry, well-ventilated indoor location, in a manner that prevents sagging, bowing, or twisting, and in accordance with manufacturer's recommendations, and CSDMA Guide Specification for Installation and Storage of Hollow Metal Doors and Frames.

.2 Store with space between stacked doors to allow air circulation.

.3 Store and protect steel doors and frames from nicks, scratches, and distortion.

1.8 SITE CONDITIONS

.1 Site Measurements: Before fabrication, verify actual dimensions of openings by measuring on site, and indicate actual measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

.2 Established Dimensions: When site measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating doors and frames without site measurements. Coordinate site construction to ensure that actual site dimensions correspond to established dimensions.

1.9 WARRANTY

.1 Manufacturer's Warranty: Submit manufacturer's standard warranty.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

.1 Steel Fire-Protection Rated Doors, Frames, and Screens: Labelled and listed by an organization accredited by Standards Council of Canada in conformance with CAN/ULC-S104 and CAN/ULC-S105 for ratings indicated.

.2 Affix appropriate label to each opening indicating the labelling requirement, as follows:

.1 At standard size openings: Fire endurance rating ; radiation protection

.2 At oversized openings: Unclassified as to fire rating ; radiation protection

2.2 PERFORMANCE REQUIREMENTS

.1 Design exterior frame assembly to accommodate expansion and contraction when subjected to a minimum and maximum surface temperature of -35 °C to 35 °C.

.2 Maximum deflection for exterior steel entrance screens under wind load of 1.2 kPa not to exceed 1/175th of span.

.3 Steel Fire-Rated Doors and Frames: Labelled and listed by an organization accredited by Standards Council of Canada in conformance with CAN/ULC-S104 for ratings specified or indicated.

.4 Provide fire labelled frames for openings requiring fire protection ratings. Test products in conformance with CAN/ULC-S104 and listed by a nationally recognized agency having factory inspection services.

.5 Provide lab-tested door and frame assemblies with acoustic performance and a minimum Sound Transmission Class (STC) 38 tested to ASTM E90.

2.3 MATERIALS

.1 Interior Doors and Frames: Metallic coated steel sheets in accordance with ASTM A924/A924M, coated to ASTM A653/A653M, Commercial Steel (CS), Type B, ZF75 galvannealed, stretcher levelled standard of flatness where used for face sheets.

.2 Metallic Coated Steel Sheet Thickness: Minimum thickness in accordance with CSDMA, Recommended Specifications for Commercial Steel Door and Frame Products, Table 1 and Appendix 1.

.3 Reinforcement Channels: To CSA G40.20/G40.21, Type 44W, coating designation to ASTM A653/653M, ZF75.

.4 Composites: Balance of core materials used in conjunction with lead, in accordance with manufacturer's proprietary design.

2.4 DOOR CORE MATERIALS

.1 Honeycomb: Structural small cell, maximum 25-mm kraft paper, minimum 36 kg weight per ream, minimum 16.5 kg/m^3 density, and sanded to required thickness.

.2 Expanded Polystyrene: To CAN/ULC-S701.1 type 4, rigid extruded board, closed cell, fire retardant treated, density 16 to 32 kg/m^3, RSI 1.0 /25 mm , to UL 2985: Thermal Insulation Materials

.3 Polyisocyanurate: To CAN/ULC-S704, rigid modified polyisocyanurate, closed cell faced board, density 32 kg/m^3, RSI 1.9 /25 mm , to UL 2985: Thermal Insulation Materials

.4 Acoustic Composite Core: Tested as part of a fully operable assembly to ASTM E90 and ASTM E413 to provide Sound Transmission Classification (STC) of 51.

2.5 ADHESIVES

.1 Honeycomb Core and Steel Component Adhesive: Heat resistant, spray grade, polyurethane.

.2 Polystyrene and Polyurethane Core Adhesive: Heat resistant, epoxy resin based, low viscosity, contact cement.

.3 Lock-Seam Edge Adhesive: Fire resistant, resin reinforced polychloroprene, high viscosity, sealant/adhesive.

2.6 ACCESSORIES

.1 Touch-up Primer: To CAN/CGSB-1.181

.2 Isolation Coating: Alkali-resistant bituminous paint

.3 Exterior Top Caps: Rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19Ma, stainless steel channel inserts

.4 Interior Top Caps: Steel

.5 Frame Thermal Breaks: Rigid polyvinylchloride extrusion conforming to ASTM D4726

.6 Door Bottom Seal: Section 08 71 00 - Door Hardware

.7 Door Silencers/Bumpers: Single stud neoprene type, grey colour. Self-adhesive type silencers are not acceptable.

.8 Metallic Paste Filler: To manufacturer's standard.

.9 Fire Labels: Metal riveted.

.10 Floor Anchors and Channel Spreaders: 1.60-mm nominal tee anchors, 1.19-mm wall stud anchors, and provide anchors appropriate to site conditions, as follows:

.1 Exterior Locations: Hot-dipped, zinc-coated

.2 Interior Locations: Wipe coat galvanized

.3 At Masonry: Corrugated, galvanized tee anchors or heavy gauge galvanized wire ties

.4 Drilled stud anchors for wire tie to studs

.5 At Existing Concrete Openings: Lag bolts, shields and bushing

2.7 FABRICATION-FRAMES

.1 Fabricate frames in accordance with CSDMA Recommended Dimensional Standards for Commercial Steel Doors and Frames.

.2 Fabricate frames to profiles and maximum face sizes as indicated.

.3 Interior Frames: 1.6 mm welded type construction.

.1 Provide minimum 16-mm stop height for factory-sealed double-glazed units.

.4 Blank, reinforce, drill, and tap frames for mortised, templated hardware, and using templates provided by finish hardware supplier. Reinforce frames for surface-mounted hardware.

.5 Protect mortised cut-outs with steel guard boxes.

.6 Reinforce frames for surface-mounted hardware.

.7 Prepare door openings for door silencers:

.1 Three silencers on strike jamb for single door openings.

.2 Two silencers on heads for double door openings.

.8 Manufacturer's nameplates on frames and screens are not permitted.

.9 Conceal fastenings except where exposed fastenings are indicated.

.10 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.

.11 Insulate exterior frame components with polyurethane insulation.

.12 Provide fire labelled frame products for openings requiring fire protection ratings, as scheduled. Test products in conformance with CAN/ULC-S104, CAN/ULC-S106 and list by a nationally recognized agency having factory inspection services and construct as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.

2.8 FRAME ANCHORAGE

.1 Provide concealed anchorage to floor and wall construction.

.2 Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb.

.3 Provide 2 anchors for rebate opening heights up to 1520 mm, and one additional anchor for each additional 760 mm of height or fraction thereof.

.4 Locate anchors for frames in previously placed concrete, masonry or structural steel a maximum 150 mm from top and bottom of each jamb and intermediate anchors at a maximum 660 mm on centre.

2.9 FRAMES-WELDED TYPE

.1 Lead radiation lined doors shall be a welded type frame accurately mitered jointed.

.2 Perform welding to CSA W59.

.3 Accurately mitre or mechanically joint frame product and securely weld on inside of profile.

.4 Cope accurately and securely weld butt joints of mullions, transom bars, centre rails, and sills.

.5 Grind welded joints and corners to flat plane, fill with metallic paste, and sand to uniform smooth finish.

.6 Securely attach floor anchors to inside of each jamb profile.

.7 Weld in two temporary jamb spreaders per frame to maintain proper alignment during shipment.

.8 Securely attach lead to inside of frame profile from return to jamb soffit (inclusive) on door side of frame only.

2.10 FABRICATION – FRAMES, KNOCKED-DOWN TYPE

.1 Ship knocked-down type frames unassembled.

.2 Provide frames with mechanical joints which interlock securely and provide functionally satisfactory performance when assembled and installed in accordance with CSDMA Guide Specification for Installation and Storage of Hollow Metal Doors and Frames.

.3 Securely attach floor anchors to inside of each jamb profile.

2.11 FABRICATION – DOORS, GENERAL

.1 Doors: Swing type, flush, with provision for glass openings as indicated.

.2 Interior doors: Honeycomb core laminated core construction.

.3 Laminated Core Doors:

.1 Form both face sheets from a sheet of 18-gauge steel.

.2 Core shall be a composite of 14.6 kg/m^2 /1.2 mm sheet lead, laminated under pressure to face sheets.

.4 Factory-prepare 12.7-mm diameter holes and larger on-site at time of hardware installation, except for mounting and through-bolt holes.

.5 Reinforce doors for surface-mounted hardware where required. Provide flush steel top caps to exterior doors. Provide inverted top and bottom channels to interior doors.

.6 Prepare doors for recessed mounting of automatic door bottoms where scheduled in Section 08 71 00 – Door Hardware.

.7 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.

.8 Provide fire labelled doors for openings requiring fire protection ratings, as scheduled. Test such products in conformance with CAN/ULC-S104, listed by a nationally recognized agency having factory inspection services, and construct as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.

.9 Manufacturer's nameplates on doors are not permitted. Nameplates on hinge edge are acceptable.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: Verify conditions of substrates previously installed under other Sections or Contracts are acceptable for steel doors and frames installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION-GENERAL

.1 Install doors and frames to CSDMA Guide Specification for Installation and Storage of Hollow Metal Doors and Frames.

.2 Install fire-rated doors and frames in accordance with NFPA 80.

3.3 INSTALLATION-FRAMES

.1 Set frames plumb, square, level, and at correct elevation.

.2 Secure anchorages and connections to adjacent construction.

.3 Brace frames rigidly in position until built-in:

.1 Remove temporary jamb spreaders.

.2 Provide temporary wood spreaders at third points of frame rebate height to maintain frame width until adjacent building-in work completed.

.3 Provide vertical support at centre of head for openings exceeding 1200 mm in width.

.4 Remove wood spreaders after frames have been built-in.

.4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.

.5 Fill rough opening with low pressure spray-applied polyurethane foam to AAMA 812.

.6 Apply sealant at perimeter of frames between frame and adjacent material.

.7 Install door silencers.

3.4 INSTALLATION – DOOR HARDWARE

.1 Install hardware in accordance with manufacturer's instructions and Section 08 71 00 – Door Hardware, using manufacturer's door hardware templates.

3.5 SITE QUALITY CONTROL

.1 Tolerances: Provide even margins between doors and jambs, and doors and finished floor and thresholds as follows.

.1 Hinge Side: 1.0 mm

.2 Latch Side and Head: 1.5 mm

.3 Refer to Section 01 91 13 – General Commissioning Requirements for commissioning requirements.

3.6 ADJUSTING

.1 Use primer to touch-up finishes damaged during installation.

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

.3 Repair damage to zinc coatings in accordance with ASTM A780/A780M.

.4 Repair damage to adjacent materials caused by metal doors and frames installation.

.5 Adjust operable parts for correct function.

3.7 CLEANING

.1 Progress Cleaning: Perform in accordance with Section 01 74 00 – Cleaning, and as follows:

.1 Remove traces of primer, sealants, epoxy, and filler materials. Clean doors and frames.

.2 Clean glass and glazing materials with approved non-abrasive cleaner.

.2 Final Cleaning: Perform in accordance with Section 01 74 00 – Cleaning.

.3 Waste Management: Perform in accordance with Section 01 74 19 – Waste Management and Disposal.

3.8 PROTECTION

.1 Protect installed products and components from damage during construction. Install temporary protective covering to exposed components.

.2 Protect thresholds, hardware, frames, doors, and glass from damage. Lock operative door bottom in up position.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures

.2 Section 06 08 99 - Rough Carpentry for Minor Works

.3 Section 08 11 13 – Hollow Metal Doors and Frames

.4 Section 08 71 00 – Door Hardware

.5 Section 08 80 00 - Glazing

.6 Section 09 91 23 – Interior Painting

1.2 REFERENCE STANDARDS

.1 American National Standards Institute (ANSI)/Decorative Hardwoods Association (Previously Hardwood Plywood and Veneer Association (HPVA)):

.1 ANSI/HPVA HP-1-2020, American National Standard for Hardwood and Decorative Plywood

.2 American National Standards Institute (ANSI)/National Electrical Manufacturers Association (NEMA):

.1 ANSI/NEMA LD3-2005, High-Pressure Decorative Laminates (HPDL)

.3 American National Standards Institute (ANSI)/Window and Door Manufacturers Association (WDMA):

.1 ANSI/WDMA I.S. 1A-21, Interior Architectural Wood Flush Doors

.2 ANSI/WDMA I.S. 6A-13, Interior Architectural Wood Stile and Rail Doors

.4 Architectural Woodwork Manufacturers Association of Canada (AWMAC)/Woodwork Institute (WI):

.1 North American Architectural Woodwork Standards (NAAWS), 3.1 errata edition

.5 ASTM International (ASTM):

.1 ASTM E90-09, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

.6 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-71.19-M88, Adhesive, Contact, Sprayable

.2 CAN/CGSB-71.20-M88, Adhesive, Contact, Brushable

.7 CSA Group (CSA):

.1 AAMA/WDMA/CSA 101/I.S.2/A440-11, NAFS – North American Fenestration Standard/Specification for Windows, Doors, and Skylights

.2 CSA A440S1-17, Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440-11, NAFS – North American Fenestration Standard/Specification for Windows, Doors, and Skylights

.3 CSA A440.2-14, Fenestration Energy Performance

.4 CAN/CSA-A440.4-07, Window, Door, and Skylight Installation

.5 CSA O115-M1982, Hardwood and Decorative Plywood

.6 CAN/CSA O132.2 Series-90, Wood Flush Doors

.7 CAN/CSA-O132.5-M1992, Stile and Rail Wood Doors

.8 CAN/CSA-Z808-96, A Sustainable Forest Management System: Guidance Document

.9 CSA Z809-16, Sustainable Forest Management

.10 CSA Certification Program for Windows and Doors

.8 Forest Stewardship Council (FSC):

.1 FSC-STD-01-001-V5-2, FSC Principles and Criteria for Forest Stewardship

.9 National Fire Protection Association (NFPA):

.1 NFPA 80-2013, Standards for Fire Doors and Other Opening Protectives

.10 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards:

.1 SCAQMD Rule 1113-2016, Architectural Coatings

.2 SCAQMD Rule 1168-2017, Adhesives and Sealant Applications

.11 Sustainable Forestry Initiative (SFI):

.1 SFI-2015-2019 Standard

.12 Underwriters Laboratories (UL):

.1 UL 2761-2011, Sustainability for Sealants and Caulking Compounds

.2 UL 2762-2011, Sustainability for Adhesives

.3 UL 2768-2011, Sustainability for Architectural Surface Coatings

.13 Underwriters Laboratories of Canada (ULC):

.1 CAN/ULC-S104-15, Standard Method for Fire Tests of Door Assemblies

.2 CAN/ULC-S105-16, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN/ULC-S104

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Coordination:

.1 Coordinate steel door frame dimensions and installation tolerances with Section 08 11 13 – Hollow Metal Doors and Frames.

.2 Coordinate door hardware with Section 08 71 00 – Door Hardware.

.3 Coordinate glass and glazing units with Section 08 80 00 – Glazing.

.4 For fire-protection rated doors, coordinate fire-protection rated door frames to CAN/ULC-S105.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's product data for each type of wood door. Indicate door designation, type, and model, product characteristics, door core description, fabrication details, dimensions , fire-protection rating, and finishes.

.2 Submit WHMIS SDS - Safety Data Sheets. Indicate VOCs for door materials and adhesives.

.3 Shop Drawings: Submit to Departmental Representative as follows:

.1 Shop drawing format to conform to NAAWS requirements.

.2 For each type of door include scaled details of components and indicate the following:

.1 Size of door

.2 Core construction and thickness

.3 Transom panel construction, if applicable

.4 Cut-outs and locations for lights and louvres

.5 Swing direction

.6 Undercut dimensions

.7 Hardware location and preparation requirements

.8 Blocking for hardware in mineral core doors

.9 Fire-protection rating

.10 Sound Transmission Class

.11 Location of sealants

.12 Location of manufacturer's nameplates

.13 Glazing, if applicable

.14 Types of finishes

1.5 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Warranty Documentation: Submit manufacturer's material and fabrication warranty.

1.6 QUALITY ASSURANCE

.1 Submit test data indicating compliance with Sound Transmission Class (STC) requirements when tested to ASTM E90. Include laboratory name, test report number, and date of test , when requested by the Departmental Representative.

.2 Certificates: Manufacturer's product certificates certifying materials comply with specified performance characteristics, criteria, and physical requirements.

.3 Qualifications:

.1 Installers: Five years of experience with installation of wood doors of similar complexity and scope to that required for the Project.

.2 Testing Agencies: Provide fire-protection rated wood doors under label service program of a testing agency acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Perform in accordance with Section 01 61 00 - Common Product Requirements.

.2 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging with manufacturer's labels. Wrap doors.

.3 Storage and Handling Requirements:

.1 Store materials off ground in a dry, clean, well-ventilated indoor location.

.2 Arrange for delivery after construction activities causing high humidity are completed.

.3 Unwrap and protect doors from scratches, handling marks, other damages, dampness and in accordance with manufacturer's/fabricator's recommendations and NA CAN/CSA-O132.2 Series, Appendix A.

.4 Store doors away from direct sunlight.

1.8 SITE CONDITIONS

.1 Site Measurements: Before fabrication, verify actual dimensions of openings by measuring on site, and indicate actual measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

.2 Established Dimensions: When site measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating doors without site measurements. Coordinate site construction to ensure that actual site dimensions correspond to established dimensions.

1.9 WARRANTY

.1 Manufacturer's Warranty: Submit manufacturer's standard warranty.

.2 Special Warranty:

.1 If the Subcontractor is an AWMAC manufacturer member in good standing, issue a two year AWMAC Guarantee Certificate to the Owner.

.2 AWMAC Guarantee to cover replacing, reworking, and/or refinishing deficient wood doors due to faulty workmanship or defective materials supplied and installed, if discovered during two year period following the date of issuance.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

.1 Fire-Protection Rated Wood Doors: Labelled and listed by an organization accredited by the Standards Council of Canada, having factory inspection services, in conformance with CAN/ULC-S104 for ratings indicated. Fabricate as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to the manufacturer.

.2 Affix appropriate label to each required opening indicating a labelling requirement, as follows:

.1 At standard size openings: Fire endurance rating.

2.2 WOOD FLUSH DOORS

.1 Construction: 5-ply for all indicated wood doors.

.2 Door Core:

.1 Solid Particleboard or agrifibre Core: Internal stile and rail frame bonded to particleboard or agrifibre core with wood lock blocks.

.2 Mineral Core: Reinforced with SCL, as required for hardware installation, as indicated in NAAWS.

.3 Structural Composite Lumber (SCL) core.

.4 Staved Lumber Core.

.5 Hollow Core: Hollow grid to NAAWS, with blocking as required for hardware.

.3 Door Faces:

.1 Faces for Transparent Finish, Veneer Grade Hardwood:

.1 Wood Species: Hardwood

.4 Stiles and Rails: hardwood or structural composite lumber/hardwood. Stile thickness minimum 38 mm and rail thickness minimum 38mm.

.5 Door Edge: Minimum 6mm hardwood, one piece full length, species to match wood veneer.

.6 Hardware blocking, Fire Resistant Rated Doors: Fire resistant materials acceptable to the authorities having jurisdiction, for positive attachments of closers, exit devices, hinges and locksets.

.7 Adhesive: ANSI/HPVA Type I (waterproof)

2.3 GLAZING

.1 Glazing: As indicated is section 08 80 00 - Glazing.

2.4 FABRICATION

.1 Provide blocking for surface-mounted hardware to prevent need for through bolting

.2 Vertical Edge Profiles:

.1 Bevel vertical edges of single acting doors 3 mm in 50 mm on lock side and 1.5 mm in 50 mm on hinge side.

.2 Double Acting Doors: Radius vertical edges 60 mm

.3 At Fire Rated Doors: To NFPA 80

.3 Finish plastic laminate smooth and flush with stile edges of door, bevel at approximately 20 degrees.

.4 Provide waterproof non-staining membrane at cut-outs on exterior doors to exclude moisture from core. Provide metal flashing at top edge of exterior out-swinging doors.

.5 Factory-prepare holes 12.7 mm in diameter and larger except mounting and through-bolt holes, on site when installing hardware.

.6 Provide fire labelled doors for openings requiring fire-protection ratings.

.7 Manufacturer's nameplates on doors are not permitted. Nameplates on hinge edge are acceptable.

2.5 FINISHES

.1 Shop Priming for Doors with Opaque Finish:

.1 Before applying shop primer, steam out deep scratches and ease sharp edges by sanding.

.2 Shop prime doors with one coat of wood primer. Primer compatible with finish paint indicated in Section 09 91 23 – Interior Painting. Apply primer to all four door edges, to edges of cut outs, and to mortises.

2.6 ACCESSORIES

.1 Glazing and Louvre Stops:

.1 Solid hardwood, mitred corners, flush moulding, species matching face veneer, opaque finish. Free of open defects, shake, splits, and doze.

.2 Steel, 1.0 mm metal core thickness , screw attached. Accurately fit and butt at corners glazing trim and stops, locate on secure side of door or facing interior of room.

.3 Provide 16 mm minimum stop height for factory-sealed double-glazed units.

.4 Provide special stops and stop adjusters for sound resistant glazed doors to maintain STC rating.

.2 Automatic Door Bottom Seal: As indicated in Section 08 71 00 – Door Hardware

.3 Perimeter Sound Gaskets: Adjustable, type to achieve STC value specified

.4 Fire Labels: Metal, riveted

2.7 SOURCE QUALITY CONTROL

.1 Tests and Inspections:

.1 Manufacture/fabricate and install work of this Section in accordance with NAAWS.

.2 Arrange and pay for inspections at factory/shop and Project site by an appointed AWMAC Certified Inspector.

.3 Include GIS inspection costs in the price of the Contract.

.4 If work does not meet NAAWS requirements; replace, rework, or refinish to the approval of AWMAC Certified Inspector.

.2 If the Subcontractor is not an AWMAC Manufacturer member, provide the Owner a two year maintenance bond, instead of the AWMAC Guarantee Certificate, to the full value of wood doors work.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: Verify conditions of substrates previously installed are acceptable and within tolerances for wood doors installation in accordance with NAAWS.

.1 Verify door frames are plumb, square, level, and in plane.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION - GENERAL

.1 Install fire-protection rated doors in accordance with NFPA 80.

.2 Install doors in accordance with manufacturer's/fabricator's instructions and CAN/CSA-O132.2 Series, Appendix A.

.3 Install glazing in accordance with Section 08 80 00 - Glazing.

3.3 INSTALLATION – DOOR HARDWARE

.1 Install hardware described in this Section in accordance with manufacturer's instructions, using manufacturer's door hardware templates.

3.4 SITE QUALITY CONTROL

.1 Tolerances: To NAAWS, Section 15, and as follows:

.1 Hinge Side: 1.0 mm

.2 Latch Side and Head: 1.5 mm

.3 Door clearances with fire-protection rating not less than 20 minutes: Maximum 6 mm at bottom, and Maximum 3 mm at sides and top.

3.5 ADJUSTING

.1 Adjust doors and hardware to function correctly, operate smoothly and easily, without binding. Adjust pairs of doors when closed within 1.6 mm of flush at the meeting edge.

.2 Fill and retouch minor nicks, chips, and scratches. Replace un-repairable damaged items.

.3 Repair damage to adjacent materials caused by wood doors installation.

3.6 CLEANING

.1 Progress Cleaning: Perform in accordance with Section 01 74 00 - Cleaning, and as follows:

.1 Clean doors after installation to remove dust, fingerprints, and pencil marks.

.2 Clean glass and glazing materials with non-abrasive cleaner.

.2 Final Cleaning: Perform in accordance with Section 01 74 00 - Cleaning.

.3 Waste Management: Perform in accordance with Section 01 74 19 - Waste Management and Disposal.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 Submittal Procedures

.2 Section 04 05 00 – Common Work Results for Masonry

.3 Section 08 71 00 – Door Hardware

.4 Section 09 21 16 – Gypsum Board Assemblies

.5 Section 09 23 00 – Gypsum Plastering

.6 Section 09 65 16 – Resilient Sheet Flooring

1.2 REFERENCE STANDARDS

.1 ASTM International (ASTM):

.1 ASTM A653/A653M-20, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

.2 ASTM A780/A780M-20, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

.3 ASTM A1008/A1008M-13, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable

.4 ASTM A666-15, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar

.5 ASTM B221-20, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

.2 National Fire Protection Association (NFPA):

.1 NFPA 80-2013, Fire Doors and Other Opening Protectives

.3 Specialty Steel Industry of North America (SSINA):

.1 Special Finishes for Stainless Steel, current edition

.4 ULC Standards (ULC):

.1 CAN/ULC-S104-15, Standard Method for Fire Tests of Door Assemblies

1.3 SECTION INCLUDES

.1 Non-rated access doors in walls and partitions

.2 Fire-protection rated access doors in walls and partitions

.3 Non-rated access doors in ceilings

.4 Fire-protection rated access doors in ceilings

.5 Access doors in floors

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Coordination:

.1 Coordinate installation of access doors and panels in walls and partitions with Section 04 05 00 – Common Work Results for Masonry.

.2 Cordinate with Section 08 71 00 – Door Hardware for access door lock cylinders.

.3 Coordinate framing dimensions and installation of access doors and panels in walls and partitions with Section 09 21 16 – Gypsum Board Assemblies and 09 23 00 – Gypsum Plastering.

.4 Coordinate installation of floor access doors and panels with Section 09 65 16 – Resilient Sheet Flooring.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's product data for each type of access door and panel components. Indicate door designation, type and model, product characteristics, fabrication details, dimensions, latching and locking types, fire-protection rating, and finishes.

.2 Submit WHMIS SDS.

.3 Samples:

.1 Submit each type of unit for review and acceptance.

.2 Samples will not be returned for inclusion into work

.3 Submit each type of hand entry access door and panel.

.4 Submit one 300 x 300-mm corner sample of each type of body entry door.

.4 Manufacturers' Instructions: Submit manufacturer's installation instructions.

1.6 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 – Closeout Submittals.

.2 Warranty Documentation: Submit manufacturer's warranty.

1.7 QUALITY ASSURANCE

.1 Qualifications:

.1 Manufacturer: Five years manufacturing access doors similar to those required for this Project. Obtain each type of access door and panel from a single manufacturer.

.2 Installers: Two years of experience installing access doors and panels of similar complexity and scope to that required for the Project.

.3 Testing Agencies: Provide fire-protection rated doors and panels manufactured under the label service program of a testing agency accredited by the Standards Council of Canada.

1.8 DELIVERY, STORAGE, AND HANDLING

.1 Perform in accordance with Section 01 61 00 – Common Product Requirements.

.2 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging with manufacturer's labels.

.1 Provide temporary protection during delivery and site storage to prevent distortion, surface damage, and rust.

.2 After arrival on site, immediately remove wet wrapping materials, inspect doors and panels for damage, and notify delivery company and supplier if damage is found.

.3 Minor damage may be repaired if refinished products match new work, and are acceptable to Departmental Representative.

.3 Storage and Handling Requirements:

.1 Store materials off ground, in a dry interior location away from direct sunlight, in a way that prevents sagging, bowing, or twisting, and in accordance with manufacturer's recommendations.

.2 Store and protect access doors and panels from nicks, scratches, distortion and rust.

.3 Apply a temporary protective coating or film to stainless steel finished surfaces. Leave protective coating/film in place until final cleaning of building.

1.9 SITE CONDITIONS

.1 Site Measurements: Before fabrication, verify actual dimensions of openings by measuring on site, and indicate actual measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

.2 Established Dimensions: When site measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating access doors and panels without site measurements. Coordinate site construction to ensure that actual site dimensions correspond to established dimensions.

1.10 WARRANTY

.1 Manufacturer's Warranty: One year warranty, free from defects in material and manufacturing.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

.1 Rated Access Doors and Panels: At fire-resistance rated wall assemblies, provide access door and panel assemblies (comprising doors, frames, hardware and other components of the Closure) complying with CAN/ULC-S104 or NFPA 80 with a fire-protection rating to suit the surrounding assembly.

.1 Labelled and listed by UL, ULC, ITS Warnock Hersey, or other inspecting agency acceptable to authority having jurisdiction (AHJ). Affix appropriate label to each unit indicating the labelling requirement.

2.2 MATERIALS

.1 Steel Sheet: To ASTM A1008/A1008M

.2 Galvannealed Steel: To ASTM A653/A653M

.3 Stainless Steel: To ASTM A666, Type 304

.4 Aluminum: To ASTM B221, extruded aluminum alloy, 6063-T6

2.3 ACCESS DOORS – NON-RATED WALLS AND PARTITIONS

.1 Mounting Type: Flush-mounted with only frame edge and door visible.

.2 Clear Opening Size: 300 mm x 300 mm

.3 Door

.1 Material:

.1 Steel, minimum 1.2 mm thick, prime paint, white colour.

.4 Frame:

.1 Material:

.1 Steel, minimum 1.6 mm, same finish as door.

.2 Galvannealed steel, minimum 1.6 mm, same finish as door.

.3 Stainless steel, minimum 1.6 mm, same finish as door.

.4 Aluminum, minimum 2.8 mm thick, same finish as door.

.2 STC-Rated Assemblies: Continuous gasket at frame perimeter to maintain STC value of wall/partition assembly.

.3 Expanded galvanized metal lath perimeter wings where installed in plaster, except veneer plaster.

.5 Accessories:

.1 Hinges:

.1 Galvanized steel, concealed hinge, 120 degree swing. Removable hinge pin to allow removal of door panel from frame, with safety cable to secure door to frame.

.2 Hinge Location: To manufacturer's standard.

.2 Lock/Latch Devices:

.1 Flush, tamper-resistant torx head cam latch.

2.4 ACCESS DOORS – ARCHITECTURAL WALLS AND PARTITIONS

.1 Mounting Type: Recessed-mounted with allowance for gypsum board insert with thickness matching adjacent walls with only frame edge and door edge visible.

.1 Clear Opening Size: 300 mm x 300 mm

.2 Door:

.1 Material:

.1 Steel, minimum 1.2 mm thick, prime paint, white colour.

.2 Galvannealed steel, 1.2 mm thick, prime paint, white colour.

.3 Stainless steel at concrete and masonry substrates, minimum 2.0 mm thick, brushed satin finish.

.4 Aluminum, minimum 2.8 mm thick, prime paint, white colour.

.3 Frame:

.1 Material:

.1 Steel, minimum 1.6 mm thick, same finish as door.

.2 STC-Rated Assemblies: Continuous gasket at frame perimeter to maintain STC value of wall/partition assembly.

.3 Plaster Finished Walls/Partitions: Expanded galvanized metal lath perimeter wings where installed in plaster, except veneer plaster.

.4 Accessories:

.1 Hinges:

.1 Galvanized steel, concealed hinge, 120 degree swing. Removable hinge pin to allow removal of door panel from frame, with safety cable to secure door to frame.

.2 Hinge Location: To manufacturer's standard.

2.5 ACCESS DOORS – NON-RATED IN CEILINGS

.1 Mounting Type: Flush-mounted

.1 Clear Opening Size: 300 mm x 300 mm.

.2 Door: Mineral fiber insulation core, insulated sandwich type construction, upward opening.

.2 Door:

.1 Material:

.1 Steel, minimum 1.2 mm thick, prime paint, white colour.

.2 Galvannealed steel, minimum 1.2 mm thick, prime paint, white colour.

.3 Stainless steel, minimum 0.962.0 mm thick, brushed satin finish.

.4 Aluminum, minimum 300 mm thick, 300

.3 Frame:

.1 Steel, minimum 1.5 mm thick, same finish as door.

.2 Galvannealed steel, minimum 1.6 mm thick, same finish as door.

.3 Stainless steel, minimum 1.6 mm thick, same finish as door.

.4 Accessories:

.1 Hinge: Continuous hinge with pin. Automatic closing device.

.2 Lock: Self latching , mortise type with provision for fitting flush lock cylinder. Lock cylinder specified in Section 08 71 00 – Door Hardware.

.1 Latch release device operable from inside of door.

2.6 FABRICATION

.1 Access Door Sizes: Provide with the following clear opening dimensions, except where indicated otherwise:

.1 For body entry: minimum 600 x 600 mm nominal

.2 For hand entry: minimum 300 x 300 mm nominal

.2 Fabricate access doors and panel assembly as a single unit, ready for site installation.

.3 Fabricate large units with sufficient quantity of latches to hold door flush with frame.

.4 Fabricate units rigid with bracing and reinforcements as required to remain square and prevent sagging.

.5 Fabricate visible surfaces flat and smooth without embossed or imprinted manufacturer's name. Grind visible welds smooth and blended.

.6 Touch-up factory-applied coatings and galvanized surfaces where finish was removed during fabrication.

.7 Locate label indicating manufacturer and model and fire-protection rating on rear of panel door or other concealed surface , to NFPA 80.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: Verify conditions of substrates previously installed are acceptable for access doors and panels installation, in accordance with manufacturer's instructions.

.1 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

.1 Installation: locate access doors within view of equipment and ensure equipment is accessible for operating, inspecting, adjusting, servicing without using special tools.

.1 Install access doors and panels permitting access to service valves, traps, dampers, cleanouts, and other mechanical, electrical and conveyor control items concealed by walls and partitions, and concealed above gypsum board and acoustic panel and plaster ceilings.

.2 Install fire protection rated access doors and panels in fire rated partitions and ceilings, in accordance with NFPA 80.

.3 Isolate steel and aluminum from direct contact with dissimilar metals, concrete, and masonry with isolation coating of alkali-resistant bituminous paint, epoxy, or other permanent non-corrosive material recommended by manufacturer.

.4 Set frames square and in-plane with the substrate assembly, aligned with adjacent visible finishes. Securely attach to substrates.

.5 Access Doors above Acoustic Panel Ceilings: Install unobtrusive identification locators, such as a small self-adhering circle on the acoustic panel.

3.3 ADJUSTING

.1 Touch-up with factory-applied finishes if damaged during installation.

.2 Repair damage to zinc coatings in accordance with ASTM A780/A780M.

.3 Repair damage to adjacent materials caused by installation of access doors and panels.

.4 Adjust operable parts for correct function.

3.4 CLEANING

.1 Progress and Final Cleaning: Perform in accordance with Section 01 74 00 – Cleaning and remove gypsum board compound from hinges, frames, and door edges.

.2 Waste Management: Perform in accordance with Section 01 74 19 – Waste Management and Disposal.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures

.2 Section 07 92 00 – Joint Sealants

.3 Section 08 80 00 – Glazing

1.2 DEFINITIONS

.1 EPDM: Ethylene Propylene Diene Monomer rubber.

1.3 REFERENCE STANDARDS

.1 Aluminum Association (AA):

.1 AA DAF 45-03, Designation System for Aluminum Finishes

.2 ASTM International (ASTM):

.1 ASTM A123/A123M-15, Standard Specification for Zinc (Hot-Dip galvanized) Coatings on Iron and Steel Products

.2 ASTM E283-04, Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

.3 ASTM E331-00, Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform Static Air Pressure Difference

.4 ASTM E547-00, Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference

.5 ASTM E1105-15, Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference

.6 ASTM F1667-13, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples

.7 ASTM E1748-95, Standard Test Method for Evaluating the Engagement Between Windows and Insect Screens as an Integral System

.3 CSA Group (CSA):

.1 AAMA/WDMA/CSA 101/I.S.2/A440-11, NAFS-North American Fenestration Standard for Windows, Doors, and Skylights

.2 CSA A440S1-09, Canadian Supplement to AAMA/WDMA/CSA 101/1.S.2/A440, NAFS-North American Fenestration Standard for Windows, Doors, and Skylights

.3 CAN/CSA-A440.2-19 /A440.3-19, Fenestration energy performance/User guide to CSA A440.2, Fenestration energy performance

.4 CAN/CSA-A440.4-19, Window, Door, and Skylight Installation

.5 CSA B111-1974, Wire Nails, Spikes and Staples

.6 CAN/CSA-Z91-02, Health and Safety Code for Suspended Equipment Operations

.7 CAN/CSA-Z809-08, Sustainable Forest Management

.4 Forest Stewardship Council (FSC):

.1 FSC-STD-01-001 V5-2-2015, FSC Principle and Criteria for Forest Stewardship

.5 Green Seal (GS):

.1 GS-11-15, Paints and Coatings

.6 Master Painters Institute (MPI):

.1 Architectural Painting Specification Manual-current edition

.1 MPI #79, Primer, Alkyd, Anti-Corrosive for Metal

.7 South Coast Air Quality Management District (SCAQMD):

.1 SCAQMD Rule 1113-2016, Architectural Coatings

.2 SCAQMD Rule 1168-2017, Adhesives and Sealants

.8 Sustainable Forestry Initiative (SFI):

.1 SFI-2010-2014 Standard

.9 Screen Manufacturers Association (SMA):

.1 SMA 1201R-2012 Specification for Insect Screens for Windows, Sliding Doors and Swinging Doors

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Pre-Installation Meetings: Convene meeting 1 week before beginning work of this Section, with Contractor, Subcontractor and Departmental Representative in accordance with Section 01 31 19 – Project Meetings to:

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Coordination with other Subcontractors and,

.4 Review manufacturer's installation instructions and warranty requirements.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, product literature and data sheets for windows and Include product characteristics, performance criteria, physical sizes, finishes and limitations.

.2 Submit WHMIS SDS.

.3 Shop Drawings:

.1 Indicate materials and details in full size scale for head, jamb and sill, profiles of components, interior and exterior trim elevations of unit, anchorage details, location of isolation coating, description of related components and exposed finishes fasteners, and sealants. Indicate location of manufacturer's nameplates.

.2 Indicate locations, dimensions, openings and requirements of related work.

.4 Samples:

.1 Submit for review and acceptance each type of unit.

.2 Samples will not be returned for inclusion into work.

.3 Include frame, sash, sill, glazing and weatherproofing method, insect screens, surface finish and hardware. Show location of manufacturer's nameplates.

1.6 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 – Closeout Submittals.

.2 Operation and Maintenance Data: Submit maintenance data for windows and incorporate into manual.

.3 Warranty Documentation: Submit manufacturer's warranty documents.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Perform in accordance with Section 01 61 00 – Common Product Requirements.

.2 Storage and Handling Requirements:

.1 Store materials off ground and in accordance with manufacturer's recommendations.

.2 Store and protect windows from nicks, scratches, and damages.

1.8 SITE CONDITIONS

.1 Site Measurements: Before fabrication, verify actual dimensions of openings by measuring on site, and indicate actual measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

.2 Established Dimensions: When site measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating windows and screens without site measurements. Coordinate site construction to ensure that actual site dimensions correspond to established dimensions.

1.9 WARRANTY

.1 Manufacturer’s warranty: Submit manufacturer’s standard materials and fabrication warranty documentation.

PART 2 PRODUCTS

2.1 DESIGN CRETERIA

.1 Classification rating: to AAMA/WDMA/CSA 101/I.S.2/ A440.2/.3.

.2 Design Aluminum framed storefront to AAMA CW-DG-1.

.3 Design aluminum components to CAN/CSA S157

.4 Frames:

.1 Profile sizes: 45x114mm.

.2 Non-thermally broken.

.5 Standard of acceptance:

.1 Alumicor TL 1800 Series Storefront

2.2 MATERIALS

.1 Materials: to AAMA/WDMA/CSA 101/I.S.2/A440 supplemented as follows:

.2 Sash: aluminum.

.3 Main frame: aluminum.

.4 Glass: Tempered, GL3, in accordance with Section 08 80 00 – Glazing.

.5 Glaze windows in accordance with AAMA/WDMA/CSA 101/I.S.2/A A440.

.6 Interior: extruded aluminum of type and size as detailed; minimum 3 mm thick, complete with anchoring devices.

.7 Isolation coating: alkali resistant bituminous paint.

.8 Sealants:

.1 VOC limit 250 g/L maximum to SCAQMD Rule 1168.

2.3 ACCESSORIES

.1 Fasteners: screws to manufacturer’s standard.

.2 Weatherseals:

.1 Black polymer (EPDM) replaceable weatherseals:

.1 Shapes, designs, and thickness to satisfy performance requirements.

.2 Weatherseals shall be provided in continuous lengths, butted firm to ends of races and to each other when in the same planes.

.3 Sealants: VOC limit 250 g/L maximum to SCAQMD Rule 1168.

2.4 FABRICATION

.1 Fabricate in accordance with AAMA/WDMA/CSA 101/I.S.2/A440 and as follows:

.2 Fabricate units square and true with maximum tolerance of plus or minus 1.5 mm for units with a diagonal measurement of 1800 mm or less, and plus or minus 3 mm for units with a diagonal measurement over 1800 mm.

.3 Face dimensions detailed maximum permissible sizes.

.4 Brace frames to maintain squareness and rigidity during shipment and installation.

2.5 ALUMINUM FINISHES

.1 Finish exposed surfaces of aluminum components in accordance with Aluminum Association Designation System for Aluminum Finishes.

.1 Colour: Clear Anodized

.1 Class II, 0.010 mm thick, AA-M10C21A31

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: Verify conditions of substrates previously installed are acceptable for beginning product installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate. Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.2 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

.1 Window installation:

.1 Install in accordance with AAMA/WDMA/CSA 101/I.S.2/A440.

.2 Arrange components to prevent variation in colour.

.2 Sill installation:

.1 Install metal sills with uniform wash to exterior, level in length, straight in alignment with plumb upstands and faces. Use one piece mm lengths at each location.

.2 Cut sills to fit window opening.

.3 Secure sills in place with anchoring devices located at ends joints of continuous sills and evenly spaced 600 mm on centre in between.

.4 Fasten expansion joint cover plates with self tapping stainless steel screws.

.5 Maintain 6 to 9 mm space between butt ends of continuous sills. For sills over 1200 mm in length, maintain 3 to 6 mm space at each end.

.3 Sealant: Comply with requirements of Section 07 92 00 – Joint Sealants for sealants to be installed during installation of windows and screens.

3.3 ADJUSTING

.1 Adjust operating hardware for correct operation in accordance with manufacturer's installation instructions.

3.4 CLEANING

.1 Progress Cleaning: Clean windows, frames, sills and glazing in accordance with Section 01 74 00 – Cleaning.

.2 Final Cleaning: Perform in accordance with Section 01 74 00 – Cleaning.

.3 Waste Management: Perform in accordance with Section 01 74 19 – Waste Management and Disposal.

3.5 PROTECTION

.1 Protect installed products and components from damage during construction. Mark glass which may be subject to accidental breakage by Subcontractors. Use temporary markings that after removal do not stain or otherwise leave a perceptible effect.

END OF SECTION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

.1 Comply with requirements of Division 1.

.2 Furnish and delivery of all finish hardware necessary for all doors. Also hardware as specified herein and as enumerated in "Set Numbers" and as indicated and requested by actual conditions of the building. The hardware shall include the furnishing of all necessary screws, special screws, bolts, special bolts, expansion shields, drop plates and all other devices necessary for the proper installation of the hardware.

.3 The Engineer-Architect approval of the schedule will not be construed as certifying that the list is complete. Acceptance of the Hardware Schedule does not relieve the supplier of responsibility of errors or omissions.

.4 Hardware should not be ordered unless a corrected copy of the shop drawings is reviewed and returned from the specification writer and bearing the approval of the Engineer-Architect.

.5 Aluminum Door hardware is to be ordered immediately after approval of shop drawings and shipped directly to the Aluminum Door supplier.

.6 Furnish, deliver and install all finish hardware necessary for all doors, also hardware as specified herein and as enumerated in hardware group indicated by actual conditions at the project site.

.7 Section 08 71 00 to include the supply and installation of all electrified hardware with all final connection and termination above the frame. Section 08 71 00 to supply wire and wire pull for the card access system, power operators and all electrified hardware. The electrified hardware shall include the furnishing of plug in connections. Electrified hardware devices to be installed as per the proper operation and application of the hardware noted by connection notes in the hardware schedule.

.8 Division 28 to provide junction boxes, high voltage wiring, conduit and pull string from power supplies to the electrified hardware locations. This will include installation and wiring of the electromagnetic wall holders.

1.2 RELATED SECTIONS

.1 03 10 00 – Concrete Forming and Accessories
.2 06 20 00 – Finish Carpentry
.3 06 40 00 – Architectural Woodwork
.4 07 92 00 – Joint Sealants
.5 08 01 00 – Operation and Maintenance of Openings
.6 08 10 00 – Doors and Frames
.7 08 40 00 – Entrances, Storefronts, and Curtain Walls
.8 08 71 13 – Automatic Door Operators

.9 08 74 00 – Access Control Hardware
.10 26 06 00 – Schedules for Electrical
.11 28 00 00 – Electronic Safety and Security

1.3 REFERENCES

.1 American National Standards Institute (ANSI) A117.1 Specification

.1 ANSI/BHMA A156.1-2006, Butts and Hinges.
.2 ANSI/BHMA A156.13-2005, Mortise Locks and Latches.
.3 ANSI/BHMA A156.3-2001, Exit Devices.
.4 ANSI/BHMA A156.4-2000, Door Controls (Closers)
.5 ANSI/BHMA A156.5-2001, Auxiliary Locks and Associated Products.
.6 ANSI/BHMA A156.6-2005, Architectural Door Trim.
.7 ANSI/BHMA A156.7-2003, Template Hinge Dimensions.
.8 ANSI/BHMA A156.8-2005, Door Controls - Overhead Holders.
.9 ANSI/BHMA A156.18-2006, Materials and Finishes.
.10 ANSI/BHMA A156.19-2007, Power Assist and Low Energy Power Operated Doors.
.11 ANSI/BHMA A156.21-2006, American National Standards for Thresholds.
.12 ANSI/BHMA A156.22-2005, Door Gasketing and Edge Seal Systems.
.13 ANSI/BHMA A156.29-2001, American National Standards for Exit Locks, Exit Locks with Alarms, Exit Alarms, Alarms for Exits.
.14 ANSI/BHMA A156.30-2003, American National Standards for High Security Cylinders.
.15 ANSI/BHMA A156.31-2001, American National Standards for Electric Strikes and Frame Mounted Actuators.

.2 Canadian Standards Association (CSA)

.1 CAN/CSA-B651-04.Accessible Design for the Built Environment.

.3 Canadian Steel Door Manufacturer's Association (CSDMA).

.1 Standard Hardware Locations in Accordance with the Canadian Steel Door and Frame Association Guidelines.
.2 Recommended locations for Architectural Hardware for Wood Flush Doors.

.4 National Fire Protection Agency (NFPA)

.1 NBC - National Building Code – Latest Edition
.2 NFPA-80 - Standard for Fire Doors and Windows – Latest Edition
.3 NFPA101 - Life Safety Code – Latest Edition
.4 NFPA-105 - Smoke and Draft Control – Latest Edition

1.4 ABBREVIATIONS

.1 The following abbreviations are applicable to this section:

.1	AHC	Architectural Hardware Consultant
.2	ALD ALF	Aluminum Door and Frame
.3	ATMS/STMS	Arm/Strike to Template with Machine Screws
.4	BB or FBB	Ball Bearing Hinges
.5	BC	Back Check
.6	BTB	Back to Back
.7	B3E or B4E	Bevel 3 or 4 sides
.8	C to C, C/L	Centerline to Centerline

.9	CDC	Certified Door Consultant
.10	CMK	Construction Masterkeyed
.11	CSC	Construction Specifications Canada
.12	CSK	Countersunk Screw Holes.
.13	Cyl.	Cylinder of a lock
.14	Deg.	Degree of opening
.15	DEL	Delay Action
.16	DHI	Door and Hardware Institute
.17	DR	Door
.18	FC	Full Cover
.19	FS	Fail Safe
.20	FSE	Fail Secure
.21	FTMS	Full template machine screws
.22	½ TMS	Half template machine screws
.23	GMK	Grand Masterkeyed
.24	KA/KD	Keyed Alike, Keyed Different
.25	HMD/PSF	Hollow Metal Door, Pressed Steel Frame
.26	LH/RH	Left Hand, Right Hand
.27	LHR/RHR	Left Hand Reverse, Right Hand Reverse
.28	MK or MKD	Master Keyed
.29	NBC	National Building Code
.30	NRP	Non removable pin
.31	TB/SB	Thru Bolts, Sex Bolts
.32	TJ	Top Jamb
.33	ULC	Underwriters Laboratories Canada
.34	WD	Wood Door

1.5 SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and data sheets in accordance with Section 01 00 01.

.2 Samples:

.1 Upon Engineer-Architect request submit samples of door hardware. Identify each sample by label indicating applicable specification paragraph number, brand name and number, finish and hardware package number.

.2 After approval samples will be returned for incorporation in the Work.

.3 Hardware List:

.1 Submit detailed hardware list and keying schedule. Hardware Schedule is to be submitted as per DHI vertical format which is in the "Sequence and Format for Hardware Schedules".

.2 Indicate specified hardware including make, model, material, function, size, finish and other pertinent information.

.3 Furnish other Sections with templates required for hardware preparation and installation. Issue templates when requested so as not to cause any delays but not before hardware list has received final review by Engineer-Architect.

.4 Keying Schedule to be in accordance with DHI manual "Keying Systems Names and Nomenclature". Key schedule is not to hold up the processing of the hardware list.

.5 Wiring Diagrams will only be supplied after the final approval of the Hardware Schedule. Submit wiring diagrams as requested for proper installation of electrical, electrical-mechanical and electrical-magnetic products.

.4 Manufacturer's Instructions: Submit manufacturer's installation instructions.

.5 Closeout Submittals: Provide operation and maintenance data for door closers, locksets, door holders, electrified hardware and fire exit hardware for incorporation into Operations and Maintenance Manuals specified in Section 01 00 01.

.6 Provide guarantee.

.1	Closers	10 year
.2	Mortise Locks	10 year mechanical / 2 year electrical
.3	Electronic Closer	2 year
.4	Exit Device	3 years
.5	Hinges	Lifetime of Building
.6	All other Hardware	1 year

1.6 QUALITY ASSURANCE

.1 Regulatory Requirements: hardware for doors in fire separations and exit doors certified by a Canadian Certification Organization accredited by Standards Council of Canada.

.2 Meet requirements of National Building Code of Canada and other applicable regulations.

.3 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

.4 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.5 Pre-installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

.6 Upon completion of finish hardware installation, hardware supplier shall inspect work and shall certify in writing that all items and their installation are in accord with requirements of Contract Documents and are functioning properly.

1.7 PRODUCT DELIVERY, HANDLING & STORAGE

.1 Packing, Shipping, Handling and Unloading:

.1 Deliver, store, handle and protect materials in accordance with Section 01 00 01.

.2 Package each item of hardware including fastenings, separately or in like groups of hardware, with necessary screws, keys, instructions and installation templates.

.3 All items of hardware should be itemized and tagged as per the approved Finish Hardware Schedule.

.4 Hardware for Aluminum Doors to be shipped directly to the Aluminum Door supplier. Hardware for Aluminum Doors will be ordered immediately after approval of shop drawings. Delays in ordering the Aluminum Door hardware will not be accepted.

.5 Shortages will not delay installation.

.6 Items damaged in shipment will be replaced properly with proper material.

.7 All Hardware shall be handled in a manner to avoid damage, marking and scratching.

.8 Hardware is to be inventoried on site and confirmed by the Contractor and Hardware Supplier.

.2 Storage and Protection:

.1 Store hardware in locked, clean and dry area.

1.8 WASTE DISPOSAL AND MANAGEMENT

.1 Separate and recycle waste materials in accordance with Section 01 00 01.

.2 Collect and separate metal, plastic, paper packing and corrugated cardboard and deposit in appropriate on site recycling bins.

.3 Dispose of corrugated cardboard, plastic packaging material in appropriate on-site bin for recycling in accordance with site waste management program.

1.9 MAINTENANCE

.1 Provide maintenance materials in accordance with Section 01 00 01.

.2 Provide three sets of maintenance tools for closers, locks and exit devices as well as a complete set of installation instructions.

.3 After the building is occupied, arrange for an appointment with the owner to instruct them of proper use, service, adjusting and maintenance of the hardware furnished in this section.

.4 Extra Material if required.

1.10 INSPECTION

.1 The hardware supplier shall arrange at least four visits to the job site.

.1 Visit project at time of delivery of hardware and inspect the personnel who will be looking after the installation and issuing of hardware at the job site. Delivered hardware to be received, sorted and itemized at the jobsite with contractor.

.2 Second visit will be required for key meeting with the owner/representative at a location at their request.

.3 Third visit will take place when about sixty percent of hardware is installed.

.4 Check all hardware on site and correct any errors or shortages. Co-ordinate with contractor to determine proper time for visit.

.5 Fourth visit shall take place just prior to building turnover. All hardware shall be checked for proper installation and adjustment. Any errors shall be corrected and adjustments made. Check the key system and furnish a report along with maintenance manuals detailing any errors found.

.6 Cost of this service will be included as part of this Section and is not covered by any allowance amount.

PART 2 PRODUCTS

2.1 HARDWARE ITEMS

.1 Only locksets and latchsets listed are acceptable for use on this project.

.2 Use one manufacturer's products only for all similar items.

.3 Manufacturer's Listed:

- .1 Hinges
  - .1 McKinney – ASSA ABLOY Door Security Solutions Canada, 160 Four Valley Drive, Vaughan, Ontario, L4H 4T9.
- .2 Locks
  - .1 Sargent – ASSA ABLOY Door Security Solutions Canada, 160 Four Valley Drive, Vaughan, Ontario, L4H 4T9.
- .3 Exit Devices
  - .1 Sargent – ASSA ABLOY Door Security Solutions Canada, 160 Four Valley Drive, Vaughan, Ontario, L4H 4T9.
- .4 Closers
  - .1 Sargent – ASSA ABLOY Door Security Solutions Canada, 160 Four Valley Drive, Vaughan, Ontario, L4H 4T9.
- .5 Power Operators
  - .1 Besam - ASSA ABLOY Entrance Systems 4020B Sladeview Crescent. Units 3&4 Ontario, L5L 6B1
- .6 Flush Bolts
  - .1 Rockwood Manufacturing – ASSA ABLOY Door Security Solutions Canada, 160 Four Valley Drive, Vaughan, Ontario, L4H 4T9.
- .7 Flatware
  - .1 Rockwood Manufacturing – ASSA ABLOY Door Security Solutions Canada, 160 Four Valley Drive, Vaughan, Ontario, L4H 4T9.
- .8 Floor/Wall Stops
  - .1 Rockwood Manufacturing – ASSA ABLOY Door Security Solutions Canada, 160 Four Valley Drive, Vaughan, Ontario, L4H 4T9.
- .9 Weatherstrip/Thresholds
  - .1 Pemko – ASSA ABLOY Door Security Solutions Canada, 160 Four Valley Drive, Vaughan, Ontario, L4H 4T9.
- .10 Power Supplies
  - .1 Securitron – ASSA ABLOY Door Security Solutions Canada, 160 Four Valley Drive, Vaughan Ontario, L4H 4T9.
- .11 Electric Strikes
  - .1 HESS – ASSA ABLOY Door Security Solutions Canada, 160 Four Valley Drive, Vaughan Ontario, L4H 4T9.

2.2 DOOR HARDWARE

.1 All fasteners to come complete with the hardware as described. Hardware supplier must be Advised immediately if required fasteners are not enclosed with hardware.

.2 Hardware must be installed with fasteners supplied by the manufacturer.

.3 Hinges Butts and hinges: to ANSI/BMHA A156.1, as listed in Hardware Schedule.

.1 Non removable pins (NRP) for all exterior and out swinging secure doors.
.2 Exterior hinges and hinges in wet areas of stainless steel, brass or bronze.
.3 Interior hinges of plated steel, unless otherwise noted.
.4 Size and quantity to be as the manufacturers hinge selection guide.
.5 Unless otherwise scheduled, supply (1) hinge for every 762mm of door height.
.6 The width of hinges shall be sufficient to clear all trim.
.7 All hinges to be five-knuckle design and ball bearing.
.8 All electric hinges to be supplied with Electrolynx QC plug in connectors as specified.
.9 Finish to Dull Chrome 26D.
.10 Standard of Acceptance:

	Specified	Acceptable Alternates	
.1			
.2	McKinney	Hager	Stanley
.3	TA2714	BB1279	FBB179
.4	TA2314	BB1191	FBB191
.5	TA3786	BB1168	FBB168
.6	TA3386	BB11699	FBB199

.4 Bored locks and Preassembled Locks and Latches:

.1 Bored locks and latches: Locks shall exceed the requirements of ANSI/BHMA A156.2 -2003, series 4000 bored lock, grade 1, designed for function as stated in Hardware Schedule. Exceeds 1.5 times A156.2 Grade 1 requirements.
.2 Locks shall be non-handed with bi-directional lever operation, except the "G" and "Y" lever designs.
.3 Through-bolt mounting shall be adaptable to fit a variety of standard cylindrical lock preps.
.4 Locks shall comply with UL10C and UBC 7-2 positive pressure requirements.
.5 Locks required for fire doors shall be listed by Underwriters Laboratories for ratings of 3 hours (A label) and less, for doors up to 4'0" (1.2m) x 10'0" (3.0m) and pairs of doors 8'0" (2.4m) x 10'0" (3.0m). Lock levers shall be made of solid material.
.6 Lock shall be available in a minimum of six different lever designs.
.7 Locks shall have a 2-3/4 inch (70mm) backset standard.
.8 Strikes shall be non-handed with a curved lip. Provide wrought boxes with strikes.
.9 Locks shall have brass 6-pin cylinder standard.
.10 Provide two nickel silver keys with each lock.
.11 Finished to 26D.
.12 Standard of Acceptance:

	Specified	Acceptable Alternates
.1		
.2	Sargent	BEST
.3	10X Line	93K

.5 Exit Devices: to ANSI/BMHA A156.3, Grade 1.

.1 Modern touch pad type, fabricated of brass, bronze, stainless steel or aluminum.
.2 UL listed for Accident Hazard or Fire Exit Hardware as required.

.3 Hex key dogging standard on non fire-rated exit devices. Cylinder dogging where specified.

.4 Exit devices shall be UL listed panic exit hardware. All exit devices for fire rated openings shall be ULC labeled fire exit hardware.

.5 Include all electrified functions as specified.

.6 Device Length as per manufacturer's guidelines.

.7 The design of the exit device shall eliminate the necessity of removing the device from the door for standard maintenance or keying changes.

.8 Trim as specified shall be through-bolted.

.9 All vertical rod in pairs to be less bottom rod where noted.

.10 Extension rods are required as per manufacturer's requirements.

.11 Electronic exit devices to have Linx quick connectors (QC).

.12 Exit devices to suite doors over 45mm where required.

.13 Standard of acceptance:

	Specified	Acceptable Alternates	
.1	Sargent	Corbin	Yale
.2	8800 - Series	ED5200	7100
.3	8700 - Series	ED5400	7110
.4	8600 - Series	ED5800	7120
.5	8500 - Series	ED4200	7200
.6	8400 - Series	ED4800	7220

.6 Door controls (closers): to ANSI/BMHA A156.4 as listed in Hardware Schedule.

.1 Modern type, surface applied.

.2 All closers for both interior and exterior doors shall be the product of one manufacturer and be matched in style.

.3 Surface closers shall be adjustable to provide sizes 1 through 6 and comply with ADA.

.4 Full rack and pinion construction.

.5 Closing speed, latching speed and backcheck shall be controlled by key operated valves.

.6 Captivated valves.

.7 Delayed action feature shall be available and controlled by a separate valve.

.8 Delayed action shall be available in addition to, not in lieu of, backcheck.

.9 The one piece closer body shall be of die cast aluminum alloy with 14% silicon minimum content. An increase of 15% in closing power shall be provided by means of adjustment of the arm leverage at the foot connection. (Standard Arm).

.10 All arms shall be finely finished with heavy duty forged steel main arm.

.11 Two mounting positions of the closer shall meet all requirements. Standard mountings shall provide 120° door opening and alternate mounting 180° door opening.

.12 All closers shall be suitable for standard, top jamb, parallel arm and track type applications when provided with proper brackets and arms.

.13 Closer covers shall be of high impact plastic material of flame retardant grade.

.14 Secured by machine screws.

.15 Spring power shall be continuously adjustable over the full range of closer sizes and allow for reduced opening force for the physically handicapped. Hydraulic regulation shall be tamper proof, non-critical valves. Closers shall have separate adjustment for latch speed, general speed and backcheck.

.16 All closer to have a forged steel main arm and forged forearm for parallel arm closers.

.17 Finish to Aluminum 689.

.18 Standard of acceptance:

.1	Specified	Acceptable Alternates:	
.2	Sargent	Norton	Corbin
.3	1431	8500	DC6200
.4	351	7500	DC3000
.5	422	2800ST	DC5000

.7 Power assist and low energy power operated doors: to ANSI/BMHA A156.19.

.1 Automatic operators shall be complete with all components including Operator Housing, Power Operator, Electronic Control, Soft Start, Switching Networks and all Connecting Hardware.

.2 Size and type to be as indicated in Hardware Groups.

.3 Operator Housing shall be complete with finished end caps prepared for mounting to door frame.

.4 Operator shall be factory assembled with all necessary components for proper operation and switching. Relays, wiring harness and other components shall be plug-in type.

.5 Operator controls shall include adjustable time delay, safe-swing circuit as well as provision for accessories as detailed in Hardware Groups.

.6 All wiring shall be of the shielded type with proper number of conductor wires to install all components specified.

.7 Operator shall include sufficient power supplies to operate all hardware and accessory items as detailed in Hardware groups. In the event additional power supplies are required it shall be added at no increase in contract price.

.8 Complete unit shall be mounted with provisions for easy servicing or replacement without removing the door or frame.

.9 Confirm frame detail and if necessary provide a suitable mounting plate to install operator properly.

.10 Standard of acceptance:

.1	Specified	Acceptable Alternates		
.2	Besam	Gyro Tech	Stanley	Horton
.3	SW200i	GT-8500	Magic Force	4100LE
.4	SW100i	GT-8710	Magic Access	7100L

.8 Architectural door trim: to ANSI/BHMA A156.6, as listed in Hardware Schedule, finished to stainless steel 32D.

.1 Door protection plates: kickplates type, 1.3 mm thick stainless steel, 203mm high, unbevelled edges, width less 40mm push side, width less 25mm on pull side for single doors. Width less 25mm for pairs. Finished to stainless steel 630.

.1 Standard of acceptance:

.1	Specified	Acceptable Alternates		
.2	Rockwood	Gallery	Standard Metal	Ives
.3	K1050	GSH80A	K10A	8400

.2 Push plates: 1.3 mm thick stainless steel, size 89mm x 381mm, finished to stainless steel 630.

.1 Standard of acceptance:

.1	Specified	Acceptable Alternates	
.2	Rockwood	Gallery	Standard Metal Ives

.3	70RC	GSH84A	K14A	8200RC	

.3 Door Pulls: 19mm round pull, 228.6mm center to center pulls, with 76mm x 305mm protection plate, mount type 1, finished to stainless steel 630.

.1 Standard of acceptance:

.1	Specified	Acceptable Alternates		
.2	Rockwood	Gallery	Standard Metal	Ives
.3	111 x 73CL	GSH4610-2	K14 x 2409-1(RC)	8303

.4 Door Pulls: 32mm Round Offset Pull, mount type 1, 1220mm center to center, mounting to be with a security bolt (#4B) for single application and (#5) for back to back, finished to stainless steel 630.

.1 Standard of acceptance: Standard Metal D-352 x Mnt.

.1	Specified	Acceptable Alternates		
.2	Rockwood	Gallery	Standard Metal	Ives
.3	BF157	GSH1180/2	3018-2	8190-10

.9 Door controls - overhead stop: to ANSI/BMHA A156.8, heavy duty construction, BHMA Grade 1 Certified, heavy duty architectural bronze construction.

.1 UL Classified: The 590 and 690 stops are UL 10B and UL 10C classified as miscellaneous fire door accessories.

.2 Corrosion resistance: Brass construction provides corrosion resistance in a variety of conditions.

.3 Holder Selector: 590 and 690 series holders are equipped with a turn knob to activate and deactivate the hold open function

.4 Thru bolts capture channel and end caps.

.5 Heavy duty shock spring absorbs load and gradually stops door.

.6 Blade shim required for all Aluminum Doors.

.7 Sized as per manufacturer's guidelines. Take into account other hardware mounted on doors.

.8 Finishes

.1 Exterior to stainless steel, 26D.

.2 Interior to steel sprayed finish, EN.

.9 Standard of acceptance:

.1	Specified	Acceptable Alternates
.2	Rixson	Sargent
.3	#1 (Concealed)	690
.4	#9 (Surface)	590
.5	#2 (Concealed)	1530
.6	#10 (Surface)	1540

.10 Door Stops and Holders and Auxiliary hardware: to ANSI/BMHA A156.16 designated by letter L and numeral identifiers as listed in Hardware Schedule finished to 26D.

.1 Floor stops dome style classification. Low dome or High dome. Die cast brass. Stops to be sized according to door clearances, thresholds or undercuts as noted in the Door Schedule. Fasteners to suite floor conditions.

.1 Standard of acceptance:

.1	Specified	Acceptable Alternates	
.2	Rockwood	Standard Metal	Ives
.3	441	S101	FS13
.4	443	S103	FS17

.5	483	S110	FS441

.2 Wall stops classification, convex or concave, cast brass or bronze. Fasteners to suite wall conditions.

.1 Standard of acceptance:

.1	Specified	Acceptable Alternates	
.2	Rockwood	Standard Metal	Ives
.3	406	S121	WS406CV
.4	409	S123	WS406CC

.11 Thresholds and Weatherstripping Thresholds: to ANSI/BMHA A156.21.

.1 Saddle threshold 152.4 mm wide x full width of door opening, extruded aluminum mill finish, serrated surface, with thermal break of rigid PVC.

.2 Panic threshold 93.7 mm wide x full width of door opening, extruded aluminum mill finish, serrated surface, with lip and vinyl door seal insert.

.3 Standard of acceptance:

.1	Specified	Acceptable Alternates	
.2	PEMKO	KN Crowder	Hager
.3	179AP	CT-39P	552W
.4	252 x 3AFG	CT45A	421S
.5	251 x 226AFG	CT49A	515S

.12 Door Gasketing and Edge Seal Systems: to ANSI/BMHA A156.22.

.1 Head and Jamb seal:

.1 Extruded aluminum frame and neoprene insert, clear anodized finish.

.2 Surface overhead stops and exit device strikes to mount on top of weatherstrip to provide continuous seal.

.3 Adhesive backed black "Santoprene" to provide smoke, light and sound control. Fire labeled 1 1/2hrs.

.4 Standard of acceptance:

.1	Specified	Acceptable Alternates	
.2	PEMKO	KN Crowder	Hager
.3	319S	W-14S	878S
.4	290APK	W20N	881S
.5	2891AS	W20S	881S
.6	S88B	W22	726S
.7	288B	W21	726S

.2 Door bottom seal:

.1 Extruded Aluminum frame and nylon brush sweep, clear anodized finish.

.2 Heavy duty, door seal of extruded aluminum frame and solid closed cell neoprene weather seal, recessed in door bottom, closed ends, automatic retract mechanism when door is open, clear anodized finish.

.3 Standard of acceptance:

.1	Specified	Acceptable Alternates	
.2	PEMKO	KN Crowder	Hager
.3	3452CNB	W35-1	770SB
.4	18100CNB	W24S	801SB
.5	4301	CT-52	747S

.3 Astragal:

.1 Flat overlapping extruded aluminum by door height with pile insert.

.2 Meeting astragal extruded aluminum frame with brush insert by each door by door height, clear anodized finish.

.3 Standard of acceptance:

.1	Specified	Acceptable Alternates	
.2	PEMKO	KN Crowder	Hager
.3	357CS	W8S	835S
.4	18061CNB	W-25S	802SB
.5	3672A	W8P	835

.13 Access Control Software.

.1 Server Software

.1 The Server Software may be either installed on a standard pc running Microsoft Windows 7 Home or Higher (Windows 7 Starter Not Supported) or purchased via an embedded hardware server box.

.2 The software shall support Microsoft SQL Server 2008 or SQL Server 2008 Express or newer.

.3 Software may be purchased outright or paid for on a subscription basis.

.4 Software shall be 100% web based and can be accessed via any web enabled device including Cell Phones, Tablets, Laptops, P.C.'s etc. without the need for any additional plug in's, i.e. no active x controls etc.

.5 It shall be possible to select any function, within a given operators permission, independent of the currently displayed screen.

.6 Functions will be accessed via tool bar Icons, which will include Help prompts that will appear when the mouse pointer dwells on the selection button.

.2 Administration Software Features

.1 Unlimited Access Privilege Groups, Assign as many access rules to each user as required, there is no limit.

.2 Unlimited Administrators; Define as many administrators the your system requires, no limit.

.3 Role based administrator security; Initial version supports 2 roles (basic admin, sys admin(root)).

.4 Dual Edit Modes; Simple/Advanced Edit modes for records allowing quick access to edit complex settings for more advanced users or simple guided edit for general users.

.5 Real time notification and status (or close to) support that automatically uses the best available solution for your browser. Also forward compatible with future web sockets implementations once server support is widely available (eta 2013)

.6 Multiple Supported Card Formats; Seamless integration to systems already in place allowing multiple cards from other venders to work on the same readers, ie HID, AWID, HARTANN...., 26Bit,40bit,36bit....

.7 Unlimited Customizable user fields; Add as many user fields as required, ie parking number, employee number, phone number ...

.8 Automatic database backup; System automatically backs up entire system configuration and logs with no user intervention.

.9 Coordinated Universal Time; Automatic time correction according to the panel's Coordinated Universal Time zone and time offset tolerance(configurable)

.10 Daylight Saving Time; Automatic Daylight Saving Time (configurable).

.11 Security Level Lock Down; Support emergency code (Orange, Red…) by using the multiple user security level(configurable).

.12 Unlimited Remote Buildings supported from one single server installation.

.13 Unlimited Doors support.

.14 Unlimited Cardholders; Maximum number of users the system will support for entry control is limited by panel used only, this could be via proximity card, biometric reader, magstripe card, smart card etc.

.15 Unlimited Access Privilege Rules; Rules to define what door a user has access to and at what times he is allowed access.

.16 Unlimited Door Time Zones; These are used for programming when doors will unlock and at what time cards will be granted access via locked door.

.17 Graphical Time Zones.

- .1 The system must have separate time zones for user access as well as door schedules.
- .2 The system time zones shall be drag and drop graphics allowing for easy viewing, as well as eliminating the chance of programming error.
- .3 User time zones will support not allowed and allowed schedules
- .4 Door time zones shall support the following modes
- .5 Lockdown (no cards other than cards flagged as master will be granted access)
- .6 Card Only (valid cards required to grant access)
- .7 Pin Only (valid pins required to grant access)
- .8 Card Or Pin (valid card or pin required for access)
- .9 Unlock (door is in public mode)
- .10 First Credential in (door will not follow its public schedule until a card flagged with first card in feature is presented at the door during the public schedule)
- .11 Dual Credential (2 valid cards one flagged as supervisor required to grant access)

.18 Unlimited Special Event Time Zones (single zone) ; Program doors to follow unique schedules on special dates, ie an event where you would like certain doors to stay public from 5pm to 8pm.

.19 Transparent Multi Site Control; Remote buildings seamlessly via one Server. Add cards to multiple buildings and doors instantly by assigning them to predefined access privilege groups.

.20 Unlimited System Users; Program as many users with unique logons for system administration or control.

.21 Manual Override Override - Panels, Doors, Auxiliary relays, Inputs/Outputs, Elevators.

.22 Block loading/CSV importing cards Load groups of cards with a single press of a button.

.23 Assa Abloy Aperio Integration System integrates seamlessly with all Aperio hardware including wireless cabinet locks utilizing Aperio RS485 Hub with a one to many connection.

.24 Alarm Integration; Program select users to enable/disable alarm panels via triple swipe actions at door readers.

.25 Auto firmware update utility; Server will automatically flash any number and mix of panels (ODM, ODM-WIFI, TDM) seamlessly without any user interaction. Firmware flashed in less than one minute

.26 Automatic door opener integration; Have selected cards activate both locks and door openers, excellent feature for Handicap persons

.27 User profile pictures on event notifications; Any events generated by user can be accompanied by their picture

.28 Triple Swipe Special Function; Allow certain users to perform various actions by triple swiping at keypad and entering code (up to 5 different actions can be programed).

.29 Integrated backup restore utility; Intuitive utility allowing for full backups of entire system

.30 Dual credential access; Program high security doors to require supervisor as well as another valid card before allowing access, great for any door or cabinet that protects assets.

.31 One time run time zones; Rather than overriding a door and forgetting to set back to normal just set a one time run time zone to for example unlock a door at a certain time, great for board meetings etc.

.32 Event Emailing Fully configurable email engine keeps administrators in the loop no matter where they are.

.33 Totally configurable live event screen Select what events you are interested in monitoring real time as well as which event you want emailed

.34 Generic Alarm Panel Interface Option; The system shall have the ability to program special cardholders to arm/disarm an alarm panel via swiping their card 3 consecutive time at specified readers. If the alarm system is armed only those cards having the alarm interface feature will be allowed access through secured doors. Doors can be excluded from this feature if needed. The system shall monitor a status output from the alarm panel and show visual status that alarm panel is armed at readers. As well as beep readers during arming and disarming of alarm panel to notify users of state change.

.3 Hardware Requirements

.1 Controllers.

.1 The system shall support multiple controllers including, single door with or without built in REX, 2 door controller, wireless single door controller with or without built in REX, Aperio RS485 integration controllers.

.2 Communication to all controllers must utilize the existing LAN or WAN

.3 Communication speed to controllers shall be at least 100 Mbps

.2 Distributed Intelligence. The System selected will utilize distributed intelligent controllers capable of maintaining their normal operation even when off-line from the System's host computer. These controllers being of modular design to easily facilitate future expansion subsequent to the initial installation of the System. Optional hardware being included for units required to supervise monitoring alarm inputs or perform output switching functions. When operated off-line the ability to perform all normal access decisions, including if a cardholder is valid at that door and at that time, along with PIN checking is a requirement. All transactions will be time and date stamped (including seconds) by the controller at the time they occur with this information being the reference used by the System's central History log. Controller clocks will be periodically synchronized System wide

.3 Door Controller Specification

.1 Unlimited Number of Door Time Zones; Unlimited number of Door Time Zone schedules the system will support. These are used for programming when doors will lock/unlock or grant credential access based on mode (Card Only, PIN Only, Card and PIN, Card or PIN, First Card In, Dual Credential, Lockdown).

.2 User Time Zones; Up to 256 User Time Zone schedules the system will support. These are used for programming when and at what time cards will be granted access via locked door.

.3 Holiday User Groups; A card user can follow one of the 50 Holiday Group setting.

.4 Holidays Per Group; Each group supports up to 50 holidays.

.5 Zones per Door Time Zone; 20 door time zones per day.

.6 Zones per User Time Zone (holidays) ; 4 user time zones per day.

.7 Zones per Door Time Zone (holiday) ; 2 door holiday time zones per day.

.8 Zones per User Time Zone (holiday) ; 2 user holiday time zones per day.

.9 Special Event Time Zones (single zone) ; Up to 32 One-Time-Run Time Zones available to program doors to follow unique schedules on special dates (ie: an event that you would like certain doors to stay public from 5pm to 8pm instead of being locked).

.10 Panel Buffer Event Storage; In an event of network failure, the panel will store the least 50,000 events in buffer for later retrieval once network connection to server is re-established.

.11 Multiple Reader Technologies; Supports proximity, biometrics, Wiegand, mag stripes and barcode reader technology.

.12 First Person In; Program to follow their public schedule only after a valid card has been presented (ie: in the case of a snow day the doors do not go public before someone is in the building).

.13 Triple-Swipe Mode; Activate multiple actions by triple swipes from a keypad-reader (configurable).

.14 16-Bit Site Code; Supports 1 ~ 65535

.15 32-Bit Card Number; Supports 0 ~ 4294967295

.16 Hold Name String; Stores up to 30 characters of each users name on-board.

.17 PIN Number; Supports 3 ~ 7 digits

.18 Start Date, Expire Date; Ability to define a credential active date range. Ideal for temporary and contract employees.

.19 Configurable Software Filter for Back-to-Back Reader Interference; Allowed tuning for readers that are close to one another.

.20 Remote Firmware Upgradable; Managed automatically by the software - no user intervention required.

.21 Multi-run Modes for Simplified Trouble-Shooting; Normal, Debug, Diagnose

.22 On-Board UI; Easy check and/or change most parameter values on the panel through on-board push button keys, LEDs, and audible beep.

.23 Password Protection; Changing parameter values are protected by a password.

.24 Output Port (fully configurable) ; Door Strike, Door Opener, External Buzzer, Alarm Interface, Aux Output

.25 Input Port (fully configurable) ; Request to Exit, Door Contact, Handicap Open, Motion, Aux Input, Emewrgency Alarm.

.26 PIN Blocking; Five consecutive incorrect PIN entry blocks PIN input for 30 sec with buzzer sound warning.

.4 Door Controller Physical Specifications

.1 32-Bit Microprocessor-Based

.2 Power over EthernetIEEE 802.3af PoE standard provides up to 15.4 Watts.

.3 DC 12V power output for motion or other devices

.4 Output Port (fully configurable) Lock relay - supply power (12V, 500mA) to the lock, over current protection, SSR Relay2, SSR Relay3 - 60V (TVS circuit limits 24V), 500mA, fully configurable, no mechanical ports.

.5 Input Ports Fully configurable including supervised or digital input setting, includes door contact, exit button, external request to exit motion etc.

.6 Tamper Sensor Photo tamper sensor (configurable)

.7 Readers Ports 2 ports, hardware data monitoring LEDs, configurable reader port mapping (Example: Reader-Port1 maps to Door1-Outside.)

.8 Network 10/100Mbps supporting Static or DHCP

.9 Displays 2 Line x 16 Ch LCD Display (contrast adjustable) with LED back light (brightness adjustable) 4 user LED's, 2 power LED's, 3 relay output indication LED's, 2 Ethernet status LED's

.10 Keyboard Four user push buttons for data entry or output selection.

.11 Time Keeps up to 1 month without power connection. No battery needed.

.12 Supports hardware-level emergency alarm interface.

.13 Sounder On-board piezo buzzer (90dB at 10cm), Optional loud buzzer (100dB at 100 cm)

.14 Multi-purpose Expansion Port Supports WiFi, serial, extra memory, I\Os .. (for future expansions)

.5 System must have the capability to fully integrate to the ASSA Abloy Aperio Wireless lock system. This integration must have the ability to interface with 8 Aperio wireless locks at a time through one interface device.

.6 Standard of acceptance:

.7 Specified Acceptable Alternates

.8 Millennium None

.14 Electric Strikes.

.1 Standard Electric Strikes: Heavy duty, cylindrical and mortise lock electric strikes conforming to ANSI/BHMA A156.31, Grade 1, UL listed for both Burglary Resistance and for use on fire rated door assemblies. Stainless steel construction with dual interlocking plunger design tested to exceed 3000 lbs. of static strength and 350 ft-lbs. of dynamic strength. Strikes tested for a minimum 1 million operating cycles. Provide strikes with 12 or 24 VDC capability and supplied standard as fail-secure unless otherwise specified. Option available for latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike.

.1 Standard of acceptance:

.1 Specified Acceptable Alternates

.2 HES RCI

.3	5200	S6514
.4	1006/1500/1600	F2164
.5	9500	F0162
.6	9600	0162

.15 Power Supplies:

.1 Dual output, field selectable 12 or 24 VDC via clearly marked toggle switch.

.2 Supplies 1 full AMP continuous current output, even while charging back-up batteries.

.3 SPDT AC monitoring output allows for remote monitoring of the power supply's 110V AC input.

.4 Separate voltage inputs for load and battery allow the batteries to charge at a higher output while the load remains at exactly 12 or 24 VDC.

.5 LED indication (AC & DC) showing power supply status UL listed low current fire alarm disconnect requires only a minimum size fire alarm relay and wire gauge Polyswitch type breakers allow for large short duration inrush current if batteries are installed (approx. 20A for 1 second) Line voltage and DC fuses Sealed lead acid-gel battery charging capability (battery not included).

.6 UL Class 2, linear regulated power supply provides the cleanest power available sensitive, active safety and security devices.

.7 UL Listed.

.8 CFAR Relay - Securitron's Fire Alarm reset module interconnects with a Securitron BPS series power supply and a fire alarm (made by others). The purpose is to provide additional safety and control in an installation where activation of the fire alarm is intended to switch off the BPS power supply.

.9 This is often done to release power to magnetic locks which are installed on perimeter doors so as to permit safe evacuation in the event of a fire. The module has three specific functions:

.1 It will maintain the released condition of devices released by activation of the fire alarm even after the fire alarm resets and until the module itself is reset by key.

.2 It allows key controlled release of the same devices (separate from the fire alarm control).

.3 It signals the released or "normal" condition of the devices via a bicolor LED.

.10 Standard of acceptance:

.1	Specified	Acceptable Alternates
.2	Securitron	Sargent
.3	BPS	3500

.16 Power Transfer Devices:

.1 Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

.2 Standard of acceptance:

.1	Specified	Acceptable Alternates
.2	Securitron	Pemko
.3	EL-CEPT	EL-CEPT

.17 Electric Door Wire Harnesses:

.1 Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

.2 Standard of acceptance:

.1	Specified	Acceptable Alternates
.2	McKinney	Stanley
.3	QC-C Series	WH Series

.18 Key Switches:

.1 Key switches furnished standard with stainless steel single gang face plate.

.2 Standard with 12 or 24 VDC bi-color LED

.3 Backing bracket permits integration with any 32mm or 28mm mortise cylinder (Not Included)

.4 Additional switch position on backing bracket allows another switch to be activated by turning the key in the opposite direction 5 Amp rated plunger switch UL Listed.

.5 Key switches available as momentary or maintained action and in narrow face plate options.

.6 Standard of acceptance:

.1	Specified	Acceptable Alternates	
.2	Securitron	Schlage Electronics	Security Door Controls
.3	MK Series	800 Series	

.19 Door Status Switch:

.1 Monitors door position remotely.

.2 SPDT concealed switch (3 wire).

.3 Contacts rated .25 Amp @24 VDC, requires 25mm diameter hole.

.4 Standard of acceptance:

.1	Specified	Acceptable Alternates
.2	Securitron	Sargent
.3	DPS W/M	3287

2.3 FASTENINGS

.1 Use only fasteners provided by manufacturer. Failure to comply may void warranties and applicable licensed labels.

.2 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.

.3 Exposed fastening devices to match finish of hardware.

.4 Where pull is scheduled on one side of door and push plate on other side, supply fastening devices, and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.

.5 Use fasteners compatible with material through which they pass.

2.4 FINISHES

	Description	Material	BMHA
.2	Exterior Hinges	Stainless Steel Metal, Satin	630
.3	Interior Hinges	Satin Chromium Plated	626
.4	Locks	Stainless Steel Metal, Satin	630
.5	Exit Devices	Satin Chromium Plated	626
.6	Closers	Aluminum Powder Coated	689
.7	Flatware	Stainless Steel Metal, Satin	630
.8	All other items	Satin Chromium Plated	626

2.5 KEYING

.1 All locks to be master keyed to the Existing BEST factory registered master key system. All locks to be master keyed as per the owners instructions.

.2 All cylinders to be interchangeable cores.

.3 All cylinders to be construction master keyed.

.4 All locks and cylinders to be visually keyed.

.5 Consult with the Architect/Engineer and the owner and secure written approval of the complete keying layout prior to placing lock order with the factory.

.6 Grand masterkeys and masterkeys shall be sent directly to the owner by registered mail, return receipt if requested.

.7 Supply:

1.	Masterkeys	5 per group
2.	Construction Masterkeys	5
3.	Control Keys – Construction Cores	3
4.	Control Keys – Permanent Cores	3
5.	Change Keys/Lock	4

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

.2 Furnish metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.

.3 Furnish manufacturers' instructions for proper installation of each hardware component.

.4 Wiring Diagrams: Provide any special information, voltage requirements and wiring diagrams to other trades requiring such information.

3.2 INSTALLATION

.1 Install door hardware in accordance with manufacturer's instructions, using special tools and jigs. Fit accurately and apply securely. Ensure that hardware is installed correctly. Issue instructions if required to Sections concerned.

.2 Install hardware to standard hardware location dimensions in accordance with Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door Manufacturers' Association.

.3 Installation is to be done by a qualified tradesman, if technical assistance is required contact the hardware supplier.

.4 Where door stop contacts door pulls, mount stop to strike bottom of pull.

.5 Install key control cabinet.

.6 Use only manufacturer's supplied fasteners. Failure to comply may void manufacturer's warranties and applicable licensed labels. Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.

.7 Remove construction cores and locks when directed by Contractor; install permanent cores and check operation of locks.

.8 Hardware should not be installed until all finishing is complete.

.9 All hardware to be installed level plumb and true.

.10 All operating parts to work freely and smoothly.

.11 Exterior thresholds to be set in exterior sealants.

.12 Install Power Operators as per manufacturer's instructions and by a qualified installer.

.13 Access control to be installed by a certified installer.

.14 High voltage wiring by Division 28. Low voltage wiring by access control supplier.

3.3 ADJUSTING

.1 Adjust door hardware, operators, closures and controls for optimum, smooth operating condition, safety and for weather tight closure.

.2 Lubricate hardware, operating equipment and other moving parts.

.3 Adjust door hardware to provide tight fit at contact points with frames.

.4 All defective or damaged hardware will have to be repaired or replaced at the contractors expense.

3.4 CLEANING

.1 Perform cleaning after installation to remove construction and accumulated environmental dirt.

.2 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacture's instructions.

.3 Remove protective material from hardware items where present.

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

3.5 DEMONSTRATION

.1 Keying System Setup and Cabinet:

- .1 Set up key control system with file key tags, duplicate key tags, numerical index, alphabetical index and key change index, label shields, control book and key receipt cards.
- .2 Place file keys and duplicate keys in key cabinet on their respective hooks.
- .3 Lock key cabinet and turn over key to Owner's Representative.

.2 Maintenance Staff Briefing:

- .1 Brief maintenance staff regarding:
- .2 Proper care, cleaning, and general maintenance of projects complete hardware.
- .3 Description, use, handling, and storage of keys.
- .4 Use, application and storage of wrenches for door closers, locksets and fire exit hardware.
- .5 Demonstrate operation, operating components, adjustment features, and lubrication requirements.

3.6 FIELD QUALITY CONTROL

.1 An inspection report will be required 6 months after substantial completion by a qualified Architectural Hardware Consultant to note any deficiencies. The inspection should include checking each lock against the key schedule to make sure the correct locks and cylinders are on the proper doors.

3.7 PROTECTION

.1 Protection must be given to all products and finishes until such time as the owner accepts the project.

3.8 CERTIFICATION

.1 After installation, Hardware Supplier is to have a regular member of the Architectural Hardware Consultants'' (AHC) Association inspect and certify in writing that all items and their installations are in accordance with specified requirements.

3.9 DOOR HARDWARE SETS

.1 The door hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

.2 The supplier is responsible for handing and sizing all products as listed in the door hardware sets. Quantities listed are for each pair of doors, or for each single door.

.3 Products listed in the Door Hardware Sets must meet the requirements described in the specification sections noted.

3.10 HARDWARE SCHEDULE

Set: 1.0

Single 5109A, 1067 x 2134 x 45, Hollow Metal x Hollow Metal, 45 min

3	Hinge, Full Mortise, Hvy Wt	TA786 127mm x 114mm NRP	US26D	MK
1	Electric Power Transfer	EL-CEPT	630	SU
1	Rim Exit Device, Storeroom	12 55 56 72 8804 ETL	US32D	SA
1	Permanent Core	1C7 x Keyway (Installed by Owner)	Std	BE
1	Power Operator	SW200i	689	NB
1	Backing Plate	Backing Plate x Full Header	Std	NB
1	Mounting Plate	Mounting Plate x Full Header	Std	NB
1	Door Sensor	Superscan 11 (Pull Side)	Std	BM
1	Door Sensor	Superscan 11 (Push Side)	Std	BM
1	Switching Network	CX-33	Std	BM
1	Lockout Relay	LO-21	Std	BM
2	Wall Actuator - Round 114mm	CM-40/2	32D	OT
2	Stainless Steel Escutcheon	CM-59S	32D	OT
1	Wall Stop	406 (Convex HD)	US32D	RO
1	Gasketing	S44BL x 3 Sides		PE

1	Gasketing	S773BL x 3 Sides		PE
1	Gasketing	ACP112BL/2		PE
1	Concealed Door Bottom (Wood Doors)	STC411APK x Door Width		PE
1	Door Raceway ElectroLynx Harness	QC-C200(P) Use Pins Where Required		MK
1	Frame Wiring ElectroLynx Harness	QC-C2500(P) Use Pins Where Required		MK
1	Position Switch	DPS-M-BK		SU
1	Power Supply	AQD1-4F1		SU
1	Battery	B-24-5		SU
1	Alarm	PZ1		SU
1	Card Proximity Reader	HID Thinline ii 5395 (Switch Plate Reader)	Std	00
1	Door Controller	Millenium 149-100958 12/24VDC	Std	00
1	DCD Back Box	Millenium 041-100992LC	Std	00
1	By Door Hardware	Request to Exit in Electrified Lock/Exit	Std	SA
1	Wiring Diagrams	Wirung Diagrams (Elevations & Point to Point)	Std	SA

Notes:
DOORS TO BE UNDERCUT 12MM ABOVE FINISH FLOOR FOR AUTO DOOR BOTTOMS TO SEAL CORRECTLY.

REQUIRES 120VAC POWER TO POWER OPERATOR LOCATION BY THE ELECTRICAL CONTRACTOR.
REQUIRES 120VAC POWER TO POWER SUPPLY LOCATION BY THE ELECTRICAL CONTRACTOR.
REQUIRES LOW VOLTAGE FROM POWER OPERATOR TO ELECTRIC LATCH RETRACTION LOCATION.
REQUIRES LOW VOLTAGE FROM POWER OPERATOR TO KEY SWITCH LOCATION.
REQUIRES LOW VOLTAGE FROM POWER OPERATOR TO ACTUATOR BUTTON LOCATION.
REQUIRES COMMUNICATION WIRE FROM THE READER TO THE JUNCTION BOX LOCATION.
REQUIRES CONDUIT TO BE SUPPLIED AND INSTALLED BY THE ELECTRICAL CONTRACTOR.
REQUIRES WIRE AND WIRE PULL BY THE ELECTRICAL CONTRACTOR.
REQUIRES WIRE CHASE IN THE DOOR.

MODE OF OPERATION:
NORMAL HOURS OF OPERATION:
THE ELECTRIC LATCH RETRACTION AND POWER OPERATOR ARE TO BE CONTROLLED BY THE CARD ACCESS SYSTEM. AT SCHEDULED TIMES THE ELECTRIC LATCH RETRACTION IS TO BE ACTIVATED AND THE EXTERIOR ACTUATOR BUTTON IS ENABLED. THE DOOR CAN BE MANUALLY PULLED OPEN OR AUTOMATICALLY BY BY DEPRESSING THE EXTERIOR ACTUATOR BUTTON.
AFTER NORMAL HOURS OF OPERATION:
DOORS ARE TO BE SECURED BY THE ACCESS CONTROL SYSTEM. ACCESS BY AUTHORIZED CARD OR KEY. ENTRY BY AUTHORIZED CARD WILL ACTIVATE THE ELECTRIC LATCH RETRACTION ENABLING THE EXTERIOR ACTUATOR BUTTON. THE DOOR CAN BE MANUALLY PULLED OPEN OR AUTOMATICALLY BY BY DEPRESSING THE EXTERIOR ACTUATOR BUTTON.
ACTIVATING THE INTERIOR ACTUATOR BUTTON WILL SIMULTANEOUSLY ACTIVATE THE POWER OPERATOR AND ELECTRIC LATCH RETRACTION. ENTRY BY KEY ONLY.
FREE EXIT AT ALL TIMES.
LOCATION OF ACTUATOR BUTTONS TO BE DETERMINED.

Set: 2.0

Single 5109AA, 1067 x 2438 x 45, Hollow Metal x Hollow Metal, 45 min

4	Hinge, Full Mortise, Hvy Wt	TA786 127mm x 114mm NRP	US26D	MK
1	Electric Power Transfer	EL-CEPT	630	SU
1	Rim Exit Device, Storeroom	12 55 56 72 8804 ETL	US32D	SA
1	Permanent Core	1C7 x Keyway (Installed by Owner)	Std	BE

1	Power Operator	SW200i	689	NB
1	Backing Plate	Backing Plate x Full Header	Std	NB
1	Mounting Plate	Mounting Plate x Full Header	Std	NB
1	Door Sensor	Superscan 11 (Pull Side)	Std	BM
1	Door Sensor	Superscan 11 (Push Side)	Std	BM
1	Switching Network	CX-33	Std	BM
1	Lockout Relay	LO-21	Std	BM
2	Wall Actuator - Round 114mm	CM-40/2	32D	OT
2	Stainless Steel Escutcheon	CM-59S	32D	OT
1	Wall Stop	406 (Convex HD)	US32D	RO
1	Gasketing	S773BL x 3 Sides		PE
1	Gasketing	S44BL x 3 Sides		PE
1	Gasketing	ACP112BL/2		PE
1	Concealed Door Bottom (Wood Doors)	STC411APK x Door Width		PE
1	Door Raceway ElectroLynx Harness	QC-C200(P) Use Pins Where Required		MK
1	Frame Wiring ElectroLynx Harness	QC-C2500(P) Use Pins Where Required		MK
1	Position Switch	DPS-M-BK		SU
1	Power Supply	AQD1-4F1		SU
1	Battery	B-24-5		SU
1	Alarm	PZ1		SU
1	Card Proximity Reader	HID Thinline ii 5395 (Switch Plate Reader)	Std	00
1	Door Controller	Millenium 149-100958 12/24VDC	Std	00
1	DCD Back Box	Millenium 041-100992LC	Std	00
1	By Door Hardware	Request to Exit in Electrified Lock/Exit	Std	SA
1	Wiring Diagrams	Wirung Diagrams (Elevations & Point to Point)	Std	SA

Notes:
DOORS TO BE UNDERCUT 12MM ABOVE FINISH FLOOR FOR AUTO DOOR BOTTOMS TO SEAL CORRECTLY.

REQUIRES 120VAC POWER TO POWER OPERATOR LOCATION BY THE ELECTRICAL CONTRACTOR.
REQUIRES 120VAC POWER TO POWER SUPPLY LOCATION BY THE ELECTRICAL CONTRACTOR.
REQUIRES LOW VOLTAGE FROM POWER OPERATOR TO ELECTRIC LATCH RETRACTION LOCATION.
REQUIRES LOW VOLTAGE FROM POWER OPERATOR TO KEY SWITCH LOCATION.
REQUIRES LOW VOLTAGE FROM POWER OPERATOR TO ACTUATOR BUTTON LOCATION.
REQUIRES COMMUNICATION WIRE FROM THE READER TO THE JUNCTION BOX LOCATION.
REQUIRES CONDUIT TO BE SUPPLIED AND INSTALLED BY THE ELECTRICAL CONTRACTOR.
REQUIRES WIRE AND WIRE PULL BY THE ELECTRICAL CONTRACTOR.
REQUIRES WIRE CHASE IN THE DOOR.

MODE OF OPERATION:
NORMAL HOURS OF OPERATION:
THE ELECTRIC LATCH RETRACTION AND POWER OPERATOR ARE TO BE CONTROLLED BY THE CARD ACCESS SYSTEM. AT SCHEDULED TIMES THE ELECTRIC LATCH RETRACTION IS TO BE ACTIVATED AND THE EXTERIOR ACTUATOR BUTTON IS ENABLED. THE DOOR CAN BE MANUALLY PULLED OPEN OR AUTOMATICALLY BY BY DEPRESSING THE EXTERIOR ACTUATOR BUTTON.
AFTER NORMAL HOURS OF OPERATION:
DOORS ARE TO BE SECURED BY THE ACCESS CONTROL SYSTEM. ACCESS BY AUTHORIZED CARD OR KEY. ENTRY BY AUTHORIZED CARD WILL ACTIVATE THE ELECTRIC LATCH RETRACTION ENABLING THE EXTERIOR ACTUATOR BUTTON. THE DOOR CAN BE MANUALLY PULLED OPEN OR AUTOMATICALLY BY BY DEPRESSING THE EXTERIOR ACTUATOR BUTTON.
ACTIVATING THE INTERIOR ACTUATOR BUTTON WILL SIMULTANEOUSLY ACTIVATE THE POWER

OPERATOR AND ELECTRIC LATCH RETRACTION. ENTRY BY KEY ONLY.
FREE EXIT AT ALL TIMES.
LOCATION OF ACTUATOR BUTTONS TO BE DETERMINED.

Set: 3.0

Single 5109D, 914 x 2134 x 45, Wood x Hollow Metal,

3	Hinge, Full Mortise	TA714 114mm x 102mm	US26D	MK
1	Entry/Office Lock	72 10XG05 LL	US26D	SA
1	Permanent Core	1C7 x Keyway (Installed by Owner)	Std	BE
1	Kick Plate	K1050 203mm x 25mm LDW	US32D	RO
1	Wall Stop	409 (HD Concave)	US32D	RO
1	Gasketing	S773BL x 3 Sides		PE
1	Gasketing	S44BL x 3 Sides		PE
1	Gasketing	ACP112BL/2		PE
1	Concealed Door Bottom (Wood Doors)	STC411APK x Door Width		PE

Notes:
DOORS TO BE UNDERCUT 12MM ABOVE FINISH FLOOR FOR AUTO DOOR BOTTOMS TO SEAL CORRECTLY.

Set: 4.0

Single 5109B, 1067 x 2134 x 45, Wood x Hollow Metal,

3	Hinge, Full Mortise, Hvy Wt	TA786 127mm x 114mm	US26D	MK
1	Entry/Office Lock	72 10XG05 LL	US26D	SA
1	Permanent Core	1C7 x Keyway (Installed by Owner)	Std	BE
1	Kick Plate	K1050 203mm x 25mm LDW	US32D	RO
1	Wall Stop	409 (HD Concave)	US32D	RO
1	Gasketing	S773BL x 3 Sides		PE
1	Gasketing	S44BL x 3 Sides		PE
1	Gasketing	ACP112BL/2		PE
1	Concealed Door Bottom (Wood Doors)	STC411APK x Door Width		PE

Notes:
DOORS TO BE UNDERCUT 12MM ABOVE FINISH FLOOR FOR AUTO DOOR BOTTOMS TO SEAL CORRECTLY.

Set: 5.0

Single 5109C, 1067 x 2134 x 45, Wood x Hollow Metal,

3	Hinge, Full Mortise, Hvy Wt	TA786 127mm x 114mm	US26D	MK
1	Classroom Lock	72 10XG37 LL	US26D	SA
1	Permanent Core	1C7 x Keyway (Installed by Owner)	Std	BE
1	Kick Plate	K1050 203mm x 25mm LDW	US32D	RO

1	Wall Stop	406 (Convex HD)	US32D	RO
1	Gasketing	S773BL x 3 Sides		PE
1	Gasketing	S44BL x 3 Sides		PE
1	Gasketing	ACP112BL/2		PE
1	Concealed Door Bottom (Wood Doors)	STC411APK x Door Width		PE

Notes:
DOORS TO BE UNDERCUT 12MM ABOVE FINISH FLOOR FOR AUTO DOOR BOTTOMS TO SEAL CORRECTLY.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures

.2 Section 01 45 00 - Quality Control

.3 01 74 21 - Construction/Demolition Waste Management and Disposal

.4 Section 01 78 00 - Closeout Submittals

.5 Section 07 92 00 – Joint Sealants

.6 Section 08 11 13 - Hollow Metal Doors and Frames

1.2 REFERENCE STANDARDS

.1 American National Standards Institute (ANSI):

.1 ANSI Z97.1-2015, Safety Glazing Materials Used in Buildings – Safety Performance Specifications and Methods of Test

.2 ASTM International (ASTM):

.1 ASTM C542-05, Standard Specification for Lock-Strip Gaskets

.2 ASTM C1503-18, Standard Specification for Silvered Flat Glass Mirror

.3 ASTM D790-17, Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

.4 ASTM D1003-13, Standard Test Method for Haze and Luminous Transmittance of Plastics

.5 ASTM D1929-20, Standard Test Method for Determining Ignition Temperature of Plastics

.6 ASTM D2240-15e1, Standard Test Method for Rubber Property-Durometer Hardness

.7 ASTM E84-20, Standard Test Method for Surface Burning Characteristics of Building Materials

.8 ASTM E330-02, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference

.9 ASTM F1233-08, Standard Test Method for Security Glazing Materials and Systems

.3 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-12.1-2017, Safety Glazing

.2 CAN/CGSB-12.2-M 91, Flat, Clear Sheet Glass

.3 CAN/CGSB-12.3-M 91, Flat, Clear Float Glass

.4 CAN/CGSB-12.4-M 91, Heat Absorbing Glass

.5 CAN/CGSB-12.6-M 91, Transparent (One-Way) Mirrors

.6 CAN/CGSB-12.8-2017, Insulating Glass Units

.7 CAN/CGSB-12.9-M 91, Spandrel Glass

.8 CAN/CGSB-12.10-M 76, Glass, Light and Heat Reflecting

.9 CAN/CGSB-12.12-M 90, Plastic Safety Glazing Sheets

.10 CAN/CGSB-12.13-M 91, Patterned Glass

.4 CSA Group (CSA):

.1 CSA A460-19, Bird-Friendly Building Design

.5 National Glass Association with GANA (NGA):

.1 GANA Glazing Manual-2008

.2 Laminated Glazing Reference Manual-2019

.6 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards:

.1 SCAQMD Rule 1168-2017, Adhesives and Sealants Applications

.7 UL Canada (UL):

.1 UL 752-2015, Standard for Bullet-Resisting Equipment

.2 UL 2761-2011, Sealants and Caulking Compounds

.8 ULC Stamdards (ULC):

.1 CAN/ULC S102-10, Test for Surface Burning Characteristics of Building Materials and Assemblies

.2 CAN/ULC S104-10, Standard Method of Fire Tests for Door Assemblies

.3 CAN/ULC S106-15, Standard Method of Fire Tests of Windows and Glass Block Assemblies

.9 United States Consumer Product Safety Commission (CPSC):

.1 CPSC 16 CFR 1201 – Safety Standard for Architectural Glazing Materials

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Pre-Installation Meetings: Convene meeting 1 week before beginning work of this Section and, with Contractor, Subcontractor and Departmental Representative in accordance with Section 01 31 19 – Project Meetings to:

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Coordination with other Subcontractors.

.4 Review manufacturer's written installation instructions and warranty requirements.

.2 Sequencing: Comply with manufacturer's recommendations for sequencing construction operations.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, product literature and data sheets for glass, sealants, and glazing accessories and include product characteristics, performance criteria, physical size, finish, and limitations.

.2 Submit WHMIS SDS.

.3 Shop Drawings: Submit drawings stamped and signed by professional engineer registered or licensed in the Province of NL, Canada.

.4 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.5 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 – Closeout Submittals.

.2 Operation and Maintenance Data: Submit maintenance data for glazing and incorporate into manual.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store, and handle materials in accordance with Section 01 61 00 – Common Product Requirements.

.2 Storage and Handling Requirements:

.1 Store materials off ground in a clean dry location and in accordance with manufacturer's recommendations.

.2 Store and protect glazing from nicks, scratches, and edge damage.

.3 Protect prefinished aluminum surfaces with wrapping.

.4 Replace defective or damaged materials with new.

1.7 AMBIENT CONDITIONS

.1 Ambient Requirements:

.1 Install glazing when ambient temperature is 10 °C minimum. Maintain ventilated environment for 24 hours after application.

.2 Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

.3 Refer to manufacturer's instructions for minimum ambient temperature for application of bird deterrent glazing film.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Design Criteria:

.1 Ensure continuity of building enclosure vapour and air barrier using glass and glazing materials as follow:

.2 Utilize inner lite of multiple lite sealed units for continuity of air and vapour seal.

.3 Limit glass deflection to 1/200 with full recovery of glazing materials.

.4 Exterior glazing design and materials: to CSA Standard A460 for bird-friendly design.

.2 Silvered mirror glass: to CAN/CGSB-12.5, 4mm thick, unless otherwise indicated.

.1 Type 1A - Float glass for normal use.

.3 Flat Glass:

.1 Float glass: to CAN/CGSB-12.3, glazing quality, 5 mm thick.

.2 Tempered Glass:

.1 Clear, heat-strengthened tempered glass conforming to CAN/CGSB 12.1, consisting of 1 pane, 6mm thick, clear glass using materials that have a proven record of no tendency to bubble, dis-colour, or lose physical and mechanical properties after fabrication and installation.

.2 Location: used for Glass Type **GL3** unless otherwise noted. See drawings for exact locations.

.3 Silvered mirror glass: to ASTM C1503, 4 mm thick.

.1 Type 1A-float glass for normal use.

.4 Glass for cabinet and millwork: to CAN/CGSB-12.5, transparent, minimum 4mm thick, unless otherwise noted.

.5 Fire Rated Glass:

.1 Fire rated Glass: tested and listed by CAN/ULC S104, CAN/ULC S106, NFPA 252, NFPA 257, and NFPA 80. Glazing compound as per manufacturer's requirements. See drawings for exact locations of glazing type **GL1 and GL2.**

.1 Standard of Acceptance: Schott Pyran Platinum F, 5mm Fire and Safety rated glass.

.6 Sealant: in accordance with Section 07 92 00 – Joint Sealants.

.1 VOC limit 250 g/L maximum to SCAQMD Rule 1168.

.1 VOC limit: 5% maximum by weight to UL 2761.

.2 Ensure sealant does not contain chemical restrictions to UL 2761.

2.2 ACCESSORIES

.1 Setting blocks: neoprene, 80-90 Shore A durometer hardness to ASTM D2240, minimum 100 mm x width of glazing rabbet space minus 1.5 mm x height.

.2 Spacer shims: neoprene, 50-60 Shore A durometer hardness to ASTM D2240, 75 mm long x one half height of glazing stop x thickness to suit application. Self-adhesive on one face.

.3 Glazing tape:

.1 Preformed butyl compound with integral resilient tube spacing device, 10-15 Shore A durometer hardness to ASTM D2240; coiled on release paper; 19 x 6 mm size; black colour.

.4 Glazing splines: resilient polyvinyl chloride, extruded shape to suit glazing channel retaining slot, . colour as selected.

.5 Glazing clips: manufacturer's standard type.

.6 Lock-strip gaskets: to ASTM C542.

.7 Mirror attachment accessories:

.1 Stainless or plated steel, J-shaped profile, adjustable, sized to match thickness of mirror.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: Verify conditions of substrates previously installed are acceptable for beginning glazing installation in accordance with manufacturer's instructions.

.1 Verify that openings for glazing are correctly sized and within tolerance.

.2 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.

.3 Visually inspect substrates.

.4 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.5 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

.1 Clean contact surfaces with solvent and wipe dry.

.2 Seal porous glazing channels or recesses with substrate compatible primer or sealer.

.3 Prime surfaces scheduled to receive sealant.

.4 Preparation-Glazing films:

.1 Clean glazing before beginning installation using neutral cleaning solution.

.2 Ensure no deleterious material adheres to glazing.

.3 Ensure dust, grease, and chemical residue are removed from surface of glazing before installation of film.

.4 Examine glazing under natural daylight and identify cracks, blisters, bubbles, discolouration, edge defects or other anomalies that may cause film to delaminate or cause vision transparency or distortion problems.

3.3 INSTALLATION: INTERIOR-DRY METHOD (TAPE AND TAPE)

.1 Perform work in accordance with GANA Glazing Manual and GANA Laminated Glazing Reference Manual for glazing installation methods.

.2 Cut glazing tape to length and set against permanent stops, projecting 1.6 mm above sight line.

.3 Place setting blocks at 1/4 points, with edge block maximum 150 mm from corners.

.4 Rest glazing on setting blocks and push against tape for full contact at perimeter of lite or unit.

.5 Place glazing tape on free perimeter of glazing in same manner described.

.6 Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.

.7 Knife trim protruding tape.

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

.1 Perform work in accordance with GANA Glazing Manual and GANA Laminated Glazing Reference Manual for glazing installation methods.

.2 Cut glazing tape to length and install against permanent stops, projecting 1.6 mm above sight line.

.3 Place setting blocks at 1/4 points, with edge block maximum 150 mm from corners.

.4 Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of lite or unit.

.5 Install removable stops, with spacer shims inserted between glazing and applied stops at 600 mm intervals, 6 mm below sight line.

.6 Fill gaps between lite and applied stop with sealant to depth equal to bite on glazing, to uniform and level line.

.7 Trim protruding tape edge.

3.5 INSTALLATION: MIRRORS

.1 Set mirrors with adhesive, applied in accordance with adhesive manufacturer's instructions.

.2 Set mirrors with clips. Anchor rigidly to wall construction.

.3 Set in frame.

.4 Place plumb and level.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 – Cleaning.

.1 Remove traces of primer and sealants.

.2 Remove glazing materials from finish surfaces.

.3 Remove labels.

.4 Clean glass and mirrors using approved non-abrasive cleaner in accordance with manufacturer's instructions.

.2 Waste Management: Perform in accordance with Section 01 74 19 – Waste Management and Disposal.

3.7 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 After installation, mark each lite with an "X" by using removable plastic tape or paste.

.1 Do not mark heat absorbing or reflective glass units.

.3 Repair damage to adjacent materials caused by glazing installation.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section includes:

.1 Gypsum board for interior partition and ceiling assemblies.

1.2 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 06 08 99 – Rough Carpentry for Minor Works

.3 Section 07 92 00 – Joint Sealants

.4 Section 08 31 00 – Access Doors and Panels

.5 Section 09 22 16 – Non-Structural Metal Framing

.6 Section 09 91 23 – Interior Painting

1.3 ABBREVIATIONS AND ACRONYMS

.1 EPD: environmental product declaration.

1.4 DEFINITIONS

.1 Environmental product declaration: Third-party verified documentation with the supporting product category rule and life cycle assessment information, including at least a cradle-to-gate scope. Prepared in accordance with ISO 14025, ISO 14040, ISO 14044, and EN 15804 or ISO 21930.

.2 Industry average environmental product declaration: Developed by an industry association and represents the average product of multiple companies. Products covered by industry average environmental product declarations are required to follow the same product category rule. Industry average environmental product declarations cannot represent a certain manufacturer or its product. Industry average environmental product declarations may be referred to as "industry-wide environmental product declarations" or "generic environmental product declarations."

.3 Product-specific type III environmental product declaration: Provides data on one product made by one manufacturer, but can involve multiple factories. Product-specific environmental product declarations can cover a product produced by a manufacturer in several plants throughout the world if all plants use the same processes. Product-specific environmental product declarations cannot represent several products and several manufacturers.

1.5 REFERENCE STANDARDS

.1 Aluminum Association (AA):

.1 AA DAF 45-03, Designation System for Aluminum Finishes

.2 ASTM International (ASTM):

.1 ASTM C473-19, Standard Test Methods for Physical Testing of Gypsum Panel Products

.2 ASTM C475/C475M-17, Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board

.3 ASTM C514-04, Standard Specification for Nails for the Application of Gypsum Board

.4 ASTM C557-03, Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing

.5 ASTM C840-18b, Standard Specification for Application and Finishing of Gypsum Board

.6 ASTM C954-18, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness

.7 ASTM C1002-07, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs

.8 ASTM C1047-19, Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base

.9 ASTM C1177/C1177M-17, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing

.10 ASTM C1178/C1178M-18, Standard Specification for Glass Mat Water-Resistant Gypsum Backing Board

.11 ASTM C1278/C1278M-24, Standard Specification for Fiber-Reinforced Gypsum Panel

.12 ASTM C1280-13, Standard Specification for Application of Gypsum Sheathing

.13 ASTM C1396/C1396M-17, Standard Specification for Gypsum Board

.14 ASTM C1629/C1629M-23, Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels

.15 ASTM C1658/C1658M-18, Standard Specification for Glass Mat Gypsum Panels

.16 ASTM C1766-15, Standard Specification for Factory-Laminated Gypsum Panel Products

.17 ASTM C1881-20, Standard Guide for Closed-Loop Recycling of Scrap Gypsum Panel Products

.18 ASTM D3273-21, Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber

.19 ASTM E90-09, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

.20 ASTM E413-16, Classification for Rating Sound Insulation

.21 ASTM F1233-21, Standard Test Method for Security Glazing Materials And Systems

.3 California Air Resources Board (CARB):

.1 2007 Suggested Control Measure (SCM) for Architectural Coatings

.4 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction

.5 European Committee for Standardization (CEN):

.1 EN 15804:2012 +A2:2019, Sustainability of construction works. Environmental product declarations. Core rules for the product category of construction products

.6 Environment and Climate Change Canada (ECCC):

.1 SOR/2021-268, Volatile Organic Compound Concentration Limits for Certain Products Regulations

.7 Gypsum Association (GA):

.1 GA-214-2021, Levels of Finish for Gypsum Panel Products

.2 GA-801-2023, Handling and Storage of Gypsum Panel Products: A Guide for Distributors, Retailers, and Contractors

.8 International Organization for Standardization (ISO):

.1 ISO 14025:2006, Environmental labels and declarations — Type III environmental declarations — Principles and procedures

.2 ISO 14040:2006, Environmental management — Life cycle assessment — Principles and framework

.3 ISO 14044:2006, Environmental management — Life cycle assessment — Requirements and guidelines

.4 ISO 14067:2018, Greenhouse gases-Carbon footprint of products-Requirements and guidelines for quantification

.5 ISO 21930:2017, Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services

.9 South Coast Air Quality Management District (SCAQMD):

.1 SCAQMD Rule 1113-2016, Architectural Coatings

.2 SCAQMD Rule 1168-2022, Adhesives and Sealants Applications

.10 Underwriters' Laboratories Inc. (UL):

.1 UL 2762-2011, Standard for Sustainability for Adhesives

.11 ULC Standards (ULC):

.1 CAN/ULC-S101-14, Standard Method of Fire Endurance Tests of Building Construction and Materials

.2 CAN/ULC-S102-10, Standard Method of Test of Surface Burning Characteristics of Building Materials and Assemblies

1.6 ADMINISTRATIVE REQUIREMENTS

.1 Coordination:

.1 Coordinate with Section 07 21 16 – Blanket Insulation for acoustic batt insulation in interior partitions.

.2 Coordinate with Section 08 31 00 – Access Doors and Panels for installation in gypsum board assemblies.

.3 Coordinate with Section 09 91 23 – Interior Painting for paint gloss levels that require a Level 5 gypsum board finish.

1.7 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data: Product literature and data sheets, including product characteristics, performance criteria, physical sizes, testing and limitations.

.1 Submit product data for:

.1 gypsum board and panel materials

.2 Submit ULC fire-resistance assembly listings for each fire-rated assembly indicated in the Contract Documents.

.3 Submit product data for assemblies indicating STC value based on testing of materials proposed for use on the Project.

.3 Shop Drawings:

.1 Indicate components, including fastener types, dimensions, spacing, locations at gypsum board edges, ends, and infield of board, and installation methods.

.2 Show locations and sizes of blocking and nailers. Include concealed blocking and reinforcement specified in other sections.

.3 Indicate type of joint compound, and number of joint compound layers.

.4 Indicate quantities and locations of electrical boxes for walls and ceilings.

.4 Manufacturer's instructions:

.1 Special delivery, storage, and handling requirements.

.2 Installation instructions.

.3 Recommended sequencing.

.4 Cleaning procedures.

1.8 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store, and handle materials in accordance with Section 01 61 00 – Common Product Requirements, and:

.1 Comply with GA-801 when handling or storing gypsum panel products.

.2 Carefully unload gypsum board shipment to prevent damage to edges and corners.

.3 Store and protect gypsum board materials from scratches, condensation, excessive humidity, and water damage.

.4 Handle gypsum boards to prevent damage to edges, ends, and surfaces.

.5 Protect ready-mix joint compounds from freezing, exposure to extreme heat, and direct sunlight.

.6 Protect prefinished aluminum surfaces with wrapping or strippable coating. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.

1.9 SITE CONDITIONS

.1 Ambient Conditions: Maintain environmental conditions in accordance with ASTM C840 and:

.1 Ventilate application areas, immediately after apply joint treatments, to remove excess moisture that might prevent proper drying of joints.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

.1 Fire-resistance-rated assemblies: Provide materials identical to those in indicated assemblies tested in accordance with CAN/ULC-S101 by an independent testing agency.

.2 Acoustic assemblies: Provide materials identical to those in indicated assemblies tested in accordance with ASTM E90 and classified in accordance with ASTM E413 by an independent testing agency.

2.2 GYPSUM BOARD AND PANEL MATERIALS

.1 Gypsum Wallboard: To ASTM C1396/C1396M.

.1 Board size: 1220 mm wide x maximum practical lengths to suit application lengths.

.2 Board thickness: As indicated on Drawings.

.3 Long edges: Bevelled.

.4 Foil backing: As indicated on Drawings.

.2 Foil-backed Special fire-resistant gypsum board: To ASTM C1396/C1396M, Type X.

.1 Surface burning characteristics: To CAN/ULC-S102.

.1 Flame-spread rating: 0 maximum.

.2 Smoke developed classification: 0 maximum.

.3 Gypsum ceiling board: To ASTM C1396/C1396M, regular.

.1 Board size: 1220 mm wide x maximum practical lengths to suit application lengths.

.2 Board thickness: 12.7 mm.

.3 Long edges: Bevelled.

.4 Surface burning characteristics: To CAN/ULC-S102.

.1 Flame-spread rating: 0 maximum.

.2 Smoke developed classification: 0 maximum.

.4 Water-resistant fibre-reinforced gypsum backing board: To ASTM C1396/C1396M, regular, with water-repellant paper surfaces and water-resistant core.

.1 Board size: 1220 mm wide x maximum practical lengths to suit application lengths.

.2 Board thickness: As indicated on Drawings.

.3 Long edges: Bevelled.

.4 Surface burning characteristics: To CAN/ULC-S102.

.1 Flame-spread rating: 0 maximum.

.2 Smoke developed classification: 0 maximum.

.5 Abuse-resistant gypsum board: To ASTM C1396/C1396M, regular and Type X, with superior resistance to surface damage and indentation than standard gypsum board.

.1 Board size: 1220 mm wide x maximum practical lengths to suit application lengths.

.2 Surface burning characteristics: To CAN/ULC-S102.

.1 Flame-spread rating: 0 maximum.

.2 Smoke developed classification: 0 maximum.

.3 Performance/design characteristics: To ASTM C1629/C1629M.

2.3 ACCESSORIES

.1 Miscellaneous framing: In accordance with Section 09 22 16 – Non-Structural Metal Framing.

.1 Furring channels

.2 Furring brackets

.3 Tie wires

.4 Inserts

.5 Flat straps and backing plates

.6 Anchors

.2 Nails: To ASTM C514.

.3 Steel screws:

.1 Fastening gypsum board to wood supports: To ASTM C1002, type W course-thread screws.

.2 Fastening gypsum board to steel members less than 0.84 mm: To ASTM C1002, type S fine thread screws.

.3 Fastening gypsum board to steel members from 0.84 mm to 2.84 mm thick: To ASTM C954.

.4 Fastening gypsum board to gypsum board (two-layer applications): To ASTM C1002, type G course-pitch high-thread self-piercing screws.

.4 Laminating compound: As recommended by manufacturer, asbestos-free.

.5 Joint tape: To ASTM C475/C475M, as recommended by manufacturer for application type. Use mould-resistant tape for moisture-resistant boards.

.6 Joint compound: To ASTM C475/C475M, as recommended by the manufacturer for application type.

.7 Casing beads, corner beads, control joints, and edge trim: To ASTM C1047, zinc-coated steel, minimum 0.5 mm base thickness, perforated flanges, one piece length per location.

.1 Colour: As scheduled.

.8 Acoustic sealant: In accordance with Section 07 92 00 – Joint Sealants. Refer to Section 07 84 00 – Firestopping for additional requirements.

.9 Insulating gaskets: Moisture-resistant, nominal 3 mm thick, closed cell neoprene strip, width to match framing, with self-sticking permanent adhesive on one face, lengths as required.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of conditions:

.1 Verify substrate and project conditions in accordance with Section 01 71 00 – Examination and Preparation, and:

.1 Verify substrates are dry, clean, and frost free.

.2 Verify wood framing is installed in accordance with Section 06 10 53 – Miscellaneous Rough Carpentry.

.3 Verify metal framing is installed in accordance with Section 09 22 16 – Non-Structural Metal Framing.

.4 Verify substrates are installed in accordance with ASTM C840.

.5 Verify substrate tolerances are suitable to achieve specified finished assembly tolerances.

.6 Verify bucks, anchors, blocking, and sound attenuation materials are installed.

.7 Verify work to be concealed has been reviewed and inspected by authority having jurisdiction (AHJ) (if required) and corrective work is completed, if any.

3.2 GENERAL INSTALLATION REQUIREMENTS

.1 Fire-resistance-rated assemblies: Provide construction identical to that in indicated assemblies tested in accordance with CAN/ULC-S101 by an independent testing agency.

.2 Acoustic assemblies: Provide construction identical to that in indicated assemblies tested in accordance with ASTM E90 and classified in accordance with ASTM E413 by an independent testing agency for assembly STC ratings indicated on Drawings.

3.3 GYPSUM BOARD ASSEMBLY INSTALLATION

.1 Erect metal framing in accordance with Section 09 22 16 – Non-Structural Metal Framing.

.2 Acoustic sealants:

.1 Apply two beads under track.

.2 Apply one bead of acoustic sealant continuously around periphery of each face of partitions to seal gypsum board/structure junction where partitions abut fixed building components.

.3 Apply sealant around penetrating mechanical and electrical work to maintain sound rating.

.4 Locate sealant so that it is covered after finishes are applied.

.5 Construct fire-rated assemblies using fire stopping sealant applied after acoustic sealant.

.3 Install acoustical batt insulation in accordance with Section 07 21 16 – Blanket Insulation.

.4 Install gypsum board in accordance with ASTM C840.

.5 Install gypsum sheathing to ASTM C1280.

.6 Secure gypsum board to framing without damaging gypsum board edges or ends.

.7 Apply single-layer gypsum board to metal furring or framing using stud adhesive, screw fasteners. Maximum screw spacing 300 mm on-centre.

.1 Single-layer application:

.1 Apply gypsum board on ceilings before application of walls.

.2 Apply gypsum board on walls vertically or horizontally, providing sheet lengths to minimize number of board edges or end joints.

.2 Double-layer application:

.1 Install gypsum board for base layer and exposed gypsum board for face layer.

.2 Apply base layer to ceilings before base layer application on walls; apply face layers in same sequence. Offset joints between layers minimum 250 mm.

.3 Apply base layers at right angles to supports unless otherwise indicated.

.4 Apply base layer on walls and face layers vertically with joints of base layer over supports and face layer joints offset minimum 250 mm with base layer joints.

.8 Install ceiling boards in direction to minimize number of end-butt joints. Stagger end joints at least 250 mm.

.9 Exterior soffits and ceilings: Install exterior gypsum board perpendicular to supports; stagger end joints over supports. Install with 6.4 mm gap where boards abut other work.

.10 Apply water-resistant gypsum board as indicated on Drawings. Apply water-resistant sealant to edges, ends, and cut-outs which expose gypsum core, and to fastener heads. Do not apply joint treatment on areas to receive tile finish.

.11 Install gypsum board with face side outwards.

.12 Do not install damaged or damp boards, or boards with evidence of mould growth.

3.4 ACCESSORY INSTALLATION

.1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure at 150 mm on-centre.

.2 Install casing beads around perimeter of suspended ceilings.

.3 Install casing beads where gypsum board butts against surfaces without trim concealing junction and where indicated. Seal joints with sealant.

.4 Install insulating gasket strips continuously at edges of gypsum board , at casing beads abutting exterior [metal] window and door frames, and where indicated on Drawings, to provide a thermal break.

.5 Install shadow mould at gypsum board / ceiling junctions as indicated on Drawings. Minimize joints; use corner pieces and splicers.

.6 Control and expansion joints:

.1 Construct control joints of preformed units set in gypsum board facing and supported independently on both sides of joint.

.2 Provide continuous polyethylene dust barrier behind and across control joints.

.3 Locate control joints at maximum 9 m spacing on partitions and ceilings.

.4 Locate control joints to coincide with the corner of a door, window, or screen frame where possible.

.5 Construct expansion joints as detailed, at building expansion and construction joints. Provide continuous dust barrier.

.6 Construct control and expansion joints to maintain sound-rated construction and fire ratings.

.7 Install cornice caps where gypsum board partitions do not extend to ceiling. Fit cornice caps over partition, secure to partition top track with two rows of sheet metal screws staggered at 300 mm on-centre.

.8 Splice corners and intersections together and secure to each member with three screws.

.9 Install access doors to electrical and mechanical fixtures specified in respective sections and in accordance with Section 08 31 00 – Access Doors and Panels.

.1 Rigidly secure frames to furring or framing systems.

3.5 FINISHING

.1 Finish face panel joints and interior angles with joint system consisting of joint compound, joint tape, and taping compound installed in accordance with manufacturer's instructions and feathered out onto panel faces.

.2 Gypsum Board Finish: Finish gypsum board walls and ceilings to the following levels in accordance with ASTM C840.

.1 Levels of finish:

.1 Level 1: Joints and interior angles to have tape embedded in joint compound. Excess joint compound, tool marks, and ridges are acceptable.

.1 Locations: To be used above finished ceilings where gypsum board is not visible to public view. fire and smoke seal as indicated on the drawings.

.1 joint treatment in smoke barrier applications

.2 Level 4: Embed tape for joints and interior angles in joint compound and immediately wiped clean with a joint knife or trowel leaving a thin coating

of joint compound over the joints and interior angles. Apply two separate coats of joint compound over flat joints. Apply one separate coat of joint compound over interior angles. Cover fastener heads and accessories with three separate coats of joint compound. Surfaces to be smooth and free of tool marks and ridges.

.1 Locations: To be used for all levels of gypsum board finish requiring paint.

.1 Gypsum board to receive primer and paint.

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

.4 Skim coating:

.1 Mix joint compound slightly thinner than for joint taping.

.2 Apply thin coat to entire surface using trowel or drywall broad knife to fill surface texture differences, variations, or tool marks.

.3 Allow skim coat to dry completely.

.4 Remove ridges by light sanding or wiping with damp cloth.

.5 Textured finish:

.1 Mask adjacent surfaces where required to protect from overspray.

.2 Apply one coat of primer-sealer over surface to be textured.

.3 When dry, apply textured finish in accordance with manufacturer's instructions to produce a uniform texture, free of thin areas and application patterns.

.4 Immediately remove droppings and accidental overspray.

3.6 TOLERANCES

.1 Maximum variation of finished gypsum board surface from true flatness: 3 mm in 3000 mm in any direction.

3.7 CLEANING

.1 Clean in accordance with Section 01 74 00 – Cleaning, and:

.1 Completely remove joint compounds from concrete floors.

.2 Waste management:

.1 Manage waste in accordance with Section 01 74 19 – Waste Management and Disposal and:

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 74 19 - Waste Management and Disposal.

.2 Section 07 92 00 – Joint Sealants

.3 Section 09 21 16 - Gypsum Board Assemblies.

1.2 REFERENCE STANDARDS

.1 ASTM International (ASTM)

.1 ASTM C645-14e1, Standard Specification for Nonstructural Steel Framing Members.

.2 ASTM A653/A653M-07, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process.

.3 ASTM C754-15, Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.

.2 Underwriter's Laboratories (UL)

.1 UL-2768-2011, Architectural Surface Coatings.

.3 The Master Painters Institute (MPI)

.1 Architectural Painting Specification Manual-current edition.

.1 MPI #26, Primer, Galvanized Metal, Cementitious.

.4 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards

.1 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for metal framing and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit 2 copies of WHMIS SDS in accordance with Section 01 35 29.06 – Health and Safety Requirements

.3 Samples:

.1 Submit duplicate 300 mm long samples of non-structural metal framing.

1.4 QUALITY ASSURANCE

.1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements.

.2 Delivery and Acceptance Requirements: deliver materials to Site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect metal framing from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Non-load bearing channel stud framing: to ASTM C645, 92 and 152 mm stud size, roll formed from 0.53 mm thickness hot dipped zinc-coated (galvanized) steel sheet in accordance with ASTM A653, Z180, for screw attachment of gypsum board.

.1 For stud lengths greater than 3500mm, use 0.91mm thickness unless otherwise noted.

.2 Knock-out service holes at 460 mm centres.

.2 Floor and ceiling tracks: to ASTM C645, in widths to suit stud sizes, and as follows:

.1 Slotted Deflection Track for Fire Separations: Premanufactured slotted top runner with 63 mm down standing legs and having 6 mm wide x 38 mm high slots spaced at 25 mm on centre along length of runner; tested and certified for use in fire rated wall construction.

.2 Double Runner Deflection Track: Outside runner using 75 mm flanges; inner runner 33 mm; maintaining 25 mm minimum deflection space.

.3 Deep Leg Deflection Track: Top runner having 75 mm down standing legs; maintaining 13 mm minimum deflection space.

.4 Base Runner: Bottom track with 33 mm upstanding legs.

.3 Non-load bearing truss stud framing system: to consist of:

.1 Studs: 92 and 152 mm size; truss-type bent rod web with double rod chords; welded together at contact points.

.1 Make rod of minimum 4.5 mm diameter cold drawn steel wire having tensile strength of 620 MPa.

.2 Design studs for clip attachment of gypsum lath or wire tying of metal lath.

.2 Floor track: snap-in type formed to hold studs securely in place at 50 mm intervals; fabricated from 0.5 mm thick steel sheet; size to suit studs.

.3 Ceiling track: channel shaped track for use with stud shoes and 1.2 mm diameter double wire ties; size to suit studs.

.4 After fabrication apply one shop coat of MPI #26 primer to steel surfaces.

.1 Descale and clean surfaces before painting.

.4 Furring Channels: Commercial steel sheet in accordance with ASTM A653, Z180, hot dipped zinc-coated (galvanized), as follows:

.1 Hat Shaped, Rigid Furring Channels: ASTM C645, 0.75 mm thickness x 22 mm deep

.2 Resilient Furring Channels: 0.46 mm thickness x 13 mm deep members designed to reduce sound transmission having asymmetrical face attached to single flange by a slotted leg (web).

.5 Curving Tracks: Commercial steel sheet with ASTM A653, Z180, hot dipped zinc-coated (galvanized), complete with flexible sliding straps to allow for curvature indicated on drawings; width to suit framing, and as follows:

.1 Width: 92 mm.

.2 Minimum base metal thickness: 0.75 mm.

.6 Acoustical sealant: in accordance with Section 07 92 00 – Joint Sealants.

.7 Sealants: VOC limit 30 g/L maximum to SCAQMD Rule 1168.

.8 Insulating strip: rubberized, moisture resistant 3 mm thick cork strip, 12 mm wide, with self sticking adhesive on one face, lengths as required.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for non-structural metal framing application in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 ERECTION

.1 Erect partitions in accordance with framing requirements of ASTM C754

.2 Align partition tracks at floor and ceiling and secure at 610 mm on centre maximum.

.3 Install damp proof course under stud shoe tracks of partitions on slabs on grade.

.4 Place studs vertically at 600 mm on centre and not more than 50 mm from abutting walls, and at each side of openings and corners.

.1 Position studs in tracks at floor and ceiling. Cross brace steel studs as required to provide rigid installation to manufacturer's instructions.

.5 Erect metal studding to tolerance of 1:1000.

.6 Attach studs to bottom track using pop rivets.

.7 Co-ordinate simultaneous erection of studs with installation of service lines. Align web openings when erecting studs.

.8 Co-ordinate erection of studs with installation of door/window frames and special supports or anchorage for work specified in other Sections.

.9 Provide two studs extending from floor to ceiling at each side of openings wider than stud centres specified.

.1 Secure studs together, 50 mm apart using column clips or other approved means of fastening placed alongside frame anchor clips.

.10 Install heavy gauge single jamb studs at openings.

.11 Erect track at head of door/window openings and sills of sidelight/window openings to accommodate intermediate studs.

.1 Secure track to studs at each end, in accordance with manufacturer's instructions.

.2 Install intermediate studs above and below openings in same manner and spacing as wall studs.

.12 Frame openings and around built-in equipment, cabinets, access panels, on four sides. Extend framing into reveals. Check clearances with equipment suppliers.

.13 Provide 40 mm stud or furring channel secured between studs for attachment of fixtures behind lavatory basins, toilet and bathroom accessories, and other fixtures including grab bars and towel rails, attached to steel stud partitions.

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

.15 Extend partitions to ceiling height except where noted otherwise on drawings.

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

.1 Use 50 mm leg ceiling tracks. Use double track slip joint as indicated.

.17 Install continuous insulating strips to isolate studs from uninsulated surfaces.

.18 Install two continuous beads of acoustical sealant under studs and tracks around perimeter of sound control partitions.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 – Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 – Cleaning.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by non-structural metal framing application.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 Submittal Procedures

.2 Section 09 21 16 – Gypsum Board Assemblies

1.2 REFERENCE STANDARDS

.1 ASTM International (ASTM):

.1 ASTM C28/C28M-10, Standard Specification for Gypsum Plasters

.2 ASTM C35-01, Standard Specification for Inorganic Aggregates for Use in Gypsum Plaster

.3 ASTM C206-14, Standard Specification for Finishing Hydrated Lime

.4 ASTM C423-22, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method

.5 ASTM C587-04, Standard Specification for Gypsum Veneer Plaster

.6 ASTM C631-09, Standard Specification for Bonding Compounds for Interior Gypsum Plastering

.7 ASTM C841-03, Standard Specification for Installation of Interior Lathing and Furring

.8 ASTM C842-05, Standard Specification for Application of Interior Gypsum Plaster

.9 ASTM C844-15, Standard Specification for Application of Gypsum Base to Receive Gypsum Veneer Plaster

.10 ASTM C1396/C1396M-17, Standard Specification for Gypsum Board

.2 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-51.33-M89, Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction

.2 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction

.3 CSA Group (CSA):

.1 CSA A82.30-M1980, Interior Furring, Lathing and Gypsum Plastering

.4 ULC Standards (ULC):

.1 ULC Online Directory for fire-resistance rated listings (UL Product iQ)

.2 CAN/ULC-S101-14, Standard Method of Fire Endurance Tests of Building Construction and Materials

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Coordination:

.1 Coordinate installation tolerances of concrete unit masonry base for veneer plaster substrate with Section 04 22 00 – Concrete Unit Masonry.

.2 Coordinate installation tolerances of gypsum base for veneer plaster substrate with Section 09 21 16 – Gypsum Board Assemblies.

.2 Sequencing:

.1 Begin plaster work after building envelope is weathertight and before installation of finish flooring or acoustic ceilings.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's mixing instructions, product literature, and data sheets for gypsum plaster materials. Include product characteristics, performance criteria, recommended thicknesses, and limitations.

.3 Test and Evaluation Reports: Submit ULC design listings indicating compliance with specified fire-resistance ratings.

1.5 QUALITY ASSURANCE

.1 Mock-Ups: Assemble a mock-up in accordance with Section 01 43 00 – Quality Assurance, and as follows:

.1 Construct a mock-up a minimum 3 m^2 from floor to ceiling and include one expansion joint, control joint, corner trim, and an interior wall corner.

.2 Acceptable mock-up may not remain as part of the completed work.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Perform in accordance with Section 01 61 00 – Common Product Requirements.

.2 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging, labelled with manufacturer's name and date it was manufactured.

.1 Deliver lath and plaster products to site 24 hours before application.

.2 Deliver fresh plaster as needed to Project site.

.3 Storage and Handling Requirements:

.1 Store gypsum plastering materials indoors, in dry location, away from heavy traffic areas and off-gassing materials, and in accordance with manufacturer's recommendations.

.2 Store and protect bagged goods from direct contact with rain, snow, splashing water, wet or damp surfaces, and condensation and moisture absorption.

.3 Stack plaster bags on planks or platforms away from damp floors and walls.

.4 Do not expose gypsum plaster base to an excessive amount of sunlight.

.5 Replace materials if defective, damaged, or if plaster is exposed to moisture.

1.7 SITE CONDITIONS

.1 Ambient Conditions:

.1 Ventilation:

.1 Have free circulation of air to carry off excess moisture.

.2 Mechanically remove moisture laden air in areas lacking normal ventilation.

.3 Protect plaster from vent drafts, heaters or windows to avoid uneven drying.

.4 Prevent excessive ventilation or air movement to allow plaster to properly set.

.5 Provide temporary screening a minimum 24 hours before, during, and until plaster is dry at unfinished openings in the building envelope that impact work of this Section.

.6 If ambient humidity levels are sufficiently low to impact the proper curing of plaster, then wet unfinished concrete floor before plaster application. Maintain minimal ventilation.

.2 Temperature:

.1 Do not apply plaster to surfaces containing frost.

.2 Maintain a uniform temperature above 13°C and below 28°C for 7 days before erection of gypsum plaster base, before and during application of plaster, and for 2 days following installation of plaster or until plaster is dry.

.3 Distribute heat evenly to areas.

.4 Prevent irregular heat on plaster near source by providing deflection or protective screens.

PART 2 PRODUCTS

2.1 DESCRIPTION

.1 Regulatory Requirements:

.1 Fire-resistance rated gypsum plastering assemblies: To CAN/ULC-S101.

2.2 MATERIALS

.1 Basecoat plasters:

.1 Gypsum neat plaster (hardwall): To ASTM C28/C28M

.2 Gypsum mill aggregated plaster: To ASTM C35

.3 Gypsum bonding plaster: To ASTM C28/C28M

.2 Finishing plaster:

.1 Hydrated finishing lime:

.1 Type N: To ASTM C206

.2 Type S: To ASTM C206

.3 Soaked overnight in water above 10°C.

.3 Sand aggregate in basecoat plasters: To ASTM C35.

.4 Texturing Plaster: Factory mixed finishing plaster prepared for texture application, to match sample reviewed by Departmental Representative.

.5 Water:

.1 Clean, fresh, potable.

.2 Free from mineral and organic substances which impact plaster set.

.3 Use the minimum amount required to achieve a plaster of workable consistency.

.4 Mixing Water Temperature: Approximately 20°C.

.6 Plastic Vapour Barrier Sheet: To CAN/CGSB-51.33, Type 2 or CAN/CGSB-51.34, maximum 60 ng/Pa·s·m^2 water vapour permeance.

.7 Bonding agent: To ASTM C631, surface applied type.

.8 Reinforcing Hair: Free of knots, dust and clumps and washed clean of pesticides.

2.3 MIXES

.1 Mix plasters to ASTM C841 in mechanical mixers, except finish coats containing lime that may be hand mixed. Use mechanical mixers that accurately control water quantity.

.2 Avoid excessive mixing. Discard plaster if it has started to set before being applied.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: Perform in accordance with Section 01 71 00 – Examination and Preparation. Verify conditions of substrates are acceptable for gypsum plastering installation in accordance with ASTM C842, and as follows.

3.2 PREPARATION

.1 Prepare surfaces to receive plaster to CSA A82.30 and ASTM C841.

.2 Remove dust, loose materials, grease, paint, and materials that may impair bond.

.3 Install grounds, screeds, beads, control joints, and accessories.

.4 Properly plug, cap or cover conduits, pipes, cables, and outlets before applying base coat.

.5 Install screeds plumb and level to allow for thickness of finish coat.

.6 Install vertical joint screeds in continuous lengths. Install horizontal joint screeds butted to vertical screeds. Install with a maximum joint bounding area of 14 m^2.

.7 Where plaster butts exposed masonry walls, insert a 1-m-wide strip of plastic vapour barrier sheet before applying plaster to protect masonry. Cut plastic vapour barrier sheet neatly at junction with plaster when plastering is completed.

.8 Mask off or temporarily protect adjacent aluminum and finished work.

.1 Do not apply plaster until such work is protected.

.2 Remove temporary protection as work progresses, before plastering is dry.

.9 Apply bonding agent to concrete surfaces in accordance with manufacturer's instructions.

3.3 APPLICATION

.1 Perform plastering work to CSA A82.30 and ASTM C842.

.2 Apply plaster finish with flatness variation of maximum 3 mm in 2.5 m in any plane.

.3 Form small V-groove where plaster finish is flush with bases, window frames, wall tiles, and other similar construction.

.4 Application-Finishing Plaster:

.1 Application-Trowel Finish Coats:

.1 Scratch plaster in thoroughly and immediately double back to fill out to smooth, dense surface for decoration, free of surface blemishes and irregularities.

.2 Apply 1.6 mm finish coat.

.3 Trowel plaster after set to achieve dense, hard, smooth surface.

.2 Application-Float Finish Coats:

.1 Scratch plaster in thoroughly and immediately double back to a true, even surface.

.2 Float using a shingle float to bring aggregate to surface to produce finish of uniform texture free of slick spots, cat faces, and other blemishes.

.3 Use water sparingly on natural colour and no water on coloured finishes.

.5 Mix Retarder:

.1 Mix retarder with water before adding to plaster.

.2 Slowly add retarder to water and stir until retarder is completely dispersed.

.3 Screen out any retarder lumps which have formed.

.4 Stir retarder mixture before using.

.6 Mix Accelerator:

.1 Sprinkle, in dry form, into mixer after plaster has been added. (Check for product specific instructions).

.2 Add dry accelerator to dry mix for hand mixing.

3.4 ADJUSTING

.1 Cut out and patch cracked, loose, or defective plaster. Patch plaster flush with surrounding plaster and matching in colour, finish, and texture.

.1 Patch work with same materials as installed plaster, except:

.1 Patch holes 13 mm or less in diameter with patching plaster.

.2 Sanding plaster for patching is not acceptable.

.2 Repair damage to materials adjacent to plaster caused by gypsum plastering installation.

3.5 CLEANING

.1 Cleaning: Perform in accordance with Section 01 74 00 – Cleaning, and as follows:

.1 Remove droppings and splatters from surfaces.

.2 Remove temporary protective coverings from floors.

3.6 PROTECTION

.1 Protect gypsum plastering from damage of other construction activities.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures

.2 Section 01 45 00 - Quality Control

.3 Section 01 74 21 - Construction/Demolition Waste Management and Disposal

.4 Section 01 78 00 - Closeout Submittals

.5 Section 06 08 99 - Rough Carpentry for Minor Works

.6 Section 09 21 16 - Gypsum Board Assemblies

.7 Division 21

.8 Division 23

.9 Division 26

1.2 DEFINITIONS

.1 Articulation Classification (AC): Indication of attenuation of sound being reflected from ceiling materials to adjacent areas in open plan areas, in accordance with ASTM E1111/E1111M.

.2 Ceiling Attenuation Class (CAC): Indication of amount of attenuation of sound passing up through a panel through the open plenum and back down through a panel into adjacent spaces where a partition is not full height, in accordance with ASTM E1414/E1414M.

.3 Light Reflectance (LR): The percentage amount of light returned from the surface of a material compared to the source.

.4 Noise Reduction Coefficient (NRC): Measure of the absorption of sound energy over four frequencies. An indication of the amount of noise a panel can absorb-measured in 0.05 increments in accordance with ASTM C423.

.5 Sound Absorption Average (SAA): Measure of the absorption of sound energy over twelve frequencies. An indication of the amount of sound a panel can absorb-measured in 0.01 increments in accordance with ASTM C423.

1.3 REFERENCE STANDARDS

.1 ASTM International (ASTM):

.1 ASTM A580/A580M-18, Standard Specification for Stainless Steel Wire

.2 ASTM A641/A641M-19, Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire

.3 ASTM C423-17, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method

.4 ASTM C635/C635M-17, Standard Specifications for the Manufacture, Performance and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings

.5 ASTM C636/C636M-19, Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels

.6 ASTM E580/E580M-20 Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions

.7 ASTM E1111/E111M-14, Standard Test Method for Measuring the Interzone Attenuation of Open Office Components

.8 ASTM E1264-19, Standard Classification for Acoustical Ceiling Products

.9 ASTM E1414/E1414M-21a, Standard Test Method for Airborne Sound Attenuation between Rooms Sharing a Common Ceiling Plenum

.10 ASTM E1477-98a, Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers

.11 ASTM F1667-18a Standard Specification for Driven Fasteners: Nails, Spikes and Staples

.2 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction

.3 Ceilings & Interior Systems Construction Association (CISCA):

.1 Ceiling Systems Handbook, 2019

.2 Seismic Construction Handbook, 2018

.4 CSA Group (CSA):

.1 CSA S832-14, Seismic Risk Reduction of Operational and Functional Components (OFCs) of Buildings

.5 Government of Canada:

.1 Workplace Fit-Up Standards 2.0

.6 ULC Standards (ULC):

.1 CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies

.2 CAN/ULC-S702.1-14, Standard for Mineral Fibre Thermal Insulation for Buildings, Part 1: Material Specification

1.4 SEQUENCING

.1 Schedule installation of acoustical panel ceilings to occur after completion of overhead mechanical and electrical work, where possible.

.2 Begin installation after building envelope, and dust and moisture producing activities are complete, and paint is dry.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit samples in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data: Submit manufacturer's installation instructions, product literature, and data sheets for ceiling suspension system, acoustic panels, and system accessories. Include product characteristics, performance criteria, physical sizes, finishes, and limitations.

.3 Shop Drawings:

.1 Submit reflected ceiling plans for special grid patterns as indicated on Drawings.

.2 Indicate lay-out, insert and hanger spacing and fastening details, splicing method for main and cross runners, location of access splines, lateral bracing and accessories.

.4 Samples for Initial Selection:

.1 Submit actual samples of acoustical panel that are 150 mm x 150 mm showing full range of colours, textures, and patterns available.

.2 Submit samples that are approximately 200 mm long of each ceiling suspension system component exposed to view showing full range of profiles, colours, and gloss levels.

.5 Samples for Verification:

.1 Submit 150 mm x 100 mm samples of each type of acoustical panel.

.2 Submit for review and acceptance of each component specified or necessary for complete installation. Include technical descriptive data.

.3 Submit samples of each component proposed for use in each type of ceiling suspension system.

1.6 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 – Closeout Submittals.

.2 Submit maintenance information for acoustical ceiling systems and incorporate into manual. Include warnings of cleaning methods that may damage finished surfaces.

.3 Submit final certificate from design professional responsible for delegated detail design of ceiling indicating conformity with accepted shop drawings.

1.7 MAINTENANCE MATERIAL SUBMITTALS

.1 Supply extra acoustical units in accordance with Section 01 78 00 – Closeout Submittals.

.2 Supply extra materials from same production run as installed materials.

.3 Supply acoustical units amounting to 2% of gross ceiling area for each pattern and type of acoustical panel, ceiling suspension system and trim required for Project-minimum one complete factory-sealed package of each.

1.8 QUALITY ASSURANCE

.1 Certifications:

.1 Fire-Resistance Rated Suspension System: Certified by a Canadian Certification Organization accredited by the Standards Council of Canada.

.2 Submit manufacturer's product certificates, certifying materials comply with specified performance criteria and physical requirements. Include certification of sustainable requirements.

.2 Manufacturers: Obtain materials for each type of acoustical panel ceiling system (panels and suspension system) from a single manufacturer. Provide products exposed to view from the same production run for each room, with consistent appearance.

1.9 DELIVERY, STORAGE, AND HANDLING

.1 Perform in accordance with Section 01 61 00 – Common Product Requirements.

.2 Storage and Handling Requirements:

.1 Store materials flat, off ground, indoors, and in a clean, dry, and well-ventilated area.

.2 Protect acoustical ceiling components from nicks, scratches, and other damage.

1.10 AMBIENT CONDITIONS

.1 Unless manufacturer's recommendations are more restrictive, maintain uniform temperature of 15 to 29 degrees C and relative humidity of 20 to 40% for 48 hours before and during installation.

.2 Store materials in work area 48 hours before beginning installation.

1.11 WARRANTY

.1 Manufacturer Warranty:

.1 Coverage of manufacturing defects in materials and workmanship resulting in failure of suspension system for 15 years from date of Substantial Performance.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

.1 Fire-Resistance Rated Acoustic Panel Ceilings: Meeting requirements of CAN/ULC-S102, labelled and listed by ULC Standards, Warnock Hersey Intertek (WHI), or another testing and inspecting agency acceptable to authorities having jurisdiction (AHJ).

2.2 DESIGN CRITERIA

.1 Superimposed Loads: Determine superimposed loads applied to ceiling suspension systems by components of the building and verify that adequate hangers are installed to support additional loads in conjunction with normal loads of the ceiling system, and as follows:

.1 Maximum Deflection: Limit deflection to L/360 in accordance with ASTM C635/C635M deflection test.

.2 Seismic Restraints: Design system to withstand seismic forces in accordance with CSA S832 and as outlined in applicable Building Code for normal Importance Category facilities based on a full uniform ceiling load acceleration in accordance with ASTM A580/A580M. Ceiling areas less than 13.4 m^2 and surrounded by walls connected to structure above do not require seismic restraints.

2.3 MATERIALS

.1 Classification: Intermediate-Duty system to ASTM C635/C635M

2.4 ACOUSTICAL CEILING SUSPENSION

.1 Ceiling Suspension System CSS1: Non-fire rated, made up as follows:

.1 Two- directional exposed tee-bar grid

.2 Concealed tee access spline

.3 Concealed tongue and groove runner

.4 CSS1 is the suspended ceiling system for the acoustical ceilings through out the project for 610x610mm and 610x1220mm ceiling tiles.

.5 Concealed H-runner, tee spline and flat steel spline

.6 Concealed zee runner and flat steel spline

.7 Metal pan special tee system

.2 Materials for Suspension System: commercial quality cold rolled steel,

.3 Exposed Tee-Bar Grid Components: Components die cut. Main tee with double web, rectangular bulb and 24 mm rolled cap on exposed face. white colour.

.4 Hanger Wire: To ASTM A641/A641M, galvanized soft annealed steel wire:

.1 Access Panel Ceilings: Minimum 3.6-mm diameter

.2 Fire-Rated Assemblies: To ULC design requirements, to seismic Design Category for seismic assemblies.

.3 Other Ceilings: Minimum 2.6-mm diameter

.5 Hanger Inserts: Purpose made.

.6 Carrying Channels: 38 x 22 mm channel, 0.7 mm thick painted, colour matching grid components, steel.

.7 Standard of Acceptance: Prelude XL 15/16" suspension system by Armstrong. G.C. to confirm with supplier that grid is acceptable for acoustical ceiling panels.

2.5 ACOUSTICAL CEILING PANELS

.1 Acoustical Panel AP-1: To ASTM E1264 and as follows:

.1 Surface Burning Characteristics: To CAN/ULC-S102:

.1 Flame-Spread Rating: 25 or less.

.2 Smoke Developed Classification: 50 or less.

.2 Sound Absorption Average (SAA) or Noise Reduction Coefficient (NRC): Minimum 0.85 to ASTM C423.

.3 Light Reflectance (LR): 0.87 to ASTM E1477.

.4 Panel Edge Type: Square edge.

.5 Colour: White

.6 Acoustic Ceiling Panel Type:

.1 AP-1- 610x610x22mm acoustic ceiling tiles

.1 Standard of Acceptance: Ultima High NRC No. 1940 by Armstrong.

.2 Acoustic Panel AP-2: to ASTM E1264 and as follows:

.1 Surface Burning Characteristics: to CAN/ULC-S102

.1 Flame-Spread Rating: 25 or less.

.2 Smoke Developed Classification: 50 or less.

.2 Noise Reduction Coeffcient (NRC): Minimum of 0.50 to ASTM C423.

.3 Light Reflectance (LR): 0.87 to ASTM E1477.

.4 Panel Edge Type: Reveal Beveled 15/16 Grid

.5 Colour White

.6 Acoustic Ceiling Panel Type:

.1 AP-2 610x1220mm acoustic tiles:

.1 Standard of Acceptance: Performa, Sand Micro #SHM-194 by CertainTeed

2.6 ACCESSORIES

.1 Hold down clips: purpose made clips to secure tile to suspension system, approved for use in fire rated systems.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verify substrate conditions are acceptable for installation of acoustical ceiling panel and suspension system in accordance with manufacturer's instructions.

.1 Visually inspect substrates in presence of Departmental Representative.

.2 Inform responsible Subcontractor(s) of unacceptable conditions immediately upon discovery.

.3 Proceed with installation after unacceptable conditions are remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION-SUSPENSION SYSTEM

.1 Comply with manufacturer's installation instructions and recommendations, including product technical bulletins, installation instructions, and data sheets.

.2 Install suspension system in accordance with accepted shop drawings, Certification Organizations tested design requirements and ASTM C636/C636M except where specified otherwise.

.3 Install suspension system by suspending 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 Attach hangers to structural members or intermediate structural supports.

.3 Fasten hangers to cast-in-place hanger inserts, powder actuated fasteners, or drilled in anchors that extend through forms into concrete.

.4 Splay hangers only where required to miss obstructions. Offset resulting horizontal forces by bracing or counter-splaying.

.4 Lay out centre line of ceiling both ways, to provide balanced borders at room perimeter.

.5 Installation Tolerances: Finished ceiling system square with adjacent walls and level within 1:1000.

.6 Secure hangers to overhead structure using attachment methods acceptable to Departmental Representative.

.7 Install hangers spaced at a maximum 1200 mm on centre and within 150 mm from ends of main tees.

.8 Coordinate suspension system with location of related components. Provide carrying channels as necessary to bridge at unavoidable interference between suspension system and other work above ceiling.

.9 Install wall moulding to provide correct ceiling height.

.10 Completed suspension system to support super-imposed loads, such as lighting fixtures , diffusers , grilles and speakers.

.11 Support light fixtures and diffusers with additional ceiling suspension hangers within 150 mm of each corner and at a maximum 610 mm around perimeter of fixture.

.12 Interlock cross member to main runner to provide rigid assembly.

.13 Frame at openings for light fixtures, air diffusers, speakers, and at changes in ceiling heights.

.14 Install perimeter trim at floating installations securely anchored to suspension system, in accurate alignment with adjacent assemblies. Install curved trim members in smooth curves to radius indicated.

3.3 INSTALLATION-ACOUSTICAL CEILING PANEL SYSTEM

.1 Install lay-in acoustical panels in ceiling suspension system in accordance with manufacturer's instructions and as indicated.

.2 Install panels with edges fully hidden from view by flanges of suspension system runners and mouldings.

.3 Install fibrous acoustical media and spacers over entire area above suspended metal panels.

.4 In fire-rated ceiling systems, secure lay-in panels with hold-down clips and protect over light fixtures, diffusers, air return grilles and other appurtenances according to Certification Organizations design requirements.

3.4 SITE QUALITY CONTROL

.1 Site Tests and Inspections: Arrange for periodic site visits by design professional responsible for delegated ceiling design work to review installed work for conformity to design.

.2 Manufacturer Services: Arrange for periodic site visits by manufacturer's representative to review installed work for conformity to manufacturer's installation instructions and recommendations.

.1 Submit written site reports within three days of visit.

.3 Non-Conforming Work:

.1 Do not support ceilings directly from permanent metal forms, floor deck, or other non-structural framing.

.2 Do not attach hangers to steel roof deck or steel deck tabs.

.3 Do not level ceilings by putting kinks in suspension wires. Kinks in suspension wires are not acceptable.

.4 Conceal fasteners including pop rivets on mouldings and trims.

3.5 CLEANING

.1 Progress Cleaning: In accordance with Section 01 74 00 – Cleaning.

.2 Final Cleaning: In accordance with Section 01 74 00 – Cleaning, and touch-up scratches, abrasions, voids, and other defects in painted surfaces.

3.6 PROTECTION

.1 Protect installed products from damage during construction.

.2 Repair damage to adjacent materials caused by acoustical suspension installation.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 resilient sheet flooring

.2 resilient bases

1.2 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures

.2 Section 01 78 00 - Closeout Submittals

.3 Section 02 41 19.16 - Selective Interior Demolition

1.3 REFERENCE STANDARDS

.1 American Association of Textile Chemists and Colorists (AATCC):

.1 AATCC 134-2019, Test Method for Electrostatic Propensity of Carpets

.2 ASTM International (ASTM):

.1 ASTM D2047-17, Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine

.2 ASTM E96/E96M-16, Standard Test Methods for Water Vapor Transmission of Materials

.3 ASTM F150-06, Standard Test Method for Electrical Resistance of Conductive and Static Dissipative Resilient Flooring

.4 ASTM F710-22, Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring

.5 ASTM F1303-04, Standard Specification for Sheet Vinyl Floor Covering with Backing

.6 ASTM F1482-21, Standard Practice for Installation and Preparation of Panel Type Underlayments to Receive Resilient Flooring

.7 ASTM F1859-21a, Standard Specification for Rubber Sheet Floor Covering Without Backing

.8 ASTM F1860-21a, Standard Specification for Rubber Sheet Floor Covering With Backing

.9 ASTM F1861-21, Standard Specification for Resilient Wall Base

.10 ASTM F1869-22, Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

.11 ASTM F1913-19, Standard Specification for Vinyl Sheet Floor Covering Without Backing

.12 ASTM F2034-18, Standard Specification for Sheet Linoleum Floor Covering

.13 ASTM F2169-15, Standard Specification for Resilient Stair Treads

.14 ASTM F2170-19a, Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

.15 ASTM F3010-18, Standard Practice for Two-Component Resin Based Membrane-Forming Moisture Mitigation Systems for Use Under Resilient Floor Coverings

.16 ASTM F3041-14, Standard Specification for Bonded Rubber Crumb Floor Coverings

.3 CSA Group (CSA):

.1 CSA B651-18, Accessible design for the built environment

.4 EOS/ESD Association (ESD):

.1 ANSI/ESD STM7.1-20, For the Protection of Electrostatic Discharge Susceptible Items-Flooring Systems Resistive Characterization

.5 General Services Administration, Federal Test Standard (FTS):

.1 FTS 101C, Method 4046, Electrostatic Properties of Materials

.6 National Floor Covering Association of Canada (NFCA):

.1 NFCA Floor Covering Reference Manual

.7 National Floor Safety Institute (NFSI):

.1 ANSI/NFSI B101.1-2022, Test Method for Measuring the Wet SCOF of Hard-Surface Walkways

.2 ANSI/NFSI B101.3-2022, Test Method for Measuring the Wet DCOF of Hard Surface Walkways

.8 ULC Standards (ULC):

.1 CAN/ULC-S102.2:2018, Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Pre-Installation Meeting:

.1 Conduct a site meeting in accordance with Section 01 31 19 – Project Meetings, attended by Departmental Representative, and related Subcontractors to:

.1 verify project requirements,

.2 review delivery, storage, and handling requirements,

.3 review installation and substrate conditions,

.4 confirm complex flooring patterns,

.5 coordinate with other Subcontractors,

.1 coordinate connection of copper grounding strips with electrical installers,

.6 review manufacturer's instructions and warranty requirements, and

.7 review NFCA Quality Assurance Program (QAP) inspection procedures and reporting , including timing of reports for multi-phase projects.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit the following action submittals before starting work of this Section:

.1 Product Data: Product literature and data sheets, including product characteristics, performance criteria, physical sizes, finishes, and limitations.

.2 Shop Drawings: Show layout and locations of seams, edges, columns, doorways, enclosing partitions, and cut-outs.

.3 Selection Samples: Full range of samples for each Product specified, representing available colours, patterns, textures, profiles, and finishes.

.1 100 mm x 100 mm manufacturer's standard size samples of each type of resilient sheet flooring.

.2 Small sections of resilient base, full profile height.

.3 50 mm long samples of stair nosing, full profile width.

.4 Full-depth samples of stair tread.

.5 Full-height samples of stair riser.

.6 100 mm long sections of sheet flooring welding beads.

.7 Manufacturer's standard size samples of other accessories exposed to view.

.4 Site Quality Control Submittals: In accordance with NFCA QAP procedures and requirements.

.1 Submit floor pre-installation test results prior to beginning flooring installation. Compare tested moisture vapour emission rates and alkalinity with manufacturer's requirements for each flooring type.

.2 Submit manufacturer's recommended corrective actions when pre-installation test results deviate from manufacturer's installation requirements.

.3 Submit the following informational submittals as work progresses:

.1 Manufacturer's Instructions: Indicate special storage and handling requirements, installation instructions and sequence, and cleaning procedures. Keep a copy on site during installation.

.2 Manufacturer's Site Reports: Manufacturer's reports confirming work of this Section complies with manufacturer's requirements for handling installation protection and cleaning, as specified in SITE QUALITY CONTROL in this Section. Submit within 5 working days of site visit.

1.6 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 – Closeout Submittals.

.2 Operation and Maintenance Data: Include the following in the operation and maintenance manual:

.1 Manufacturer's maintenance instructions.

.2 Recommended cleaning materials and methods.

.3 Bonds: Two-year maintenance bond for 100% value of work of this Section.

.4 Warranty Documentation: Submit manufacturer's warranties.

1.7 MAINTENANCE MATERIAL SUBMITTALS

.1 Extra Stock Materials: In accordance with Section 01 78 00 – Closeout Submittals.

.2 Supply a minimum 2% of each colour, pattern, texture, and type of resilient sheet flooring material in full roll width. Also supply sheet flooring off-cuts where size is 450 mm x 450 mm or larger.

.1 Label each roll of sheet flooring matching designations indicated on Drawings.

.3 Supply a minimum 4 L of each adhesive. Store in sealed, labelled containers.

.4 Supply a minimum 6 m of resilient base in each specified colour and height.

1.8 QUALITY ASSURANCE

.1 Perform work of this Section in accordance with NFCA QAP requirements.

.2 Mock-Ups: Install mock-ups in accordance with Section 01 43 00 – Quality Assurance.

.1 Install mock-up of resilient sheet flooring; include flooring seam and integral cove base at an outside wall corner..

.2 Minimum size: 100 m^2.

.3 Location: Acceptable to the Departmental Representative.

.4 Acceptable mock-ups may not remain as part of the Work.

1.9 DELIVERY, STORAGE, AND HANDLING

.1 Perform in accordance with Section 01 61 00 – Common Product Requirements.

.1 Protect adhesives, fillers, and sealants from freezing.

1.10 SITE CONDITIONS

.1 Ambient Conditions: Maintain specified ambient conditions, or more stringent manufacturer requirements, for 72 hours before installation, continuously during installation, and 72 hours after installation.

.1 Ambient room temperature: 18°C to 29°C.

.2 Floor substrate temperature: Minimum 15°C.

.3 Relative humidity: 40% to 60%

.2 Extra Ventilation: Provide high ventilation rate, maximizing outside air, during installation, and for 48 to 72 hours after installation. If possible, vent directly to outside. Prevent contaminated air recirculation through interior air distribution system. Maintain extra ventilation for at least one month following building occupancy.

1.11 WARRANTY

.1 Manufacturer Warranty: 5-year commercial warranty.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

.1 Comply with CAN/ULC-S102.2 for required flame-spread ratings labelled and listed by ULC Standards or another agency acceptable to the authority having jurisdiction.

2.2 RESILIENT SHEET FLOORING MATERIALS

.1 Sheet Vinyl Without Backing: To ASTM F1913, homogeneous construction.

.1 Thickness: 2.0 mm nominal.

.2 Colour:

.1 See Finishes Plan and Legends on drawings for more information on the standard of acceptance for the floor finishes.

.3 Slip resistance:

.1 Clip resistance: R9

2.3 RESILIENT BASE MATERIALS

.1 Rubber Wall Base:

.1 Height: 100mm

.2 Thickness: 3mm

.3 Colour:

.1 See Finishes Plan and Legends on drawings for more information on the standard of acceptance for the floor finishes.

.4 Roll Size: 36.6m

.5 Use same dye lot for entire project.

.2 Resilient Base: To ASTM F1861.

2.4 ACCESSORIES

.1 Subfloor Filler and Leveller: White premixed latex requiring only water to produce cementitious paste, as recommended by resilient sheet flooring manufacturer.

.2 Primer: As recommended by resilient sheet flooring manufacturer for site conditions and application.

.3 Adhesives:

.1 Flooring Adhesives: As recommended by resilient sheet flooring manufacturer for site conditions and application.

.2 Resilient Base Adhesives: As recommended by resilient base manufacturer for site conditions and application.

.4 Heat Welding Bead: Solid strand product recommended by resilient sheet flooring manufacturer for heat welding seams.

.1 Colour and Pattern: As selected by Departmental Representative.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verify conditions in accordance with Section 01 71 00 – Examination and Preparation, and:

.1 verify substrates are clean, and free of cracks, ridges, depressions, scale, and foreign materials;

.2 verify subfloor is free of squeaks when walking across floor; and

.3 verify painting and ceiling work is complete.

.2 Pre-Installation Testing:

3.2 PREPARATION

.1 Demolition: Remove existing flooring materials in accordance with Section 02 41 19 – Selective Demolition.

.2 Prepare concrete floor substrates in accordance with ASTM F710.

.1 Prepare concrete floor substrates exceeding manufacturer's vapour emission recommendations in accordance with ASTM F3010.

.3 Prepare wood subfloors in accordance with ASTM F1482.

.4 Clean floor of dust, mould, mildew, alkaline salts, laitance, concrete film-forming curing compounds, paint, solvents, wax, oil, grease, residual adhesive, adhesive removing compounds, sealants, soap, and other foreign material.

.5 Fill low spots, cracks, joints, holes, and other defects with subfloor filler. Trowel and float to leave smooth, flat hard surface. Prohibit traffic until filler is dry and cured.

.6 concrete slab to resilient flooring manufacturer's recommendations.

.7 Do not use permanent markers on floor substrates.

.8 Apply copper grounding strips to substrate and connect to pre-determined grounding point. Coordinate connection with Departmental Representative and electrical Subcontractors.

3.3 RESILIENT SHEET FLOORING INSTALLATION

.1 Apply adhesive uniformly using manufacturer's recommended trowel, followed by a roller or similar tool to knock down trowel ridges and eliminate them from telegraphing through finished flooring. Avoid spreading more adhesive than can be covered by resilient sheet flooring before initial adhesive sets. Applying adhesive only at perimeter is not acceptable.

.2 Lay with seams in direction of traffic to minimize number of seams.

.1 Border Widths: Minimum 1/3 of full material width.

.3 Double cut sheet joints and continuously heat weld according to manufacturer's instructions.

.4 Do not install over building expansion joints.

.5 Roll resilient sheet flooring, as installation progresses and after installation, to remove air bubbles and promote full adhesion. Use a minimum 45 kg roller, or other weight in accordance with manufacturer's instructions.

.6 Promptly remove excess adhesive.

.7 Cut flooring neatly around fixed objects.

.8 When made necessary by material width or roll length, locate cross-seams and seams at doors and pivot points in accordance with reviewed shop drawings.

.9 Install feature strips where indicated. Fit joints tightly.

.10 Install pan-type floor access covers. Maintain continuity of floor pattern.

.11 Install continuously through areas to receive built-in furniture.

.12 Install into floor drain clamping rings, and down into trench drains, where applicable. Cutting and caulking of such flooring flush with floor drain grate or trim is not acceptable and flooring will be rejected.

.13 Terminate flooring under centre line of door in openings where adjacent floor finish materials or colours are dissimilar.

.14 Install metal edge strips at unprotected and exposed edges where sheet flooring terminates.

3.4 RESILIENT BASE INSTALLATION

.1 Install resilient bases where indicated on Drawings.

.2 Lay out resilient base to minimize joints.

.3 Clean substrate and apply one coat of adhesive.

.4 Set resilient base against wall and floor surfaces tightly by using 3 kg hand roller.

.5 Scribe, cut, and fit resilient base to door frames and other obstructions.

.1 Install preformed end stops at flush door frames.

.6 Tolerances: Install straight and level, within 1:1000 variation.

3.5 PROTECTION

.1 Prohibit traffic on resilient sheet flooring for a minimum 48 hours after installation.

.2 Protect resilient sheet flooring until completion and acceptance of all work and deliveries.

.3 Protect floors under heavy traffic, rolling loads, or pallet jacks with minimum 6 mm thick temporary hardboard panels. Sweep or vacuum resilient sheet flooring before installing panels.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 45 00 - Quality Control.

.3 Section 01 61 00 - Common Product Requirements

.4 Section 01 74 19 - Waste Management and Disposal.

.5 Section 01 78 00 - Closeout Submittals.

.6 Section 08 11 13 - Hollow Metal Doors and Frames.

.7 Section 08 31 00 - Access Doors and Panels

.8 Section 09 21 16 - Gypsum Board Assemblies

.9 Section 09 23 00 - Gypsum Plastering

1.2 REFERENCE STANDARDS

.1 Environmental Protection Agency (EPA)

- .1 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, EPA Method 24-Surface Coatings.
- .2 SW-846, Test Methods for Evaluating Solid Waste: Physical/Chemical Methods.

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

- .1 Safety Data Sheets (SDS).

.3 Master Painters Institute (MPI)

- .1 The Master Painters Institute (MPI)/Architectural Painting Specification Manual (ASM)-current edition.
- .2 Standard GPS-1-12, MPI Green Performance Standard.
- .3 Standard GPS-2-12, MPI Green Performance Standard.

.4 National Research Council Canada (NRC)

- .1 National Fire Code of Canada 2015 (NFC).

.5 Society for Protective Coatings (SSPC)

- .1 SSPC Painting Manual, Volume Two, 8th Edition, Systems and Specifications Manual.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Scheduling:

- .1 Submit work schedule for various stages of painting to Departmental Representative for review. Provide schedule minimum of 48 hours in advance of proposed operations.

.2 Obtain written authorization from Departmental Representative for changes in work schedule.

.3 Schedule new additions to existing building coordinate painting operations with other trades.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data:

.1 Provide manufacturer's instructions, printed product literature and data sheets for paint and paint products and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit 2 copies of WHMIS SDS in accordance with Section 01 35 29.06 – Health and Safety Requirements.

.3 Confirm products to be used are in MPI's approved product list.

.3 Upon completion, provide records of products used. List products in relation to finish system and include the following:

.1 Product name, type and use.

.2 Manufacturer's product number.

.3 Colour number s.

.4 MPI Environmentally Friendly classification system rating.

.5 Manufacturer's Safety Data Sheets (SDS).

.4 Samples:

.1 Submit full range colour sample chips to indicate where colour availability is restricted.

.2 Submit duplicate mm sample panels of each paint with specified paint or coating in colours, gloss/sheen and textures required to MPI Architectural Painting Specification Manual standards submitted on following substrate materials:

.1 13 mm for finishes over gypsum board and other smooth surfaces.

.3 Retain reviewed samples on-site to demonstrate acceptable standard of quality for appropriate on-site surface.

1.5 CLOSEOUT SUBMITTALS

.1 Provide in accordance with Section 01 78 00 – Closeout Submittals.

.2 Operation and Maintenance Data: Provide operation and maintenance data for painting materials for incorporation into manual.

.3 Include:

.1 Product name, type and use.

.2 Manufacturer's product number.

.3 Colour number s.

.4 MPI Environmentally Friendly classification system rating.

1.6 MAINTENANCE MATERIAL SUBMITTALS

.1 Extra Stock Materials:

.1 Provide maintenance materials in accordance with Section 01 78 00 – Closeout Submittals.

.2 Submit four litre can of each type and colour of finish coating. Identify colour and paint type in relation to established colour schedule and finish system.

1.7 QUALITY ASSURANCE

.1 Qualifications:

.1 Contractor: to have a minimum of 5 years proven satisfactory experience. When requested, provide list of last 3 comparable jobs including, job name and location, specifying authority, and project manager.

.2 Qualified journeypersons as defined by local jurisdiction to be engaged in painting work.

.3 Apprentices: may be employed provided they work under direct supervision of qualified journeyperson in accordance with trade regulations.

.4 Conform to latest MPI requirements for exterior painting work including preparation and priming.

.5 Materials: in accordance with MPI Painting Specification Manual "Approved Product" listing and from a single manufacturer for each system used.

.6 Retain purchase orders, invoices and documents to prove conformance with noted MPI requirements when requested by Departmental Representative.

.7 Standard of Acceptance:

.1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.

.2 Soffits: no defects visible from floor at 45 degrees to surface when viewed using final lighting source.

.3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.1 Labels: to indicate:

.1 Type of paint or coating.

.2 Compliance with applicable standard.

.3 Colour number in accordance with established colour schedule.

.3 Storage and Handling Requirements:

.1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Observe manufacturer's recommendations for storage and handling.

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

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

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

.6 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

.1 Environmental Performance Requirements:

.1 Provide paint products meeting MPI"Environmentally Friendly" E1 ratings based on VOC (EPA Method 24) content levels

2.2 MATERIALS

.1 Only Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project

.2 Provide paint materials for paint systems from single manufacturer.

.3 Only qualified products with E2 OR E3"Environmentally Friendly" rating are acceptable for use on this project.

.4 Conform to latest MPI requirements for interior painting work including preparation and priming

.5 Use MPI listed materials having minimum E2 oe E3 rating where indoor air quality (odour) requirements exist.

.6 Paints, coatings, adhesives, solvents, cleaners, lubricants, and other fluids to be:

.1 Be ,Water-based, Water soluble, and Water clean-up].

.2 Be non-flammable.

.3 Be manufactured without compounds which contribute to ozone depletion in the upper atmosphere.

.4 Be manufactured without compounds which contribute to smog in the lower atmosphere.

.5 Do not contain methylene chloride, chlorinated hydrocarbons, toxic metal pigments.

2.3 COLOURS

.1 See Finish Plans and Legends on drawings for paint colours..

.2 Selection of colours will be from manufacturers full range of colours.

.3 Where specific products are available in restricted range of colours, selection based on limited range.

2.4 MIXING AND TINTING

.1 Perform colour tinting operations prior to delivery of paint to site. Obtain written approval from Departmental Representative for tinting of painting materials.

.2 Mix paste, powder or catalyzed paint mixes in accordance with manufacturer's written instructions.

.3 Use and add thinner in accordance with paint manufacturer's recommendations. Do not use kerosene or similar organic solvents to thin water-based paints.

.4 Thin paint for spraying in accordance with paint manufacturer's instructions.

.5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity. Strain as necessary.

2.5 GLOSS/SHEEN RATINGS

.1

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

.2 Gloss level ratings of painted surfaces shall be as specified herein.

2.6 INTERIOR PAINTING SYSTEMS

.1 Galvanized metal: doors, frames, railings, misc. steel, pipes, overhead decking, and ducts.

.1 INT 5.3A-Latex insert gloss level (over cementitious primer) finish.

.2 Plaster and gypsum board: gypsum wallboard, drywall, "sheet rock type material", and textured finishes:

.1 INT 9.2A-Latex G5 finish (over latex primer/sealer).

.2 INT 9.2A-Latex G5 finish (over latex sealer) for walls.

.3 INT 9.2A-Latex G1 finish (over latex sealer) for ceilings.

2.7 SOURCE QUALITY CONTROL

.1 Perform following tests on each batch of consolidated post-consumer material before surface coating is reformulated and canned. Testing by laboratory or facility which has been accredited by Standards Council of Canada.

.1 Lead, cadmium and chromium are to be determined using ICP-AES (Inductively Coupled Plasma-Atomic Emission Spectroscopy) technique no. 6010 as defined in EPA SW-846

.2 Mercury is to be determined by Cold Vapour Atomic Absorption Spectroscopy using Technique no. 7471 as defined in EPA SW-846

.3 Organochlorines and PCBs are to be determined by Gas Chromatography using Technique no. 8081 as defined in EPA SW-846

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 GENERAL

.1 Perform preparation and operations for interior painting in accordance with MPI Architectural Painting Specifications Manual except where specified otherwise

.2 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.3 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable to be painted in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

.2 Interior repainting work: inspected by MPI Accredited Paint Inspection Agency (inspector) acceptable to specifying authority and local Painting Contractor's Association. Painting contractor to notify Paint Inspection Agency minimum of one week prior to commencement of work and provide copy of project repainting specification and Finish Schedule.

.3 Interior surfaces requiring repainting: inspected by both painting contractor and Paint Inspection Agency who will notify Departmental Representative in writing of defects or

problems, prior to commencing repainting work, or after surface preparation if unseen substrate damage is discovered.

.4 Conduct moisture testing of surfaces to be painted using properly calibrated electronic moisture meter, except test concrete floors for moisture using simple "cover patch test". Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.

.5 Maximum moisture content as follows:

.1 Stucco, plaster and gypsum board: 12%.

.2 Concrete: 12%.

.3 Clay and Concrete Block/Brick: 12%.

.4 Hard Wood: 15%.

.5 Soft Wood: 17%.

3.4 PREPARATION

.1 Protection (not applicable to new painting work):

.1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore surfaces as directed by Departmental Representative.

.2 Protect items that are permanently attached such as Fire Labels on doors and frames.

.3 Protect factory finished products and equipment.

.2 Surface Preparation (not applicable to new painting work):

.1 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.

.2 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.

.3 Place "WET PAINT" signs in occupied areas as painting operations progress. Signs to approval of Departmental Representative.

.3 Clean and prepare surfaces in accordance with MPI Architectural Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:

.1 Remove dust, dirt, and other surface debris by vacuuming, wiping with dry, clean cloths or compressed air.

.2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.

.3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.

.4 Allow surfaces to drain completely and allow to dry thoroughly.

.5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.

.6 Use trigger operated spray nozzles for water hoses.

.7 Many water-based paints cannot be removed with water once dried. Minimize use of mineral spirits or organic solvents to clean up water-based paints.

.4 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.

.5 Where possible, prime non-exposed surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.

.1 Apply sealer to MPI #36 over knots, pitch, sap and resinous areas

.2 Apply wood filler to nail holes and cracks.

.3 Tint filler to match stains for stained woodwork.

.6 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.

.7 Touch up of shop primers with primer as specified.

.8 Do not apply paint until prepared surfaces have been accepted by Departmental Representative

3.5 EXISTING CONDITIONS

.1 Conduct moisture testing of surfaces to be painted using properly calibrated electronic moisture meter, except test concrete floors for moisture using simple "cover patch test" and report findings to Departmental Representative. Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.

.2 Maximum moisture content as follows:

.1 Stucco: 12%.

.2 Concrete: 12%.

.3 Clay and Concrete Block/Brick: 12%.

.4 Hard Wood: 15%.

.5 Soft Wood: 17%.

3.6 APPLICATION

.1 Method of application to be as approved by Departmental Representative. Apply paint by brush or roller. Conform to manufacturer's application instructions unless specified otherwise.

.2 Brush and Roller Application:

.1 Apply paint in uniform layer using brush and/or roller type suitable for application.

.2 Work paint into cracks, crevices and corners.

.3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.

.4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces free of roller tracking and heavy stipple.

.5 Remove runs, sags and brush marks from finished work and repaint.

.3 Spray application:

.1 Provide and maintain equipment that is suitable for intended purpose, capable of atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.

.2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.

.3 Apply paint in uniform layer, with overlapping at edges of spray pattern. Back roll first coat application.

.4 Brush out immediately all runs and sags.

.5 Use brushes and rollers to work paint into cracks, crevices and places which are not adequately painted by spray.

.4 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access.

.5 Apply coats of paint continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.

.6 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.

.7 Sand and dust between coats to remove visible defects.

.8 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.

.9 Finish inside of cupboards and cabinets as specified for outside surfaces.

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

.11 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

.12 Wood, drywall, plaster, stucco, concrete, concrete masonry units and brick; if sprayed, must be back rolled.

3.7 SITE TOLERANCES

.1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.

.2 Ceilings: no defects visible from floor at 45 degrees to surface when viewed using final lighting source.

.3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

3.8 SITE QUALITY CONTROL

.1 Interior painting and decorating work to be inspected by a MPI Accredited Paint Inspection Agency (inspector) acceptable to specifying authority and local Painting Contractor's Association. Painting contractor will notify Paint Inspection Agency a minimum of one week prior to commencement of work and provide a copy of project painting specification, plans and elevation drawings (including pertinent details) as well as a Finish Schedule.

.2 Interior surfaces requiring painting to be inspected by Paint Inspection Agency who will notify Departmental Representative and GeneralContractor in writing of defects or problems, prior to commencing painting work, or after prime coat shows defects in substrate.

.3 Where "special" painting, coating or decorating system applications (i.e. elastomeric coatings) or non-MPI listed products or systems are to be used, paint or coating manufacturer will provide as part of this work, certification of surfaces and conditions for specific paint or coating system application as well as on site supervision, inspection and approval of their paint or coating system application as required at no additional cost to Departmental Representative.

.4 Standard of Acceptance:

.1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.

.2 Ceilings: no defects visible from floor at 45 degrees degrees to surface when viewed using final lighting source.

.3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

.5 Field inspection of painting operations to be carried out be independent inspection firm as designated by Departmental Representative.

.6 Advise Departmental Representative when surfaces and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.

.7 Cooperate with inspection firm and provide access to areas of work.

.8 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Departmental Representative.

3.9 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 – Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 – Cleaning.

.3 Waste Management: separate waste materials for reuse in accordance with Section 01 74 19 – Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 78 00 - Closeout Submittals.

1.2 REFERENCE STANDARDS

.1 Aluminum Association (AA)

.1 AA DAF 45-03(R2009), Designation System for Aluminum Finishes.

.2 ASTM International

.1 ASTM A123/A123M-13, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.2 ASTM A653/A653M-13, Standard Specification for Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process.

.3 ASTM B32-08, Standard Specification for Solder Metal.

.4 ASTM B456-11e1, Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.

.3 Canada Green Building Council (CaGBC)

.1 LEED Canada-NC Version 1.0-2004, LEED (Leadership in Energy and Environmental Design):Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum 2007).

.2 LEED Canada-CI Version 1.0-2007, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.

.3 LEED Canada 2009 for Design and Construction-2010, LEED Canada 2009 for Design and Construction Leadership in Energy and Environmental Design Green Building Rating System Reference Guide.

.4 LEED Canada for Existing Buildings, Operations and Maintenance-2009, LEED Canada 2009 Leadership In Energy and Environmental Design Green Building Rating System Reference Guide.

.4 Canadian General Standards Board (CGSB)

.1 CGSB 31-GP-107Ma-90, Non-Inhibited Phosphoric Acid Base Metal Conditioner and Rust Remover.

.2 CGSB 41-GP-6M-1983, Sheets, Thermosetting Polyester Plastics, Glass Fibre Reinforced.

.5 CSA Group (CSA)

.1 CSA W47.2-11, Certification of Companies for Fusion Welding of Aluminum.

.2 CSA W59-13, Welded Steel Construction (Metal Arc Welding).

.3 CSA W59.2-M1991(R2013), Welded Aluminum Construction.

.6 Canadian Sheet Steel Building Institute (CSSBI)

.1 CSSBI SSF 6-2012, Sheet Steel Facts #6, Metallic Coated Sheet Steel for Structural Building Products.

.7 Green Seal (GS)

.1 GS-11-2013, Standard for Paints and Coatings.

.2 GS-36-2013, Adhesives for Commercial Use.

.8 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Safety Data Sheets (SDS).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for signage and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of NL, Canada.

.2 Submit catalogue sheets and full size templates.

.3 Indicate materials, thicknesses, sizes, finishes, colours, construction details, removable and interchangeable components, access panels, mounting methods, schedule of signs.

.4 Submit drawn-to-scale details for individually fabricated or incised lettering indicating word and letter spacing.

.5 Full or ½ scale artwork for pictographs used in Transport Canada Buildings will be provided.

.4 Samples:

.1 Submit duplicate representative sample of each type sign, sign image and mounting method including, but not limited to: graphics, cast letters, sign box installation method, channel letters, and wall plates fixed mounting installation method.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 – Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for illuminated signs for incorporation into manual.

1.5 QUALITY ASSURANCE

.1 Welding Certification in accordance with CSA W47.2.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect specified materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 MATERIALS

.1 See **Appendix A - Memorial University Interior Signage Manual 2.0** for standard of signage indicated on drawings.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for signage installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Manufacturer's Instructions: compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheets.

.2 Erect and secure signs plumb and level at elevations as directed by Departmental Representative.

.3 Comply with sign manufacturer's installation instructions and approved shop drawings.

.4 Mechanical attachment:

.1 To concrete or solid masonry: use lag screws and expansion bolts or screws and fibre plugs, as appropriate for stresses involved.

.2 To hollow masonry: use toggle bolts or equivalent.

.3 To steel: use bolts with nut and lock washers, self-tapping screws.

.1 Do steel welding to CSA W59 and aluminum welding to CSA W59.2.

.2 Finish exposed welds flush and smooth.

.4 To wood: use screws.

.5 Secure into framing members behind stud walls or above ceilings.

.6 Mechanical fasteners on exterior: non-staining, non-ferrous type.

.7 Fabricate special fasteners as required for installation conditions.

.8 Mechanical fasteners and methods of attachment subject to Departmental Representative's approval.

.1 Obtain Departmental Representative's approval before fixing to structural steel.

.5 Adhesive attachment:

.1 Use self-stick adhesive foam tape to manufacturer's instructions to fix sign and prevent "rocking".

.2 Keep tape maximum 1.6 mm from edges.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 – Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 – Cleaning.

.1 Leave signs clean.

.2 Remove debris from interior of sign boxes.

.3 Touch up damaged finishes.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.3 Section 06 08 99 - Rough Carpentry for Minor Works

.4 Section 09 21 16 - Gypsum Board Assemblies.

.5 Section 09 22 16 - Non-Structural Metal Framing

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for wall and corner guards and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit 2 copies of WHMIS SDS in accordance with Section 01 35 29.06 – Health and Safety Requirements. Indicate VOC's for material as follows:

.1 Caulking materials during application and curing.

.2 Adhesives.

.3 Installation Drawings:

.1 Indicate on drawings large scale details, materials, finishes, dimensions, anchorage and assembly.

.4 Samples:

.1 Submit duplicate 300 mm long samples of profiles and colours for corner guards trolley rail.

1.3 QUALITY ASSURANCE

.1 Test Reports:

.1 Submit certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates:

.1 Submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect wall and corner guards from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Clear Polycarbonate corner guard with a 3 mm radius, length to be 1220mm. Standard of acceptance, Pawling Corporation, model # CG-24.

2.2 ACCESSORIES

.1 Fasteners: self-tapping stainless steel, countersunk, flush mounting.

.2 Adhesive: water resistant type as recommended by manufacturer for substrate.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wall and corner guards installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 MANUFACTURER'S INSTRUCTIONS

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

3.3 INSTALLATION

.1 Install units on solid backing and erect with materials and components straight, tight and in alignment.

.2 Adhere wall guards as indicated by manufacturer, straight and level to variation plus or minus 3 mm over 3000 mm straight edge, non-cumulative.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 – Cleaning.

.1 Leave Work area clean at end of each day.

.2 Perform cleaning after installation to remove construction and accumulated environmental dirt.

.3 Clean surfaces after installation using manufacturer's written recommended cleaning procedures.

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

.5 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 – Cleaning.

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by wall and corner guards installation.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 61 00 – Common Product Requirement.

.3 Section 01 74 19 - Waste Management and Disposal.

.4 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 Section 01 74 19 - Waste Management and Disposal, and with the Waste Reduction Workplan.

.2 Remove from site and dispose of all 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 as approved by Owner's Representative.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirement.

.2 Apply temporary protective coating to finished surfaces. Remove coating after erection. Do not use coatings that will become hard to remove or leave residue.

.3 Leave protective coating in place until final cleaning of building.

PART 2 PRODUCTS

2.1 MULTI-PURPOSE DRY CHEMICAL EXTINGUISHERS (TYPE B)

.1 Stored pressure rechargeable type, hose and shut-off nozzle, Squeeze grip operation, positive on/off operation, pull pin safety locks, waterproof stainless steel gauge, glossy corrosion resistant red polyester powder paint finish, Ammonium phosphate powder. ULC labelled for A, B and C Class protection. Size 4.5 kg with a rating of 4-A: 60-B.C. Extinguisher dimensions 140 mm diameter x 500 mm high. Extinguisher range of 3 m to 4.5 m and a discharge time of 20 to 22 seconds.

.1 Acceptable Product: National Fire Equipment Ltd. Model ABC-10G, Badger, Flag, or approved equal.

2.2 EXTINGUISHER WALL CABINETS

.1 Provide and install 368 mm x 762 mm x 101 mm semi-recessed fire extinguisher cabinet constructed of 18 ga. (1.19 mm) steel tub and 14 ga. (2 mm) steel door and trim with 25 mm return frame, a full length semi-concealed piano hinge and flush stainless steel door latch. Front section to have full 51 mm adjustment to wall. Viewing area to be provided with a plastic bubble canopy. Entire cabinet finished in baked enamel paint.

.2 Acceptable Product: National Fire Equipment Ltd. Model CE-950-1, Ansul, Badger, Flag, or approved equal.

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 on wall brackets as indicated.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 74 19 - Waste Management and Disposal.

.3 Section 01 78 00 – Closeout Submittals.

.4 Section 09 21 16 – Gypsum Board Assemblies.

1.2 SUBMITTALS

.1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit catalogue details for each type of door illustrating profiles, dimensions and methods of assembly.

1.3 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with municipal regulations.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Apply temporary protective coating to finished surfaces. Remove coating after erection. Do not use coatings that will become hard to remove or leave residue.

.2 Leave protective coating in place until final cleaning of building.

PART 2 PRODUCTS

2.1 ACCESS DOORS

.1 Sizes: Except as indicated otherwise, to be minimum sizes as follows:

.1 For body entry: 600 x 600 mm.

.2 For hand entry: 300 x 300 mm.

.2 Construction: Rounded safety corners, concealed hinges, screwdriver latch, anchor straps, able to open 180º.

.3 Materials

.1 Tiled or marble surfaces and other special areas: 304 Stainless steel with brushed satin or polished finish as directed by Engineer.

.2 Other areas: Prime coated steel. Finish painting of primed access doors shall be the responsibility of the General Contractor.

.4 Access doors shall be supplied by the Mechanical Contractor for installation by the General Contractor.

.5 Acceptable Product: MIFAB, Zurn, or approved equal.

2.2 EXCLUSIONS

.1 Lay-in tile ceilings: use unobtrusive identification locators.

2.3 FIRE RATED ACCESS DOORS

.1 Provide fire-rated access doors where access to concealed mechanical services is required in fire-rated walls and ceiling.

.2 Maintain integrity of fire-rated separations.

.3 Construction:

.1 Door and trim: 18 ga. steel.

.2 Return frame: 16 ga. steel.

.3 Insulation: 47.6 mm thick mineral wool contained within door cavity.

.4 Hinge: fully concealed, pivot type hinge, allowing opening to 170 degrees.

.5 Latches: self-latching direct action lock, opposite hinge which will accept both key and knurled knob which shall be included with each door.

.6 Inside panel release.

.7 Finish: electrostatically-applied, baked grey enamel, over phosphate treated steel. This will serve as the prime coat. Finish paint coat to be applied in the field by the General Contractor.

.8 Provide Type 304 stainless steel access doors with #4 satin finish where fire-rated access doors are installed in special areas such as tile or marble surfaces.

.9 Acceptable Product: National Fire Equipment Model WB-FR standard access door, Zurn, MIFAB, or approved equal.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Installation:

.1 Drywall surfaces: to Section 09 21 16 – Gypsum Board Assemblies.

3.2 LOCATION

.1 Location: Ensure that equipment is within view and accessible for operating, inspecting, adjusting, servicing without using special tools.

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 45 00 - Quality Control.

.4 Section 01 74 19 - Waste Management and Disposal.

.5 Section 01 78 00 - Closeout Submittals.

.6 Section 09 91 23 - Interior Painting.

.7 Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

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's Representative.

.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's Representative 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's Representative for approval. Submission of individual data will not be accepted unless directed by Owner's Representative.

.2 Make changes as required and re-submit as directed by Owner's Representative.

.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's Representative will provide 1 set of mechanical drawing 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's Representative for approval and make corrections as directed.

.4 Perform testing, adjusting and balancing for HVAC using as-built drawings.

.5 Submit completed Mechanical AutoCAD as-built drawings CD 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.

1.4 MAINTENANCE

.1 Furnish spare parts in accordance with Section 01 78 00 - Closeout Submittals.

.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 19 - 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 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.

3.2 CLEANING

.1 Clean interior and exterior of all systems including strainers.

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 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.

3.4 DEMONSTRATION

.1 Owner's Representative 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's Representative may record these demonstrations on video tape for future reference.

3.5 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 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 19 - Waste Management and Disposal.

.5 Section 01 78 00 - Closeout Submittals.

.6 Section 09 91 23 - Interior Painting.

.7 Section 10 44 16.19 - Fire Extinguishers and Safety Blankets.

.8 Section 21 13 13 - Wet Pipe Sprinkler Systems.

1.2 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop drawings: submit drawings stamped and signed by engineer registered in the Province of Newfoundland and Labrador.

.3 Shop drawings to show:

.1 Mounting arrangements.

.2 Operating and maintenance clearances.

.4 Shop drawings and product data accompanied by:

.1 Manufacturer to certify current model production.

.2 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's Representative before final inspection.

.3 Operation data to include:

.1 Operation instruction for systems and component.

.2 Description of actions to be taken in event of equipment failure.

.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.

.6 Approvals:

.1 Submit 2 copies of draft Operation and Maintenance Manual to Owner's Representative for approval. Submission of individual data will not be accepted unless directed by Owner's Representative.

.2 Make changes as required and re-submit as directed by Owner's Representative.

.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's Representative will provide 1 set of mechanical drawing 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 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).

.2 Submit to Owner's Representative for approval and make corrections as directed.

.3 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

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.

1.4 MAINTENANCE

.1 Furnish spare parts in accordance with Section 01 78 00 - Closeout Submittals.

.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.

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 19 - 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 PAINTING, REPAIRS AND RESTORATION

.1 Do painting in accordance with Sections 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.

3.2 CLEANING

.1 Clean interior and exterior of all systems including strainers.

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 Submit tests as specified in other sections of this specification.

3.4 DEMONSTRATION

.1 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.2 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

.3 Instruction duration time requirements as specified in appropriate sections.

.4 Owner's Representative may record these demonstrations on video tape for future reference.

3.5 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 wet pipe sprinkler system for heated areas.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 35 29.06 - Health and Safety Requirements.

.3 Section 01 61 00 - Common Product Requirements.

.4 Section 01 74 19 - Waste Management and Disposal.

.5 Section 01 78 00 - Closeout Submittals.

.6 Section 23 05 05 - Installation of Pipework.

.7 Section 23 05 19.01 - Thermometers and Pressure Gauges - Piping Systems.

1.3 REFERENCES

.1 American National Standards Institute/National Fire Prevention Association (ANSI/NFPA)

.1 ANSI/NFPA 13, Installation of Sprinkler Systems.

.2 ANSI/NFPA 25, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

1.4 DESIGN REQUIREMENTS

.1 Design system in accordance with ANSI/NFPA 13, using following parameters:

.1 Hazard:

.1 To suit occupancy as indicated.

.2 Pipe size and layout:

.3 Hydraulic design using occupancy hazard fire control approach.

.4 Sprinkler head layout: to ANSI/NFPA 13.

.2 Water supply:

.1 Engineer shall provide water supply information to the fire protection contractor for purposes of hydraulic analysis.

.3 System type:

.1 Wet sprinkler system:

.1 Occupancy hazards shall be as outlined on the drawings.

.2 No combustible sprinkler pipe shall be allowed to be used on this project.

.3 The water supply for sprinklers shall be that required to supply the maximum calculated sprinkler demand plus the inside/outside hose stream allowance as per NFPA-13 requirements.

.4 A hydraulic calculation shall be done for the design area on Pav C Level 5.

.5 Electrical rooms, server rooms, telephone rooms and data closets shall be sprinklered.

.6 All electrical equipment shall be supplied with drip shields by the Electrical Contractor.

.7 All sprinklers in water entry rooms, mechanical rooms, janitor rooms, electrical rooms and other areas subject to potential damage shall be outfitted with wire guards.

.8 Sprinklers shall be installed below all obstructions in excess of 1200 mm in width such as ductwork.

.9 All exposed sprinkler piping in service spaces such as mechanical, janitor and electrical rooms shall be painted along its entire length. The colour shall be red and the painting shall be the responsibility of the General Contractor.

.10 Exposed sprinkler piping in finished spaces shall be painted to match the background against which the piping is installed. This painting shall be the responsibility of the General Contractor.

.11 Wet system piping shall be installed level.

.12 Auxiliary drain valves shall be supplied and installed for all trapped sections of piping. The auxiliary drains shall be as follows:

- .1 More than 50 gallons trapped: NPS 1 valve.
- .2 Less than 50 gallons but more than 5: NPS ¾ valve.
- .3 Less than 5 gallons: remove single pendant sprinkler.

.13 The usage of quick response sprinkler heads shall allow reduction of the hydraulic design area in accordance with NPFA-13 without reducing the design density.

.14 Light hazard classification areas:

- .1 No inside hose allowance.
- .2 Total combined inside/outside hose allowance: 379 L/min.
  - .1 Water supply density: 4 mm/min.
  - .2 Design area: 139 m².
  - .3 Water supply duration: 30 minutes.

.15 When multiple hazard classifications exist the water supply for each individual hazard classification shall be used in the calculations for the design area for that hazard.

.16 Include with each system materials, accessories, and equipment inside and outside building to provide each system complete and ready for use.

.17 Design and provide each system to give full consideration to blind spaces, piping, electrical equipment, ducts, and other construction and equipment in accordance with detailed shop drawings.

.18 Locate sprinkler heads in consistent pattern with ceiling grid, lights, and air supply diffusers.

.19 Devices and equipment for fire protection service: ULC approved for use in wet pipe sprinkler systems.

.20 Location of Sprinkler Heads:

.1 Locate heads in relation to ceiling and spacing of sprinkler heads not to exceed that permitted by NFPA 13.

.2 Uniformly space sprinklers on branch.

.3 Center in T-bar ceiling tiles.

.21 Water Distribution:

.1 Make distribution uniform throughout the area in which sprinkler heads will open.

.2 Discharge from individual heads in hydraulically most remote area to be 100% of specified density required in NFPA 13.

.22 Density of Application of Water:

.1 Size pipe to provide specified density when system is discharging specified total maximum required flow.

.2 Application to horizontal surfaces below sprinklers shall be to the density for hazard classification indicated on drawings and to NFPA-13.

.23 Sprinkler Discharge Area:

.1 Area: hydraulically most remote m² area as defined in NFPA 13.

.2 Carry out hydraulic calculations for design areas mentioned previously in this specification section.

.24 Outside Hose Allowances:

.1 Include allowance in hydraulic calculations for outside hose streams per NFPA-13 for the hazard classifications indicated.

.25 Friction Losses:

.1 Calculate losses in piping in accordance with Hazen-Williams formula with 'C' value of 120 for steel piping,

150 for copper tubing, and 140 for cement-lined ductile-iron piping.

.26 Show the following in the drawings submitted to the Owner's Representative for approval.

.1 Show the layout and size of all piping and equipment from the point of connection to the water supply, to the sprinkler cross mains. The contract drawings must include a detailed sprinkler riser diagram. Water velocity in the piping should not exceed 6 m/s (20 ft/s).

.2 Show location and size of service mains, interior feed mains, control valves, sprinkler risers, drain lines, sectional valves and inspector's test valves and switches on the drawings.

.3 Specify waterflow data including hydrant flow results, including location where the hydrant flow test was conducted, the location and size of existing mains and new water supply lines that will serve the sprinkler system (including all supervisory valves), and the location and size of all risers.

.4 Highlight or clearly indicate the area(s) to be protected by sprinklers on the drawings.

.5 Specify waterflow requirements including the design density, design area, the hose stream demand, the duration of supply, and sprinkler spacing and area of coverage in this section.

.6 Highlight all concealed spaces on the drawings that require sprinkler protection, such as spaces above suspended ceilings that are built of combustible material or that can contain combustible materials, such as storage, and communication cabling that is not fire-rated.

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.

.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop Drawings:

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.1 Shop drawings: submit drawings stamped and signed by a professional engineer registered in the Province of Newfoundland and Labrador.

.2 System to be hydraulically designed. Submit hydraulic calculations.

.2 Indicate:

.1 Materials.

.2 Finishes.

.3 Method of anchorage

.4 Number of anchors.

.5 Supports.

.6 Reinforcement.

.7 Assembly details.

.8 Accessories.

.3 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

.1 Test reports:

.1 Submit certified test reports for wet pipe fire protection sprinkler systems from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.

.2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.3 Instructions: submit manufacturer's installation instructions.

.2 Manufacturer's Field Reports: manufacturer's field reports specified.

.4 Closeout Submittals:

.1 Submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals in accordance with ANSI/NFPA 25.

.2 Manufacturer's Catalog Data, including specific model, type, and size for:

.1 Pipe and fittings.

.2 Valves, including gate, check, and globe.

.3 Sprinkler heads.

.4 Pipe hangers and supports.

.5 Mechanical couplings.

.3 Drawings:

.1 Sprinkler heads and piping system layout.

.1 Prepare detail working drawings of system layout in accordance with NFPA 13, "Working Drawings (Plans)".

.2 Show data essential for proper installation of each system.

.3 Show details, plan view, elevations, and sections of systems supply and piping.

.4 Show piping schematic of systems supply, devices, valves, pipe, and fittings. Show point to point electrical wiring diagrams.

.2 Electrical wiring diagrams.

.4 Design Data:

.1 Calculations of sprinkler system design.

.5 Field Test Reports:

.1 Preliminary tests on piping system.

.6 Records:

.1 As-built drawings of each system.

.1 After completion, but before final acceptance, submit one (1) complete set of as-built drawings of each system for record purposes. Drawings to be on CD in AutoCAD file format.

.7 Operation and Maintenance Manuals:

.1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

.2 Provide detailed hydraulic calculations including summary sheet, and Contractors Material and Test Certificate for aboveground and underground piping and other documentation for incorporation into manual specified in Section 01 78 00 - Closeout Submittals in accordance with ANSI/NFPA 13.

1.6 QUALITY ASSURANCE

.1 Qualifications:

.1 Installer: certified journeyperson in wet sprinkler systems with 5 years documented experience approved by manufacturer.

.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 MAINTENANCE

.1 Extra Materials:

.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

.2 Provide spare sprinklers and tools as required by ANSI/NFPA 13.

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 Storage and Protection:

.1 Store materials indoors in dry location.

.2 Store and protect materials from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

.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 19 - Waste Management and Disposal.

PART 2 PRODUCTS

2.1 ABOVE GROUND PIPING SYSTEMS

.1 Provide fittings for changes in direction of piping and for connections.

.1 Make changes in piping sizes through tapered reducing pipe fittings, bushings will not be permitted.

.2 Perform welding in shop; field welding will not be permitted.

.3 Conceal piping in areas with suspended ceiling.

2.2 PIPE, FITTINGS AND VALVES

.1 All grooved products to be of one manufacturer.

.2 Grooved couplings and fittings to be manufactured from ductile iron conforming to ASTM A-536.

.3 Acceptable Product: Victaulic, Star, Gruvlok, Shurjoint, or approved equal.

.4 Pipe:

.1 Ferrous:

.1 Welded and seamless steel pipe for fire protection use to ASTM A795.

.2 Welded and seamless steel pipe to ANSI/ASTM A53.

.3 Electric Resistance Welded (ERW) steel pipe to ASTM A135.

.4 Roll-grooved steel pipe up to and including NPS 5 to be Schedule 10 minimum.

.5 Roll-grooved steel pipe NPS 6 to have minimum nominal wall thickness of 3.4 mm.

.6 Roll-grooved steel pipe NPS 8 to have nominal wall thickness of 4.77 mm.

.7 Threaded steel piping NPS 6 and smaller to be minimum Schedule 40.

.5 Joints:

.1 Joints in roll-grooved piping to be accomplished utilizing rigid style ductile iron couplings with EPDM gaskets, unless otherwise indicated.

.1 Acceptable product: Victaulic Style 009 Installation ready rigid coupling with EPDM gaskets, or approved equal.

.2 Field connections of ANSI, Class 150 flanged components to sprinkler field piping to be accomplished utilizing a flange to roll-grooved piping adapter.

.1 Acceptable product: Victaulic Style 744 firelock flange adapter, or approved equal.

.3 All threaded piping shall have threads cut in accordance with ANSI B1.20-.1 - Pipe Threads, General Purpose (Inch). Joint compound or tape shall only be applied to male threads.

.4 Where flexibility is required flexible couplings shall be used.

.1 Acceptable Product: Victaulic Style 009 installation ready rigid coupling with Vic Plus EPDM gaskets, Victaulic #75 coupling, or approved equal.

.6 Fittings:

.1 Roll-grooved steel pipe:

.1 Branch outlets to be accomplished utilizing Mechanical-T branch connectors with locating collar engaging into hole. Provide Grade 'E' standard pressure-responsive gasket or O-rings for sealing purposes. Branch outlet connection to be either roll-grooved or female threaded to match branch piping joint.

.1 Acceptable Product: Victaulic Style 920, 922 Mechanical -T branch connections, or approved equal.

.2 Sprinkler head connections, branch connections, drop nipples and sprigs shall be made with Snap-Let outlet connections with locating collar engaging into hole. Provide Grade 'E' standard pressure responsive gasket.

.1 Acceptable Product: Victaulic Style 922 Snap-Let connection, or approved equal.

.3 Pipe fittings such as 90º elbow, 45º elbow, straight tees, etc., shall be of ductile iron to ASTM A-536 or forged steel to ASTM A-234 with grooved or shouldered ends for direct connection into grooved piping systems with steel pipe.

.1 Acceptable Product: Victaulic firelock fittings for usage with Victaulic Style 009 installation ready coupling, or approved equal.

.2 Threaded steel pipe:

.1 Malleable iron threaded fittings Class 150 and 300 to ANSI B16.3.

.2 Fittings serving galvanized piping shall be galvanized.

.7 Valves:

.1 ULC listed for fire protection service.

.2 Butterfly valves NPS 2½ to NPS 10.

.1 Ductile iron body to ASTM A-536 coated with a polyphenylene sulphide blend.

.2 Disc of ductile iron to ASTM A-536 with EPDM coating providing bubble tight shut-off.

.3 Grooved ends for installation in grooved steel piping system.

.4 Suitable for 1200 kPa working pressure.

.5 Provide complete with two single pole, double throw supervisory switches pre-wired monitoring the open position.

.6 Manual gear operator.

.7 To be utilized in field piping NPS 2½ to NPS 10.

.8 Acceptable Product: Victaulic Series 705-W fire protection butterfly valve with weatherproof actuator, or approved equal.

.3 Butterfly valves NPS 1 to NPS 2:

.1 Bronze body to ASTM B584.

.2 Stainless steel disc type 304.

.3 Brass handle.

.4 EPDM disc seal.

.5 Threaded ends.

.6 Suitable for 1200 kPa working pressure.

.7 Manual gear operation.

.8 Provide c/w two single pole, double throw supervisory switches, pre-wired monitoring the open position.

.9 Acceptable Product: Milwaukee Valve Company BB-SCS02, or approved equal.

.4 Ball valves NPS 1 to NPS 2:

.1 Ductile iron body to ASTM A-536, painted.

.2 Type 316 stainless steel ball.

.3 Grooved ends for installation in grooved steel piping systems.

.4 Suitable for 2065 kPa working pressure.

.5 Provide with double pole, double throw supervisory switch, pre-wired monitoring the open position.

.6 Manual gear operator.

.7 Acceptable Product: Victaulic Series 728 firelock ball valve, or approved equal.

.5 Check valves:

.1 Ductile iron body to ASTM A-536.

.2 Single disc, spring loaded check valve suitable for anti-hammer service.

.3 Provide valve drilled, tapped and plugged downstream for drainage outlet.

.4 Grade 'E' EPDM seal.

.5 Grooved ends for installation in grooved steel piping systems.

.6 Suitable for 1725 kPa working pressure.

.7 Acceptable Product: Victaulic Series 717 and 717R Vic-check, or approved equal.

.8 Hangers:

.1 ULC listed for fire protection service.

.2 To NFPA-13.

.9 Alarm test module:

.1 Integrated alarm test and drain valve constructed of corrosion resistant bronze with dual polycarbonate sight glass suitable for maximum rated working pressure of 2007 kPa.

.1 Acceptable Product: Victaulic Testmaster 11, AGF, or approved equal.

2.3 SPRINKLER HEADS

.1 Manufacturers: Subject to compliance with requirements, provide products by one of the following:

.1 Reliable Automatic Sprinkler Co., Inc.

.2 Tyco Fire & Building Products LP.

.3 Victaulic Company.

.4 Viking Corporation.

.2 General Requirements:

.1 Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.

.2 Pressure Rating for Automatic Sprinklers: 175 psig minimum.

.3 Sprinklers shall be glass bulb type, with hex shaped wrench boss integrally cast into the sprinkler body to reduce the risk of damage during installation. (Wrenches shall be provided by the sprinkler manufacturer that directly engage the cast wrench boss.)

.3 Automatic Sprinklers with Heat-Responsive Element:

.1 Nonresidential Applications: UL 199.

.4 Unless otherwise noted, all sprinklers shall be of one manufacturer.

.5 Type.

.1 Standard spray sprinkler shall be used throughout (except as noted below).

.6 Sprinkler Head Type and Locations:

.7 Temperature Ratings

.1 Unless otherwise noted sprinkler temperature ratings shall be in accordance with NFPA 13.

.8 Sprinkler Guards:

.1 All sprinklers in mechanical rooms, electrical rooms, elevator machine rooms, server rooms, telephone rooms, data closets, and other areas where sprinklers are subject to damage shall be provided with wire guards.

.2 Manufacturers: Subject to compliance with requirements, provide products by one of the following:

.1 Reliable Automatic Sprinkler Co., Inc.

.2 Tyco Fire & Building Products LP.

.3 Victaulic Company.

.4 Viking Corporation.

.3 Standard: UL 199.

.4 Type: Wire cage with fastening device for attaching to sprinkler.

.5 Guard shall be approved for use with sprinkler.

.6 Escutcheons and guards shall be listed, and supplied for use with the sprinkler by the sprinkler manufacturer.

2.4 SIGNS

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

2.5 SPARE PARTS CABINET

.1 For storage of maintenance materials, spare sprinkler heads and special tools.

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, inspect and test to acceptance in accordance with ANSI/NFPA 13 and ANSI/NFPA 25.

.2 Provide all auxiliary drains as required and pipe to nearest drainage source.

.3 Sprinkler heads installed in T-bar ceilings to be centered in tiles.

.4 All cutting and patching required to enable installation of sprinkler piping shall be the responsibility of the General Contractor. Construction of furred cavities to conceal exposed sprinkler piping shall be the responsibility of the General Contractor.

.5 Sprinkler feed main, cross main, and riser pipe routing indicated on the drawings is intended to provide the sprinkler contractor with a possible workable route for installation purposes. These routes have been predetermined by the Owner's Representative and represent potential routes to minimize interference with mechanical/electrical services. This sprinkler contractor is in no way held to this routing, and may deviate at his/her desire. The ultimate responsibility with finding a workable route through the new facility lies with the successful sprinkler contractor. This project is limited to a base building development with planned owner equipment to be added in the future. The space shown for the routing on the tender documents was selected to maintain maximum flexibility for future equipment installation. Therefore alternate routing that negatively affects this future flexibility shall not be acceptable.

.6 Supply all access doors as required to enable floor, wall and ceiling access to concealed fire protection system devices. All fire protection equipment supplied and installed under this Contract must be fully accessible for future service and maintenance. Access doors shall be installed by the General Contractor.

3.3 PIPE INSTALLATION

.1 Install piping straight and true to bear evenly on hangers and supports. Do not hang piping from plaster ceilings.

.2 Keep interior and ends of new piping thoroughly cleaned of water and foreign matter.

.3 Keep piping systems clean during installation by means of plugs or other approved methods. When work is not in progress, securely close open ends of piping to prevent entry of water and foreign matter.

.4 Inspect piping before placing into position.

3.4 FIELD PAINTING (RESPONSIBILITY OF GENERAL CONTRACTOR)

.1 Clean, pretreat, prime, and paint new exposed piping systems including valves, piping, conduit, hangers, supports, miscellaneous metalwork, and accessories.

.2 Apply coatings to clean, dry surfaces, using clean brushes.

.3 Clean surfaces to remove dust, dirt, rust, and loose mill scale.

.4 Immediately after cleaning, provide metal surfaces with 1 coat of pretreatment primer applied to minimum dry film thickness of 0.3 mil, and one coat of zinc chromate primer applied to minimum dry film thickness of 1.0 mil.

.5 Shield sprinkler heads with protective covering while painting is in progress.

.6 Upon completion of painting, remove protective covering from sprinkler heads.

.7 Remove sprinkler heads which have been painted and replace with new sprinkler heads.

.8 Provide primed surfaces with following:

.1 Exposed piping in finished areas:

.1 Provide primed surfaces with 2 coats of paint to match adjacent surfaces.

.2 Provide valves and operating accessories with 1 coat of red alkyd gloss enamel applied to minimum dry film thickness of 1.0 mil.

.3 Identify as specified in Section 23 05 53.01 - Mechanical Identification.

.2 Exposed piping in unfinished areas and Mechanical/Electrical service spaces:

.1 Provide primed surfaces with one coat of red alkyd gloss enamel applied to minimum dry film thickness of 1.0 mil.

.2 Identify as specified in Section 23 05 53.01 - Mechanical Identification.

.3 Exposed piping in stairwells to be considered as being installed in an unfinished area.

3.5 FIELD QUALITY CONTROL

.1 Site Test, Inspection:

.1 Perform test to determine compliance with specified requirements in presence of Owner's Representative.

.2 Test, inspect, and approve piping before covering or concealing.

.3 Preliminary Tests:

.1 Hydrostatically test each system at 1400 kPa for a 2 hour period with no leakage or reduction in pressure.

.2 Flush piping with potable water in accordance with NFPA 13.

.3 Piping above suspended ceilings: tested, inspected, and approved before installation of ceilings.

.4 Test alarms and other devices.

.5 Test water flow alarms by flowing water through inspector's test connection. When tests have been completed and corrections made, submit signed and dated certificate in accordance with NFPA 13.

.4 Formal Tests and Inspections:

.1 Do not submit request for formal test and inspection until preliminary test and corrections are completed and approved.

.2 Submit written request for formal inspection at least 15 days prior to inspection date.

.3 Repeat required tests as directed.

.4 Correct defects and make additional tests until systems comply with contract requirements.

.5 Furnish appliances, equipment, instruments, connecting devices, and personnel for tests.

.6 Authority of Jurisdiction, will witness formal tests and approve systems before they are accepted.

3.6 CLEANING

.1 Proceed in accordance with Section 01 74 00 - Cleaning

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

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 45 00 - Quality Control.

.4 Section 01 74 19 - Waste Management and Disposal.

.5 Section 01 78 00 - Closeout Submittals.

.6 Section 09 91 23 - Interior Painting.

.7 Section 23 05 93 – Testing, Adjusting and Balancing for HVAC.

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's Representative.

.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's Representative 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's Representative for approval. Submission of individual data will not be accepted unless directed by Owner's Representative.

.2 Make changes as required and re-submit as directed by Owner's Representative.

.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's Representative will provide 1 set of mechanical drawing 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's Representative for approval and make corrections as directed.

.4 Perform testing, adjusting and balancing for HVAC using as-built drawings.

.5 Submit completed Mechanical AutoCAD as-built drawings CD 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.

1.4 MAINTENANCE

.1 Furnish spare parts in accordance with Section 01 78 00 - Closeout Submittals.

.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 Provide 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 19 - 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 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.

3.2 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.

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 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.

3.4 DEMONSTRATION

.1 Owner's Representative 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's Representative may record these demonstrations for future reference.

3.5 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.
- .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's Representative.
- .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

2.1 NOT USED.

PART 3 EXECUTION

3.1 NOT USED.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE OF WORK

.1 New ductwork and related HVAC equipment supplied and installed under this Contract shall be cleaned in accordance with this specification section.

1.2 CONTRACTOR'S QUALIFICATION

.1 Cleaning work shall be carried out by a firm specialized in cleaning of ventilation equipment and accessories. The Contractor shall provide a list of the five (5) latest cleaning projects carried out, indicating clients' names and contacts.

.2 The HVAC system cleaning contractor shall be a certified member of a nationally recognized non-profit industry organization dedicated to the cleaning of HVAC systems. (National Air Duct Cleaners Association (NADCA), or approved equal.)

.3 The HVAC system cleaning contractor shall have a minimum of one (1) air system cleaning specialist (ASCS) on staff, certified by a nationally recognized certification program and organization dedicated to the cleaning of HVAC systems (NADCA, or approved equal.)

1.3 CONNECTED WORK

.1 The HVAC cleaning contractor shall include in his quotation all related work such as dismantling or removal of ceilings, installation of access doors, moving and covering furniture, protecting floors or equipment, unless otherwise directed by the Engineer.

.2 Provide architectural access doors in solid walls and ceilings as required by cleaning operations.

.3 Provide architectural work (demolition/repair/painting) required for the installation of the new access doors. Repair finish to match existing.

.4 Provide access doors in ductwork as required by cleaning operations.

PART 2 PRODUCTS

2.1 EQUIPMENT

.1 MAC2500 system (or equal) complete with 860 kPa minimum air compressor.

.2 Industrial type vacuum cleaner with HEPA filters.

.3 Adjustable mechanical rotary brush.

.4 Specialized Robotic Duct Cleaning System, Brandy II.

.5 Refer to the list of equipment below:

.1 Commercial vacuum cleaner 85 L/S:

.1 Standard filter.

.2 Industrial vacuum cleaner 99 L/S:

.1 HEPA filter

.2 45 to 170 litre tank.

.3 Pick-up unit under vacuum:

.1 HEPA filter

.2 151 litre mobile tank 200, 250, 300, 350 mm hoses

.3 104 to 1181 L/S blower.

.4 Brushes with telescopic handle:

.1 100, 150, 175, 225, 300, 350 mm.

.2 4.87 m reach.

.5 Rotary electric brushes with adapter:

.1 100, 150, 175, 225, 300, 350 mm

.2 Rotation adaptor

.3 Suction adapter.

.6 Manual brushes in various sizes:

.1 Manual atomizer

.2 Electric atomizer

.3 Stiff brush for coils

.4 827 kPa air compressor

.5 Vacuum cleaner for liquids.

2.2 CLEANING PRODUCTS

.1 All cleaning products used shall meet current standards and regulations. The HVAC cleaning Contractor shall supply data sheet on toxicity for each product used. All products shall be approved by the Owner's Representative.

.2 To prevent system unbalance, yellowing of walls and to maintain air quality, the use of varnish, glue and other sealants attaching dust to the surface is strictly prohibited.

.3 During the execution of the work, the HVAC cleaning Contractor shall use non-polluting products, having no adverse effect on equipment, premises nor environment. Products shall not be toxic, carcinogenic nor offensive to occupants.

.4 Acceptable products for each application:

2.3 ACCESS DOORS

.1 Access doors in ductwork shall meet specification Section 23 33 00 – Air Duct Accessories.

.2 Access doors for solid walls and ceilings shall meet specification Section 10 44 16.20 – Access Doors for Mechanical Systems.

PART 3 EXECUTION

3.1 APPLICATIONS

.1 Table of products and applications:

Product	Application
CC800(degreaser)Distributed by: DMCD Distribution	Turning vanesDampersFilter sectionsFan sectionsLouversDrainage pansPlenums
Neutrac(Neutral detergent, no acid, no alkali)Distributed by: Lalema Inc	GrillesDiffusersDeflectors
ET100 (vinyl base)Distribution by : DMCD Distribution	Coating for acoustic insulation

3.2 PRE-CLEANING

.1 Video inspection and recording shall be done with a remote robot, utilizing digital format, for optimum clarity. This shall include a mechanical inspection of safety equipment and ventilation filtration components.

.2 Before commencement of cleaning activities, the HVAC cleaning Contractor shall submit to the Owner's Representative for review a cleaning schedule indicating the description of equipment to be cleaned and the cleaning procedures to be utilized.

3.3 CLEANING

.1 Ductwork:

.1 Metallic ductwork shall be cleaned employing robotic direct contact brushing. The cleaning of the ductwork shall employ a proprietary set of motorized brushes that are designed to operate and fit within the size and conditions of the ductwork. These brushes shall contact the ductwork on all four sides simultaneously, providing a work method that ensures particulate removal of a quality superior to traditional compressed air and hand vacuuming. These brushes shall render the interior surface of ductwork to its original clean, smooth condition. In addition, specialized robotic tracked vehicles shall be used to provide video scanning and direct contact cleaning where applicable.

.2 Both pressurized and cellular foam gaskets shall be employed in the ductwork during cleaning to ensure the loosened particulate is directed to the HEPA filtration units and not allowed to enter the workplace. As a secondary safety precaution in specialized areas, sterilized sheets shall be used as drop cloths.

.3 A proprietary HEPA filtered vacuum air handling machine shall be employed to exhaust contaminants from the ductwork as they are removed from the ductwork surfaces by robotic direct contact brushes and robots.

.4 All vacuum units shall utilize high efficiency absolute filters (better than 99.997% retention at 0.3 microns).

.5 All particulate captured by the HEPA filtration units shall be contained and disposed of at an approved site.

.2 Fans, air handling units and energy recovery units:

.1 Supply and exhaust air fans shall be vacuumed utilizing HEPA filtered vacuum equipment.

.2 Fans and fan housings shall be cleaned utilizing HEPA filtered vacuum equipment.

.3 Filter trays and housings shall be vacuumed utilizing HEPA filtered vacuum equipment.

.3 Fire dampers:

.1 All vacuuming and cleaning shall be performed with HEPA Filtered vacuum equipment. Improper fit and air leakage associated with equipment mounting shall be identified and reported.

.2 Fusible links shall be identified and replaced, if required.

.4 Ventilation diffusers:

.1 All ventilation diffusers shall be cleaned utilizing HEPA filtered vacuum equipment.

.2 Mark original settings of mechanism before cleaning.

.5 Access openings:

.1 Robotics shall be used to provide access to the ventilation duct distribution system at all existing outlets to minimize damage to the mechanical integrity of the ventilation systems.

.2 Cut openings in ductwork and install new duct access doors as required to facilitate cleaning operations.

.3 Duct access doors shall meet specification Section 23 33 00 - Duct Accessories.

.6 Air intake louvres:

.1 Air intake louvers and screens shall be vacuumed utilizing HEPA filtered vacuum equipment.

.7 Dampers:

.1 Manual balancing dampers and automatic control dampers shall be cleaned utilizing HEPA filtered vacuum equipment.

.2 Mark original settings of mechanism before cleaning.

3.4 POST CLEANING

.1 Inspection and documentation:

.1 After the cleaning procedure is complete, a visual inspection shall again be performed by the robot which shall provide a digital video of the cleaned ductwork.

.2 All mechanical deficiencies noted in the robotic inspections shall be identified.

3.5 OWNER REPRESENTATIVE INSPECTION

.1 The HVAC cleaning Contractor shall permit free access to the Owner's Representative for the inspection of ongoing work. The HVAC cleaning Contractor shall provide all required assistance to the Owner's Representative during these inspections.

.2 The HVAC cleaning Contractor shall supply remote controlled equipment for the Owner's Representative to visualize progress of HVAC systems cleaning, as required.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 74 00 – Cleaning.

.2 Section 01 74 19 - Waste Management and Disposal.

.3 Section 07 84 00 – Firestopping.

.4 Section 23 08 01 - Performance Verification Mechanical Piping Systems.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - 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's Representative.

1.3 QUALITY ASSURANCE

.1 Installers to be certified to journeyperson.

PART 2 PRODUCTS

2.1 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. Unions are not required in installations using grooved mechanical couplings.

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 and 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: DN 20 unless indicated otherwise, with hose end male thread, cap and chain.

.1 Acceptable Product: Dahl Figure 50430-0 or approved equal.

3.4 AIR VENTS

.1 Install automatic air vents at high points in piping systems and as indicated.

.2 Install manual air vents as indicated.

.3 Install isolating valve at each automatic air vent.

.4 For vents equipped with discharge pipe connections, pipe discharge to nearest floor drain such that discharge is visible.

3.5 DIELECTRIC COUPLINGS

.1 General: Compatible with system, to suit pressure rating of system.

.2 Locations: Where dissimilar metals are joined.

.3 Dielectric couplings:

.1 Protect against galvanic and stray current corrosion.

.2 Female IPS x copper solder joint up to and including DN 50.

.3 Flanged x copper solder joint DN 65 to DN 50.

.4 Body, flanges, bolts and nuts: steel with galvanized coating.

.5 Tail piece: brass.

.6 Insulator: nylon.

.7 Gaskets: Viton high temperature application (121°C @ 516 kPa).

.8 Maximum working pressure: 1.72 MPa, except 1.2 MPa for flanged fittings.

.9 Maximum working water temperature: 121°C.

.10 Copper connections to ANSI B16.22.

.11 Threaded connections to ANSI B1.20.1.

.12 Acceptable Product: Wilkins Model DUC dielectric pipe fittings, Watts, Victaulic, Maloney, or approved equal.

.4 Dielectric unions are not to be used for purposes of disassembly. Where disassembly is required, provide dielectric unions and additional unions or couplings.

3.6 PIPEWORK INSTALLATION

.1 Installation by certified journeyperson.

.2 Follow pipe routing on drawings unless forced to so otherwise by site co-ordination requirements with other services or disciplines. Record changes required to suit field conditions on as-built drawings.

.3 Screwed fitting jointed with Teflon tape or pipe dope as recommended by manufacturer.

.4 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.

.5 Push-to-connect piping: Prepare copper tube and install in strict accordance with installation instructions. Pipe ends shall be cleaned, free from indentations, projections burrs and foreign matter. Use a tube preparation tool as supplied by the manufacturer to clean and make installation mark. Push copper tube into fittings to installation depth mark, per installation instructions. Keep fittings free of dirt and oil.

.6 Protect openings against entry of foreign material.

.7 Install so as to enable isolation and removal of equipment without interrupting operation of other equipment or systems.

.8 Assemble piping using fittings manufactured to ANSI standards.

.9 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.

.10 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.

.11 Install concealed pipework to minimize furring space, maximize headroom, and conserve space.

.12 Slope piping, except where indicated, in direction of flow for positive drainage and venting.

.13 Install, except where indicated, to permit separate thermal insulation of each pipe.

.14 Group piping wherever possible and as indicated.

.15 Ream pipes, remove scale and other foreign material before assembly.

.16 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.

.17 Provide for thermal expansion as required and/or indicated.

.18 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 Use ball or butterfly valves at branch take-offs for isolating purposes except where otherwise specified. DN 50 and under to be ball valve and DN 65 and above to be butterfly.

.6 Use chain operators on valves DN 65 and larger where installed more than 2400 mm above floor in Mechanical Rooms.

.19 Check Valves:

.1 Install silent check valves at discharge of pumps.

.2 Install swing check valves in horizontal lines only.

.3 Install spring loaded check valves in vertical and/or horizontal pipes.

3.7 SLEEVES

.1 General: Install where pipes pass through masonry, concrete structures, fire rated assemblies, and elsewhere as indicated. Where pipes pass through existing concrete assemblies the holes may be core drilled.

.2 Material: Schedule 40 black steel pipe, galvanized.

.3 Construction: Foundation walls, slab on grade floors, and floors above finished grade to have annular fins continuously welded on at mid-point. Sleeves elsewhere do not need annular fins.

.4 Sizes: 6 mm minimum clearance between sleeve and uninsulated pipe or between sleeve and insulation for aboveground pipe and 12 mm minimum clearance for underground pipe passing through walls. Ensure sufficient space to accommodate pipe penetration seals where required.

.5 Installation:

.1 Concrete walls, masonry walls, concrete floors on grade: Terminate flush with finished surface.

.2 Other floors: Terminate 75 mm above finished floor.

.6 Sealing:

.1 Foundation walls, Mechanical Room floors, and slab-on grade floors: utilize pipe penetration seals. Omit insulation at pipe penetration seals.

.2 Elsewhere:

.1 Fill between sleeve and uninsulated pipe or between sleeve and insulation with mineral wool insulation and seal with non-shrink caulk.

.2 Fill voids between pipes and sleeves in pipes penetrating exterior walls with spray-in foam insulation. Cut back foam insulation flush with exterior wall and paint to match colour of exterior wall.

.3 Maintain integrity of fire rating of all fire rated walls and floors being penetrated. Reference Item 3.9 of this specification section.

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 The Mechanical Contractor shall be required to firestop all mechanical services penetrating fire separations as well as rated fire separations.

.3 Pipe penetrations through fire separations must be sealed with manufacturers listed 'systems' particular to the application to maintain the integrity of the separation being pierced. Intumescent firestop sealant and mineral wool insulation are components of these systems. Install sealant, insulation and all other materials in accordance with the requirements of the listing.

.4 Where pipes penetrate fire separations and there is no manufacturers listed 'system' to deal with the requirements of the particular application, prepare a sketch of the application and submit it to the firestopping product manufacturer for an engineering judgment. Upon receipt of this engineering judgment, submit same to the authority having jurisdiction for approval prior to commencement of installation of the firestopping system.

.5 Firestop material to be applied on both sides of wall penetrations and on the underside of floor penetrations only, unless otherwise directed by the firestopping product manufacturer.

3.10 FLUSHING OUT OF PIPING SYSTEMS

.1 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.

.2 Preparatory to acceptance, clean and refurbish equipment and leave in operating condition, including replacement of filters in piping systems.

3.11 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK

.1 Advise Owner's Representative, 48 hours minimum prior to performance of pressure tests.

.2 Pipework:

.1 Test as specified in relevant sections of mechanical specifications.

.2 Hydraulically test steel hydronic piping systems to 1.5 times the system operating pressure or minimum 860 kPa, whichever is greater.

.3 Maintain specified test pressure without loss for 30 minutes 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's Representative.

.6 Pay costs for repairs or replacement, retesting, and making good. Owner's Representative to determine whether repair or replacement is appropriate.

.7 Insulate or conceal work only after approval and certification of tests by Owner's Representative.

.8 Provide test reports for all piping installed under this contract to Owner's Representative. See pressure test form at the end of this specification section.

.9 Water testing to be avoided during freezing conditions.

3.12 EXISTING SYSTEMS

.1 Connect into existing piping systems at times approved by Owner's Representative.

.2 Be responsible for damage to existing plant by this work.

.3 Ensure daily clean-up of existing areas.

3.13 HYDROSTATIC TEST RECORD

.1 An example of a hydrostatic test record is shown below for reference:

Project:			Phase:		Project No:	
Contractor/Vendor:			Location:			
Specifications:			Date:			
Drawings:						
Location/ItemFrom - to -	**Work Pressure**	**Test Pressure**	**Duration**	**# of Services and meters of Pipe (Civil Only)**	**Results**	
	(kPa)	**(kPa)**		**(Civil Only)**	**Accepted**	**Rejected**
REMARKS:						
CONTRACTOR/VENDOR:				**JBC WITNESS/VERIFICATION**		
I hereby certify all tests have been carried out according to contract specifications and the above item(s) has passed the required test, unless otherwise noted.						
Contractor:				Engineer/Site Rep.:		
Date:				Date:		

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Electrical motors, drives and guards for mechanical equipment and 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 61 00 - Common Product Requirements.

.5 Section 01 74 00 – Cleaning.

.6 Section 01 74 19 - Waste Management and Disposal.

.7 Section 01 78 00 - Closeout Submittals.

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 National Electrical Manufacturers Association (NEMA).

.4 U.S. Department of Energy (DOE) Energy Policy Act EPACT.

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.

.2 Shop Drawings: Submit drawings stamped and signed for approval by Owner's Representative.

.3 Quality Control: in accordance with Section 01 45 00 - Quality Control.

.1 Instructions: submit manufacturer'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 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.

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 19 - Waste Management and Disposal.

PART 2 PRODUCTS

2.1 GENERAL

.1 Motors 1 HP and above shall be NEMA premium efficiency.

.2 Motors below 1 HP shall be standard efficiency in accordance with EPACT and the requirements of ASHRAE 90.1.

2.2 MOTORS

.1 Provide motors for mechanical equipment as specified.

.2 Motors shall be NEMA design B unless otherwise noted.

.3 Motors shall be insulation Class B unless otherwise noted. Class B insulated motors shall have a motor insulation temperature rating of 130°C with an allowable temperature rise at full load with 1.0 service factor of 80°C and an allowable temperature rise at service factor of 90°C. The reference ambient temperature shall be 40°C. The 10°C temperature differential between the allowable maximum temperature shall provide a "hot spot" allowance for the interior of the motor winding.

.4 Motors controlled by variable frequency drives shall have insulation Class 'H', phase insulation and a winding thermostat in the motor. These motors shall be wound with inverter spike resistant (ISR) wire and shall be inverter duty rated.

.5 All motors shall be suitable for variable torque application unless otherwise noted.

.6 All motors to have minimum 1.15 service factor unless otherwise noted.

.7 See mechanical schedules for motor HP and voltage.

.8 All motors to be squirrel cage induction motors unless otherwise noted.

.9 All motors to be continuous duty rated.

.10 All motor enclosures to be TEFC unless otherwise noted.

.11 Motors shall be regreaseable and shall have bearings with a minimum L10 life of 20,0000 hrs.

2.3 TEMPORARY MOTORS

.1 If delivery of specified motor will delay completion or commissioning work, install motor approved by Owner's Representative 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. Provide sheave of correct size to suit balancing.

.4 For motors 10 HP and over: sheave with split tapered bushing and keyway having fixed pitch unless specifically required for item concerned. Provide sheave of correct size to suit balancing.

.5 Correct size of sheave to be determined during commissioning. The Mechanical Contractor shall be responsible for all costs associated with providing sheaves of correct size if those that were originally shipped with the equipment are unsuitable for the application.

.6 Minimum drive rating: 1.5 times nameplate rating on motor. Keep overhung loads within manufacturer's design requirements on prime mover shafts.

.7 Motor slide rail adjustment plates to allow for centre line adjustment.

.8 Supply one set of spare belts for each set installed.

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 SECTION INCLUDES

.1 Materials and installation for thermometers and pressure gauges in piping 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 74 19 - Waste Management and Disposal.

.4 Section 23 05 53.01 – Mechanical Identification.

1.3 REFERENCES

.1 American Society of Mechanical Engineers (ASME)

- .1 ASME B40.100, Pressure Gauges and Gauge Attachments.
- .2 ASME B40.200, Thermometers, Direct Reading and Remote Reading.

.2 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-14.5, Thermometers, Bimetallic, Self-Indicating, Commercial/Industrial Type.

1.4 SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit shop drawings and product data.

.3 Submit manufacturer's product data for following items:

- .1 Thermometers.
- .2 Pressure Gauges.
- .3 Ball Valves.
- .4 Wells.
- .5 Snubbers.

1.5 HEALTH AND SAFETY

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 – Health and Safety Requirements.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

.2 Collect, separate and place in designated containers for reuse and recycling, paper, plastic, polystyrene, corrugated cardboard packaging, steel, metal, in accordance with Waste Management Plan.

.3 Fold up metal banding, flatten and place in designated area for recycling.

.4 Place materials defined as hazardous or toxic waste in designated containers.

.5 Ensure emptied containers are sealed, labelled and stored safely for disposal away from children.

PART 2 PRODUCTS

2.1 GENERAL

.1 Design point to be at mid point of scale or range.

.2 Ranges: dual imperial and metric.

2.2 DIRECT READING THERMOMETERS

.1 Industrial, variable angle type, DN 15 NPT connection liquid filled, accuracy 1% full scale, 100 mm diameter dial type glass lens, stainless steel case and stem, recalibrate-reset screw.

.1 Acceptable Product: Winters Bi-Metal Thermometers T3200 Series, Marsh, Wika, Trerice, or approved equal.

2.3 THERMOMETER WELLS

.1 Copper pipe: brass.

.2 PVC or CPVC pipe: stainless steel.

.3 Provide thermowell of proper length to suit insertion length of thermometer specified above.

2.4 PRESSURE GAUGES

.1 102 mm, dial type: to ASME B40.1, Grade 1A, stainless steel case, tube and socket having 1% accuracy full scale, DN 6 NPT bottom connection.

.1 Acceptable Product: Winters LF Premium Series, Marsh, Wika, Trerice, or approved equal.

.2 Provide:

.1 Snubber for pulsating operation (all gauges).

.2 Gasketted pressure relief back with solid front (all gauges).

.3 Glycerin filled for high vibration applications (all gauges).

.4 Mini ball valve of brass body construction with stainless steel ball and Teflon gaskets. Valve to be equipped with DN 6 NPT female x DN 6 NPT male end connections (all gauges).

2.5 PRESSURE AND TEMPERATURE GAUGE

.1 Case: powder black painted steel with chrome ring.

.2 Lens: plastic.

.3 Socket: brass.

.4 Connection: DN 6 NPT with 63 mm extension.

.5 Movement: precision machined copper alloy movement ensuring sustained accuracy and extended service.

.6 Pointers: black finished aluminum.

.7 Dial size: 63 mm round.

.8 Dial face: corrosion resistant aluminum.

.9 Accuracy:

.1 Pressure: ±3% of full scale.

.2 Temperature: ±2% of full scale.

.10 Acceptable product: Continental Precision Instruments Tridicator, Winters, Marsh, WIKA, Trerice, or approved equal.

PART 3 EXECUTION

3.1 GENERAL

.1 Install so they can be easily read from floor or platform.

.2 Install in locations indicated.

3.2 THERMOMETERS

.1 Install in wells on piping. Provide heat conductive material inside well.

.2 Install wells.

.3 Use extensions where thermometers are installed through insulation.

.4 Supply and install tee fittings, nipples and couplings to enable installation of thermometers in piping systems as indicated.

.5 Provide nipples of sufficient length to ensure thermometer extends out into fluid stream for accurate fluid temperature reading.

3.3 PRESSURE GAUGES

.1 Use extensions where pressure gauges are installed through insulation.

3.4 NAMEPLATES

.1 Install engraved lamicoid nameplates as specified in Section 23 05 53.01 - Mechanical Identification, identifying medium.

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 19 - Waste Management and Disposal.

.4 Section 01 78 00 – Closeout Submittals.

.5 Section 23 05 05 – Installation of 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/AMSE B16.18, Cast 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 B 62, Specification for Composition Bronze or Ounce Metal Castings.

.3 ASTM B 283, Specification for Copper and Copper Alloy Die Forgings (Hot Pressed)

.4 ASTM B 505/B505M, Specification for Copper-Base Alloy Continuous Castings.

.5 ASTM B124/B124M, Specification for Copper and Copper Alloy Forging Rod, Bars and Shapes.

.3 Canadian Standards Association (CSA)

.1 CSA B242, Groove and shoulder type Mechanical 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:

.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 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.

1.6 DELIVERY, STORAGE AND DISPOSAL

.1 Waste Management and Disposal

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - 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 MATERIALS

.1 Except for specialty valves, to be single manufacturer.

.2 All quarter turn ball valves shall be provided with handle extensions to enable valve operation while valve body is insulated.

2.2 END CONNECTIONS

.1 Connection into adjacent piping/tubing:

.1 Copper tube systems: Solder ends for piping up to and including DN 50.

.2 Grooved copper connection system for piping DN 65 and above.

.3 Permanent push to connect system for piping DN 15 and DN 50.

2.3 BALL VALVES

.1 DN 50 and under, soldered:

.1 Body and cap: brass.

.2 Pressure rating: Class 150, 1.03 MPa steam, WP = 4.13 MPa WOG.

.3 Connections: soldered ends.

.4 Stem: brass tamperproof ball drive.

.5 Packing: PTFE.

.6 Ball and seat: replaceable chrome plated brass ball and PTFE seats.

.7 Gland: brass.

.8 Operator: removable lever handle.

.9 Two-piece construction, full port.

.10 Acceptable Product: Jenkins Figure 202J, Milwaukee, Newman Hattersley, Kitz, Toyo, Crane, Apollo, NIBCO, or approved equal.

.2 DN 50 and under, permanent push to connect.

.1 Acceptable Product: Victaulic PermaLynx, Star, Gruvlok, Shurjoint, or approved equal.

.3 DN 50 and under, threaded.

.1 Body and cap: brass.

.2 Pressure rating: Class 150, 1.03 MPa steam, WP = 4.13 MPa WOG.

.3 Connections: screwed ends to ANSI B1.20.1 and with hex shoulders.

.4 Stem: brass tamperproof ball drive.

.5 Packing: PTFE.

.6 Ball and seat: replaceable chrome plated brass ball and PTFE seats.

.7 Gland: brass.

.8 Operator: removable lever handle.

.9 Two-piece construction, full port.

.10 Acceptable Product: Jenkins Figure 201J, Milwaukee, Newman Hattersley, Kitz, Toyo, Crane, Apollo, NIBCO, or approved equal.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install valves in upright position with stem above horizontal.

.2 Remove internal parts before soldering.

.3 Utilize ball valves for purposes of isolation unless otherwise noted.

.4 Adjoining tube, coupling, and fittings with grooved joint valves shall be copper-tube dimensioned. Flaring tube or fitting ends to accommodate IPS sized valves is not permitted.

.5 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, normal position, manufacturer and model number.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section includes:

.1 Hangers and supports for mechanical piping and 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 61 00 - Common Product Requirements.

.4 Section 01 74 19 - Waste Management and Disposal.

.5 Section 01 78 00 - Closeout Submittals.

.6 Section 23 31 13.01 - Metal Ducts - Low Pressure to 2500 Pa.

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 ANSI/ASME B31.3, Pressure Piping.

.3 ANSI/ASME B31.9, Building Service Piping.

.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 Canadian Standards Association (CSA)

.4 Factory Mutual (FM)

.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 ASME B31.1, B31.3, B31.9 or MSS SP58

.3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.

.4 Design hangers and supports to support systems under 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.

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's Representative.

.3 Submit shop drawings and product data for following items:

.1 Hangers and supports.

.2 Connections to equipment and structure.

.4 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

.1 Instructions: submit manufacturer'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 19 - 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.

.2 Clamps: manufactured from steel with electro-galvanized finish. Cushion to be manufactured from a thermoplastic elastomer, oil and chemical resistant and suitable from service temperatures from 10C to 149C.

.1 Acceptable Product: Unistrut Cush-A-Clamp, or approved equal.

.3 Upper attachment Unistrut: suspension from ceiling mount Unistrut channel.

.1 Channel: cold formed from low-carbon strip steel. Channel shall be pre-galvanized, of 12 ga. Material thickness and 41.3 mm x 41.3 mm dimensions.

.1 Acceptable Product: Unistrut P1000 or approved equal.

.2 Channel nuts: manufactured from mild steel bars and case hardened after machining. Channel nuts shall have electro-galvanized finish, ½" -13 nut size thread, for use with Unistrut P1000 Series channel.

.1 Acceptable Product: Unistrut P1010 or approved equal.

.4 Upper attachment structural: suspension from lower flange of I-Beam:

.1 Cold piping DN 50 maximum: malleable iron C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, 12 mm diameter rod.

.1 Acceptable Product: Myatt Fig. 586, Hunt, Grinnell, or approved equal.

.2 Cold piping DN 65 or greater, all hot piping: malleable iron beam clamp, eye rod, jaws and exterior with carbon steel retaining clip, tie rod, nuts and washers, 12 mm diameter rod.

.1 Acceptable Product: Myatt Fig. 510 or 511, with Myatt Fig. 480 weldless eye nut, Hunt, Grinnell, or approved equal.

.5 Upper attachment structural: suspension from upper flange of I-Beam:

.1 Cold piping DN 50 maximum: malleable iron C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, 12 mm diameter rod.

.1 Acceptable Product: Myatt Figure 586, Hunt, Grinnell, or approved equal.

.2 Cold piping DN 65 or greater, all hot piping: malleable iron top-of-beam hook, nut and washer, 12 mm diameter rod.

.3 Acceptable Product: Myatt Figure 506, Hunt, Grinnell, or approved equal.

.6 Upper attachment structural: suspension from bottom chord of open web steel joints:

.1 All piping: malleable iron plate washer with maximum 9 mm diameter rod.

.1 Acceptable Product: Myatt Figure 545, Hunt, Grinnell, or approved equal.

.7 Upper attachment structural: suspension from structural steel support channel or angle:

.1 All piping: malleable iron C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, 12 mm diameter rod.

.1 Acceptable Product: Myatt Fig. 586, Hunt, Grinnell, or approved equal.

.8 Hanger rods: continuous 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 Acceptable Product: Myatt Fig. 434, Hunt, Grinnell, or approved equal.

.9 Shop and field-fabricated assemblies.

.1 Trapeze hanger assemblies: MSS SP-89.

.2 Steel brackets: MSS SP-89.

.10 Pipe attachments: material to MSS SP-58.

.1 Attachments for steel piping: carbon steel galvanized.

.2 Use insulation shields for cold pipe work below 65°C, DN 15 and above and for hot pipe work 66°C and over, up to and including DN 50. In addition use insulation shields on cold piping 65°C and below in conjunction with high density insulation at pipe stanchion saddle supports and pipe stanchion saddle anchors regardless of pipe size.

.1 Acceptable product: Myatt Fig. 251 or 251S as applicable, Hunt, Grinnell, or approved substitute.

.3 Use pipe covering insulation saddles for all hot piping 66°C and over, DN 65 and above. In addition use pipe covering insulation saddles on all hot piping 66°C and over at pipe stanchion saddle supports and pipe stanchion saddle anchors, regardless of pipe size.

.1 Acceptable product: Myatt Fig. 210-240 as applicable, or approved substitute.

.4 Oversize pipe hangers and supports for insulated pipes.

.11 Adjustable clevis: material to MSS SP-69, 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.

.2 Acceptable Product: Myatt Fig. 124L, Hunt, Grinnell, or approved equal.

.12 Standard roller hanger: carbon steel yoke with cast iron roll. Provide complete with hanger rod and nuts for vertical height adjustment.

.1 Acceptable product: Myatt Fig. 258, Hunt, Grinnell, or approved substitute.

.13 U-bolts: carbon steel to MSS SP-69 with 2 nuts at each end to ASTM A563.

.1 Finishes for steel pipework: galvanized.

.2 Acceptable Product: Myatt Fig 402, Hunt, Grinnell, or approved equal.

.14 Pipe stanchion saddle supports:

.1 Pipe stanchion saddle: to be used to support piping from the floor or ground. Provide complete with U-bolt for pipe securement.

.1 Acceptable Product: Myatt Fig. 306S, Hunt, Grinnell, or approved equal.

.2 Pipe stanchion saddle support pipe: Schedule 40 black iron primed pipe supplied and installed by the Mechanical Contractor. Cut to length in field as required.

.3 Pipe stanchion saddle floor mounting plates: 150 mm x 150 mm x 6 mm primed steel plate drilled to accept 6.4 mm bolt head sleeve anchors.

.1 Acceptable Product: Hilti HLC bolt head sleeve anchors, or approved equal.

.15 Rigid base support: to be used to provide a rigid support at base of pipe elbows. Support to consist of vertical stanchion support factory welded to a steel base plate. Stanchion support member to be field welded to the piping being supported. Horizontal support plate shall be factory drilled to accept bolt head sleeve anchors in the field.

.1 Acceptable Product: Myatt fig. 703 complete with Hilti HLC bolt head sleeve anchors, Hunt, Grinnell, or approved equal.

.16 Heavy duty support clip: Designed to secure pipe tight against any surface. Carbon steel construction.

.1 Acceptable Product: Myatt Fig. 162, Hunt, Grinnell, or approved equal.

2.3 RISER CLAMPS

.1 Steel pipe or cast iron pipe: galvanized black carbon steel to MSS SP-58, type 42.

.2 Bolts: to ASTM A307.

.3 Nuts: to ASTM A563.

.4 Acceptable Product: Myatt Figure 182, Hunt, Grinnell, or approved equal.

2.4 INSULATION PROTECTION SHIELDS AND SADDLES

.1 Use insulation shields for cold pipe work below 65°C and for hot pipe work 66°C and over, up to and including DN 50. In addition use insulation shields on cold piping 65ºC and below in conjunction with high density insulation at pipe stanchion saddle supports and pipe stanchion saddle anchors regardless of pipe size.

.1 Acceptable Product: Myatt Fig. 251 or 251S as applicable, Hunt, Grinnell, or approved equal.

.2 Use pipe covering insulation saddles for all hot piping 66°C and over, DN 65 and above. In addition use pipe covering insulation saddles on all hot piping 66°C and over at pipe stanchion saddle supports and pipe stanchion saddle anchors, regardless of pipe size.

.1 Acceptable Product: Myatt Fig. 210-240 as applicable, Hunt, Grinnell, or approved equal.

2.5 EQUIPMENT SUPPORTS

.1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel. The supply of material and the fabrication labour required to construct these equipment supports shall be the responsibility of the Mechanical Contractor.

.2 All fabricated equipment supports shall be primed before installation in the field.

.3 All galvanized equipment supports shall be touched up with cold galvanizing as required to maintain the integrity of the finish.

2.6 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

.1 Provide templates to ensure accurate location of anchor bolts.

2.7 DUCT HANGERS

.1 See specification Section 23 31 13.01 - Ductwork - Metallic to 2500 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 in accordance with:

.1 Manufacturer's instructions and recommendations.

.2 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.

.3 Provide supplementary structural steelwork where structural bearing does not exist.

3.3 HANGER SPACING

.1 Plumbing piping: most stringent requirements of Canadian Plumbing Code.

.2 Steel screwed or flanged pipes: in accordance with table below.

.3 Rigid, joint roll groove pipe: in accordance with manufacturer of rigid joint system or table below, whichever is more stringent, but not less than one hanger at joints.

.4 Within 300 mm of each elbow.

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, 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 5 degrees from vertical.

.2 Where angularity of rod hanger resulting from horizontal pipe movement is less than 5 degrees, offset pipe hanger and support so that rod hanger is vertical in the hot position.

.3 Where angularity of rod hanger resulting from horizontal pipe movement is greater than 5 degrees, utilize yoke style pipe roll.

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 to flanges of beams and channels.

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 controls, 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 35 29.06 - Health and Safety Requirements.

.3 Section 01 61 00 - Common Product Requirements.

.4 Section 01 74 19 - Waste Management and Disposal.

.5 Section 09 91 23 - Interior Painting.

.6 Section 25 05 54 - EMCS: Identification.

1.3 REFERENCES

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.60, Interior Alkyd Gloss Enamel.

.2 CAN/CGSB-24.3, Identification of Piping Systems.

.2 Canadian Standards Association (CSA)

.1 CSA B52, Mechanical Refrigeration Code.

.3 National Fire Protection Association (NFPA)

.1 NFPA 13, Standard for the Installation of Sprinkler Systems.

1.4 SUBMITTALS

.1 Product Data:

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

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.

PART 2 PRODUCTS

2.1 GENERAL

.1 MUN has a computerized maintenance software program that the mechanical and electrical equipment labeling will be linked to. MUN identifies equipment in the field using a unique equipment identification tag linked back to their TMA software program. MUN also uses a bar code system to identify their mechanical and electrical equipment which is also linked to their TMA maintenance software system. MUN maintenance staff personnel use IPads equipped with bar code scanning software to provide them with information on each piece of mechanical and electrical equipment in the field. Hence the mechanical and electrical equipment labeling methodology to be utilized must include the unique equipment identification tag as well as a unique bar code.

.2 Lamacoid labels shall not be used on equipment in the field. The unique equipment tag and bar code for each piece of equipment shall be on vinyl stickers which are to be placed on each piece of equipment in the field. This provides for flexibility to update the equipment tag over time and simply stick the new label on over the old label.

.3 The lettering and bar code shall be applied to the vinyl label through a printer made for these types of labels. MUN uses a Brother P-Touch Pro label maker. The mechanical contractor shall procure this model or one like it for the purposes of preparing the equipment labels for this project.

.4 The mechanical contractor shall prepare a complete list of project mechanical equipment to be labeled in an Excel spreadsheet. Each individual piece of equipment shall be included on this list. The equipment list shall be submitted for review as a shop drawing. The equipment tag shall include a "Building Prefix", an "Equipment Prefix", and a "Sequential Number". The "Building Prefix" for this building is ENX. The appendix document includes a list of "Equipment Prefix" identifiers. If any equipment is utilized on this project that is not included in the list, please contact the engineer for direction on the proper "Equipment Prefix" to use.

.5 The equipment list shall include:

.1 Location

.2 Drawing Identification

.3 TAG ID

.4 Service

.5 Description

.6 Manufacturer

.7 Model #

.8 Serial #

.9 Barcode

.6 Following acceptance of the contractor's equipment list. The equipment labels shall be converted to a bar code utilizing Microsoft Excel. The labels shall be batch produced in an Excel spreadsheet. This link provides additional information on how barcodes are generated: https://www.barcoderesource.com/barcodeappforoffice.shtml

.7 Example label below:

.1

2.2 EQUIPMENT LABELS

.1 Plastic Labels for Equipment:

.1 Material and Thickness: minimum 160 micrometers thick laminated tape with adhesive. Labels are to withstand any type of scrape or abrasion, and be resistant to water, oil, chemicals and fading from UV rays. Labels shall be intended for indoor and outdoor use.

.2 Basis of Design and Acceptable Products: Basis of design is 1 inch thick "Brother P-touch TZE tape - TZeS-251 extra strength adhesive" or approved equal or better. Alternative product shall contain manufacturer's literature to declare labels can withstand any type of scrape or abrasion, and are resistant to water, oil, chemicals and fading from UV rays and are intended for indoor and outdoor use.

.3 Letter Colour: Black.

.4 Background Colour: White.

.5 Maximum Temperature: Able to withstand temperatures up to 356 deg. F (150 deg. C)

.6 Minimum Label Size: The width shall be 1 inch and width to vary for required label content, but not less than 3 inch.

.7 Minimum Letter size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering. Information to include MS Excel applied barcode 39 as shown below. Where larger than 1/4 inch lettering used, barcode to be place adjacent to the letters.

.8 Adhesive: Factory applied permanent adhesive, compatible with substrate.

2.3 PIPING SYSTEMS GOVERNED BY CODES

.1 Sprinklers: to NFPA-13.

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 Peel and stick markers and arrows held in place with pressure sensitive tape.

.1 Acceptable Product: Seton OPTI-Code pipe markers and arrows held in place with Seton 59653 40 mm wide pressure sensitive tape, Brady, or approved equal.

.7 Colours and Legends:

.1 Where not listed, obtain direction from Owner's Representative.

.2 Colours for legends, arrows, to following table:

.1

Background colour	Legend, arrows
Yellow	BLACK
Blue	WHITE
Green	WHITE

.3 Background colour marking and legends for piping systems:

.1

Contents	Background colour marking	Legend
Equipment drainage	Green	EQUIP. DRAIN
Condensate (evaporators)	Green	COND. DRAIN
Chilled water supply	Yellow	CWS
Chilled water return	Yellow	CWR
Sprinkler	Red	SPRINKLER
Hot water supply	Yellow	HWS
Hot water return	Yellow	HWR

2.5 IDENTIFICATION DUCTWORK SYSTEM

.1 Install plastic-laminated duct labels with permanent adhesive on air ducts in the color, stencil and size described below.

.2

.3 Stenciled Duct Label Option: Stenciled labels, showing service and flow direction man be provided instead of plastic-laminated duct labels, at installer's option, if lettering larger than 25 mm high is needed for proper identification because of distance from normal location of required identification.

.4 Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 17 meters in each space where ducts are exposed or concealed by removable ceiling system.

.5 Color Codes / Stencil / Size:

.1

System	Stencil
Supply Air	SUPPLY AIR
Outside Air	OUTSIDE AIR
Return Air	RETURN AIR
Mixed Air	MIXED AIR
Washroom Exhaust	WASHROOM EXHAUST
Lab General Exhaust	LAB EXHAUST

.2 Examples:

2.6 MANUAL VALVE IDENTIFICATION

.1 Applies to manually activated valves only. Control valves, pressure relief valves, pressure reducing valve, sprinkler valves, etc. are identified as equipment and fall under the equipment label procedure identified above. This section applies to manual isolation valves only.

.2 The mechanical contractor shall prepare a valve tag schedule. The mechanical contractor shall prepare a complete list of valves to be labeled in an Excel spreadsheet. Each individual valve shall be included on this list. The valve tag schedule shall be submitted for review as a shop drawing. The valve tags shall include a "Sequential Number". The "Sequential Number" shall be based on the following ranges. If any valves are utilized on this project that are not included in the list, please contact the engineer for direction on the proper "Sequential Number" to use.

Numbering Range	System
0000-1999	Hydronic Heating & Cooling

.3 The valve tag schedule shall include the following headings:

.1 Tag #: Valve Tag Number

.2 Level: Level that the valve is located on

.3 Location: Indicates if valve is located at equipment, overhead in an open ceiling space or above ceiling. Room number that valve is located in.

.4 System: System that valve belongs to.

.5 Equipment Tag: System tag that valves serves

.6 Type: Type of valve – butterfly, ball, etc.

.7 Size: Diamter of valve

.8 Model: Valve model number

.9 Manufacturer: Valve manufacturer

.10 Service: Purpose of valve

.11 NO/NC: Normal valve position – open or closed

.4 Physical tags with label and barcode to be prepared in same manner as equipment tags described herein.

2.7 CONTROLS COMPONENTS IDENTIFICATION

.1 Identify all systems, equipment, components, controls, sensors in accordance with the above described systems. The controls components are part of the scope of the equipment labels.

.2 Control system component identification shall be the responsibility of the Controls Contractor. Reference Section 25 05 54 – EMCS: Identification.

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 EQUIPMENT LABEL INSTALLATION

.1 Preparation:

.1 Clean piping and equipment surface of substances that could impair bond of identification devices, including moisture, dirt, oil, grease, release agents, and incompatible primers, paints and encapsulants.

.2 Installation:

.1 Where installation of label is restricted, such as valves, place the label on 1/16 inch thick clear plexiglass and fasten with #10 (4.5 mm) ball chain. Ensure:

.1 Clear plexiglass to be 8 mm larger in width and 10 mm larger in length than the label.

.2 Center the label vertically and horizontally on the plexiglass.

.3 Bullnose the corners and clean any sharp edges.

.4

.2 Labels are to be place on the front of the equipment in a location where it can be visible.

.3 Locations:

.1 In conspicuous location to facilitate easy reading and identification from operating floor.

.4 Standoffs:

.1 Provide for nameplates on hot and/or insulated surfaces.

.5 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 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 SCHEDULE

.1 Install one copy of valve schedule mounted in frame behind non-glare glass in water entry room. Provide one copy (reduced in size if required) in each operating and maintenance manual.

3.7 IDENTIFICATION ON CEILINGS

.1 Where valves, fire dampers, or similar system component that require access are located above ceilings the mechanical contractor shall provide indicators for these locations.

.2 A 20 mm colored adhesive vinyl indicator shall be used to identify the location of equipment above the ceiling. The indicator shall be located on the underside of the acoustic ceiling tile or on the access hatch in the case of gypsum board ceilings.

.3 The color coding and shape for the indicator is noted below. If any equipment or systems are not included in the below list, please contact the engineer for direction on the proper color and shape to use.

.1

Service	Indicator
Hydronic Heating Valves	
Chilled Water Valves	
HVAC – VAV / Reheat Coils	
Fire / Smoke Dampers	
Fire Suppression Valves	

3.8 CLEANING

.1 Proceed in accordance with Section 01 74 00 – Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, 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.

.3 This Section specifies the requirements and procedures for total mechanical systems testing, adjusting, and balancing. Requirements include measurement and establishment of the fluid quantities of the mechanical systems as required to meet design specifications, and recording and reporting the results. In addition carry out acoustical testing as identified below.

.4 Test, adjust, and balance the following mechanical systems:

.1 Reheat coils.

.2 VAV boxes.

.5 Duct silencers. Measure air pressure drop and insertion loss across each silencer.

.6 Perform acoustical testing requirements outlined in specification Section 23 32 48 – Acoustical Air Plenums.

1.2 DEFINITIONS

.1 Systems testing, adjusting, and balancing is the process of checking and adjusting all the building environmental systems to produce the design objectives. It includes:

.1 The balance of air and water distribution.

.2 Adjustment of total system to provide design quantities.

.3 Electrical measurement.

.4 Verification of performance of all equipment and automatic controls.

.5 Acoustical testing of finished systems.

.2 Test: To determine quantitative performance of equipment

.3 Adjust: To regulate the specified fluid flow rate and air patterns at the terminal equipment (e.g., reduce fan speed, throttling).

.4 Balance: To proportion flows within the distribution system (submains, branches, and terminals) according to specified design quantities.

.5 Procedure: Standardized approach and execution of sequence of work operations to yield reproducible results.

.6 Report forms: Test data sheets arranged for collecting test data in logical order for submission and review. These data sheets should also form the permanent record to be used as the basis for required future testing, adjusting, and balancing.

.7 Terminal: The point where the controlled fluid enters or leaves the distribution system. These are supply inlets on water terminals, supply outlets on air terminals, return outlets

on water terminals, and exhaust or return inlets on air terminals such as registers, grilles, diffusers, louvers, and hoods.

.8 Main: Duct or pipe containing the system's major or entire fluid flow.

.9 Submain: Duct or pipe containing part of the systems' capacity and serving two or more branch mains.

.10 Branch main: Duct or pipe serving two or more terminals.

.11 Branch: Duct or pipe serving a single terminal.

1.3 QUALIFICATIONS OF TAB PERSONNEL

.1 Submit names of personnel certified to perform TAB to Owner's Representative within 90 days of award of contract.

.2 Provide documentation confirming qualifications, successful experience.

.3 Test and Balance Technician's Qualifications: minimum 3-years of successful testing, adjusting, and balancing experience on projects with testing and balancing requirements similar to those required for this project.

.4 Agency Qualifications:

.1 Employ the services of an independent testing, adjusting, and balancing agency meeting the qualifications specified below, to be the single source of responsibility to test, adjust, and balance the building mechanical systems identified above, to produce the design objectives. Services shall include checking installations for conformity to design, measurement and establishment of the fluid quantities of the mechanical systems as required to meet design specifications, and recording and reporting the results.

.2 The independent testing, adjusting, and balancing agency shall be certified by National Environmental Balancing Bureau (NEBB) or by the Associated Air Balance Council (AABC) in those testing and balancing disciplines required for this project and shall have at least one Technician certified by NEBB or AABC as a Test and Balance Technician.

.5 Codes and Standards:

.1 NEBB: "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems."

.2 AABC: "National Standards For Total System Balance".

.3 American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE):

.1 ASHRAE Handbook, HVAC Applications Volume, Chapter 36, Testing, Adjusting, and Balancing.

.6 Recommendations and suggested practices contained in the TAB Standard: mandatory.

.7 Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.

.8 Use TAB standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.

.9 Where instrument manufacturer calibration recommendations are more stringent than those listed in the TAB standard, use manufacturer's recommendations.

.10 TAB Standard quality assurance provisions such as performance guarantees form part of this contract.

.1 For systems or system components not covered in TAB standard, use TAB procedures developed by TAB Specialist.

.2 Where new procedures and requirements are applicable to Contract requirements have been published or adopted by body responsible for TAB Standard used (AABC, NEBB, or SMACNA), requirements and recommendations contained in these procedures and requirements are mandatory.

1.4 PURPOSE OF TAB

.1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads.

.2 Adjust and regulate equipment and systems so as to meet specified performance requirements and to achieve specified interaction with 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.

1.5 EXCEPTIONS

.1 TAB of systems and equipment regulated by codes, standards to be to satisfaction of authority having jurisdiction.

1.6 CO-ORDINATION

.1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule so as to ensure completion before acceptance of project.

.2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

1.7 PRE-TAB REVIEW

.1 Review contract documents before project construction is started and confirm in writing to Owner's Representative 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's Representative 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.

.4 Pre-Balancing Conference: Prior to beginning of the testing, adjusting, and balancing procedures, schedule and conduct a conference with the Owner's Representative and representatives of installers of the mechanical systems. The objective of the conference is final coordination and verification of system operation and readiness for testing, adjusting, and balancing.

1.8 START-UP

.1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.

.2 Follow special start-up procedures specified elsewhere in other Divisions.

1.9 OPERATION OF SYSTEMS DURING TAB

.1 Operate systems for length of time required for TAB and as required by Owner's Representative for verification of TAB reports.

.2 Systems operation: systems shall be fully operational prior to beginning procedures.

1.10 START OF TAB

.1 Notify Owner's Representative 7 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 are airtight to within specified tolerances.
  - .4 Correct fan rotation.
  - .5 Fire 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 and 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 system complete, operational.

1.11 APPLICATION TOLERANCES

.1 Do TAB to following tolerances of design values:

.1 HVAC systems: plus 5%, minus 5%.

1.12 ACCURACY TOLERANCES

.1 Measured values to be accurate to within plus or minus 2 % of actual values.

1.13 INSTRUMENTS

.1 Prior to TAB, submit to Owner's Representative list of instruments to be used together with serial numbers.

.2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.

.3 Calibrate within 3 months of TAB. Provide certificate of calibration to Owner's Representative.

1.14 SUBMITTALS

.1 Submit, prior to commencement of TAB:

.1 Procedures and Agenda: Submit a synopsis of the testing, adjusting, and balancing procedures and agenda proposed to be used for this project.

.2 Sample Forms: Submit sample forms, if other than those standard forms prepared by the Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB) are proposed.

1.15 PRELIMINARY TAB REPORT

.1 Draft report: Upon completion of testing, adjusting, and balancing procedures, prepare draft report on the approved forms. Draft report may be hand written, but must be complete, factual, accurate, and legible. Organize and format draft report in the same manner specified for the final report. Submit 2 complete sets of draft report. Only 1 complete set of draft report will be returned with comments.

1.16 TAB REPORT

.1 Submit testing, adjusting, and balancing reports bearing the seal and signature of the Test and Balance Technician. The reports shall be certified proof that the systems have been tested, adjusted, and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed; are a true representation of how the systems are operating at the completion of the testing, adjusting, and balancing procedures; and are an accurate record of all final quantities measured, to establish normal operating values of the systems.

.2 Final Report: Upon verification and approval of draft report, prepare final report, type written, and organized and formatted as specified below. Submit 2 complete sets of final report.

.3 Report Format: Report forms shall be those standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted, and balanced. Bind

report forms complete with schematic systems diagrams and other data in reinforced, vinyl, three-ring binders. Provide binding edge labels with the project identification and a title descriptive of the contents. Divide the contents of the binder into the below listed divisions, separated by divider tabs:

.1 General Information and Summary

.2 Air Systems

.4 Report Contents: Provide the following minimum information, forms and data:

.1 General Information and Summary: Inside cover sheet to identify testing, adjusting, and balancing agency, the Company, Technician, and Project. Include addresses, and contact names and telephone numbers. Also include a certification sheet containing the seal and name, address, telephone number, and signature of the Certified Test and Balance Technician. Include in this division a listing of the instrumentations used for the procedures along with the proof of calibration.

.2 The remainder of the report shall contain the appropriate forms containing as a minimum, the information indicated on the standard report forms prepared by the AABC or NEBB, for each respective item and system. Prepare a schematic diagram for each item of equipment and system to accompany each respective report form.

.3 Calibration Reports: Submit proof that all required instrumentation has been calibrated to tolerances specified in the referenced standards, within a period of six months prior to starting the project.

1.17 VERIFICATION

.1 Reported results subject to verification by Owner's Representative.

.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's Representative.

.4 Bear costs to repeat TAB as required to satisfaction of Owner's Representative.

1.18 SETTINGS

.1 After TAB is completed to satisfaction of Owner's Representative, 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.

1.19 COMPLETION OF TAB

.1 TAB to be considered complete when final TAB Report received and approved by Owner's Representative.

1.20 AIR SYSTEMS

.1 Standard: TAB to be to most stringent of this section or TAB standards of AABC 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 AABC or NEBB.

.4 Quality assurance: Perform TAB under direction of supervisor qualified to standards of AABC or 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, 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, 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).

1.21 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 Building pressure conditions:

.1 Adjust HVAC systems, airflow rates to specified values to achieve proper building pressurization.

.3 Acoustical measurements:

.1 As per requirements of specification Section 23 32 48 – Acoustical Air Plenums.

PART 2 PRODUCTS

2.1 NOT APPLICABLE

PART 3 EXECUTION

3.1 PRELIMINARY PROCEDURES FOR AIR SYSTEM BALANCING

.1 Before operating the system, perform these steps:

.1 Obtain design drawings and specifications and become thoroughly acquainted with the design intent.

.2 Obtain copies of approved shop drawings of all air handling equipment, outlets (supply, return, and exhaust) and control system.

.3 Compare design to installed equipment and field installations.

.4 Walk the system from the system air handling equipment to terminal units to determine variations of installation from design.

.5 Check filters for cleanliness.

.6 Check dampers for correct and locked position, and control system for completeness of installation before starting fans.

.7 Prepare report test sheets for both fans and outlets. Obtain manufacturer's outlet factors and recommended procedures for testing. Prepare a summation of required outlet volumes to permit a crosscheck with required fan volumes.

.8 Determine best locations in main and branch ductwork for most accurate duct traverses.

.9 Place outlet dampers in the full open position.

.10 Prepare schematic diagrams of system "as-built" ductwork and piping layouts to facilitate reporting.

.11 Lubricate all motors and bearings.

.12 Check fan belt tension.

.13 Check fan rotation.

3.2 MEASUREMENTS

.1 Provide all required instrumentation to obtain proper measurements, calibrated to the tolerances specified in the referenced standards. Instruments shall be properly maintained and protected against damage.

.2 Provide instruments meeting the specifications of the referenced standards.

.3 Use only those instruments which have the maximum field measuring accuracy and are best suited to the function being measured.

.4 Apply instrument as recommended by the manufacturer.

.5 Use instruments with minimum scale and maximum subdivisions and with scale ranges proper for the value being measured.

.6 When averaging values, take a sufficient quantity of readings which will result in a repeatability error of less than 5 percent. When measuring a single point, repeat readings until 2 consecutive identical values are obtained.

.7 Take all reading with the eye at the level of the indicated value to prevent parallax.

.8 Use pulsation dampeners where necessary to eliminate error involved in estimating average of rapidly fluctuation readings.

.9 Take measurements in the system where best suited to the task.

3.3 PERFORMING TESTING, ADJUSTING AND BALANCING

.1 Perform testing and balancing procedures on each system identified, in accordance with the detailed procedures outlined in the referenced standards.

.2 Cut insulation, ductwork, and piping for installation of test probes to the minimum extent necessary to allow adequate performance of procedures.

.3 Patch insulation, ductwork, and housings, using materials identical to those removed.

.4 Seal ducts and piping, and test for and repair leaks.

.5 Seal insulation to re-establish integrity of the vapor barrier.

.6 Mark equipment settings, including damper control positions, valve indicators, fan speed control levers, and similar controls and devices, to show final settings. Mark with paint or other suitable, permanent identification materials.

.7 Retest, adjust, and balance systems subsequent to significant system modifications, and resubmit test results.

3.4 RECORD AND REPORT DATA

.1 Record all data obtained during testing, adjusting, and balancing in accordance with, and on the forms recommended by the referenced standards, and as approved on the sample report forms.

.2 Prepare report of recommendations for correcting unsatisfactory mechanical performances when system cannot be successfully balanced.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Materials and methods for pressure testing all ducts over 5 m in length, forming part of a supply, return or exhaust ductwork system directly or indirectly connected to air handling equipment.

.2 All ductwork installed on this project shall be pressure tested unless it is part of the exclusions outlined in Item 1.8 below.

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 19 – Waste Management and Disposal.

.5 Section 01 78 00 – Closeout Submittals.

.6 Section 01 91 13 – Commissioning (Cx) Requirements.

1.3 REFERENCES

.1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.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's Representative for approval at least three months before proposed date of first series of tests. Do not start tests until approval received in writing from Owner's Representative.

.2 Prepare report of results and submit to Owner's Representative within 24 hours 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.

1.6 TESTING AGENCY

.1 Certified NEBB/AABC TAB Agency.

1.7 TIMING

.1 Ducts to be tested before installation of insulation or any other form of concealments.

.2 Test after seals have cured.

.3 Test when ambient temperature will not affect effectiveness of seals, gaskets, etc.

1.8 EXCLUSIONS

.1 Flexible connections to diffusers.

1.9 VERIFICATION

.1 Owner's Representative to witness tests and to verify reported results.

.2 Testing results to be certified by the same TAB agency approved by Engineer to undertake TAB on this project.

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's Representative at least three months before anticipated start date.

.4 Test instruments: calibrated and certificate of calibration deposited with Owner's Representative no more than 28 days before start of tests.

.5 Re-calibrated every six months thereafter.

2.2 SYSTEM LEAKAGE TOLERANCES

.1 As outlined in SMACNA HVAC Air Duct Leakage Test Manual for the applicable duct static pressure class, seal class, and leakage class in each instance. The applicable duct pressure class shall be determined from the external static pressure in the air handling unit and fan schedules. The listed external static pressure is not the duct pressure class. Consult the SMACNA HVAC Air Duct Leakage Test Manual for further clarification in this matter.

.2 Evaluation of test results to use surface area of duct test section and pressure in duct as basic parameters.

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 CLEANING

.1 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

3.4 TRIAL TEST

.1 Carry out trial leakage test to demonstrate workmanship.

.2 After acceptance of trial leakage test by Engineer, proceed with installation and testing of remaining ductwork.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 74 19 - 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.

.5 Section 23 31 13.01 – Ductwork - Metallic to 2500 Pa.

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 C449/C449M, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.

.2 ASTM C518, Standard Test Method for Steady State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

.3 ASTM C553, Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

.4 ASTM C612, Specification for Mineral Fiber Block and Board Thermal Insulation.

.5 ASTM C795, Specification for Thermal Insulation for Use with Austenitic Stainless Steel.

.6 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 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.

1.6 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.

1.7 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.

1.8 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - 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's Representative.

.5 Divert unused adhesive material from landfill to official hazardous material collections site approved by Owner's Representative.

.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:

.1 Rigid mineral fibre board:

.1 "K" factor of 0.032 W/m. ºC at mean ambient temperature of 24ºC when tested in accordance with ASTM C612, Type 1A and 1B, rigid.

.2 Mineral fibre blanket:

.1 "K" factor of 0.035 W/m.ºC at mean ambient temperature of 24ºC when tested in accordance with ASTM C518, flexible blanket.

.2 Listed "K" factor for mineral fibre blanket is installed value which takes into account a 25% insulation compression factor.

.3 TIAC Code C-1: Rigid mineral fibre to ASTM C612 with factory applied vapour retarder jacket to CGSB.51-GP-52Ma:

.1 Density: 96.11 kg/m³.

.2 Installed “R” values:

.1 25 mm thick: 0.73 m².ºC/W.

.2 50 mm thick: 1.45 m².ºC/W.

.3 Sound absorption coefficients when tested in accordance with ASTM C423, Type A mounting, as follows:

	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
25 mm thick	0.10	0.35	0.85	1.04	1.05	1.03
50 mm thick	0.38	0.93	1.10	1.07	1.07	1.07

.1 Noise reduction coefficient: 0.80 for 25 mm thick and 1.05 for 50 mm thick.

.2 Acceptable Product: Johns-Manville Series 8000 spin-glass, Type 817 with FSK reinforced foil and paper (Foil - Scrim-Kraft), Manson, Owens-Corning, Knauf, or approved equal.

.4 TIAC Code C-2: Mineral fibre blanket to ASTM C553 faced with factory applied vapour retarder jacket to CGSB 51-GP-52Ma.

.1 Density: 24.1 kg/m³.

.2 Installed "R" Value:

.1 40 mm thick: 0.83 m².ºC/w.

.2 50 mm thick: 1.11 m².ºC/w.

.3 Operating temperature limits: 40ºC to 121ºC.

.4 Acceptable Product: Johns-Manville Micro-Lite XG formaldehyde free, Type 150 with FSK reinforced foil and paper (foil - Scrim-Kraft), Mason, Owens-Corning, Knauf, or approved equal.

2.3 JACKETS

.1 Canvas:

.1 220 gm/m^2 cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.

.1 Acceptable Product: S. Fattal Thermocanvas, or approved equal.

2.4 ACCESSORIES

.1 Vapour retarder lap sealer:

.1 Rubber/Resin solvent based adhesive, flammable wet, fire-resistant dry.

.2 Acceptable Product: Henry/Bakor 230-06, Foster, Childers or approved equal.

.2 Tape: self-adhesive, aluminum, reinforced, 50 mm wide minimum.

.1 Acceptable Product: Duro Dyne, Dyn Air or approved equal.

.3 Contact adhesive: quick setting:

.1 Non-flammable, rubberized emulsion based adhesive.

.2 Acceptable Product: Henry Bakor 200-38, Foster, Childers or approved equal.

.4 Lagging coating (cement):

.1 Fire resistive, heavy duty resin emulsion insulation lagging coating.

.2 Acceptable Product: Henry Bakor 120-09, Foster, Childers or approved equal.

.5 Fasteners: 4 mm diameter pins with 35 mm diameter clips, length to suit thickness of insulation.

.1 Acceptable Product: Duro Dyne, Dyn-Air or approved equal.

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 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.

.1 Hangers, supports to be outside vapour retarder jacket.

.4 Supports, Hangers in accordance with Section 23 31 13.01 - Ductwork - Metallic to 2500 Pa:

.1 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.

.5 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:

.1

	TIAC Code	Vapour Retarder	Thickness
Round supply duct (entirety)	C2	Yes	25 mm
Rectangular supply duct (entirety)	C1	Yes	25 mm

.2 The insulation table above represents types and material thicknesses for thermal insulation mounted on the exterior of ductwork.

.3 Utilize metal corners on all exposed rectangular ducts to be insulated.

.4 Finishes: conform to following table:

.1

Indoor, concealed	None
Indoor, exposed	Canvas CRF/1 and CRD/1

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Thermal insulation for all piping, fittings, valves, flanges and associated piping components installed under this contract, unless specified otherwise in other sections.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 35 29.06 - Health and Safety Requirements.

.3 Section 01 61 00 - Common Product Requirements.

.4 Section 01 74 00 - Cleaning

.5 Section 01 74 19 - Waste Management and Disposal

.6 Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

.7 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 C209, Standard Test Methods for Cellulosic Fiber Insulating Board.

.2 ASTM C335, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.

.3 ASTM C518, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

.4 ASTM C534/C534M, Standard Specification for Preformed Cellular Thermal Insulation in Sheet and Tubular Form.

.5 ASTM C547, Standard Specification for Mineral Fibre Pipe Insulation.

.6 ASTM C1136, Standard Specification for Flexible, Low Permeance Vapour Retarders for Thermal Insulation.

.7 ASTM E96/E96M, Standard Test Methods for Water Vapour Transmission of Materials.

.3 Canadian General Standards Board (CGSB)

.1 CGSB 51-GP-52Ma, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

.2 CAN/CGSB-51.53, Poly (Vinyl Chloride) Jacketting Sheet, for Insulated Pipes, Vessels and Round Ducts

.4 Manufacturer's Trade Associations

.1 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).

1.4 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 installation standard:

.1 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.

.3 Shop Drawings:

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.4 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

.1 Instructions: submit manufacturer's installation instructions to Owner's Representative.

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 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 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - 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, packing material in appropriate on-site containers for recycling in accordance with Waste Management Plan.

.4 Divert unused metal materials from landfill to metal recycling facility approved by Owner's Representative.

.5 Divert unused adhesive materials from landfill to official hazardous material collections site approved by Owner's Representative.

.6 Do not dispose of unused adhesive materials into sewer systems, into lakes, 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 specified includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) of 0.033 W/m.ºC at mean ambient temperature of 24ºC values at 24°C mean temperature when tested in accordance with ASTM C335.

.3 TIAC Code A-1: Rigid moulded mineral fibre with factory applied vapour retarder jacket and AP-T (All Purpose Tape) closure:

.1 Mineral fibre: to ASTM C547.

.2 Jacket: to CGSB 51-GP-52 Ma and ASTM C1136.

.3 Maximum "k" factor: to ASTM C547 and 2.2.2 above .

.4 Maximum service temperature: -18°C to 454°C.

.5 Acceptable products: Johns-Manville Micro-Lok AP-T Plus with self-sealing lap, Manson, Owens-Corning, Knauf, or approved equal.

.4 TIAC Code A-6: flexible unicellular tubular elastomer:

.1 Insulation: to ASTM C534.

.2 Maximum thermal conductivity of 38.88 W.mm/$m^{2.\circ}$C at 23.8 ºC mean temperature when tested in accordance with ASTM C518.

.3 Maximum vapor transmission of 146 perm-mm when tested in accordance with ASTM- E96.

.4 Acceptable Product: Armstrong AP-SS, or approved equal.

2.3 INSULATION SECUREMENT

.1 Longitudinal joints to be made with factory applied self-seal tape for Code A-1 insulation.

.2 Longitudinal joints to be made with factory applied self-seal adhesive for code A-6 insulation.

.3 Butt joints for Code A-1 insulation to be made with self-adhesive reinforced butt strips supplied complete with insulation.

.4 Ends of pipe insulation at valves which are specified as not requiring insulation are to be sealed with vapour retarder lap sealer. Vapour retarder lap sealer shall be a rubber/resin solvent based adhesive, flammable wet, fire resistant dry. Acceptable product: Henry/Bakor 230-06, Foster, Childers or approved equal.

2.4 FITTINGS

.1 All fittings to be insulated to same thickness as adjacent piping insulation.

.2 Fittings for Code A-1 insulation to be insulated with flexible fibreglass insulation inserts:

.1 Acceptable products: Johns Manville Hi-Lo temp insulation inserts complete with Zeston 2000 PVC insulated jacket covers, Mason, Owens-Corning, Knauf, or approved equal.

.3 All cold piping systems subject to condensation to be insulated with two (2) layers of flexible fiberglass insulation inserts. In addition, an approved vapour retarder mastic compatible with PVC shall be applied between the pipe insulation and the insulation fitting cover and on the PVC fitting cover throat overlap seam.

.4 All exposed and concealed piping fittings insulated with Code A-1 insulation are to be insulated with flexible fibreglass insulation inserts and PVC insulated fitting covers.

.5 In addition to pipe fittings such as elbows, tees, reducers, end caps, Y-branches, P-traps, etc., the insulation method for fittings outlined above shall apply to the following, unless other insulation method is specified elsewhere:

.1 Grooved pipe couplings and fittings.

.2 Flanged connections for pipe-to-pipe and pipe-to-equipment connections.

.3 All valves and components in hydronic systems including but not limited to the following:

.1 Balancing valves DN 50 and below

.2 Wye strainers DN 50 and below

.3 Control valves DN 50 and below

.4 Check valves DN 50 and below

.5 Pressure relief valves DN 50 and below

.6 Pressure reducing valves DN 50 and below

.7 Isolation valves including ball, butterfly, gate, globe, etc. DN 50 and below

.8 Grooved piping couplings and fittings

.9 Flanged connections for pipe to pipe and pipe to equipment connections.

2.5 JACKETS

.1 Polyvinyl Chloride (PVC) indoors / outdoors:

.1 One-piece moulded type and sheet to CAN/CGSB-51.53 with pre-formed shapes as required.

.2 Colours: white.

.3 Minimum service temperatures: -29°C.

.4 Maximum service temperature: 66°C.

.5 Moisture vapour transmission: 0.02 perm.

.6 Thickness: 20 mil (0.51 mm).

.7 Fastenings:

.1 Use solvent weld adhesive compatible with insulation to seal laps and joints. Circumferential seams should be a minimum of 25 mm overlap, and longitudinal seams should be 38 mm to 51 mm overlap. This applies to both jackets and fitting covers.

.2 Tacks.

.3 Pressure sensitive vinyl tape of matching colour, 10 mil (0.254 mm).

.4 Provide slip joints outdoors between fixed supports and on continuous long runs of straight piping. Increase circumferential overlap to 203 mm to 254 mm and apply a flexible white caulking in the overlap area to maintain a sealed system.

.8 Special requirements:

.1 Indoor: flame spread rating 25, smoke developed rating 50.

.2 Outdoor: UV rated material.

.9 Acceptable product: Johns Manville Zeston 2000 PVC insulating fitting covers, Proto Corp, Childers, or approved equal.

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 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 As specified in Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

3.4 PIPING INSULATION SCHEDULES

.1 TIAC Code: A-1.

.1 Insulation securements: as per Item 2.3.

.2 Seals: as per Item 2.3.

.3 Installation: TIAC Code: 1501-H and 1501-C.

.4 Provide insert between support shield and piping on cold piping 65°C and below, DN 50 or larger. In addition, provide at pipe stanchion saddle supports for cold piping 65°C and below, and hot piping above 65°C regardless of pipe size. Inserts to be fabricated from Johns-Manville Thermo-12 or other high density insulating material suitable for the piping service temperature. Insulation inserts shall be no less than the following lengths:

.1 DN 15 to DN 65: 250 mm long.

.2 DN 80 to DN 150: 300 mm long.

.3 DN 200 to DN 250: 400 mm long.

.2 Thickness of insulation to be as listed in following table.

.1 Do not insulate exposed, chrome plated piping, valves, fittings.

.2

Application	TIAC Code	Pipe sizes (DN) and insulationthickness (mm)				
		to 25	32 to 50	65 to 100	125 to 150	200 & over
Chilled Water Piping	A-1	25	38	38	38	38
Hydronic Heating Piping	A-1	25	25	25	38	38

.3 Finishes:

.1 Exposed indoors / outdoors: PVC jacket.

.2 Exposed in mechanical rooms, closets and accessible service spaces: PVC jacket.

.3 Concealed, indoors: fibreglass insulation inserts complete with PVC insulated jacket covers on fittings. No further finish. (Code A-1)

.4 Installation:

.1 Exposed indoors/outdoors: CPF/4

.2 Concealed indoors: CPF/2.

3.5 CLEANING

.1 Proceed in accordance with Section 01 74 00 - Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 91 13 – Commissioning Requirements: supplemented as specified herein.

.2 Section 21 13 13 – Wet Pipe Sprinkler Systems.

.3 Section 23 05 93 – Testing, Adjusting and Balancing for HVAC.

1.2 CLEANING AND START-UP OF MECHANICAL PIPING SYSTEMS

.1 In accordance with Section 23 08 02 - Cleaning and Start-up of Mechanical Piping Systems.

1.3 WET SPRINKLER SYSTEM

.1 Cleaning, testing, start-up, performance verification of equipment, systems, components, and devices is specified elsewhere in other Mechanical Divisions.

.2 Verification of controls, detection devices, alarm devices is specified other Mechanical and Electrical Divisions.

.3 Verify operation of interlocks between HVAC systems and fire alarm systems.

1.4 REPORTS

.1 In accordance with Section 01 91 13 – Commissioning (Cx) Requirements: supplemented as specified herein.

1.5 TRAINING

.1 In accordance with Section 01 91 13 – Commissioning (Cx) Requirements: supplemented as specified in relevant specification sections

PART 2 PRODUCTS

2.1 NOT APPLICABLE.

PART 3 EXECUTION

3.1 NOT APPLICABLE.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Procedures and cleaning solutions for cleaning new hydronic piping 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 61 00 - Common Product Requirements.

.4 Section 01 74 00 - Cleaning

.5 Section 01 74 19 - Waste Management and Disposal

.6 Section 23 05 93 - Testing, Adjusting and Balancing of HVAC

1.3 REFERENCES

.1 Health Canada / Workplace Hazardous Materials Information System (WHMIS).

.1 Material Safety Data Sheets (MSDS).

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.

.2 Quality assurance submittals: submit following in accordance with Section 01 33 00 – Submittal Procedures.

.1 Instructions: submit manufacturer's installation instructions.

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 Packing, shipping, handling and unloading.

.1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 61 00 – Common Product Requirements.

.2 Waste Management and Disposal:

.1 Construction / Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

PART 2 PRODUCTS

2.1 CLEANING SOLUTIONS (TO BE USED FOR STEEL HYDRONIC PIPING ONLY)

.1 Chemical cleaner designed to remove mill scale, cutting oil and other particles before start-up.

.2 Specific gravity: 1.044.

.3 PH at 100% concentration: 9.5.

.4 Slightly alkaline liquid compound wetting agents, alkaline additives and corrosion inhibitors.

.5 Acceptable Manufacturer: Magnus Magsol 20 A, Chem-Aqua, or approved equal.

PART 3 EXECUTION

3.1 CLEANING HYDRONIC SYSTEMS

.1 This contract shall include the cleaning of the new hydronic systems piping and components installed.

.2 Timing:

.1 Systems to be operational, hydrostatically tested and with devices functional, before cleaning is carried out.

.3 Cleaning agency:

.1 Retain qualified water treatment specialist to perform system cleaning.

.4 Cleaning procedures:

.1 Provide detailed report outlining proposed cleaning procedures at least 4 weeks prior to proposed starting date. Report to include:

.1 Cleaning procedures, flow rates, elapsed time.

.2 Chemicals and concentrations to be used.

.3 Inhibitors and concentrations.

.4 Specific requirements for completion of work.

.5 Special precautions for protecting piping system materials and components.

.5 Conditions at time of cleaning of systems

.1 Systems to be free from construction debris, dirt and other foreign material.

.2 Control valves to be operational, fully open to ensure that coils and terminal units can be cleaned properly.

.3 Strainers to be cleaned prior to initial fill.

.4 Install pressure gauges on strainers to detect plugging.

.6 Report on Completion of Cleaning

.1 When cleaning is completed, submit report, complete with certificate of compliance with specifications of cleaning component supplier.

.7 Hydronic Systems:

.1 Flush system thoroughly with water, back flush pump, strainers, blow down drain valves and risers to remove all loose debris.

.2 For steel piping, then add 2% solution (by volume) of approved pipeline cleaning agent to the system by means of a mechanical non-electric pump to be provided by the cleaning agent supplier. For plastic hydronic piping system use water.

.3 Circulate for 48 hours (unheated).

.4 During recirculation, back flush strainers, drain valves and risers at their lowest point once every 8 hours.

.5 Drain cleaning water completely.

.6 Then fill and drain system several times. Circulate 30 minutes every time the system is refilled.

.7 Bleed system at several points until water is clear and nonfoaming. Clean strainers.

.8 Draw a water sample from the system and send it out to a laboratory for analysis.

.9 If the laboratory report is satisfactory, the systems may then be filled with the inhibited glycol solution.

3.2 START-UP OF HYDRONIC SYSTEMS

.1 After cleaning is completed, complete the following for each hydronic system:

.1 Flood system with water such that 27 kPa is measured at the highest point in the piping distribution system and measure initial fill pressure at expansion tank.

.2 Drain system.

.3 Set expansion tank precharge to equal the system fill pressure at the point of connection with the system when the system is cold.

.4 Clean out strainer baskets.

.5 Fill system with inhibited glycol solution.

.6 Establish circulation. Ensure air is removed. Check pumps to be free from air, debris, possibility of cavitation when system is at design temperature.

.7 Check pressure in expansion tank with circulating pumps OFF and again with pumps ON.

.8 Check pressurization to ensure proper operation and to prevent water hammer, flashing, cavitation. Eliminate water hammer and other noises.

.9 Bring system up to design temperature and pressure slowly.

.10 Repeat Item .7 with heating medium at design temperature.

.11 Perform TAB as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

.12 Adjust pipe supports, hangers, springs as necessary.

.13 Monitor pipe movement.

.14 Retighten bolts, etc. using torque wrench, to compensate for heat caused relaxation. Repeat several times during commissioning.

.15 Check operation of drain valves.

.16 Adjust valve stem packings as systems settle down.

.17 Check operation of over temperature protection devices on circulating pump starter.

.18 Adjust alignment of piping at pump to ensure flexibility, adequacy of pipe movement, absence of noise or vibration transmission.

.19 Check operation of pressure/temperature relief valves.

3.3 CLEANING

.1 Provide 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 ESTIMATED SYSTEM VOLUME

.1 Actual system volume and quantity of cleaning solutions to be determined by Contractor in the field. Contractor shall be responsible to provide all cleaning solutions as required.

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.

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 19 - Waste Management and Disposal.

.4 Section 01 78 00 - Closeout Submittals.

.5 Section 23 05 00 - Common Work Results for HVAC.

.6 Section 23 05 05 - Installation of Pipework.

.7 Section 23 05 23.01 - Valves - Bronze.

.8 Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

.9 Section 23 08 01 - Performance Verification of Mechanical Piping.

.10 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, Cast Iron Pipe Flanges and Flanges Fittings, Class 25, 125, 250 and 800.

.2 ASME B16.3, Malleable-Iron Threaded Fittings, Classes 150 and 300.

.3 ASME B16.5, Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and other Special Alloys.

.4 ASME B16.9, Factory-Made Wrought Steel Buttwelding Fittings.

.5 ASME B18.2.1, Square and Hex Bolts and Screws.

.6 ASME B18.2.2, Square and Hex Nuts.

.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 Canadian Standards Association (CSA International).

.1 CSA B242, Groove and Shoulder Type Mechanical Pipe Couplings.

.2 CSA B242.2, Grooving Dimensions.

.3 CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.

.4 CSA W47.1S1, Supplement No. 1 to W47.1, Certification of Companies for Fusion Welding of Steel Structures.

.5 CSA B52 – Boiler Pressure Vessel and Pressure Piping Code

.4 Manufacturer's Standardization Society of the Valve and Fittings Industry, Inc. (MSS).

.1 MSS-SP-67, Butterfly Valves.

.2 MSS-SP-80, Bronze Gate, Globe, Angle and Check Valves.

.5 Provincial 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.

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 19 - 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.

PART 2 PRODUCTS

2.1 CANADIAN REGISTRATION NUMBERS (CRN)

.1 All hydronic piping and components DN 25 or larger shall be considered pressure piping and shall be in accordance with the Province of Newfoundland and Labrador Boiler, Pressure Vessel and Compressed Gas Regulations.

.2 All hydronic piping fittings and pressure piping system components shall be required to carry C.R.N. for the Province of Newfoundland and Labrador. Submit shop drawings of pressure piping components clearly showing applicable C.R.N.

2.2 PIPE

.1 Steel pipe: to ASTM A53/A53M, Grade B, as follows:

.1 Up to DN 150, Schedule 40.

.2 DN 200 and over, Schedule 30.

.3 DN 300 and over, 10 mm wall thickness.

2.3 PIPE JOINTS

.1 Contractor has option to pick from available acceptable pipe joining methodologies described below for respective pipe sizing ranges.

.2 DN 50 and under: Schedule 40 screwed fittings with Teflon tape.

.1 Pipe thread: taper.

.3 DN 65 and over: welding fittings and flanges to CSA W47.1 and CSA W47.1S1.

.1 Flanges: raised face, weld neck or slip-on.

.2 Flange gaskets: to suit application.

.3 Bolts and nuts: to ASME B18.2.1 and ASME B18.2.2.

.4 DN 65 and over grooved pipe couplings to CSA B242 designed with angle bolt pads to provide a rigid joint unless otherwise noted.

.1 Acceptable product: Victaulic #107 Quick Vic installation ready couplings DN 65 to 200, Victaulic #07 couplings DN 250 to 300, Victaulic AGS W07 DN 350 to 600; Shurjoint; Gruvlok, or approved equal.

.2 Coupling gaskets to be Grade "E" EPDM suitable for 40% propylene glycol / water mixture and associated corrosion inhibitors at temperature range of approximately -16ºC to 83ºC. Advise owner's representative during shop drawing submission if gasket material will meet service condition requirements.

.3 All grooved products to be of one manufacturer.

.5 DN 65 and over grooved pipe flange adapter for directly incorporating flanged components with ANSI class 125 or Class 150 bolt hole patterns.

.1 Acceptable product: Victaulic Style 741 flange adapter, Star, Shurjoint, Gruvlok, or approved equal.

.2 Coupling gaskets to be grade "E" EPDM suitable for 40% propylene glycol / water mixture and associated corrosion inhibitors at temperature range of approximately -16ºC to 83ºC. Advise owner's representative in writing during shop drawing submission if gasket material will meet service condition requirements.

.3 All grooved products to be of one manufacturer.

2.4 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 Ductile iron grooved end fitting conforming to ASTM A536.

.1 Acceptable products: Victaulic, Star, Shurjoint, Gruvlok, or approved equal.

2.5 VALVES

.1 Connections:

.1 DN 50 and smaller: screwed ends.

.2 DN 65 and larger: flanged ends or grooved ends.

.2 Ball valves:

.1 DN 50 or smaller: See specification Section 23 05 23.01 - Valves - Bronze.

.3 Drain valves: DN 20 unless otherwise indicated, bronze, with hose end male thread and complete with cap and chain.

.1 Acceptable product: Dahl Figure 50430-0, or approved equal.

PART 3 EXECUTION

3.1 PIPING INSTALLATION

.1 Install pipework in accordance with Section 23 05 05 – Installation of Pipework by certified journeyperson and authority having jurisdiction.

.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 job site and review installation. Contractor shall remove and replace any joints deemed improperly installed.

3.2 CLEANING, FLUSHING AND START-UP

.1 In accordance with Section 23 08 02 – Cleaning and Start-up of Mechanical Piping Systems.

3.3 TESTING

.1 Test system in accordance with Section 23 05 05 – Installation of Pipework.

3.4 BALANCING

.1 Refer to Section 23 05 93 – Testing, Adjusting and Balancing for HVAC, for applicable procedures.

3.5 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 The supply and installation of hydronic specialties 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 74 19 - Waste Management and Disposal

.4 Section 01 78 00 – Closeout Submittals.

.5 Section 23 05 05 – Installation of Pipework.

.6 Section 23 08 01 – Performance Verification of Mechanical Piping Systems.

1.3 REFERENCES

.1 American Society of Mechanical Engineers (ASME)

.1 ANSI/ASME, Boiler and Presure Vessel Codes

.2 ASME B16.1, Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250 and 800.

.2 American Society for Testing and Materials (ASTM)

.1 ASTM A47/A47M, Specification for Ferritic Malleable Iron Castings.

.2 ASTM A126, Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.

.3 ASTM A278M, Specification for Gray Iron Castings for Pressuer-Containing Parts for Temperatures up to 345ºC.

.4 ASTM A516/A516M, Specification for Pressure Vessel Plates, Carbon Steel, for Moderate and Lower Temperature Service.

.5 ASTM A536, Specification for Ductile Iron Castings.

.6 ASTM B62, Specification for Composition Bronze or Ounce Metal Castings.

.3 Air-conditioning, Heating and Refrigeration Institute (AHRI)

.1 ARI 410, Forced-circulation Air-cooling and Air-heating Coils.

.4 Canadian Standard Association (CSA).

.1 CSA B51, Boiler, Pressure Vessel and Pressure Piping Code.

.5 Province of Newfoundland and Labrador

.1 Boiler, Pressure Vessel and Compressed Gas Regulations.

1.4 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data: Submit WHMIS MSDS – Material Safety Data Sheets in accordance with Section 02 62 00.01 – Hazardous Materials.

.1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate on product data expansion tanks, air vents, separators, valves, and strainers.

.3 Closeout Submittals:

.1 Submit maintenance data in accordance with 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.

1.6 DELIVERY STORAGE AND DISPOSAL

.1 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - 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 PERFORMANCE REQUIREMENTS

.1 Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature:

.2 Hot-Water Heating Piping: 150 psig at 200 deg F.

.3 Chilled-Water Piping: 150 psig at 200 deg F.

PART 2 PRODUCTS

2.1 CANADIAN REGISTRATION NUMBERS (CRN)

.1 All hydronic piping and components DN 25 or larger shall be considered pressure piping and shall be in accordance with the Province of Newfoundland and Labrador Boiler, Pressure and Compressed Gas Regulations.

.2 All hydronic piping, fittings and pressure piping system components shall be required to carry C.R.N. for the Province of Newfoundland and Labrador. Submit shop drawings of pressure piping components clearly showing applicable C.R.N.

2.2 AIR VENT

.1 Manual air vent:

.1 Chrome brass body.

.2 Stainless steel check valve.

.3 Automatic or manual operation.

.4 Brass disc bearing cover.

.5 Copper thermostat assembly.

.6 Neoprene O-ring.

.7 Heat resistant ABS plastic material handwheel.

.8 Cellulose fibre disc.

.9 Maximum rated working pressure: 861 kPa.

.10 Maximum rated working temperature: 116ºC.

.11 Two-piece construction.

.12 Positive shut-off ball check.

.13 Replacement cartridge shall be capable of being installed without shutting or draining down the system.

.14 Connection: DN 6 NPT (male).

.15 Acceptable products: Watts Regulator Series HAV Model No. 590713, ITT Bell and Gossett, Taco, or approved equal.

2.3 WYE-PATTERN STRAINERS (DN 6 TO DN 80)

.1 ASTM A-126 Class B, cast iron body, wye-pattern strainer for liquid service.

.2 20 mesh strainer screen for DN 6 to DN 50, DN 80 strainer shall utilize a 1 mm perforated screen. All screens shall be 304 stainless steel.

.3 Female NPT inlet/outlet connections.

.4 Non-asbestos, gasketted, threaded screen retainer cap.

.5 Tapped blow-off connection.

.6 Maximum rated working pressure: 1.72 MPa.

.7 Maximum operating temperature: 208ºC.

.8 Acceptable products: Watts Regulator Model 77S, Hoffman, Wilkins, or approved equal.

2.4 DUCT MOUNTED HEATING COILS

.1 Furnish and install, where indicated on the drawings, coils as described in the following specifications:

.1 Application:

.1 Duct mounted hot water reheat coils.

.2 Type "HW" Construction:

.1 Designation See schedule on drawings.

.2 Tubes shall be 15.8 mm diameter seamless copper, 0.51 mm average wall thickness

.3 Fins shall be continuous plate with full fin collars for dependable fin spacing. Fins shall be star patterned and shall be 0.1905 mm thick in aluminum material.

.4 Headers shall be single piece copper, suitable for minimum 1379 kPa coil design pressure, with no separate end disks or caps brazed or welded into header ends. Connections shall be brass (for copper headers) with male pipe threads and shall be welded to header barrels. Coils shall have beveled welded end caps on the header barrels.

.5 Both tube-to-return bend and tube-to-header joints shall be high strength brazed. Welding and brazing shall be done by ASME qualified personnel. Tube to header connection nipples shall have an orifice design to enhance turbulence at low fluid flow.

.6 Casings shall be minimum 16 ga mill galvanized steel. Top and bottom casing panels to be 38.1 mm double flanged for stacking. End casings shall have smooth, embossed tube holes to provide adequate bearing surface for tubes so as to avoid tube abrasion.

.7 Coils shall be suitable for working pressure of 1379 kPa @ 104 C and leak tested at 2068 kPa air under water. Coils must be hydrostatically tested.

.3 Type "HWP" Construction:

.1 Designation: See schedule on drawings.

.2 Tubes shall be 15.8 mm diameter seamless copper, 0.51 mm average wall thickness

.3 Fins shall be continuous plate with full fin collars for dependable fin spacing. Fins shall be star patterned and shall be 0.1905 mm thick in aluminum material.

.4 Coils to be single or dual serpentine fed with brass FPT half union connections, joined to tubes by means of a brazed joint.

.5 Both tube-to-return bend and tube-to-connection joints shall be high strength brazed. Welding and brazing shall be done by ASME qualified personnel.

.6 Casings shall be minimum 16 ga mill galvanized steel with 19 mm perimeter mounting flanges. End casings shall have smooth, embossed tube holes to provide adequate bearing surface for tubes so as to avoid tube abrasion.

.7 Coils shall be suitable for working pressure of 1724 kPa @ 204°C and pneumatically leak tested at 2068 kPa air under water. Coils must be hydrostatically tested.

.8 Coils must be drainable when installed level with no trapping circuits.

.9 Return bends shall receive a coat of rust inhibitive, high temperature shop primer prior to shipment.

.4 Performance: See coil schedules on drawings.

.5 Provide type "HP" and type "HWP" as indicated in coil schedules on drawings.

.6 Coils shall be tested and rated in accordance with Air Conditioning and Refrigeration Institute (ARI) Standard 410 and certified in accordance with the ARI certification program.

.7 Acceptable material: Aerofin Model HW and HWP, Rosemex, Trane, Luvata Heatcraft, or approved equal.

2.5 COIL KITS

.1 Coil kits shall be permitted for substitution of hydronic specialties specified within this section.

.2 Acceptable product: Victaulic Koil Kits, or approved substitute.

2.6 DIELECTRIC FITTINGS

.1 Description: Combination fitting of copper-alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

.2 Insulating Material: Suitable for system fluid, pressure, and temperature.

.3 Dielectric Flanges:

.1 Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

.1 Capitol Manufacturing Company.

.2 Central Plastics Company.

.3 Watts Regulator Co.; a division of Watts Water Technologies, Inc.

.2 Factory-fabricated companion-flange assembly, for 150 or 300 psig minimum working pressure to suit system pressures.

.4 Dielectric-Flange Kits:

.1 Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

.1 Advance Products & Systems, Inc.

.2 Calpico, Inc.

.3 Central Plastics Company.

.4 Pipeline Seal and Insulator, Inc.

.2 Companion-flange assembly for field assembly. Include flanges, full-face or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

.3 Separate companion flanges and steel bolts and nuts shall have 150 or 300 psig minimum working pressure where required to suit system pressures.

.5 Dielectric Couplings:

.1 Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

.1 Calpico, Inc.

.2 Lochinvar Corporation.

.2 Galvanized-steel coupling with inert and noncorrosive thermoplastic lining; threaded ends; and 300 psig minimum working pressure at 225 deg F.

.6 Dielectric Nipples:

.1 Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

.1 Perfection Corporation; a subsidiary of American Meter Company.

.2 Precision Plumbing Products, Inc.

.3 Sioux Chief Manufacturing Company, Inc.

.4 Victaulic Company of America.

.2 Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300 psig minimum working pressure at 225 deg F.

2.7 VALVES

.1 Automatic Flow-Control Valves:

.1 Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

.1 Flow Design Inc.

.2 Griswold Controls.

.3 Belimo.

.4 Bell & Gossett Zylem Inc.

.5 Honeywell.

.6 Tour and Anderson, available through Victaulic Company of America.

.2 The ½"-1-1/4" valve bodies shall be constructed out of brass and rated for 360 PSIG working pressure.

.3 The 1-1/2" – 2" valve bodies shall be constructed out of ductile iron and rated for 360 PSIG working pressure.

.4 The 2-1/2" – 6" valve bodies shall be flanged, constructed out of ductile iron and rated for 175 PSIG or 360 PSIG working pressure.

.5 The valve bodies shall be rated for fluid temperatures 32°F (0°C) to 248°F (120°C) and ambient temperatures 34°F (1°C) to 122°F (50°C).

.6 The valve bodies shall include two pressure pressure\temperature ports.

.7 The valve assembly shall include a field adjustable, lockable dial that shall have the flow rate setting with gallons per minute printed on it.

.8 The valve assembly shall provide 100% authority at all times.

.9 The valve assembly shall provide full stroke control regardless of the GPM setting on the dial.

.10 The valve assembly shall contain a stainless steel stem and spring.

.11 The valve bodies close off\leakage rate shall meet an ANSI Class IV Shut off rating of ≤ 60 PSID (≤ 140 PSID as a flow limiter only; no actuator used).

.12 The valve shall be within +/-5% of set GPM within the valve's operating range.

.13 Piston and Spring Assembly: Stainless steel, tamper proof, self cleaning, and removable.

.14 Combination Assemblies: Include bonze or brass-alloy ball valve.

.15 Identification Tag: Marked with zone identification, valve number, and flow rate.

.16 Size: See schedule on drawings.

.17 Valve to be supplied complete with electric actuator by the mechanical contractor. Reference specification section 25 for details pertaining to electric activator.

2.8 TEMPERATURE/PRESSURE TEST PORTS

.1 Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

.1 Trerice; D3742.

.2 Winters.

.3 WIKA.

.2 Construction: brass body.

.3 Size: ½ NPT.

.4 Valve plug material: Nordel.

.5 Rated Operating limits: 275 F and 500 Psig.

2.9 FLEXIBLE CONNECTION

.1 Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

.1 American BOA; Parrap

.2 Senior Flexonics.

.3 Proco.

.4 Mason.

.2 Material:

.1 Hose: 321 L stainless steel.

.2 Braid: 300 series stainless steel.

.3 Construction: annular butt welded hydro formed closed pitch hose.

.4 Performance: 50,000 cycle rated and pressure rated per ISO 10380.

.5 Connections:

.1 Threaded up to NPS 2.

.2 Flanged NPS 2 – ½ and above.

.3 Or to suit equipment end connection.

.6 Length: minimum of 900 mm.

.7 Operating conditions:

.1 Hydronic Heating and Cooling:

.1 Service temperature range to be 40F to 200 F.

.2 Maximum required working pressure: 150 Psig.

PART 3 EXECUTION

3.1 PIPING APPLICATIONS

.1 Hot water heating piping, aboveground, NPS 2 and smaller, shall be any of the following:

.1 Schedule 40 steel pipe; Class 150, malleable-iron fittings; cast-iron flanges and flange fittings; threaded joints; and installation ready grooved coupling.

.2 Hot water heating piping, aboveground, NPS 2-1/2 and larger, shall be any of the following:

.1 Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, welded and flanged joints, and installation ready grooved pipe couplings.

.3 Chilled water piping, aboveground, NPS 2 and smaller, shall be any of the following:

.1 Schedule 40 steel pipe; Class 150, malleable-iron fittings; cast-iron flanges and flange fittings; threaded joints; and installation ready pipe couplings.

.4 Chilled water piping, aboveground, NPS 2-1/2 and larger, shall be any of the following:

.1 Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, welded and flanged joints, and installation ready grooved pipe couplings.

3.2 VALVE APPLICATIONS

.1 Install shutoff-duty valves at each branch connection to supply mains, and at supply connection to each piece of equipment.

.2 Install pressure independent control valve in the return pipe of each heating or cooling terminal.

3.3 PIPING INSTALLATIONS

.1 Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated piping locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

.2 Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

.3 Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

.4 Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

.5 Install piping to permit valve servicing.

.6 Install piping at indicated slopes.

.7 Install piping free of sags and bends.

.8 Install fittings for changes in direction and branch connections.

.9 Install piping to allow application of insulation.

.10 Select system components with pressure rating equal to or greater than system operating pressure.

.11 Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

.12 Install piping at a uniform grade of 0.2 percent upward in direction of flow.

.13 Reduce pipe sizes using eccentric reducer fitting installed with level side up.

.14 Install branch connections to mains using tee fittings in main pipe, with the branch connected to the side, top or at any angle above the midpoint of the main pipe. For up-feed risers, connect the branch to the top of the main pipe. Branch lines in welded piping shall be made with welding tees except that branch lines less than one half diameter of main may be made with Weld O Lets.

.15 In addition to installing piping wells for thermometers and gauges, provide piping wells and fittings required for building control system sensors.

.16 Install valves according to Division 23.

.17 Install unions in piping, NPS 2 and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

.18 Install flanges in piping, NPS 2-1/2 and larger, at final connections of equipment and elsewhere as indicated.

.19 Install strainers on inlet side of each control valve, and elsewhere as indicated. Install NPS 3/4 nipple and ball valve in blowdown connection of strainers NPS 2 and larger. Match size of strainer blowoff connection for strainers smaller than NPS 2.

.20 Identify piping as specified in Division 23 Section "Mechanical Identification."

3.4 HANGERS AND SUPPORTS

.1 Hanger, support, and anchor devices are specified in Division 23. Comply with the following requirements for maximum spacing of supports.

.2 Install the following pipe attachments:

.1 Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.

.2 Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.

.3 Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.

.4 Spring hangers to support vertical runs.

.3 Install hangers for steel piping with the following maximum spacing and minimum rod sizes:

3.5 PIPE JOINT CONSTRUCTION

.1 Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.

.2 Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

.3 Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

.4 Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

.5 Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

.1 Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

.2 Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

.6 Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

.7 Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

.8 Pressure-Sealed Joints: Use manufacturer-recommended tool and procedure. Leave insertion marks on pipe after assembly.

3.6 HYDRONIC SPECIALTIES INSTALLATION

.1 Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere for system air venting.

3.7 TERMINAL EQUIPMENT CONNECTIONS

.1 Sizes for supply and return piping connections shall be the same as or larger than equipment connections.

.2 Install control valves in accessible locations close to connected equipment.

.3 Install ports for pressure gages and thermometers at coil inlet and outlet connections according to Division 23.

3.8 CHEMICAL TREATMENT

.1 Fill systems with fresh water and add liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products from piping. Circulate solution for a minimum of 48 hours, drain, clean strainer screens, and refill with fresh water.

.2 Reference Section 23 08 02.

3.9 FIELD QUALITY CONTROL

.1 Prepare hydronic piping according to ASME B31.9 and as follows:

.1 Leave joints, uninsulated and exposed for examination during test.

.2 Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.

.3 Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.

.2 Perform the following tests on hydronic piping:

.1 Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.

.2 While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.

.3 Isolate expansion tanks and determine that hydronic system is full of water.

.4 Subject piping system to hydrostatic test pressure that is 1.5 times the system's working pressure, not less than 100 psi. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times "SE" value in Appendix A in ASME B31.9, "Building Services Piping."

.5 After hydrostatic test pressure has been applied for at least 15 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.

.6 Prepare written report of testing.

.3 Perform the following before operating the system:

.1 Open manual valves fully.

.2 Inspect air vents at high points of system and bleed air completely (manual type).

.3 Set temperature controls so all coils are calling for full flow.

.4 Verify lubrication of motors and bearings.

3.10 INSPECTION SERVICES GROOVED PRODUCTS

.1 Product Training:

.1 The grooved coupling manufacturer's (the "manufacturer") 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. This shall be at the expense of the installing contractor.

.2 IACET/Training:

.1 A factory trained manufacturer's representative (direct employee) shall provide on-site training for contractor's field personnel in the use of grooving tools, application of groove, and product installation in compliance with the following:

.1 Manufacturer must be accredited as an Authorized Provider by the International Association for Continuing Education and Training (IACET)

.2 Manufacturer must demonstrate that it complies with the ANSI/IACET standard which is recognized as a standard of good practice

.3 Upon written agreement, the manufacturer shall provide the contractor with a primary point of contact to coordinate jobsite visits, inspections, and required reporting.

.4 The project kick off installation training is a mandatory requirement and shall be a minimum of one hour training seminar for all purchasing contractor installers on the Project. The training will be conducted by a factory trained representative and will cover the grooving and installation process for the coupling manufacturer's products installed on the Project and must take place prior to initiating the Jobsite Examinations.

.5 The Engineer / Contractor is solely responsible for making the final selection of the system and its components and assuring that all performance, endurance, maintenance, safety, warning requirements and industry standards of the application are met.

.1 Ensure all products are suitable for the intended application, and are in accordance with the manufacturer's latest published product submittals and catalog data.

.2 Inspection:

.1 The factory trained representative's review on any project or jobsite for correct assembly is based solely on an external examination of the visible and accessible manufacturer's couplings after being installed as part of a mechanical pipe joint. The external examination will be limited to the visual assembly requirements of the coupling specified in the coupling manufacturer's published installation instruction handbooks and where required, a confirmation on bolt/nut torque using a torque wrench as specified in the coupling manufacturer's installation handbooks.

.2 Jobsite Examinations covers factory trained representative visits to the project.

.1 A visit is defined as eight (8) consecutive hours at the Project over a twenty four (24) hour period totaling an estimated two hundred (200) joints examined and documented.

.2 All grooved joints on this project shall require a jobsite examination.

.3 Confirmation of Visual Examinations:

.1 The factory trained representative will document and provide a written report stating compliance or noncompliance of all of the manufacturer's couplings as described in Jobsite Examinations.

.2 Locations of limited or no pipe joint accessibility preventing examination will be documented and reported to the owner for disposition.

.3 Application:

.1 Upon completion of the manufacturer's inspection of the installation and any identified corrections, the manufacturer will provide the owner or purchaser with a limited warranty on manufacturer's products (the "Warranted Products").

.2 The grooved coupling manufacturer warrants all products to be free from defects in materials and workmanship under normal conditions of use and service as described in the manufacturer's documentation and as consistent with good piping practices.

.3 The grooved coupling manufacturer shall not be responsible for any product which has been subject to misuse,

.4 The grooved coupling manufacturer shall not be responsible for any product which has been repaired or altered in any manner outside of grooved coupling manufacturer's factory or which has been used in a manner contrary to manufacturer's instructions or recommendations.

.5 The grooved coupling manufacturer shall not be responsible for system design errors or any issues that arise as a result of any system design errors.

.6 The grooved coupling manufacturer warrants that the Warranted Products have been installed in accordance with the grooved coupling manufacturer's instructions and shall perform in accordance with the applicable grooved coupling manufacturer's published specifications subject to a successful inspection, limitation to inspected products, reasonable access to the jobsite as well as the conditions and limitations contained within the warranty.

.1 Core Sciences Building - Memorial University must notify the grooved coupling manufacturer by certified mail, return receipt requested, within thirty (30) days of discovering any alleged failure of the Warranted Products;

.2 Core Sciences Building - Memorial University allows the grooved coupling manufacturer's employees or agents reasonable access to the Warranted Products and the piping system to conduct an investigation following any notice of alleged failure.

.3 Upon completion of the investigation, the grooved coupling manufacturer will authorize the repair to the Warranted Products and the piping system if they determine the failure is covered by the manufacturer's warranty; and,

.4 At the grooved coupling manufacturer's option, the grooved coupling manufacturer may approve the contractor who makes the repair to the Project and the grooved coupling manufacturer retains the right to inspect following such repairs.

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 19 - Waste Management and Disposal.

.4 Section 01 91 13 – Commissioning Requirements.

.5 Section 07 84 00 – Firestopping.

.6 Section 09 91 23 – Interior Painting.

.7 Section 23 05 94 – Pressure Testing of Ducted Air Systems.

1.3 REFERENCES

.1 American Society for Testing and Materials (ASTM)

.1 ASTM A480/A480M, Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.

.2 ASTM A621/A621M, Specification for Steel Sheet and Strip, Carbon, Hot-Rolled, Drawing Quality.

.3 ASTM A653/A653M, Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

.4 ASTM A924, Standard Specification for General Requirements for Sheet Steel, Metallic-coated by the Hot-Dip Process.

.5 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

.2 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE).

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.4 National Fire Protection Agency (NFPA)

.1 NFPA 90A, Installation of Air Conditioning and Ventilating Systems.

.2 NFPA 90B, Installation of Warm Air Heating and Air Conditioning Systems.

.5 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

.1 SMACNA HVAC Duct Construction Standards, Metal and Flexible.

.2 SMACNA HVAC Duct Leakage Test Manual.

.3 IAQ Guidelines for Occupied Buildings Under Construction.

.6 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC S110, Fire Tests for Air Ducts.

1.4 SUBMITTALS

.1 Submit shop drawings and product data in accordance with Specification.

.2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets 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.

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 19 - 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 to 2500	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 made airtight with sealant, tape or combination thereof.

.3 Class C: transverse joints made air tight with gaskets, sealant, tape or combination thereof. Longitudinal seams unsealed.

.3 Duct systems seal classification required shall be determined from external static pressure listed in air-handling equipment schedules on drawings. This shall be the seal class used to determine acceptable air leakage when carrying out the duct testing specified in Section 23 05 94 - Pressure Testing of Ducted Air Systems.

.4 Irrespective of the SMACNA specified sealing methodology for the respective duct static pressure construction class, all rectangular and round duct shall be sealed to a minimum of Class B with all transverse and longitudinal seams sealed.

2.2 SEALANT

.1 Sealant: oil resistant, polymer type flame resistant duct sealant. Temperature range of minus 30°C to plus 93°C.

.1 Acceptable Product: Dura-Dyne S-2, Foster, Childers, Monsey Bakor, or approved equal.

2.3 TAPE

.1 Tape: polyvinyl treated, open weave fiberglass tape, 50 mm wide.

.1 Acceptable Product: Dura-Dyne FT-2, Foster, Childers, Monsey Bakor, or approved equal.

2.4 DUCT LEAKAGE

.1 In accordance with SMACNA HVAC Duct Leakage Test Manual and specification Section 23 05 94 - Pressure Testing of Ducted Air System.

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 Over 400 mm: with turning vanes for all sizes.

.4 Branches:

.1 Rectangular main and branch: with 45° entry on branch.

.2 Round main and branch: enter main duct at 45° with conical connection.

.3 Rectangular main and round branch: choice of either 45° main duct entry with conical connection or spin-on connection.

.4 Provide volume control damper in branch duct near connection to main duct.

.5 Main duct branches: with volume control damper.

.5 Transitions:

.1 Diverging: 20° maximum included angle.

.2 Converging: 30° 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.

.2 Firestopping material and installation must not distort duct. Leave room between fire damper sleeve and wall opening for thermal expansion in the event of a fire as per fire damper listing from manufacturer.

.3 Material and installation within annular space between ducts, fire damper sleeves and adjacent fire separation to Section 07 84 00 – Firestopping and fire damper manufacturer's recommendations.

2.7 GALVANIZED STEEL

.1 Lock forming quality: Z90 zinc coating.

.2 Thickness, fabrication and reinforcement: metal gauges, transverse joint type and required reinforcement in accordance with SMACNA HVAC Duct Construction Standards, Metal and Flexible, 2005 Version, for the external static pressure listed in the air-handling equipment schedules on the drawings.

.3 Steel thickness and zinc coating class is to be factory stenciled on the steel.

.4 All longitudinal joints to be Pittsburgh Lock type unless otherwise indicated. See Item 3.3 this specification section.

2.8 SPIRAL DUCT (SINGLE WALL - NON-GASKETED)

.1 Application:

.1 All concealed round duct not specified as "gasketed".

.2 Galvanized steel with lock formed seams fabricated to SMACNA and ASHRAE Standards.

.1 Acceptable Product: Flexmaster Canada Ltd., Atlantic Industries Limited, Peppertree Air Solutions Inc., or approved equal.

2.9 HANGERS AND SUPPORTS

.1 Strap hangers: of same material as duct. See detail on drawings for strap hanger material thickness and strap hanger spacing.

.2 Extend strap hangers down side and turn under 25 mm fastening securely to side and underside of duct.

.3 Hanger configuration: to ASHRAE and SMACNA.

.4 Support vertical ducts with angles screwed to duct and bearing on building structure.

.5 Hangers: black carbon steel angle (primed) with black carbon steel rods to ASHRAE and SMACNA. See detail on drawings for angle iron size and thickness, rod diameter, and angle spacing.

.6 Upper hanger attachments:

.1 Upper attachment Unistrut: Suspension from Unistrut channel.

.1 Channel: cold formed from low-carbon strip steel. Channel shall be pre-galvanized, of 12 ga. Material thickness and 41.3 mm x 41.3 mm dimensions

.1 Acceptable Product: Unistrut P1000 or approved equal.

.2 Channel nuts: manufactured from mild steel bars and case hardened after machining. Channel nuts shall have electro-galvanized finish, ½" – 13 nut size thread, for use with Unistrut P1000 Series channel.

.1 Acceptable Product: Unistrut P1010 or approved equal.

.2 Upper attachment structural: suspension from structural steel support channel or angle:

.1 All piping: Malleable iron C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, 12 mm diameter rod.

.1 Acceptable Product: Myatt Fig. 586, Hunt, Grinnell, or approved equal.

.3 Upper attachment to structural: suspension from OWSJ:

.1 Plate washer secured to bottom angle of OWSJ.

.1 Acceptable Product: Myatt Figure 545 Plate washer, Hunt, Grinnell, or approved equal.

.7 Hanger support rod:

.1 Horizontal roof and floor applications: continuous threaded rod.

.1 Acceptable Product: Myatt Figure 434, Grinnell, Hunt, or approved equal.

PART 3 EXECUTION

3.1 GENERAL

.1 Do work in accordance with NFPA 90A, NFPA 90B, ASHRAE 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 ASHRAE and SMACNA.

.4 Install breakaway joints in ductwork on both sides of fire separation.

.5 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.

.6 Manufacture duct in lengths and diameter to accommodate installation of acoustic duct lining.

3.2 HANGERS

.1 Strap hangers: install in accordance with SMACNA and drawings, whichever is more stringent.

.2 Angle hangers: complete with locking nuts and washers.

.3 Hanger spacing: in accordance with ASHRAE, SMACNA and drawings, whichever is more stringent.

.4 All upper hanger attachment assemblies to be of galvanized finish.

.5 Supply and install steel supports where none exist and are required to accommodate suspension of ductwork.

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 1 coat of sealant to manufacturers recommendations.

3.4 FIELD PAINTING (RESPONSIBILITY OF THE GENERAL CONTRACTOR)

.1 Preparation, product and method / application as per Section 09 91 23 – Interior Painting

.2 Protect all control devices, operable dampers and mechanical equipment prior to application.

.3 Exposed ductwork in unfinished areas and Mechanical / Electrical spaces shall not require additional painting.

3.5 IDENTIFICATION DUCTWORK SYSTEM

.1 50 mm high stencilled letters and directional arrows 150 mm long x 50mm high.

.2 Colours: Black, or co-ordinated with base colour to ensure strong contrast.

.3 Identify system: e.g. Supply AHU-01, Exhaust EF-02.

3.6 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

.1 On long straight runs in open areas in 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.

.10 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.

3.7 LEAKAGE TESTS/COMMISSIONING

.1 Refer to Section 23 05 94 - Pressure Testing of Ducted Air System.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Materials and performance criteria for sound attenuation for mechanical systems.

1.2 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 74 19 - Waste Management and Disposal.

.3 Section 23 05 93 – Testing, Adjusting and Balancing for HVAC.

1.3 REFERENCES

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

.2 American Society for Testing and Materials International (ASTM)

.3 ASTM A 653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.4 ASTM C 423, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

.5 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials

.6 ASTM E 90, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

.7 ASTM E 477, Test Method for Measuring Acoustical and Airflow Performance of Duct Liner Materials and Prefabricated Silencers.

.8 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS)

.9 National Building Code (NBCC)

.10 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

.11 American Society of Heating, Refrigeration and Air-conditioning Engineers (ASHRAE)

.12 Associated Air Balance Council (AABC)

.13 National Environmental Balancing Bureau (NEBB)

.14 National Fire Protection Association (NFPA)

.1 NFPA 255, Test of Surface Burning Characteristics of Building Materials.

.15 Underwriters Laboratories (UL)

.1 UL 723, Test of Surface Burning Characteristics of Building Materials.

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) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.

1.5 SHOP DRAWINGS:

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Provide separate shop drawings for each piece of attenuation equipment, system shop drawings complete with product data.

1.6 QUALITY ASSURANCE

.1 Submittals: submit following in accordance with section 01 33 00 - submittal procedures.

.2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.3 Instructions: submit manufacturer's installation instructions.

1.7 PERFORMANCE REQUIREMENTS

.1 Rating Data:

.1 Provide performance rating data, certified by professional engineer or accredited test laboratory and supported by calculations and verified by test results in accordance with referenced standards as follows:

.1 Silencer: insertion loss, pressure drop at design conditions, generated noise level.

.2 Acoustical performance measurements in accordance with ASTM E 477, ASTM E 90 and ASTM C 423, except where specified otherwise.

.3 Duct lagging: sound transmission loss.

1.8 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.

1.9 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.

1.10 WASTE MANAGEMENT AND DISPOSAL:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

PART 2 PRODUCTS

2.1 SILENCERS

.1 General:

.1 Silencers shall be of size, configuration, capacity as scheduled on the drawings. All silencers shall be factory fabricated and supplied by the same manufacturer.

.2 Silencer inlet and outlet connection dimensions must be equal to the duct sizes shown on the drawings. Duct transitions at silencers are not permitted.

.2 Materials:

.1 Rectangular silencers:

.1 All rectangular silencers shall be constructed with an 18 gauge galvanized steel outer casing and 22 gauge galvanized perforated steel inner.

.3 Acoustic media:

.1 Media shall be of acoustic quality, shot-free glass fiber insulation with long, resilient fibers bonded with a thermosetting resin. Glass fiber density and compression shall be as required to ensure conformance with laboratory test data. Glass fiber shall be packed with a minimum of 15% compression during silencer assembly. Media shall be bacteria and fungus resistant, resilient such that it will not crumble or break, and conforming to irregular surfaces. Media shall not cause or accelerate corrosion of aluminum or steel. Mineral wool will not be permitted as a substitute for glass fiber.

.4 Media protection:

.1 The acoustic media shall be completely wrapped with Tedlar film to help prevent shedding, erosion and impregnation of the glass fiber. The wrapped acoustic media shall be separated from the perforated metal by a factory installed 12 mm thick acoustically transparent spacer. The spacer shall be flame retardant and erosion resistant. A mesh, screen or corrugated perforated liner will not be acceptable as a substitute for the specified spacer.

.5 Combustion ratings:

.1 Silencer materials, including glass fiber, Tedlar film and acoustical spacer shall have maximum combustion ratings as noted below when tested in accordance with ASTM E84, NFPA 255 or UL 723:

.1 Flamespread classification: 20.

.2 Smoke development rating: 45.

.6 Construction:

.1 Silencers shall be constructed in accordance with ASHRAE and SMACNA standards for the pressure and velocity classification specified for the air

distribution system in which it is installed. The silencers shall not fail structurally when subjected to a differential air pressure of 1.98 kPa.

.2 Casings shall be lockformed and sealed, to provide leakage-resistant construction. Airtight construction shall be achieved by use of a duct-sealing compound supplied and installed by the Contractor at the jobsite.

.3 All perforated steel shall be adequately stiffened to ensure flatness and form. All spot welds shall be painted.

.7 Acoustic performance:

.1 Silencer dynamic insertion loss shall not be less than that listed in the silencer schedule.

.1 All silencer ratings shall be determined in a duct-to-reverberant room test facility which provides for airflow in both directions through the test silencer in accordance with the ASTM E-477-06a test standard. The test set-up, procedure and facility shall eliminate all effects due to flanking, directivity, end reflection, standing waves and reverberation room absorption.

.8 Aerodynamic performance:

.1 Silencer pressure drops shall not exceed those listed in the silencer schedule. Silencer pressure drop measurements shall be made in accordance with ASTM E-477 test standard. Tests shall be conducted and reported on the identical units for which acoustical data is presented.

.9 Acceptable Product: Vibro-Acoustics, Vibron, Korfund, VAW Systems, Metlane, or approved equal.

2.2 LAGGING

.1 Not applicable.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Silencers:

.1 Install in accordance with manufacturer's instructions.

.2 Instrument test ports: install at inlet and outlet of each in-duct silencer to permit measurement of pressure loss and insertion loss.

.3 Suspension: to manufacturer's instructions.

3.2 FIELD QUALITY CONTROL

.1 Experienced and competent sound testing agent to take sound measurement after start up and testing, adjusting and balancing of systems to Section 23 05 93 - Testing Adjusting and Balancing (TAB) for HVAC.

.2 Sound measurements to extend over frequency range of 64 to 8000 Hz and to be taken:

.1 In duct upstream and downstream of each silencer.

.2 Three (3) locations in Level 5 Pavilion C.

.3 Provide owner's representative with notice 24 h in advance of commencement of tests.

.4 Establish adequacy of equipment isolation, acceptability of noise levels in occupied areas, other conditions affecting acoustics and, where appropriate, recommendation for remedial measures and costs.

.5 Submit complete report of test results including sound curves, include in commissioning manual.

3.3 MANUFACTURER'S FIELD SERVICES:

.1 Arrange with manufacturer's representative to review work of this Section and submit written reports to verify compliance with Contract Documents.

.2 Manufacturer's Field Services: consisting of product use recommendations and periodic site visits to review installation, scheduled as follows:

.1 Upon completion of installation.

.3 Submit manufacturer's reports to Owner's Representative within 3 days of manufacturer representative's review.

3.4 ADJUSTING

.1 Make adjustments and corrections in accordance with written report.

.2 Provide Owner's Representative with notice 24 h in advance of visit.

3.5 CLEANING

.1 Proceed in accordance with Section 01 74 00 - Cleaning

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

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 00 – Cleaning.

.5 Section 01 74 19 - Waste Management and Disposal.

.6 Section 01 78 00 – Closeout Submittals.

1.3 REFERENCES

.1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.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 MSDS – Material Safety Data Sheets. Indicate VOCs 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 Instructions: submit manufacturer's installation instructions.

.5 Closeout Submittals: submit maintenance and engineering data for incorporation into manual specified in Specification.

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 19 - 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's Representative.

PART 2 PRODUCTS

2.1 GENERAL

.1 Manufacture in accordance with SMACNA - HVAC Duct Construction Standards.

2.2 ACCESS DOORS IN DUCTS

.1 Door: two panel design with inner and outer panels pressed from 24 gauge galvanized mild steel for sizes 8 x 5, 12 x 6 and 18 x 10 and 22 gauge galvanized mild steel for sizes 22 x 14 and 26 x 18. Standard thickness shall be nominal 25 mm.

.2 Insulation: 20 mm thick insulation totally contained between door panels. Insulation shall have a density of 40 Kg per cubic meter.

.3 Seal: extruded seal with welded seam incorporating an integral flexible hollow tube for low leakage performance fitted between the two door panels for strength and stability.

.4 Frame: pressed one piece dual flange/frame from 24 gauge galvanized mild steel for all sizes. Frame to be pre-punched for duct mounting.

.5 Latches: zinc plated steel progressive cam fasteners and fastening clamps, two sets for sizes 8 x 5 and 12 x 6, four sets for size 18 x 10, and six sets for sizes 22 x 14 and 28 x 18. Cam fasteners to be positioned at strategic locations for optimum closure, and low leakage.

.6 Security chain: retaining safety chain is to be fitted to both door and frame to alleviate damage or injury.

.7 Suitable for mounting in insulated and non-insulated ducts both internal and external.

.8 Flat oval shape.

.9 Provide complete with cut-out templates for duct.

.10 Doors to be tested to 2 kPa static pressure and shall conform to American and British leakage standards DW 144 Class A and C.

.11 Acceptable Product: Air Management Inc. (AMI) ACC Series, AST, or approved equal.

2.3 FIRE DAMPER ACCESS DUCT SECTIONS

.1 Access doors adjacent to fire dampers shall be at a minimum of 300 mm X 300 mm to permit service and inspection. In locations where it is not possible to install a 300 mm X 300 mm access door due to duct size, the Mechanical Contractor shall install fire damper access duct sections as described below.

.2 Fire damper access duct sections shall comply with NFPA 80.

.3 Fire damper access duct sections shall come complete with access sections, removeable Sure Clamps and adapter sections.

.4 Sure clamps shall come complete with silicon or neoprene gaskets.

.5 Rectangular fire damper access duct sections shall be fabricated of 26 gauge galvanized sheet metal. Round fire damper access duct sections sizes 100 mm to 300 mm diameter shall be fabricated of 22 gauge galvanized sheet metal, sizes larger than 300 mm diameter shall be fabricated of 20 gauge galvanized sheet metal.

.6 Fire damper access duct sections shall come with a label that reads “FIRE DAMPER ACCESS”.

.7 Acceptable Product: Sure clamp access - removeable duct section by Langdon Inc., or approved equal.

2.4 TURNING VANES

.1 Factory or shop fabricated 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.

.5 Acceptable Product: Duro-Dyne IP1 or IP2, Dyn Air, or approved equal.

2.6 SPIN-IN COLLARS

.1 Conical galvanized sheet metal spin-in collars with lockable butterfly damper.

.2 Sheet metal thickness to corresponding round duct standards.

2.7 OPEN ENDED DUCT PROTECTION

.1 To be used during construction.

.2 Co-extruded polyethylene, green in colour, designed to adhere to galvanized steel, 600% elongation, 2.5 mil thickness, 13.1 lbs/in tensile strength.

.3 Acceptable Product: Ductmate Proguard, or approved equal.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Access doors and viewing panels:

.1 Size:

.1 8 x 5 (200 x 1235) one hand or sight.

.2 12 x 6 (300 x 150) one hand and sight.

.3 18 x 10 (450 x 250) both hands and sight.

.4 22 x 14 (550 x 350) full body entry.

.5 26 x 18 (650 x 450) full body entry plus ladder.

.2 Locations:

.1 Fire dampers.

.2 Control dampers.

.3 Devices requiring maintenance.

.4 Required by code.

.5 Elsewhere as indicated.

.2 Fire damper access duct sections:

.1 To be installed when the minimum fire damper access door size of 300 mm X 300 mm is not able to be installed due to duct size.

.2 If installed within an insulated duct system, insulate fire damper access duct section separately such that the removable duct section can be removed without disturbing adjacent duct insulation.

.3 If fire damper access duct section is insulated, provide label on the insulation indicating “FIRE DAMPER ACCESS”.

.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 Inlets and outlets of fan systems.

.2 Main and sub-main ducts.

.3 And as indicated.

.2 For temperature readings:

.1 At inlet and discharge of reheat coils.

.2 And as indicated.

.3 For acoustical readings:

.1 Upstream and downstream of silencers.

.4 Turning vanes:

.1 Install in accordance with recommendations of SMACNA and as indicated.

.5 Utilize covering protection over all open end ducts during construction. This includes suspended ducts under construction as well as ductwork temporarily stored on floor on construction site awaiting installation.

3.2 CLEANING

.1 Perform cleaning operations as specified in Specification 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 61 00 - Common Product Requirements.

.5 Section 01 74 00 - Cleaning

.6 Section 01 74 19 - Waste Management and Disposal.

.7 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 Material Safety Data Sheets (MSDS).

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) Material Safety Data Sheets (MSDS) 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 19 - Waste Management and Disposal.

PART 2 PRODUCTS

2.1 GENERAL

.1 Manufacture to SMACNA standards.

2.2 MANUAL BALANCING DAMPERS

.1 Rectangular:

.1 Frame: for units under 36" wide x 12" high (914 x 305) the frame shall be 22 gauge galvanized steel. For units over 36" wide x 12" high (914 x 305) the frame shall be 18 gauge steel formed into a structural hat channel shape with tabbed corners for reinforcement.

.2 Blades: for units under 36" wide x 12" high (914 x 305) the blades shall be single skin, 22 gauge galvanized steel with center 'V' groove for reinforcement. For units over 36" wide x 12" high (914 x 305) the blades shall be single skin 18 gauge galvanized steel with three longitudinal grooves for reinforcement.

.3 Bearings: corrosion resistant synthetic sleeve type turning in an extruded hole in the damper frame.

.4 Axles: round, screwed into the damper blade.

.5 Provide single blade dampers for ducts up to 36" wide x 12" high (914 x 305). Provide multiple blade dampers for ducts larger than 36" wide x 12" high (914 x 305) in either direction.

.6 Maximum size single section: 48" wide x 48" high (1219 x 1219).

.7 Minimum size: 5" wide x 4" high (127 x 102).

.8 Dampers are to be supplied approximately 6 mm smaller than given duct dimensions.

.9 Acceptable Product: Air Management Inc. (AMI) Model MD2005, Ruskin, or approved equal.

.2 Round:

.1 Frame: 20 gauge galvanized steel, 7" (178) long.

.2 Blade: single skin 20 gauge galvanized steel.

.3 Bearings: corrosion resistant molded synthetic type.

.4 Axle: control shaft shall extend beyond the frame through a factory mounted, locking hand quadrant. Axle to be 3/8" (10) square shape.

.5 Maximum damper size: 20" diameter (508).

.6 Minimum damper size: 4" diameter (102).

.7 Dampers are to be supplied approximately 6 mm smaller than given duct dimensions.

.8 Maximum temperature: 121ºC.

.9 Acceptable Product: Air Management Inc (AMI) Model MD200R, Ruskin, or approved equal

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 Fire and smoke dampers, and fire stop flaps.

1.2 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 35 29.06 – Health and Safety Requirements.

.3 Section 01 61 00 – Common Product Requirements.

.4 Section 01 74 00 – Cleaning.

.5 Section 01 74 19 – Waste Management and Disposal.

.6 Section 01 78 00 – Closeout Submittals.

.7 Section 01 91 13 – Commissioning (Cx) Requirements.

.8 Section 23 31 13.01 – Ductwork - Metallic to 2500 Pa.

1.3 REFERENCES

.1 American National Standards Institute/National Fire Protection Association (ANSI/NFPA)

.1 ANSI/NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems.

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.3 Underwriters Laboratories of Canada (ULC)

.1 CAN4-S112, Fire Test of Fire Damper Assemblies.

.2 ULC-S505, Fusible Links for Fire Protection Service.

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) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate the following:

.1 Fire dampers.

.2 Operators.

.3 Fusible links.

.4 Design details of break-away joints.

.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.

.3 Closeout Submittals:

.1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals

1.5 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.

.2 Certificates:

.1 Catalogue or published ratings those obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards.

1.6 MAINTENANCE

.1 Extra Materials:

.1 Provide maintenance materials in accordance with Section 01 78 00 – Closeout Submittals.

.2 Provide the following:

.1 6 fusible links of each type.

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 19 - Waste Management and Disposal.

PART 2 PRODUCTS

2.1 FIRE DAMPERS (IN WALL OR FLOOR)

.1 Furnish and install, at locations shown on plans, fire dampers constructed and tested in accordance with the current edition of UL555 Standard for Fire Dampers. Dampers up to 5.95 m² for vertical mount and 2.32 m² for horizontal mount shall be classified for dynamic closure to a minimum 12.1 m/s and 996 Pa static pressure for horizontal air flow, air flow up and air flow down. Velocity and pressure ratings shall include both in-duct and no-duct installations. Each fire damper shall be marked with a UL Classified 1½ hour fire protection rating, the maximum velocity/pressure rating for each horizontal and vertical installation and "for use in dynamic systems". Dampers marked "for use in static systems only" are not permitted. In addition, each dynamic fire damper shall include a 74ºC fusible link. Each dynamic fire damper shall include an integral roll formed steel sleeve and retaining angles furnished by the damper manufacturer to ensure appropriate installation. Submittal information shall include the fire protection rating, maximum velocity/pressure ratings and the manufacturer's UL installation instructions. Each fire damper shipment shall include the same UL installation instructions. The dampers shall be installed in accordance with these instructions.

.2 Rectangular fire dampers to be Style 'B' with blades out of airstream for reduced airflow restriction, 80-90% free area.

.3 Round fire dampers to be style WR, welded, 90-95% free area, round enclosure. The wall sleeve shall be rectangular and the blades shall be out of the airstream for reduced airflow restriction.

.4 Vertical and horizontal closure spring operation for assured closure under air flow (i.e. fans on) in HVAC systems.

.5 Shall meet all UL and NFPA criteria for primary fire dampers installed in walls with fire resistive rating of less than 3 hours.

.6 Provide integral sleeves of sufficient length to full, span wall or floor assembly opening.

.7 Fire dampers in metal stud walls or supported in wall or floor openings with metal stud framing shall have such framing installed in accordance with the damper manufacturer's recommendations.

.8 Acceptable Product: Ruskin Model DIBD2 (1½ hr.), Nailor, Controlled Air, Air Management Inc. (AMI), Alumavent, Ventex, Lau, or approved equal.

2.2 COMBINATION FIRE SMOKE DAMPERS - RECTANGULAR

.1 General: Furnish and install, at locations shown on plans, combination fire smoke dampers constructed and tested in accordance with the current edition of UL555S Standard for Smoke Dampers.

.2 Fire Resistance: 1-1/2 hours in accordance with UL555

.3 Smoke Rating: Leakage Class I Smoke Damper in accordance with UL555S. A Class I smoke damper leaks no more than 8 cubic feet per minute (0.23 m^3/min) at 4 in. wg. (1 kPa) differential pressure.

.4 Air Flow Rating: 10.16 m/s at 996 Pa

.5 Frame: 5 inches x minimum 16 gage (127 x minimum 1.6 mm) roll formed, galvanized steel hat-shaped channel, reinforced at corners. Structurally equivalent to 13 gage (2.3 mm) U-channel type frame.

.6 Blades: galvanized steel channel (in gauges required by UL Listing).

.1 Style: Single skin with 3 longitudinal grooves.

.2 Action: Opposed.

.3 Material: Minimum 16 gage (1.6 mm) galvanized steel.

.4 Width: Maximum 6 inches (152 mm).

.7 Bearings: Self-lubricating stainless steel sleeve type, turning in extruded hole in frame.

.8 Seals:

.1 Blade: Inflatable silicone fiberglass material to maintain smoke leakage rating to a minimum of 450°F (232°C) and galvanized steel for flame seal to 1,900°F (1,038°C). Mechanically attached to blade edge (glue-on or grip type seals are not acceptable).

.2 Jamb: Stainless steel, flexible metal compression type.

.9 Linkage: Concealed in frame.

.10 Axles: Minimum ½ inch (13) diameter plated steel, hex-shaped, mechanically attached to blade.

.11 Mounting: Vertical and/or Horizontal

.12 Temperature Release Device: Heat-Actuated, Quick Detect

.1 Close (in a controlled manner) and lock damper during test, smoke detection, power failure, or fire conditions through actuator closure spring. At no time shall actuator disengage from damper blades.

.2 Allow damper to be automatically and remotely reset after test or power failure conditions. After exposure to high temperature or fire, inspect damper before reset to ensure proper operation.

.3 Controlled closing and locking of damper in 7 to 15 seconds to allow duct pressure to equalize. Instantaneous closure is not acceptable.

.13 Release Temperature:

.1 165 degrees F (74 degrees C).

.14 Actuator:

.1 Electric 120 V, 60 Hz, two-position, fail close.

.2 Mounting: External

.3 Direct coupled, spring return.

.4 Provide complete with mounting bracket and screws.

.5 20 N•m torque capacity.

.6 Running time for 95 degree stroke rotation to be 15 seconds.

.7 Power supply: 120 VAC.

.8 Power consumption in operation: 30 VA operation

.9 Power consumption in rest: 7.5 W, 12 VA, End stop 47 VA, 0.5 A slow blow fuse

.10 Provide complete with auxiliary switches: 2 x SPDT, 7 A resistive (2.5 A inductive) at AC 250 V, one set at 10 degree, one set at 85 degrees.

.11 Acceptable Product: Belimo FSAF120A, Honeywell, Johnson Controls, or approved equal.

.15 Finish: Mill galvanized

.16 Accessories:

.1 Fire Stat complete with Indicator Switches:

.1 UL classified dual temperature device allows the damper to be re-opened after initial closure from high heat.

.2 Electrically and mechanically locks damper in closed position when duct temperatures exceed 165 degrees F (74 degrees C) or 212 degrees F (100 degrees C).

.3 Allow damper to remain operable through a high limit temperature sensor for smoke management purposes while temperature is below 250 degrees F (121 degrees C) or 350 degrees F (177 degrees C).

.4 Replaces EFL or PFL Controlled closure heat actuated temperature release devices on standard dampers from Item 12 above.

.5 Blade position indicator switches: Two position indicator switches linked directly to damper blade in order to allow remote indication of damper blade position.

.6 Acceptable product: Ruskin TS 150EZ Fire Stat, Nailor, Controlled Air, Air Management Inc. (AMI), or approved equal

.2 Factory Sleeve:

.1 Minimum 20 gage (1.0 mm) thickness, minimum 17 inches (432 mm) long.

.2 Silicone caulk factory applied to sleeve at damper frame to comply with leakage rating requirements.

.3 Breakaway Connections:

.1 Ductmate

.17 Source Quality Control:

.1 Factory Tests: Factory cycle damper and actuator assembly to assure proper operation.

.18 Acceptable manufacturers: Ruskin Model FSD60 (1½ hr.), Nailor, Controlled Air, Air Management Inc. (AMI), or approved equal

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 ANSI/NFPA 90A and in accordance with conditions of ULC listing.

.2 Provide duct mounted and wall and/or ceiling mounted access door adjacent to each damper. All ceiling and wall mounted access doors required to gain access to fire dampers and linkages shall be supplied by the Mechanical Contractor for field installation by the General Contractor. These doors shall be shop primed for field painting by the General Contractor. All duct mounted access doors shall be supplied and installed by the Mechanical Contractor.

.3 Ensure access doors/panels, fusible links, damper operators are easily observed and accessible.

.4 Install break-away joints of approved design on each side of fire separation.

.5 Supply fire damper with integral sleeve and retaining angles.

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 Commission in accordance with Section 01 91 13 – Commissioning (Cx) Requirements.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Materials and installation of flexible 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 19 - Waste Management and Disposal.

.4 Section 01 91 13 – Commissioning (Cx) Requirements.

1.3 REFERENCES

.1 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE)

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.3 National Fire Protection Association (NFPA)

.1 NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems.

.2 NFPA 90B, Standard for Installation of Warm Air Heating and Air-Conditioning Systems.

.4 Sheet Metal and Air-Conditioning Contractors' National Association (SMACNA)

.1 SMACNA HVAC Duct Construction Standards - Metal and Flexible.

.2 SMACNA IAQ Guideline for Occupied Buildings under Construction.

.5 Underwriters' Laboratories Inc. (UL)

.1 UL 181, Standard for Factory-Made Air Ducts and Air Connectors.

.6 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S110, Fire Tests for Air Ducts.

1.4 SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data: submit WHMIS MSDS – Material Safety Data Sheets and information pertaining to the following:

.1 Thermal properties.

.2 Friction loss.

.3 Acoustical loss.

.4 Leakage.

.5 Fire rating.

1.5 QUALITY ASSURANCE

.1 Certification of Ratings:

.1 Catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

.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 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 19 - Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Place materials defined as hazardous or toxic in designated containers.

.5 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.

.6 Ensure emptied containers are sealed and stored safely.

.7 Fold up metal and plastic banding, flatten and place in designated area for recycling.

1.7 INDOOR AIR QUALITY (IAQ)

.1 During construction, meet or exceed the requirements of SMACNA IAQ Guideline for Occupied Buildings under Construction.

PART 2 PRODUCTS

2.1 GENERAL

.1 Factory fabricated to CAN/ULC S110.

.2 Flame spread rating not to exceed 25. Smoke developed rating not to exceed 50.

2.2 NON-METALLIC - INSULATED

.1 Non-collapsible, coated trilaminate aluminum foil/mylar/fiberglass mesh type mechanically bonded to, and helically supported by, external corrosion resistant, galvanized steel wire with factory applied, 37 mm thick flexible glass fibre thermal insulation with flame retardant, non-toxic polyethylene vapour barrier jacket.

.2 Performance:

.1 Rated velocity: 20.3 m/s.

.2 Pressure:

.1 Positive: 3.0 kPa.

.2 Negative: 0.25 kPa

.3 Classification: ULC-S110 and ULC-181 Class 1 air duct.

.4 Acceptable Product: Flexmaster Canada Ltd Fabriflex Type FAB-3T, Wiremold, Thermaflex, or approved equal.

2.3 FLEXIBLE DUCT HANGER SUPPORTS

.1 Flexible duct hanger supports shall be constructed of durable composite material and shall be 40 mm wide to prevent any restriction of the internal diameter of the ductwork when the weight of the supported section rests on the hanger. The hanger support shall be UL listed for use in return air plenum spaces.

.2 Acceptable Product: Thermaflex Flextie, Flexmaster, Wiremold, or approved equal.

2.4 FLEXIBLE DUCTWORK ELBOW SUPPORTS

.1 Flexible duct elbow supports shall be constructed of durable composite material and shall be fully adjustable to support flexible duct diameters from 150 mm to 400 mm diameter. Flexible duct elbow supports shall be UL listed for use in return air plenum spaces.

.2 Acceptable Product: Thermaflex FlexFlow Elbow, Flexmaster, Wiremold, or approved equal.

2.5 FLEXIBLE DUCT FASTENING CLAMP

.1 Stainless steel band with cadmium plated hexbolt for attaching flexible ductwork to metal duct fittings. Clamps to be suitable for sizes 150 mm, 200 mm and 300 mm diameter.

.2 Acceptable Product: Thermaflex Snaplock Clamp, Flexmaster, Wiremold, or approved equal

PART 3 EXECUTION

3.1 DUCT INSTALLATION

.1 Install in accordance with: NFPA 90A and NFPA 90B SMACNA.

.2 Maximum length of flexible duct: 3 m.

.3 Flexible duct supports to be installed at a maximum spacing of 1.0 m. Maximum allowable sags between supports to be 12 mm per 300 mm.

.4 Provide a flexible duct elbow at each flexible duct diffuser connection.

.5 Utilize flexible duct fastening clamps to secure flexible duct to metal duct fittings. For duct sizes other than those sizes listed, utilize plastic draw bands UL listed for air plenum applications.

.6 Provide flexible ductwork only in locations as indicated on drawings.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 45 00 – Quality Control.

.3 Section 01 74 19 - Waste Submittal and Disposal.

.4 Section 01 78 00 – Closeout Submittals.

.5 Section 23 32 48 – Acoustical Air Plenums.

.6 Section 25 30 02 – EMCS: Field Control Devices

.7 Section 25 90 01 – EMCS: Site Requirements, Applications and Systems Sequences of Operation

1.2 REFERENCES

.1 American National Standards Institute (ANSI)

.1 ANSI/AMCA 210, Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.

.2 ANSI/NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems.

.2 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

.1 AHSRAE 130, Methods of Testing for Rating Ducted Air Terminal Units.

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.4 International Organization of Standardization (ISO)

.1 ISO 3741, Acoustics-Determination of Sound Power Levels of Noise Sources Using Sound Pressure - Precision Methods for Reverberation Rooms.

.5 Underwriter's Laboratories (UL)

.1 UL 181, Factory-Made Air Ducts and Air Connectors.

.2 UL 1995, Heating and Cooling Equipment.

.6 Air-conditioning Refrigeration Institute (ARI)

.1 ARI 880, Air Terminals.

.7 National Fire Protection Association (NFPA)

.1 NFPA 90A, Installation of Air-conditioning and Ventilation Systems.

.8 American Society for Testing and Materials International (ASTM)

.1 ASTM C665, Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame construction and Manufactured Housing.

.2 ASTM D4300, Standard Test Methods for Ability of Adhesive Films to Support or Resist the Growth of Fungi.

.9 Air Diffusion Council (ADC).

.10 Canadian Standards Association (CSA).

1.3 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 certified ADC (Air Diffusion Council) testing agency signifying adherence to codes and standards.

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) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 – Submittal Procedures.

.2 Test data: to ANSI/AMCA 210.

.1 Submit published test data on DIN (Direct Internal Noise), in accordance with ISO 3741 made by independent testing agency for 0, 2.5 and 6 m/s branch velocity or inlet velocity.

.2 Sound power level with minimum inlet pressure of 0.25, 0.5, 1, and 1.5 kPa in accordance with ISO 3741 for 2nd through 7th octave band, also made by independent testing agency.

.3 Pressure loss through silencer shall not exceed 60% of inlet velocity pressure maximum.

.2 Shop Drawings:

.1 Submit shop drawing in accordance with Specification.

.2 Indicate the following:

.1 Capacity.

.2 Pressure drop.

.3 Noise rating.

.4 Leakage.

.5 Dimensions.

.3 Quality assurance submittals: submit following in accordance with Specification.

.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.

.4 Closeout Submittals:

.1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.

1.5 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.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver store and handle in accordance with Specification.

.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 19 - Waste Management and Disposal.

1.7 MAINTENANCE

.1 Extra Materials:

.1 Provide maintenance materials in accordance with Section 01 78 00 – Closeout Submittals.

.2 Furnish list of individual manufacturer's recommended spare parts for equipment. Include:

.1 Bearings and seals.

.2 Addresses of suppliers.

.3 List of specialized tools necessary for adjusting, repairing or replacing.SPEC NOTE: Insert list of required samples and mock-ups.

PART 2 PRODUCTS

2.1 MANUFACTURED UNITS

.1 Terminal units of the same type to be product of one manufacturer.

2.2 VARIABLE VOLUME BOXES

.1 Pressure independent factory reset to minimum and maximum air volume.

.2 Sizes, capacities and sound ratings: as indicated and/or as specified herein.

.3 Differential pressure not to exceed 25 Pa at inlet air velocity of 10 m/s.

.4 Sound ratings of assembly not to exceed 30 NC at 124 Pa inlet pressure.

.5 Performance shall be ARI certified.

.6 Air flow sensor (i.e. cross hairs) to be supplied complete with VAV box. The air flow sensor shall be located at the inlet of the assembly. The sensor shall have twelve (12) total pressure sensing ports and a center averaging chamber designed to accurately average the flow across the inlet of the assembly. In addition, the flow sensor shall have four (4) static pressure sensing ports located on the downstream side of the center averaging chamber. Sensor shall provide accuracy within 5% with a 90° sheet metal elbow directly at the inlet of the assembly. The air flow sensor shall amplify the sensed air flow signal.

.7 Supply box complete with protective metal shroud for digital controls supplied and installed by the EMCS Controls Contractor.

.8 Box control to be direct digital utilizing controllers supplied and installed by the EMCS Contractor.

.9 The EMCS Controls Contractor shall supply and install damper actuator and VAV controller for each box.

.10 The EMCS Controls Contractor shall supply transformer, 115 to 24V for control purposes.

.11 Terminal unit to be CSA certified.

.12 Construction:

.1 Housing, metal end caps and metal angles to be 22 gauge zinc coated steel.

.2 19 mm thick dual density insulation with reinforced aluminum foil facing which meets UL 181, NFPA 90A and ASTM C665 standards.

.3 Integral S-cleats sealed in place.

.4 Mould resistant caulking which meets requirements of ASTM D-4300.

.5 Nylon flange bushing to seal insulation around damper shaft.

.6 Foil lined insulated inlet panel with caulking seal.

.13 Damper: galvanized steel with peripheral gasket and self lubricating bearings. Air leakage past closed damper not to exceed 2% of nominal rating at 750 Pa inlet static pressure, in accordance with ARI Standard 880.

.14 Provide each terminal unit with a internally acoustically lined multi-outlet attenuator section to suit size and quantity of outlets shown for each specific terminal unit. Multi-outlet attenuators shall be fabricated and supplied complete with terminal units.

.15 Acceptable product: E.H. Price SDV-5000 with Cleanroom Aluminum Foil System (CRAF) and Multi-Outlet Attenuator (MOA), Titus, Nailor, Krueger, Metalaire, Tuttle & Bailey, or approved equal.

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 recommendations.

.2 Support independently of ductwork.

.3 Install with at least 1000 mm of rigid inlet ducting and minimum of four duct diameters of straight inlet duct, same size as inlet.

.4 Locate so that controls, dampers and access panels are easily 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.

3.4 COMMISSIONING

.1 Commission in accordance with Section 01 91 13 – General Commissioning (Cx) Requirements.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section includes:

.1 Supply, return and exhaust grilles, diffusers and registers 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 61 00 - Common Product Requirements.

.4 Section 01 74 00 – Cleaning.

.5 Section 01 74 19 - Waste Management and Disposal.

.6 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 Ducts and Outlets.

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) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate following:

.1 Capacity

.2 Throw and terminal velocity

.3 Noise criteria

.4 Pressure drop

.5 Neck velocity

.2 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

.1 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 19 - Waste Management and Disposal.

1.8 MAINTENANCE

.1 Extra Materials:

.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

.2 Include:

.1 Keys for volume control adjustment

.2 Keys for air flow pattern adjustment.

PART 2 PRODUCTS

2.1 GENERAL

.1 To meet capacity, pressure drop, terminal velocity, throw, noise level, neck velocity as indicated in schedule on drawings.

.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: as per schedule on drawings.

.5 Acceptable Product: E. H. Price, Titus, Nailor, Carnes, Airvector, Anemostat, Kreuger, Metalaire, Tuttle & Bailey, or approved equal.

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.

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.

3.3 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 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 coordinated 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 91 13 - General Commissioning (Cx) Requirements.

.5 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.

.4 Allowable down time: AEL > 99%.

1.4 DESIGN REQUIREMENTS

.1 Confirm with Owner's Representative 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's Representative.

.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's Representative 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's Representative 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's Representative 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 –Commissioning (Cx) Requirements.

.2 Carry out commissioning under direction of Owner's Representative and in presence of Owner's Representative and Commissioning Co-ordinator.

.3 Inform, and obtain approval from, Owner's Representative 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's Representative 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.

.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's Representative 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's Representative.

.3 Commission integrated systems using procedures prescribed by Commissioning Co-ordinator and/or Owner's Representative.

.4 Debug system software.

.5 Optimize operation and performance of systems by fine-tuning PID values and modifying CDLs as required.

.6 Program CDL changes as directed by Owner's Representative.

.7 Test life safety procedures including interface with fire alarm system.

3.2 FIELD QUALITY CONTROL

.1 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 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's Representative and Commissioning Co-ordinator and provide:

.1 Technical personnel capable of re-calibrating field hardware and modifying software.

.2 Commissioning to commence during final startup testing.

.3 O&M personnel to assist in commissioning procedures as part of training.

.4 Commissioning to be supervised by qualified supervisory personnel and Owner's Representative.

.5 Commission systems considered as life safety systems before affected parts of the facility are occupied.

.6 Operate systems as long as necessary to commission entire project.

.7 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's Representative to verify reported results.

3.3 ADJUSTING

.1 Final adjusting: upon completion of commissioning as reviewed by Owner's Representative set and lock devices in final position and permanently mark settings.

3.4 DEMONSTRATION

.1 Demonstrate to Commissioning Coordinator and/or Owner's Representative 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 –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. Personnel for training purposes shall be provided by the EMCS Contractor. All costs associated with training the Owner into the proper operation of the EMCS shall be borne by the EMCS Contractor.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.1 Section 25 05 01 - EMCS: General Requirements.

.2 Section 25 05 03 – EMCS: Project Record Documents.

1.3 DEFINITIONS

.1 CDL - Control Description Logic.

.2 For 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 brief overview of content of each segment to Owner's Representative 30 days prior to anticipated date of beginning of training.

.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's Representative 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 = 8 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.

.2 Phase 1: program to begin before 30 day test period at time mutually agreeable to Contractor, Owner's Representative 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.

.11 Allow one (1) day for Phase 1 training.

.3 Phase 2: program to begin 8 weeks after acceptance by Owner's Representative of 30 day test period.

.1 Operator training: provide operating personnel, maintenance personnel and programmers with condensed version of Phase 1 training.

.2 Equipment maintenance training: provide personnel with training in maintenance of EMCS components, maintenance and calibration of sensors and controls.

.3 Programming: provide personnel with training in following subjects:

.1 Software and architecture.

.2 Application programs.

.3 Controller programming.

.4 Trouble shooting and debugging.

.5 Colour graphic generation.

.6 Display and interpret summaries.

.7 Command points.

.8 Modify points and point groups.

.9 Define trend logs.

.10 Schedule and print reports.

.4 Allow two (2) days for Phase 2 training.

PART 2 PRODUCTS

2.1 NOT USED

PART 3 EXECUTION

3.1 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 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 19 - Waste Management and Disposal.

.5 Section 01 91 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 30 02 - EMCS: Field Control Devices.

.16 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).

.3 ANSI/IEEE 260.1, American National Standard Letter Symbols Units of Measurement (SI Units, Customary Inch-Pound Units, and Certain Other Units).

.4 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.

.5 Canadian Standards Association (CSA International).

.6 CAN/CSA-Z234.1, Canadian Metric Practice Guide.

.7 CAN/CSA 22.2, No. 0 General Requirements , Canadian Electrical Code, Part 2.

.8 National Electrical Manufacturers Association (NEMA)

1.4 ACRONYMS, ABBREVIATIONS AND DEFINITIONS

.1 Acronyms used in EMCS.

.2 AEL - Average Effectiveness Level

.3 AI - Analog Input

.4 AO - Analog Output

.5 BACnet - Building Automation and Control Network

.6 BC(s) - Building Controller(s)

.7 BECC - Building Environmental Control Centre

.8 CAB - Canadian Automated Building (CAB) Protocol

.9 CAD - Computer Aided Design

.10 CDL - Control Description Logic

.11 CDS - Control Design Schematic

.12 COSV - Change of State or Value

.13 CPU - Central Processing Unit

.14 DI - Digital Input

.15 DO - Digital Output

.16 DP - Differential Pressure

.17 ECU - Equipment Control Unit

.18 EMCS - Energy Monitoring and Control System

.19 HVAC - Heating, Ventilation, Air Conditioning

.20 IDE - Interface Device Equipment

.21 I/O - Input/Output

.22 ISA - Industry Standard Architecture

.23 LAN - Local Area Network

.24 LCU - Local Control Unit

.25 MCU - Master Control Unit

.26 NC - Normally Closed

.27 NO - Normally Open

.28 OS - Operating System

.29 O&M - Operation and Maintenance

.30 OWS - Operator Work Station

.31 PC - Personal Computer

.32 PCI - Peripheral Control Interface

.33 PCMCIA - Personal Computer Micro-Card Interface Adapter

.34 PID - Proportional, Integral and Derivative.

.35 RAM - Random Access Memory

.36 ROM - Read Only Memory

.37 SP - Static Pressure

.38 TCU - Terminal Control Unit

.39 USB - Universal Serial Bus

.40 UPS - Uninterruptible Power Supply

.41 WAN- Wide Area Network

1.5 DEFINITIONS

.1 Point: may be logical or physical.

.2 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.

.3 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.

.4 Point Name: As per attached Memorial University Point Naming Conventions.

.5 Point Object Type: points fall into following object types:

.6 AI (analog input).

.7 AO (analog output).

.8 DI (digital input).

.9 DO (digital output).

.10 Pulse inputs.

.11 Symbols and engineering unit abbreviations utilized in displays: to ANSI/ISA S5.5.

.12 Printouts: to ANSI/IEEE 260.1.

.13 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:

.3 Building Controllers.

.4 Control devices as listed in I/O point summaries and/or shown on the control drawings.

.5 Data communications equipment necessary to affect EMCS data transmission system, including gateway and LAN hardware and software for connection to LAN network.

.6 Field control devices.

.7 Software/Hardware complete with full documentation.

.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.

.13 Coordinate with Honeywell for integration of the control system into EBI.

.14 Design Requirements:

.15 Design and provide conduit and wiring linking elements of system.

.16 Supply sufficient programmable controllers of types to meet project requirements. Quantity and points contents as reviewed prior to installation.

.17 Location of controllers as reviewed by Owner's Representative prior to installation.

.18 Metric references: in accordance with CAN/CSA Z234.1.

.19 Language Operating Requirements:

.20 Provide English interface to system through operator selectable access codes.

.21 Use non-linguistic symbols for displays on graphic terminals wherever possible. Other information to be in English.

.22 Operating system executive: provide primary hardware-to-software interface specified as part of hardware purchase with associated documentation to be in English.

.23 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.

.24 Include, in English:

.25 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).

.26 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.

.27 Reporting function such as trend log, trend graphics, alarm report logs, energy report logs, maintenance generated logs.

.28 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.

.29 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 shall be the responsibility of the Division 25 EMCS Contractor unless otherwise noted. Wire and conduit above 50 volts by Electrical Division.

.30 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 to communicate at the supervisory layer to the WAN using the BACnet/IP protocol implemented on Ethernet.

.31 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. In addition, the capability for a remote dial in access directly to the system shall be provided.

.32 The EMCS system shall be integrated into the MUN campus EBI system. The integration of the EMCS controls into the campus-wide Honeywell EBI system shall be undertaken outside the contract and shall not be included in the pricing for the EMCS controls. Reference Controls Integration Allowance in specification section 01 21 00.

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:

.3 Equipment list and systems manufacturers within 10 days after award of contract.

.4 Quality Control:

.5 Provide equipment and material from manufacturer's regular production, CSA certified, manufactured to standard quoted plus additional specified requirements.

.6 Where CSA certified equipment is not available submit such equipment to inspection authorities for special inspection and approval before delivery to site.

.7 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.

.8 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.

.9 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.

.10 Permits and fees: in accordance with general conditions of contract.

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 similar installations. Submit ten (10) days after tender closing date.

.3 Have access to local supplies of essential parts.

.4 Ensure factory qualified supervisory personnel continuously direct and monitor work and attend site meetings.

.5 Health and Safety:

.6 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.7 Be able to provide factory trained personnel on site within 24 hours notice or provide instructions on maintenance and emergency service on system.

.8 BACnet devices to bear BACnet testing laboratories BTL mark and listed on BACnet manufacturer's 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:

.3 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

.4 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.5 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.

.6 Separate for reuse and recycling and place in designated containers Steel, Metal, Plastic waste in accordance with Waste Management Plan.

.7 Place materials defined as hazardous or toxic in designated containers.

.8 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional, Municipal, and Provincial regulations.

.9 Label location of salvaged material's storage areas and provide barriers and security devices.

.10 Ensure emptied containers are sealed and stored safely.

.11 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative Owner's Representative.

.12 Fold up metal and plastic banding, flatten and place in designated area for recycling

PART 2 PRODUCTS

2.1 ACCEPTABLE SYSTEMS, MANUFACTURERS

.1 Honeywell International Inc., ComfortPoint Open. (Basis of Design)

.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 Item-by-item statement of compliance with all EMCS specification sections.

.12 Proof of demonstrated ability of system to communicate utilizing BACnet protocol.

.13 Control cabinet locations.

.14 Spare point capacity of each controller by number and type.

.15 Controller location.

1.5 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures and coordinate with requirements in this Section.

.2 Shop Drawings to consist of 1 hard copy and 1 soft copy of design documents, shop drawings, product data and software.

.3 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.

.4 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.

.5 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 Network architecture.

.10 Project installation schedule.

.11 Names of subtrades working for EMCS contractor.

.12 Mounting support details for components installed in airflow systems.

.6 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 1.5.7 to 1.5.27 as follows:

.7 Network drawing showing the network connection of all master control units, expandable local control units, and local control units to indicate the location of each of these elements.

.8 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.

.9 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.

.10 The schematic control diagram to include a complete wiring diagram for all electrical connections, including motor starters, heating coils, etc.

.11 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.

.12 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.

.13 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.

.14 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 - %.

.15 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.

.16 The point schedule to provide at minimum the following information on the control panel:

.1 Panel identification.

.2 Panel location.

.3 Reference drawing.

.17 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.

.18 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.

.19 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.

.20 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's Representative in writing. Sequence to include all modes of operation including fail safe, emergency and fire modes.

.21 Valve schedule including design flow, CV, size, type, actuator, pressure drop and maximum shut off pressure differential for each control valve.

.22 Damper schedule including design air flow, size, type actuator and torque requirements for each control damper.

.23 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.

.24 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.

.25 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.

1.6 PRELIMINARY SHOP DRAWING REVIEW

.1 Submit preliminary shop drawings within 30 working days of award of contract.

1.7 DETAIL SHOP DRAWING REVIEW

.1 Submit detailed shop drawings within 90 working days after award of contract and before start of installation. Detail shop drawings shall be as described in item 1.5 of this specification section. In addition, provided the following:

.1 Graphic system schematic displays of all systems specified, including floor plans. Graphics submitted shall be in paper form. Screen shots from web page displays shall be acceptable as long as they are deemed legible to the satisfaction of the Owner's Representative.

.2 Complete system CDL's including companion English language explanations. Submittal shall be paper hard copy, not soft copy.

.3 Listing of and example of specified reports.

.4 Listing of time of day schedules.

.5 Listing of all points being monitored and alarmed.

.6 Listing of points being trended.

.7 Sample of "Operating Instructions Manual" to be used for training purposes.

.8 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's Representative retains right to revise sequence or subsequent CDL prior to software finalization without cost to Owner.

PART 2 PRODUCTS

2.1 NOT USED

PART 3 EXECUTION

3.1 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. This work shall be deemed the responsibility of the EMCS Contractor.

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 For acronyms 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's Representative 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 Locations of obscure devices to be indicated on drawings.

.4 Panel/circuit breaker number for sources of normal/emergency power.

.5 Names, addresses, telephone numbers of each sub-contractor having installed equipment, local representative for each item of equipment, each system.

.6 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.

.7 Basic system design and full documentation on system configuration.

.2 Submit for final review by Owner's Representative.

.3 Provide before issuance of Substantial Completion, 4 hard and 1 soft copy of as-built documentation 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 four (4) hard and one (1) soft copy of O and M manuals to Owners Representative 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 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.

.4 Explicit description of hardware and software functions.

.5 System operation to include:

.1 Complete step-by-step procedures for operation of system.

.2 Emergency, alarm and failure recovery.

.3 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 of software.

.4 Software modules, 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, and program execution.

.6 Software for each Controller.

.7 Maintenance: document maintenance procedures including inspection, periodic preventive maintenance, fault diagnosis, repair or replacement of defective components, including calibration, maintenance, and 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.

PART 2 PRODUCTS

2.1 NOT USED

PART 3 EXECUTION

3.1 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. This work shall be the responsibility of the EMCS Contractor.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.1 Section 25 05 01 - EMCS: General Requirements.

.2 Section 23 05 53.01 – Mechanical Identification.

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's Representative for approval samples of nameplates, identification tags and list of proposed wording.

PART 2 PRODUCTS

2.1 NAMEPLATES FOR PANELS

.1 Refer to Section 23 05 53.01 – Mechanical Identification.

.2 Control Panels shall be identified with equipment labels.

2.2 NAMEPLATES FOR FIELD DEVICES

.1 Refer to Section 23 05 53.01 – Mechanical Identification.

.2 Field Devices shall be identified with equipment labels.

2.3 NAMEPLATES FOR ROOM SENSORS

.1 Refer to Section 23 05 53.01 – Mechanical Identification.

.2 Room Sensors shall be identified with equipment labels.

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's Representative.

.3 If panel has no clear space for label, mount adjacent to panel.

.4 Size: 25 mm x 125 mm.

.5 Lettering height: 8 mm.

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 CONDUIT

.1 Colour code EMCS conduit.

.2 Code with plastic tape or paint at points

.3 Pre-paint box covers and conduit fittings. Alternatively utilize pre-painted conduit.

.4 Coding: use fluorescent orange paint.

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.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 11 00 – Summary of Work.

.2 Section 01 73 00 – Execution.

.3 Section 07 84 00 – Firestopping.

.4 Section 21 05 01 – Common Work Results-Mechanical.

.5 Section 23 05 00 – Common Work Results of HVAC.

.6 Section 23 05 05 – Installation of Pipework.

.7 Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment.

.8 Section 23 07 13 – Thermal Insulation for Ducting.

.9 Section 25 05 01 – EMCS: General Requirements.

.10 Section 26 05 00 – Common Work Results-Electrical.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CSA C22.1, Canadian Electrical Code, Part 1.

.2 CAN/CSA C22.2 No.83, Electric Metallic Tubing.

.3 CAN/CSA C22.2 No.56, Flexible and Liquid Tight Metal Conduit.

.4 CAN/CSA C22.3 No.1, Overhead Systems.

.5 CAN/CSA C22.3 No. 7, Underground Systems.

1.3 SYSTEM DESCRIPTION

.1 Electrical:

.1 120 Volt power wiring to the EMCS panels shall be the responsibility of the Division 26 – Electrical Contractor. 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 Motor starters shall be the responsibility of the Division 26 Electrical Contractor.

.3 In general wiring between field devices and EMCS panels below 50 Volts shall be the responsibility of the Division 25 EMCS Contractor unless otherwise noted.

.4 Wiring below 50 Volts between mechanical equipment (AHUs, VAV boxes, reheat coils, VFDs, Heat pumps, airflow stations, humidifiers, field sensors, etc.) and the EMCS shall be the responsibility of the Division 25 EMCS Contractor. Terminations at mechanical equipment shall be the responsibility of the Division 25 EMCS Contractor. Terminations at EMCS panels shall be the responsibility of the Division 25 EMCS Contractor.

.5 Wiring between motor starters and the EMCS shall be the responsibility of the Division 26 Electrical Contractor. Terminations at Motor Starters shall be the responsibility of the Division 26 Electrical Contractor. Terminations at EMCS panels shall be the responsibility of the Division 25 EMCS Contractor.

.6 CT's in motor starters to be supplied and installed by the Division 26 Electrical Contractor.

.7 120 Volt power wiring to dampers actuators and end switches shall be the responsibility of the Division 26 – Electrical Contractor. Damper actuators shall be supplied and installed by the Division 25 EMCS Contractor. Terminations at dampers shall be the responsibility of the Division 25 EMCS Contractor. Terminations at motor starters shall be the responsibility of the Division 26 – Electrical Contractor

.8 Network communication wiring between EMCS Controllers shall be the responsibility of the Division 25 EMCS Contractor.

.2 Mechanical

.1 Duct mounted devices, such as temperature sensors, humidity sensors, firestats, etc., shall be supplied and installed by the Division 25 EMCS Contractor.

.2 Cutting of holes in ductwork to facilitate installation of duct mounted control devices shall be carried out by the Mechanical Contractor under the direction of the Division 25 EMCS Contractor, unless otherwise noted.

.3 All damper actuators shall be supplied and installed by the Division 25 EMCS Contractor.

.4 All operable dampers shall be supplied and installed by the Mechanical Contractor, unless otherwise noted.

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 supplemented as specified herein.

.2 Repair all surfaces damaged during execution of work.

PART 2 PRODUCTS

2.1 PIPING

.1 Sleeves, escutcheons: refer to Section 23 05 05 – Installation of Pipework.

.2 Hangers and supports: refer to Section 23 05 29– Hangers and Supports for HVAC Piping and Equipment.

.3 Insulation: refer to Section 23 07 19 – HVAC Piping Insulation 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 Galvanized unistrut shall be considered as an acceptable alternate to the steel support outlined above where applicable.

2.3 WIRING

.1 As per requirements of Electrical Divisions.

.2 For wiring under 50 volts:

.1 All wiring shall be run in conduit and all wiring shall be FT4 rated.

.2 Where exceptions to the above are approved and it is permitted to omit conduit, use FT6 rated wiring.

.3 Sizes:

.1 Wiring for safeties/interlocks for starters, motor control centres, to be stranded, #14 minimum.

.2 Field wiring to digital device: #18AWG or 20AWG stranded twisted pair.

.3 Analog input and output: shielded #18 minimum solid copper or #20 minimum stranded twisted pair. Wiring must be continuous without joints. Provide three or four wire where indicated and/or where required.

.4 More than 4 conductors: #22 minimum solid copper.

.5 See Section 25 10 01 – EMCS: Local Area Network (LAN) for details of wiring associated with EMCS communication Networks, which is the responsibility of the Division 25 EMCS Contractor.

.4 Terminations:

.1 Terminate wires with screw terminal type connectors suitable for wire size, and number of terminations.

2.4 CONDUIT

.1 As per requirements of Electrical Division.

.2 Electrical metallic tubing to CSA C22.2 No. 83. Flexible and liquid tight flexible metal conduit to CSA C22.2 No.56.

.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.

.3 Watertight connectors and couplings for EMT installed in areas exposed to sprinkler heads. Steel set-screw type connectors and couplings for EMT in all other locations. Size as required.

.7 Fittings for thin wall conduit:

.1 Connectors and couplings: steel, set screw type.

2.5 WIRING DEVICES, COVER PLATES

.1 Conform to CSA.

.2 Cover plates and blank plates: finish to match other plates in area.

2.6 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.

.4 Maintain 100 mm clearance between conduit and underside of roof deck.

.5 Maximum support spacing not to exceed 1.5 meters.

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 SUPPORTS

.1 Install special supports as required and as indicated.

3.3 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.

.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. This work shall be the responsibility of the General Contractor.

.11 Make necessary arrangements for cutting of chases, drilling holes and other structural work required to install electrical conduit, cable, pull boxes, outlet boxes. Drilling of holes shall be the responsibility of the General Contractor.

.12 Install cables, conduits and fittings which are to be embedded or plastered over, neatly and closely to building structure to minimize furring.

3.4 CONDUIT SYSTEM

.1 All wiring which is responsibility of the Division 25 EMCS Contractor shall be installed within conduit. Communication wiring shall be installed in conduit. Conduit sizes to suit wiring requirements. 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's Representative before starting such work.

.4 Bend conduit so that diameter is reduced by less than 1/10th original diameter.

.5 Limit conduit length between pull boxes to less than 30 m.

.6 Use conduit outlet boxes for conduit up to 32 mm diameter and pull boxes for larger sizes.

.7 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's Representative.

.8 Install polypropylene fish cord in empty conduits for future use.

.9 Where conduits become blocked, remove and replace blocked sections.

.10 Pass conduits through structural members only after receipt of Owner's Representative's written approval. Drilling of structural members, if required, shall be the responsibility of the General Contractor.

.11 Conduits may be run in flanged portion of structural steel.

.12 Group conduits wherever possible on suspended or surface channels.

.13 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.

.14 Install terminal blocks or strips indicated in cabinets to Electrical Division.

3.5 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's Representative 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.

3.6 STARTERS, CONTROL DEVICES

.1 Install and make control connections as indicated. Power connections above 50V by Electrical Division. Control connections at starters shall be the responsibility of the Division 26 Electrical Contractor.

.2 Starters shall be supplied and installed by Division 26 Electrical Contractor.

.3 Current transformers in starters shall be the responsibility of the Division 26 Electrical Contractor.

.4 Over-current devices in starters shall be the responsibility of the Division 26 Electrical Contractor.

.5 Identify each control wire, terminal for external connections with permanent number marking identical to diagram.

.6 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.

3.7 GROUNDING

.1 Install complete, permanent, continuous grounding system for equipment, including conductors, connectors and accessories where shown, specified and as required.

.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.

3.8 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.

.1 Section 01 78 00 - Closeout Submittals.

.2 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 For 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's Representative.

.3 Submit detailed inspection reports to Owner's Representative.

.4 Submit dated, maintenance task lists to Owner's Representative 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's Representative, after inspection indicating that planned and systematic maintenance have been accomplished.

.7 Revise and submit to Owner's Representative 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's Representative 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's Representative.

1.7 SERVICE CONTRACTS

.1 Provide in-depth technical expertise and assistance to Owner's Representative and Commissioning Coordinator in preparation and implementation of service contracts and in-house preventive maintenance procedures. Service contracts duration is for the one (1) year warranty period.

.2 Service Contracts to include:

.1 Annual verification of field points for operation and calibration.

.2 4 visits per year, above and beyond emergency calls.

.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

2.1 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's Representative 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 of building controllers, peripheral equipment, interface equipment and other panels.

.2 Check equipment cooling fans as required.

.3 Review system performance with Operations Supervisor and/or Owner's Representative 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 Run system software diagnostics as required.

.6 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).

.2 Related Sections:

.1 Section 25 05 01 – EMCS: General Requirements.

1.2 DEFINITIONS

.1 Acronyms and definitions: refer to Section 25 05 01 – EMCS: General Requirements.

1.3 SYSTEM DESCRIPTION

.1 The EMCS shall utilize its own LAN independent from the building LAN.

.2 The Owner's high speed internet connection shall be shared for usage by host computers on the local building LAN as well as by the EMCS. The high speed internet connection shall be split outside of the building LAN firewall so as to not adversely impact security on the building LAN. The router used for this purpose shall be provided by the Owner at no cost to the EMCS Contractor.

.3 The Owner's internet service provider (ISP) shall provide the EMCS contractor with a static (Non-rotating) IP address. All costs associated with this IP address shall be borne by the Owner. The Owner's IT department to assist the EMCS contractor in obtaining this IP address and splitting of the high speed internet incoming service.

.4 The Ethernet LAN shall be 100Base-TX and shall use 24 AWG unshielded twisted pair (UTP) cable. The actual cable shall be four (4) pair category 6 cable. The Ethernet shall use two of the four pairs. The first pair shall carry the transmit signal positive and negative. The second pair shall carry the receive signal positive and negative.

.5 All EMCS devices residing on the Ethernet LAN shall have Network Interface Cards (NICs) that plug into the hosts motherboard. The Ethernet shall terminate at each NIC with an 8-pin RJ-45 connector. The pin designations shall be as follows:

.1 Pin 1: transmit (+)

.2 Pin 2: transmit (-)

.3 Pin 3: receive (+)

.4 Pin 6: receive (-)

.6 Do not run Ethernet cable in same conduit as electrical cable.

.7 If forced to cross over electrical cable do so at 90° angle.

.8 Ethernet data communication rate shall be 100 Mbps.

.9 EMCS data communications over Ethernet shall be BACnet/IP open communications protocol as per ANSI/ASHRAE standard 135.

.10 The BACnet/IP communication protocol and the Ethernet LAN communication standard shall comply with the International Organization for Standardization Open System Interconnection (ISO/OSI) seven-layer model.

.11 The EMCS shall communicate to an external IP Wide Area Network (WAN), the internet. The EMCS shall convert EMCS graphic displays and data it receives from the EMCS System to web pages which can then be viewed using standard web browser software.

.12 The Ethernet shall operate using carrier sense multiple access collision detect (CSMA/CD) protocol.

.1 Carrier sense: each station shall continuously listen for traffic on the medium to determine when gaps between frame transmission occur.

.2 Multiple access: stations may begin transmitting any time they detect that the network is quiet (there is no traffic).

.3 Collision detect: if two or more stations in the same network begin transmitting at approximately the same time, the bit streams from the transmitting stations will interfere (collide) with each other, and both transmission will be unreadable. If that happens, each transmitting station must be capable of detecting that a collision has occurred before it has finished sending its frame. Each station must stop transmitting as soon as it has detected the collision and then must wait a length of time before attempting to retransmit the frame.

.13 The Ethernet devices shall implement only the bottom two layers of the OSI protocol stack, namely Physical and Data Link.

.14 Ethernet cable must not be spliced. It must be run continuous between devices.

.15 Maximum length of an Ethernet drop cable between a hub and a device shall be 100 m.

.16 LCUs shall reside on a Master Slave/Token Passing (MS/TP) subnet. The MS/TP subnet shall terminate at either MCUs or expandable LCUs.

.17 The data communication rate over MS/TP shall be selectable between 9.6 to 76.8 Kbps.

.18 The signaling standard over MS/TP shall be EIA-485.

.19 The MS/TP subnet shall use 22 AWG tinned copper shielded twisted pair cable.

.20 The MS/TP cable shall terminate at each device black or red to (+) and white, clear or green to (-).

.21 Connect shield drain wire of MS/TP communication cable to a single earth ground point. Do not connect the shield drain to the controller ground terminal; rather terminate the shield drain wire to the same point as the device ground.

.22 Maximum segment length for MS/TP shall be 1220 m.

.23 Maximum number of devices on any MS/TP subnet shall be 65.

.24 Tape off MS/TP shield drain on the other end.

.25 Provide terminating resistors for the end of the MS/TP LANs.

.26 The EMCS shall communicate with the IP WAN using Transmission Control Protocol/Internet Protocol (TCP/IP).

.1 IP: Network layer (Layer 3) of the OSI protocol that contains addressing information that enables data packets to be routed.

.2 TCP: Provides reliable transmission of data in an IP environment. TCP corresponds to the transport layer of the OSI reference model. TCP provides

stream data transfer, reliability, efficient flow control, full duplex operation, and multi-plexing.

.27 The system shall be able to expand or modify network either via LAN, auto-dial telephone line, router connections or combination thereof.

.28 LAN to be provided with all hardware and software required to allow communication with a remote BACnet client or network either directly or through gateway, as well as dial-up modem.

.29 The EMCS to provide full accessibility through an ordinary browser such as Internet Explorer or Netscape Navigator without proprietary software being loaded onto every computer that is used to access the system.

1.4 DESKTOP PC AND EXPANDABLE LCU PANEL SUPPORT

.1 Desktop PC and expandable LCUs are to reside directly on LAN so that communications may be executed directly between controllers on a peer-to-peer basis.

1.5 DYNAMIC DATA ACCESS

.1 The EMCS LAN to provide capabilities to be able to access point status and application report data or execute control functions for other devices via EMCS LAN.

.2 Access to data to be based upon logical identification or building equipment.

1.6 GENERAL NETWORK DESIGN

.1 The network design to be a fully distributed network, with each primary system having its own locally mounted dedicated LCU. Any failure in the network shall not affect the control of these primary systems. Connecting hardware points from one system to more than one LCU is not acceptable. Any points associated with a system are to be connected to one dedicated LCU.

.2 The automation layer of the network to be the layer of the network where overall network supervision and feature implementation to take place. The controllers at this level of the network to be referred to as supervisory controllers. The primary purpose of these controllers to be historical data collection, supervisory control, facility wide operations strategies, software feature implementation and network integration.

.3 The field layer to be the level at which the sensors and actuators are connected into the network to allow the control function to take place. In order to implement a fully distributed network each controlled system to have a dedicated field layer controller, and all the field points (sensors and actuators) associated with this system to be connected to this controller. In following this practice the network to be highly fault tolerant, with known modes of failure, and any controller failure to only affect one HVAC system. The field layer controller to have all the sensors actuators and operator I/O devices required to allow the controlled system to function independently of any other controller in the network.

.4 The EMCS to fully integrate the following subsystems which shall be capable of operating in a stand-alone mode, yet be software integrated to comprise the complete EMCS:

.1 Each VAV box.

.2 Room temperature control.

.5 Supply and install hardware and software required to provide remote alarm reporting via an email system that shall accomplish the reporting of selected EMCS alarm conditions using fully readable, individual, specific alarm messages of 240 characters at one time. The alarm text and an optional supplementary instruction message to be transmitted as a record to the email address. A record that the page occurred to be sent to a text file on the EMCS.

.6 Network to include:

.1 High speed data transfer rates for alarm reporting, quick report generation from multiple controllers upload/download information between network devices. Baud rate to be 100 Megabytes per second.

.2 Support of any combination of operator workstations and expandable LCU controllers directly connected to the Ethernet LAN. The Ethernet LAN to be capable of supporting at least 256 devices.

.3 Detection and accommodation of single or multiple failures of operator workstations and expandable LCU panels or network media. System to reconfigure itself automatically to allow all operational equipment to perform designated functions effectively in event of single or multiple failures.

PART 2 PRODUCTS

2.1 NOT USED

PART 3 EXECUTION

3.1 NOT USED

END OF SECTION

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

.1 Provide all labor, materials, equipment and services necessary for a complete Building Automation System (BAS) comprised of various types of BTL-listed BACnet-communicating Direct Digital Control (DDC) controllers (referred to as "BAS Controllers"), BTL-listed BACnet-communicating Operator Interface software, conventional electric/electronic controls, and equipment-mounted controls, as indicated. The system shall be fully functional and include all software and hardware for all specified capabilities.

.2 All controls required by this project shall be integrated into a single system and coordinated by the Controls Contractor as follows. ("Controls Contractor" is defined here as that responsible for this project in its entirety.)

.1 The Controls Contractor is responsible for providing all controls described in the construction documents regardless of where within the documents these controls are described.

.2 Each supplier of a controls product is responsible for the installation, configuration, programming, start-up and testing of that product unless otherwise stated.

.3 The Controls Contractor shall coordinate the resolution of any incompatibility issues between the BAS products provided under this section and those provided elsewhere in this specification.

.4 The Controls Contractor is responsible for all material and labor to interconnect control products provided by multiple suppliers regardless of where these products are described within the contract documents.

.5 The Controls Contractor is responsible for providing sufficient space and power for the BAS components.

.6 The Controls Contractor is responsible for resolving any conflicts that arise in control of the same equipment by both the BAS and fire alarm systems.

.3 BAS and EMCS are used interchangeably to mean the Building Automation System Controls Contractor.

.4 The BAS field layer devices must follow the I/O point naming convention for Memorial University of Newfoundland.

1.2 RELATED DOCUMENTS

.1 The following documents include requirements that pertain to and are hereby made part of the work of this section:

.1 Division 22

.2 Division 23

.3 Division 25

.4 Division 26

1.3 RELATED WORK

.1 Equipment or systems specified under other Division 23 and/or 26 sections are part of or integrated with the BAS, or installed under this section. These include, but are not limited to, control dampers, and actuators.

.2 Power: See the Division 26 drawings for the location of 120 VAC power, if any, provided for the BAS. Any power in addition to that shown shall be provided under this section, shall be from an emergency power source, if available, and shall comply with the requirements of Division 26.

.3 IP Communications: IP communications shall be owner provided. See specification section 25 10 01 – EMCS: Local Area Network (LAN).

.4 Test and Balance: Provide assistance to the efforts specified in Test and Balance specification. This assistance shall include on-site instruction on operator interface to the BAS, the provision of software and any special hardware (e.g., cables, signal converters) to allow for PC operator interface to the BAS, and instruction on access to all setpoints or parameters that need to be adjusted for balancing.

.5 Thermostats: Install/wire all thermostats provided with equipment specified in other Division 23 sections at the locations shown.

1.4 QUALITY ASSURANCE

.1 All materials and equipment shall be new unless otherwise specified.

.2 Materials and equipment shall be the manufacturer's latest standard design that complies with the specification requirements.

.3 Codes and Standards:

.1 All electrical installation work shall comply with the latest version of the Canadian Electrical Code.

.2 Provide electrical products which have been tested, listed and labeled by CSA, ULC and comply with NEMA standards.

.3 UL916 – Energy Management Equipment

.4 ASHRAE BACnet Standard 135, 2004 revision or later.

1.5 DEFINITIONS/ABBREVIATIONS

.1 Advanced Application Controller – A fully programmable controller which is BTL-listed as a B-AAC device and which communicates via BACnet MS/TP to an associated Network Controller (NC). These controllers are used for terminal unit (including VAV boxes) and small AHU/RTU control.

.2 Application Specific Controller – A low-level MS/TP controller typically not custom-programmable and BTL-listed as a B-ASC device.

.3 BACnet – "Building Automation Control Network", the data communications technology defined by ASHRAE standard 135.

.4 BACnet/IP - The use of the Ethernet and IP data/network link protocols for the transport of BACnet messages.

.5 B-BC, B-AAC, B-ASC and B-AWS – Abbreviations for BACnet Building Controller, BACnet Advanced Application Controller, BACnet Application Specific Controller. BACnet Advanced Operator Workstation Software. Used by the BACnet standard and BTL to

define the various device and software profiles, and BACnet functionality to be provided by different classes of DDC Devices (for support of interoperability).

.6 BBMD – BACnet/IP Broadcast Management Device. The method used by BACnet for handling broadcast messages over IP (which does not support broadcasting). The approach involves the use of one BACnet/IP device per IP segment to maintain a Broadcast Distribution Table (BDT) listing all other BACnet devices on that network segment. This allows a multi-cast message sent over IP (to each BBMD) to be in turn broadcasted to all other devices on each BACnet/IP segment.

.7 BTL – BACnet Testing Laboratory. Provides BACnet conformance testing (e.g., to confirm that a B-BC device meets the minimum requirements for the Building Controller profile as defined in the BACnet standard). If the device passes BTL testing it is said to be "BTL-listed" as, say, a "B-BC device". Also note that devices tested by an ISO accredited laboratory may also issue a certificate, and be referred to as "BTL-certified" device.

.8 COV (Change of Value) – An optional BACnet service that allows data to be communicated only when it has changed state and/or has changed its value by a pre-defined threshold. This service substantially reduces the use of communications bandwidth by BACnet in lieu of using the standard "Read" services (which must be polled at regular intervals to ensure that changes in values are seen by the system).

.9 EIA-485 – The standard which dictates the physical attributes (i.e., Layer 1 of the OSI model) of a multi-drop topology used as the basis for many low-speed (i.e., ~100 kbps or less) communications protocols (i.e., BACnet MS/TP, Modbus-485, and most proprietary BAS protocols).

.10 Gateway – Software used to translate one applications protocol data (i.e., BACnet) to another (e.g., Modbus or LonTalk). This software can be installed as a "driver" in a BAS controller (i.e., for Modbus) or provided by a separate gateway device (i.e., for LonTalk) so that the BAS can connect to "Third Party" devices)..

.11 LonTalk - The communications protocol defined by ANSI/CEA 709.1. Additionally, "LonMark-certified" devices are LonTalk devices that meet additional applications and interoperability guidelines specific to the HVAC market.

.12 Mobile Device – A smartphone, tablet, etc. that uses a mobile operating system (i.e., Android, Apple iOS, Windows Mobile, etc.) that supports internet communications and web-browsing.

.13 Modbus - A master/slave protocol (i.e., all data must be "read") that can be used over serial (EIA-232), EIA-485 (i.e. Modbus-RTU or 485), and IP (i.e., Modbus-TCP) connections. It was developed by the Modicon Corporation and is managed by the Modbus Organization, but has not been codified as a standard.

.14 MS/TP - An EIA-485 data link technology unique to and defined by BACnet for the transport of BACnet messages.

.15 NC - Network Controller, the highest-level controller in the BAS architecture, with B-BC listing, BACnet/IP communications, and routing to/from MS/TP controller sub-networks.

.16 Operator Interface – Refers to any BAS functionality that allows a user to monitor, control, debug and/or modify the system (including Thin Client support via the Web Server and Service Software).

.17 PICS – Protocol Implementation Conformance Statement. A BACnet form that must be completed for BTL-listing in which the device's BACnet device profile (e.g., B-BC), required feature choices (e.g., BACnet/IP vs. MS/TP), and optional features (e.g., COV) are to be documented.

.18 Service Software - A suite of optional Operator Interface software modules/functions used mainly by the contractor during installation or service, such as system configuration, setup, programming, graphics development, etc.

.19 Thick Client – A PC that must have Operator Interface software installed on it to perform operator interface functions.

.20 Thin Client - A PC that accesses Operator Interface functions via a Web Browser.

.21 Third-Party Controls - Any controls integral to and/or provided with system/equipment (e.g., "factory-provided" controls mounted on chillers and/or boiler equipment) that are to be integrated digitally (e.g., via BACnet or Modbus) to the BAS.

.22 Web Server – A BAS component (Operator Interface software or Network Controller) which provides access via a Thin Client.

1.6 SUBMITTALS

.1 Product Data and Shop Drawing Submittals:

.1 Manufacturer's Product Data:

.1 For each furnished control device submit catalog data including manufacturer's name, product name and specific model number, options included, product image, proof of BTL-listing, dimensions, functional description and operating characteristics, protocol conformance information, and electrical requirements (AC vs. DC, voltage and current draw, or VA). Data sheets shall be keyed to the shop drawings' bill of material lists.

.2 Provide a schedule for control valves indicating service, size, arrangement (2 , or 3-way), application (water, steam, on/off/ modulation), failsafe, actuator model, use of actuator end switches, flows, flow coefficient, and pressure drops for each system.

.2 Shop Drawings shall be generated in AutoCAD and include:

.1 System architecture diagram showing the communications wiring topology, model # or designation of each communicating device (e.g., BAS controller, Workstation, Server, etc.) including the HVAC or other system/equipment controlled, location and designation of each enclosure containing one or more communicating devices, and connections to third party controls.

.2 Floor plans showing enclosure locations, field devices not mounted in enclosures or on equipment (e.g., space temperature), terminal devices (e.g., VAV box) controller locations, and Workstation/Server locations.

.3 Schematic diagram of each controlled system/equipment showing point devices/interfaces with a point naming scheme matching that used on the associated control enclosure wiring diagram. Provide a bill of material for all of the devices shown with nomenclature keyed to the catalog data.

.4 Enclosure layout and wiring diagram showing the BAS Controllers, gateways/interfaces to third-party controls, enclosure-mounted field devices, internal wiring and wiring to field devices (with wiring tags matching those used on the schematic diagrams), a point list with expanded point description information, communications wiring connections, and power supply. All enclosure devices shall be labeled and keyed to a bill of materials.

.5 Sequence of operation modified and expanded from that provided in this specification to include control details specific to the mechanical and controls equipment provided.

.6 List of all data communicated via digital communications interfaces to third-party controls.

.1 Prior to completion of the submittals coordinate with the Third Party equipment suppliers to review their documentation and verify that the data (i.e., BACnet objects and properties, Modbus registers, etc.) required to complete the system is available.

.2 Prior to completion of the submittals meet with the Owner or Owner's representative to review the data lists available for communication to/from the Third Party controls. Based on the Owner's input modify the list of data to be communicated from that specified. It is the Contractor's responsibility to schedule this meeting with the Owner.

.7 Wiring details not shown on any of the above drawings.

.3 BAS Testing: Provide for approval a description of all system acceptance tests along with the forms/checklists that shall be used in the testing.

.4 Provide 1 copy of the submittals.

.2 Record (As-Built) Document Submittals

.1 Drawings: As-built versions of the shop drawings along with electronic copies of the AutoCAD files.

.2 Operation and Maintenance Manuals shall include the following:

.1 As-Built versions of the Manufacturer's Product Data.

.2 Maintenance information for all devices.

.3 An operator's manual which will include detailed instructions for all operations of the BAS.

.4 A programmer's manual which will include all information necessary to perform programming functions.

.5 Complete project-specific, custom sequence programming, system databases, parameter listings, etc. for the equipment controlled under this phase of the work (backed up to the Operator Interface or Web Server and onto CD/DVD's).

.6 A copy of the warranty.

.7 Operating and maintenance cautions and instructions.

.8 Log-in requirements, information, and/or /instructions (including any hardware key(s) or software licensing documentation) to allow Owner access (for both viewing and modification) to all system set-up databases, custom programming, Service Software, etc. at the highest user level provided by the manufacturer.

.9 Recommended spare parts list.

.10 All original issue documentation and software DVD's/CD's (if applicable) for third party hardware and software.

.3 Completed BAS test forms/checklists.

.4 Provide 1 copy of the submittals.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

.1 The following manufacturers (restricted to the product line listed, if any) are acceptable:

.1 Honeywell International, Inc., ComfortPoint Open.

.2 All BAS controllers shall be by one of the above manufacturers, except when the controls are specified under another section (i.e., referenced as "controls provided with the unit," "factory-mounted controls," or "unit manufacturer provided controls," etc. within this section). "BAS Components" includes BAS Controllers. Manufacturers of valves, actuators, sensors, and other field devices shall be as specified in the remainder of this section.

2.2 BAS ARCHITECTURE AND GENERAL REQUIREMENTS

.1 Provide a minimum of one Network Controller (NC) per air handling system that is BTL-listed to the B-BC BACnet profile. More than one NC may be needed to meet the requirements in the remainder of this paragraph.

.2 All NC's shall be connected together by BACnet/IP.

.3 Remote Communications: The BAS shall be remotely accessible via an internet connection provided by the Owner.

.4 All Advanced Application and Application Specific Controllers shall be connected to NC's via BACnet MS/TP.

.1 A sufficient number of NC's shall be provided to support the number of Advanced Application and Application Specific Controllers.

.2 No more than 30 Advanced Application and Application Specific Controllers shall be connected to a single NC network (e.g., that connected to a single MS/TP port on an NC).

.3 Controllers for terminal equipment (e.g., VAV boxes) shall be connected to the same NC used to control the associated AHU (i.e., the AHU which feeds supply air to the terminal equipment).

.5 A sufficient number of BAS Controllers shall be provided to meet the memory needs of the project programming, alarming and trending (24 samples for each point) along with 25% spare capacity for future use.

.6 A sufficient number of BAS Controllers and Point Expansion Modules shall be provided to meet the point needs of the project. Point termination types shall include:

.1 Analog Input (AI) - Thermistor, 0-10 VDC or 4-20 maDC.

.2 Binary Input (BI) - Monitoring of dry contacts, including contact closure "pulses" up to 10 per second.

.3 Analog Output (AO) - 0-10 VDC, 0-20 VDC or 4-20 maDC.

.4 Binary Output (BO) - Two-state DC voltage signal or magnetically held dry contact closure.

.7 Each BAS NC shall have a spare (e.g., not used for network communications purposes) Ethernet/IP port connection (e.g., for a Cat5 or 6 connection) for local connection of an

Operator Interface. Devices not equipped with an additional integral IP port shall include a separate, functional/powered network switch in the control panel.

.8 Each BAS Controller shall continue to execute its control software, sample input points, and update output points without connection to its BACnet/IP or MSTP network or an Operator Interface.

.9 All BAS Controllers shall utilize non-volatile or battery-backed volatile memory for writable information (e.g., setpoints and other control parameters, custom control software, and the device's control state at power loss). Battery backup for volatile memory shall provide for at least 72 hours of power loss.

.1 Each BAS Controller shall be able detect a changeover to battery-backed power and modify the state of the control program, if required by the Sequence of Operation.

.2 Application Specific Controllers need not have battery backup for volatile memory used for the devices' control state (battery backup is only required if volatile memory is used for setpoints and other control parameters, and control software).

.3 NOTE – Upon the reestablishment of power to a BAS Controller these devices shall return to normal operation (e.g., network communications, scanning of inputs, execution of the sequence of operation, and control of the outputs) in less than one minute. If this requirement cannot be met the Contractor shall provide 24 hours of uninterruptible power supply to each BAS Controller so that they are not affected by a loss of power in the building (and the sequence of operation shall be modified accordingly so that nuisance alarms do not occur during a loss of building power).

.10 Digital Communications to Third-Party Controls

.1 The BAS is required to send/receive information via digital communications technologies (i.e. Ethernet/IP, or EIA-485) and application protocols (i.e., BACnet, or Modbus) to specified "Third-Party" controls provided under other sections of this specification.

.2 See the specification sections of the equipment involved for the type of communications technology/interface (e.g., the data link layer protocol) and application protocol used by each of the Third-Party controls, and for the list of data to be shared with these controls.

.3 Communications not requiring a BAS Gateway (i.e., BACnet) - Design the BAS to include the NC's and sufficient EIA-485 communications ports (for MS/TP) to support the communications and data handling capacities required.

.4 Communications Requiring a Network Controller "Driver" (e.g., Modbus) – Design the BAS to include the NC's and sufficient EIA-485 communications ports (for Modbus-RTU), and any optional software "drivers" and/or hardware if necessary to support the communications technology and application protocol gateway interfaces.

2.3 NETWORK CONTROLLER (NC)

.1 An NC is a BTL-listed BACnet B-BC device with the BACnet options specified below, non-volatile memory for operating system software; read/write memory for custom control programming, trending, and alarming; real time clock; integral point or point expansion terminations; and communications support to other NC's. Allowable products are the Honeywell Comfort Point Open Plant Controllers, CPO-PC-6A, CP-IPC, or equivalent.

.2 NC Communications Network: Provide 100baseT Ethernet minimum communications with BACnet/IP support for interconnection to other NC's, Operator Interfaces, and to an Internet/Intranet connection, if specified.

.3 Web-Server – Provide password-protected access directly to the controller to view, diagnose and modify operating features/parameter using a web browser. The web pages used for this capability are factory provided and require no setup other than that required for programming the controller.

.4 Point Termination – NC's shall provide point termination for up to 256 points per NC through a choice of I/O expansion units (based on the type of communications connection to the NC):

.1 Expansion I/O Board or Controller (Honeywell CP-EXPIO, CPO-DIO, or equivalent):

.1 These high point-density expansion I/O devices connect via an EIA-485 communications port locally and/or remotely from the NC at a distance of up to 1,200 meters, and with up to 15 devices on a single network.

.2 Each board supports 8 AI's (configurable as BI's), 6 BI's, 6 AO's and 4 BO's.

.3 Each controller supports 8 universal inputs (configurable as either AI's or BI's), 8 BI's, and 16 BO's.

.4 Each board's BO and BI points shall have an associated on/off status LED indicator.

.5 Controller Network – An NC shall provide:

.1 Communications support as a Master to up to three separate 76.8Kbps minimum BACnet MS/TP data link layer communications connections for Advanced Application and Application Specific Controllers.

.2 BACnet Clause 6 Routing (between the specified NC's and Controller Network technologies) and BACnet/IP Broadcast Management (BBMD).

2.4 ADVANCED APPLICATION CONTROLLER

.1 An Advanced Application Controller is a BTL-listed BACnet B-AAC device with non-volatile memory for operating system software; read/write memory for custom programming; and communications support for Operator Interface and the Controller Network. Allowable products are Honeywell ComfortPoint Open: CPO-DIO Digital I/O Controller, CPO-VAV2A and CP-VAV Unitary Controller, CP-SPC Small Point Controller, or equivalents.

.2 Advanced Application Controller Network – Provide 76.8Kbps minimum BACnet MS/TP communications.

.3 Point Termination – Advanced Application Controllers shall provide direct point termination through integral point connections.

.4 VAV Terminal Unit Flow Sensing – Provide an integral differential pressure sensor for controllers used for control of VAV terminal unit's provided with pitot-tube style flow probe.

2.5 APPLICATION SPECIFIC CONTROLLER

.1 An Application Specific Controller is a BTL-listed BACnet B-ASC device dedicated for use with specific equipment and applications. It shall be provided with non-volatile memory for operating system software; read/write memory for all other purposes; factory-provided control software; and communications support for Operator Interface, and the Controller Network.

.1 Application Specific Controllers shall not be used for systems/equipment that require custom application programming to meet the Sequence of Operation (i.e., if an Application Specific Controller is used the factory-provided control software/program must be able to perform the Sequence of Operation without "upper level" control from another BAS Controller).

.2 Application Specific Controllers shall only be used for terminal/zone equipment such as fan coil units, and heat pumps (i.e., when the factory-provided control software meets the Sequence of Operation); or where explicitly allowed by the Sequence of Operation.

.2 ASC's for pressure independent applications shall have an integral differential pressure sensor for air flow measurement and an optionally integral damper actuator.

.3 Each ASC shall have a 76.8Kbps minimum BACnet MS/TP Controller Network connection (as an MS/TP Master).

.4 Each ASC shall be provided with integral point termination.

2.6 SENSOR/TRANSMITTERS

.1 Reference specification section 25 30 02 – Field Control Devices.

2.7 ACTUATORS

.1 Reference specification section 25 30 02 – Field Control Devices.

2.8 SWITCHES AND AUXILIARY CONTROL DEVICES

.1 Reference specification section 25 30 02 – Field Control Devices.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install BAS components and materials in accordance with manufacturer's instructions. Where the drawings conflict with these instructions, the Contractor shall submit a written request for clarification.

.2 Contractor shall coordinate installation with all other trades to avoid field condition conflicts.

.3 Electrical products and execution shall comply with requirements of applicable Division 26 sections of these specifications.

.4 Control Wiring and Communications Cabling:

.1 Install control wiring in EMT.

.1 Field devices provided with pig-tail wiring without any integral means of flexible metal raceway attachment shall be enclosed with a suitable means to allow for flexible metal raceway attachment.

.2 Install parallel to building lines, supported from structural members. Raceway supported from or anchored to piping, duct supports, the ceiling suspension system, or other electrical conduits is not acceptable.

.3 Flexible metal raceway, not in excess of three feet in length, shall be used for termination of raceway on vibrating equipment. The flexible metal raceway shall be supported at each end.

.4 Shielded wiring shall be used where recommended by the manufacturer and installed according to the manufacturer's installations.

.5 All communications wiring shall be installed as continuous lengths with no splices between termination points.

.6 All Ethernet/IP communications wiring and devices (hubs, repeaters, etc.) shall be provided by the Contractor and dedicated for use by the BAS.

.5 Enclosures:

.1 All BAS components, including controllers, sensors and other devices, shall be installed within enclosures.

.2 Enclosure locations shall be coordinated with other trades and shown in the submittals for approval.

.3 Enclosures for all devices except space sensors shall be NEMA rated for the location.

.6 Field Devices

.1 Locations shown on the drawings shall be used. Other locations shall be shown on the submittals for approval.

.2 Space thermostats and sensors shall be mounted 1219 mm AFF unless otherwise noted.

.3 Outdoor temperature sensors shall be located on a north exposure, in a shaded location, and installed in a sunshield.

.4 Freezestats shall be located so that the reset button and SetPoint adjustment are accessible using no more than an 1828 mm high ladder. For equipment mounted above this height the freezestat shall not be mounted on the equipment so that this height limit is met (e.g., on an adjacent wall).

.7 Third-Party Controls – "Third-Party" controls are supplied or provided under other sections of this specification. The following installation requirements apply to these controls:

.1 General Communications Requirement – For BACnet communications listed above, alarms and/or data will be automatically transmitted via BACnet Alarm and Event services, if supported by the Third Party Controls. If not, the BAS shall use polling (e.g., regular ReadProperty service calls for BACnet) to request the alarms on a frequency determined based on consultation with the Owner, and request any data used by the BAS for control on a frequency appropriate for the control application.

.8 Safeties

.1 All safety devices (freezestats, duct high/low pressure switches, etc.) shall be hard-wired directly to the controlled equipment (i.e., the safety sequence shall not be implemented through a "software interlock").

.9 Identification

.1 All BAS components, including controllers, sensors and other devices, shall be identified with nameplate designations to match the shop drawings.

.2 Components mounted within enclosures shall be identified with adhesive backed metalized polyester film labels with designations printed by a laser printer or other indelible method.

.3 Enclosures and other devices mounted in the field shall be identified with engraved plastic laminate labels affixed with rivets.

.4 Wiring shall be identified at each point of termination using a printed tag to match that shown on the drawings and affixed using a heat shrink sleeve.

3.2 SYSTEM TESTING AND ACCEPTANCE

.1 All BAS acceptance testing shall be performed in the presence of the Owner or Owner-designated representative. The system shall not be considered substantially complete until the testing is complete and approved. The contractor shall perform all calibration, start-up and testing procedures necessary to assure the completion of the system acceptance testing prior to commencement of the system acceptance tests.

.2 Point Tests - Perform the following tests for each point:

.1 Analog Input - Compare sensor reading to that of a calibrated portable measurement device.

.2 Binary Input – Manually actuate the monitored equipment and compare actual state with that read by the system.

.3 Analog Output – Through software, set the output to three or more values across the full range of actuation and compare with position of controlled device (or output signal for controlled device positions that cannot be visually observed).

.4 Binary Output – Through software, actuate the output and compare the control command with the actual operation of the controlled device.

.5 Data (from digital communications with "Third-Party Controls") – Perform the above tests, though the comparison (except for data representing binary outputs) shall be between that provided at the Third-party controller display and the BAS. Perform the above "Binary Output" test for data that represents digital outputs.

.3 System Tests – Perform the following tests for all sequences of operation:

.1 Develop trend data in graphical form showing the properly damped step response of each DDC loop.

.2 Simulate varying input values to verify reset schedules, and temperature lockouts.

.3 Manually initiate system start-ups to verify interlocks and sequencing.

.4 Simulate safety device and fire alarm system contact actuation to verify emergency, alarm, and life safety sequences.

.5 Simulate day/night changeover to observe occupied, unoccupied, optimum start, and warm-up modes.

.6 Simulate seasonal changeovers to observe proper operation of heating and cooling modes.

3.3 WARRANTY

.1 Provide all labor, material and equipment necessary for operation of the BAS according to the design for a period of one year after substantial completion of the project. All warranty or final completion service shall be scheduled with the Owner to minimize disruptions to facility operations.

.2 Emergency Service: Owner will initiate service calls when the BAS is not functioning properly. Contractor personnel shall be available to provide emergency warranty service. The Owner shall be provided with a telephone number where service representative can be reached at all times. Within 24 hours after receiving a request for service the problem shall be remotely resolved (i.e. via remote communications with the BAS) or service personnel shall be at the site. The Contractor shall fully restore the BAS to proper operating condition within two (2) days.

3.4 TRAINING

.1 The Contractor shall provide instruction to designated personnel in the adjustment, operation and maintenance of the specific BAS components and BAS installed. All training shall be held during normal work hours of 8:00 a.m. to 5:00 p.m. weekdays as scheduled in advance with the Owner.

.2 Provide one 8-hour, training classes in the St. John's area. Training shall include:

.1 Overview of BAS architecture and products.

.2 Use of the operator's manuals and shop drawings to understand and troubleshoot the system.

.3 Provide 8 hours of on-site BAS demonstration, training and/or assistance for a period of one year from final completion of the project. Demonstration and training topics to include:

.1 Explanation of drawings, and operations and maintenance manuals.

.2 Walk-through of the job to locate control components.

.3 Overview of the Sequences of Operation.

.4 BAS architecture.

.5 Explanation of adjustment, calibration and replacement procedures.

3.5 SOFTWARE SETUP, CONFIGURATION AND PROGRAMMING

.1 All data base entry, software configuration, initialization of alarms, and custom application programming to meet this specification shall be provided.

.2 All setpoints, PID tuning parameters, control deadbands, operating differentials, reset schedules, etc. shall be adjustable by an operator without need for accessing/modifying custom control programming code. (Honeywell EBI front end)

.3 The following control software shall be provided in addition to that described in the Sequence of Operation (where applicable):

.1 PID Control: Each control loop shall be controlled by a PID (proportional-integral-derivative) algorithm. The loop shall be tuned using the P and I gains as a minimum.

.2 Reset: Unless otherwise noted, any SetPoint required to be reset shall use a cascaded PID loop or an "every x minutes increment/decrement by y" algorithm. Contractor to tune these reset loops to provide stable control.

.3 Anti-Short Cycling: All BO points shall be protected from short cycling. This feature shall allow minimum on-time and off-time to be selected. Unless otherwise noted, all motors shall be limited to four starts per hour (one per hour for a chiller, six for cooling tower fans).

.4 Optimum Start: All air handlers that do not operate continuously shall be optimally started at the latest possible time to meet the occupied conditions at the time of occupancy. Utilize all space temperature inputs associated with the air handler, along with the outside air temperature. The algorithm shall include tuning parameters for adjusting the influence of space and outside air temperature on the start time.

.1 Warm-up Mode – An optimally started AHU shall operate in the warm-up mode until occupancy. The outside air damper(s) close and the return air dampers open. If the AHU supplies multiple zones (e.g., VAV boxes) the supply air temperature shall be the space temperature SetPoint (adj.).

.5 Night Setback – When not in the occupied or warm-up modes an AHU shall cycle on to maintain a night setback temperature of 15.5ºC (adj.) if the AHU supplies a single zone or if the zones that cannot provide heating without operation of the AHU (pinch-down VAV boxes with reheat coils)

.6 Alarm Communications: The BAS's alarm/event communications features shall be set up to automatically initiate IP-based alarm/event communications (i.e., to pagers, mobile phones, email, alarm printers, etc.) for selected alarms/events. Consult with the Owner to determine what communications method(s) is required, the communications devices involved, and what alarm conditions/priority/time-of-day shall initiate these communications.

.4 Graphic Screens:

.1 Honeywell EBI front end (Cash Allowance)

.5 Point names, schedules, and space temperature set points shall be chosen to meet the approval of the owner (even if specified herein).

.6 Only one NC's BACnet BBMD (broadcast messaging management) capability shall be enabled per IP subnet and configured with the list of all peer BBMD's and its subnet's devices.

3.6 SEQUENCE OF OPERATION

.1 General:

.1 Points - The points shown/listed on the mechanical drawings or included with the sequences to be provided by the consultant shall be considered minimum. Provide all points and point types required to meet the sequence of operation.

.2 DDC Sequence for Manually Started Equipment – Unless noted otherwise, when an operator starts the main component (e.g., fan, boiler, chiller, etc.) of an HVAC system (e.g., AHU, hot water plant, chiller plant, etc.) by a manual method

outside of the BAS (e.g., a motor starter HOA) the BAS will execute the described system (based on sensing motor operation via the status input).

.3 Safeties – None of the safety sequences described below shall be implemented by "software interlocks".

.2 Specific Sequences:

.1 Consult the drawings and specification section 25 90 01 – EMCS: Site Requirements, Applications and Systems Sequences of Operation.

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 Canadian Standards Association

.1 CSA Type 1 Enclosure.

.2 CSA Type 2 Enclosures.

.3 CSA Type 4X 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 Manufacturers detailed installation instructions.

.3 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 Operating conditions: 0 - 32 ºC with 10 - 90 % RH (non-condensing) unless otherwise specified.

.3 Terminations: use standard conduit box with slot screwdriver compression connector block unless otherwise specified.

.4 Account for hysteresis, relaxation time, maximum and minimum limits in applications of sensors and controls.

.5 Outdoor installations: use weatherproof construction in CSA 4X enclosures.

2.2 TEMPERATURE SENSORS

.1 General:

.1 All temperature sensors shall be either 3000 ohm or 10,000 ohm thermistors.

.2 Space temperature sensors:

.1 Flat plate Type: (TS_F)

.1 10,000 ohm, type 2, NTC thermistor, ±0.2°C accuracy.

.2 Wall mount.

.3 Stainless steel plate.

.4 Dimensions: to suit standard concealed electrical wall enclosure.

.5 Acceptable Product: Greystone TE200AS24, BAPI, Honeywell, Johnson Controls, Veris, or approved equal.

.2 Adjustable type: (TS)

.1 Sensor shall contain a backlit LED display room temperature, setpoint on demand and occupancy. Controller shall function as room control unit, and shall allow occupant to raise and lower setpoint and activate override use, all within limits as programed by building operator.

.2 The room sensor shall simultaneously display room setpoint and room temperature.

.3 Wall sensor: 10,000 ohm +/- 0.2ºC

.4 Setpoint adjustment: up/down push buttons for +/- 10 positive steps. 0 – 10,000 ohm signal.

.5 Override switch with LCD indication.

.6 Power: 24 VAC/DC +/- 10%, 20 mA max.

.7 Environment: 0 - 50ºC, 0 – 95% RH non-condensing.

.8 Dimensions: 84 mm wide, 119 mm high, 29 mm deep.

.9 Acceptable Products: Greystone TSPC-14-P-ES, Honeywell, Johnson Controls, Venis, Delta, or approved substitute.

.3 Duct/Air Handling Unit temperature sensors:

.1 Averaging:

.1 10,000 ohm, type 2, NTC thermistor, ±0.2°C accuracy.

.2 Duct mount or air handling equipment mount.

.3 Metal utility box.

.4 Duct averaging with flexible plenum-rated sensing cable.

.5 Provide sensor of sufficient length to suit application.

.6 Sensing cable shall incorporate numerous sensors along length of cable. The cable shall act as a single sensor averaging any temperature change across the sensors.

.7 Acceptable Product: Greystone TE200FDM24 of length as required, BAPI, Honeywell, Johnson Controls, Veris, or approved equal.

2.3 CARBON DIOXIDE SENSOR – SELF CALIBRATING

.1 The CO2 transmitter shall be an NDIR (non dispersive infrared), folded and extended path type optical sensor. The optical sensor shall be made of a polymer with an interior coating of gold for the best light refraction. No substitutes for gold will be accepted. Optical bench shall be temperature compensated. The optical path length of the sensor shall be at least 122 mm in order to ensure long-term stability and resolution. To ensure optimum quality and consistency of the product, it shall be completely assembled using Certified ISO-9001 manufacturing processes.

.2 Calibration: Sensor shall not require manual calibration over a minimum product rated life of 15 years. Sensor shall utilize an integrated Automated Baseline Compensation (ABC) algorithm that calibrates the sensor based on baseline concentrations measured during unoccupied periods in the space.

.3 Quality: To ensure optimum quality and consistency of the product the transmitter shall be fully assembled (electronics, packaging and optical sensor) using ISO-9001 certified processes in an ISO-9001 certified manufacturing facility to ensure optimum and consistent product quality. Proof of ISO-9001 certification of the manufacturing facility shall be available upon request from the manufacturer.

.4 Product Accuracy: The product shall have an accuracy of ±1% of measured range + 3% of measured value (± 50 ppm at 1000 ppm).

.5 Analog Output: The product should be capable of providing dual, simultaneous outputs of both current and voltage: A) 0-5 VAC and 4-20 mA or B) 0-10V and 4-20 mA.

.6 Wall Mount for Standard Jbox (2.75" X 4.75")

.7 Display: The transmitter shall not contain a display.

.8 Acceptable material: Airtest TR9294-B, or approved substitute.

2.4 ELECTRIC ISOLATION RELAY

.1 Supply and install relays with contacts capable of switching:

.1 15 amps at 120 VAC and with a 24 VAC coil rated at 46 mA.

.2 10 amps at 110 VAC and with a 120 VAC coil rated at 9.2 mA.

.3 7.5 amps at 110 VAC and with a 110VAC coil rated at 21.8 mA.

.4 Provide each relay with a NEMA 1 general purpose electrical enclosure with lockable cover sized to suit. Terminals shall be plug-in/solder type.

.5 Provide number of poles and throw configuration as shown on the drawings.

.2 Acceptable Product: Omron General Purpose LY2 Relays, Honeywell, Johnson Controls, or approved equal.

2.5 CONTROL TRANSFORMER

.1 Comply with NEMA Standard DC20-1992 for voltage-regulating ability.

.2 CSA certified.

.3 Energy limiting winding.

.4 Primary voltage: 120/1/60.

.5 Secondary voltage: 24 VAC.

.6 Transformer VA capacity to be sized by contractor to suit the application. Do not exceed 100 VA on any one (1) single low voltage control transformer.

.7 Provide independent control transformer for DDC controllers with full wave rectifiers.

.8 Provide separate control transformer for actuators controlled from DDC controller with full wave rectifiers.

.9 Acceptable Product: Marcus Indoor Type MC enclosed style single phase transformer, Honeywell, Johnson Controls, or approved equal.

2.6 DAMPER ACTUATORS (GENERAL)

.1 Electronic actuation shall be provided.

.2 The actuator shall be direct coupled over the shaft, enabling it to be mounted directly to the damper shaft without the need for connecting linkage. The fastening clamp assembly shall be of a "V" bolt design with associated "V" shaped toothed cradle attaching to the shaft for maximum strength and eliminating slippage. Spring return actuators shall have a "V" clamp assembly of sufficient size to be directly mounted to an integral jackshaft of up to 27 mm when the damper is constructed in this manner. Single bolt or set screw type fasteners are not acceptable.

.3 The actuator shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the rotation of the actuator. Mechanical end switches or magnetic clutch to deactivate the actuator at the end of rotation are not acceptable.

.4 For power-failure/safety applications, an internal mechanical, spring return mechanism shall be built into the actuator housing. Non-mechanical forms of fail-safe operation are not acceptable.

.5 All spring return actuators shall be capable of both clockwise and counter-clockwise spring return operation by simply changing the mounting orientation.

.6 Proportional actuators shall accept a 0 to 10 VDC or 0 to 20 mA control signal and provide a 2 to 10 VDC or 4 to 20 mA operating range. All proportional actuators shall provide a 2 to 10 VDC position feedback signal.

.7 All 24 VAC/VDC actuators shall operate on Class 2 wiring and shall not require more than 10 VA for AC or more than 8 watts for DC applications. Actuators operating on 120 VAC power shall not require more than 10 VA.

.8 All non-spring return actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered. Spring return actuators with more than 6.7 N.m torque capacity shall have a manual crank for this purpose.

.9 All proportional actuators shall have an external, built-in switch to allow the reversing of direction of rotation.

.10 Actuators shall be provided with a conduit fitting and a minimum 1 m long electrical cable and shall be pre-wired to eliminate the necessity of opening the actuator housing to make electrical connections.

.11 Actuators shall be Underwriters Laboratories Standard 873 listed and Canadian Standards Association Class 4813 02 certified as meeting correct safety requirements and recognized industry standards.

.12 Actuators shall be designed for a minimum of 60,000 full stroke cycles at the actuator's rated torque and shall have a 2-year manufacturer's warranty, starting from the date of project substantial completion. Manufacturer shall be ISO9001 certified.

2.7 PRESSURE INDEPENDENT CONTROL VALVES - MODULATING

.1 Application:

.1 Two-way modulating control valve for reheat coils

.2 Pressure independent balancing and control valves with integrated differential pressure controllers and optimized EQM (Equal Percentage Modified) control characteristic. The valves will be equipped with digital actuators with automatic stroke adaptation to the real lift of the control valve.

.3 Setting and measurement:

.1 Flow setting has to be performed steppless by hand with digitally configurable presetting ia the actuator, by lift limitation of the control plug from 100% down to 20% of the of the valves max capacity.

.2 Setting value, type and size of the valve must be visible from top.

.3 The valve has to be equiped with 2 or 3 measuring points enabling to measure: flow, temperature, stabilized differential pressure and available differential pressure (from pump).

.4 For easy commissionning and measurement the valve must have uni-directional access to the measuring points, the setting and the connection of the actuator.

.5 Isolation function for use during system maintenance, must be possible with flow setting mechanism without separate tools.

.4 Main characteristics:

.1 For high corrosion resistance the body and main components should be made from dezincification resistant alloy or corosion protected by Electrophoretic painting.

.2 The nominal lift for maximum flow capacity of the valve must be:

.1 4,0 mm for DN 15-20

.2 6,5 mm for DN 25-32

.3 15 mm for DN 40-50

.4 20 mm for DN 65-125

.5 30 mm for DN150

.3 To minimize the pump energy consumption, the minimum differential pressure for proper valve function should not exeed:

.1 15 kPa for valves DN 15-20

.2 23 kPa for valve DN 25-32

.3 30 kPa for valve DN 40-150

.4 55 kPa for DN100-125 High Flow

.5 60 kPa for DN150 High Flow

.4 The leakage rate should be ≤0,01% of maximum flow at the highest flow setting (class IV acording to EN 60534-4).

.5 Nominal pressure (PN) and maximum acceptable differential should be in accordance with the system requirements.

.5 Installation:

.1 For easy installation, the valve and actuator should be possible to install in all positions, including position with actuator downwards the valve.

.2 Pipe connection:

.1 DN 15-50 male thread according to ISO 228

.2 DN 65-150 flanges according to EN-1092-2, type 21, face to face length according to EN 558 series 3 or ASME 7 ANSI B16.42 Class 150

.6 Acceptable product: Victaulic IMI TA-COMPACT-P, Honeywell, Bray, Johnson Controls, Belimo, or approved substitute.

2.8 PRESSURE INDEPENDENT CONTROL VALVE – MODULATING ACTUATORS

.1 Model 160 and 500:

.1 Application:

.1 Two-way modulating control valve for reheat coils

.2 Functions:

.1 Proportional control

.2 Manual override

.3 Stroke detection

.4 Mode, status and position indication

.5 Stroke limitation setting

.6 Valve blockage protection

.7 Valve clogging detection

.8 Error safe position

.9 Diagnostic/Logging

.3 Supply voltage:

.1 24 VAC/VDC ±15%.

.2 Frequency 50/60 Hz ±3 Hz

.4 Power consumption:

.1 Model 160:

.1 Operation: < 1.0 VA (VAC); < 0.6 W (VDC)

.2 Standby: < 0.5 VA (VAC); < 0.25 W (VDC)

.2 Model 500:

.1 Operation: < 3.2 VA (VAC); < 1.6 W (VDC)

.2 Standby: < 1.3 VA (VAC); < 0.6 W (VDC)

.5 Input signal:

.1 0(2)-10 VDC, Ri 47 kΩ.

.2 Adjustable hysteresis sensitivity 0.1-0.5 VDC.

.3 0.33 Hz low pass filter.

.4 Proportional:

.1 0-10, 10-0, 2-10 or 10-2 VDC.

.5 Proportional split-range:

.1 0-5, 5-0, 5-10 or 10-5 VDC.

.2 0-4.5, 4.5-0, 5.5-10 or 10-5.5 VDC.

.3 2-6, 6-2, 6-10 or 10-6 VDC.

.6 Proportional dual-range (for change-over):

.1 0-3.3 / 6.7-10 VDC or

.2 2-4.7 / 7.3-10 VDC.

.7 Default setting: Proportional 0-10 VDC

.6 Characteristics:

.1 Linear, EQM 0.25 and inverted EQM 0.25.

.2 Default setting: Linear.

.7 Control speed:

.1 Model 160:

.1 10 s/mm

.2 Model 500:

.1 4 or 6 s/mm

.8 Adjusting force:

.1 Model 160:

.1 160/200 N

.2 Self-adjusting for IMI Hydronic Engineering valves.

.2 Model 500:

.1 Push 500 N

.2 Pull 300 N

.9 Temperature:

.1 Media temperature: max. 120°C

.2 Operating environment: 0°C – +50°C (5-95%RH, non-condensing)

.3 Storage environment: -20°C – +70°C (5-95%RH, non-condensing)

.10 Stroke:

.1 Model 160: 6,9 mm. Automatic detection of the valve lift (stroke detection)

.2 Model 500: 16.2 mm. Automatic detection of the valve lift (stroke detection)

.11 Material:

.1 Cover: PC/ABS GF8

.2 Housing: PA GF40.

.3 Swivelling nut: Nickel-plated brass

.12 Acceptable product: Victaulic IMI TA-Slider 160 or TA-Slider 500, Honeywell, Bray, Johnson Controls, Belimo, or approved substitute.

2.9 INPUT/OUTPUT SUMMARIES

.1 Refer to I/O Schedules for a complete listing of DDC control I/O points.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install field control devices in accordance with manufacturers recommended methods, procedures and instructions.

.2 Temperature transmitters, humidity transmitters, controllers, relays: install in CSA 2 enclosures or as specified. Provide for electrolytic isolation in all cases when dissimilar metals make contact.

.3 Support field-mounted transmitters as required.

.4 Install wall mounted devices and control tubs on plywood panel properly attached to wall. Supply and installation of plywood shall be the responsibility of the EMCS Contractor. Plywood shall be good one side. Plywood panels shall be painted by the General Contractor to match the wall colour onto which they are to be mounted. Painting shall be the responsibility of the General Contractor.

.5 Co-ordinate location of all devices with work of all other trades and ensure all devices are fully accessible for service and testing.

.6 EMCS contractor shall provide all required access panels for wall, floor or ceiling access for control devices.

.7 Duct access required for service and maintenance of duct mounted control devices shall be supplied and installed by the Mechanical Contractor.

3.2 TEMPERATURE 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.

.4 Install in CSA 4X enclosures.

.5 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.

.6 Support sensor element separately from coils, filter racks.

.7 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.

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.

.3 Wiring and tubing within panels: locate in trays or individually clipped to back of panel.

.4 Identify wiring and conduit clearly.

3.4 FIELD MOUNTED TRANSMITTERS AND SENSORS

.1 Support properly.

.2 Install wall mounted devices on plywood panel attached properly to wall.

3.5 IDENTIFICATION

.1 Identify field devices properly.

.2 Refer to Section 25 05 54 - EMCS: Identification.

3.6 TESTING

.1 Calibrate and test field devices for accuracy and performance. Submit report detailing tests performed, results obtained to Owner's Representative for approval. Owner's Representative will verify results at random. Provide testing equipment and manpower necessary for this verification.

3.7 COMMISSIONING

.1 Refer to Section 25 01 11 - EMCS: Start-up, Verification and Commissioning.

END OF SECTION

PART 1 GENERAL

1.1 DESIGN DOCUMENTATION

.1 Design documentation for each system to include, as a minimum:

.2 Narrative type of Sequence of Operation.

.3 Control Description Logic (CDL).

.4 Input/Output Summary Schedules.

.5 Schematics.

1.2 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:

.1 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 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
RAD	Return air damper
RAT	Return air temperature
RAH	Return air humidity
MAT	Mixed air temperature
EAD	Exhaust air damper
PFPD	Pre-filter pressure drop
PFAL	Pre-filter pressure drop alarm
FFPD	Final filter pressure drop
FFALM	Final filter pressure drop alarm
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
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
EF#-C	Exhaust fan # control
EF#-S	Exhaust fan # status
EAT	Exhaust air temperature
EAV	Exhaust air volume
CP3C	Circulating pump #3 control

CP3F	Circulating pump #3 flow rate
CP3S	Circulating pump #3 status
HTA	High temperature alarm
LTA	Low temperature alarm
HTC	High temperature cutout
LTC	Low temperature cutout
HLA	High level alarm
RM-T	Room temperature
Examples of specific space conditions:	
RM-TNPER 2	Space temperature, North Perimeter, 2nd floor
AFS	Air flow switch
AFM	Air flow monitor
F	Flow (instantaneous)
FT	Flow (total)
P	Pressure
ST	Supply temperature
RT	Return temperature
FA	Fire alarm
DP	Differential pressure
DCW	Domestic cold water system
DHW	Domestic hot water system
DHWR	Domestic hot water system recirculation
SPRD	Sprinkler - Dry pipe system
SPRW	Sprinkler - Wet pipe system

1.3 I/O SUMMARY SCHEDULES

.1 General:

.1 The Division 25 EMCS Contractor shall provide a complete I/O summary schedule similar to the one listed below, listing and describing all I/Os 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 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: (e.g. AI, AO, DI, DO).

.5 Column 5: Eng. Units: Describes the engineering units used (e.g. 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 3 words.

.8 Column 8: Assoc. Point: Identifies/Describes points for purposes of alarm suppression, software interlocks.

.9 Column 9: Type: defines the type of alarm (e.g. 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 (e.g. L2 = Low alarm, Level 2. H1 = High alarm, Level 1).

.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-energize. 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 60 seconds). 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 (e.g. supply air temperature optimization, enthalpy control) should be described as part of CDLs.

.3 Parameters for all application programs should be provided separately as part of the design documentation (e.g. 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																				
PROJECT NAME											**PROJECT NO.**									
PCU NO.											**AREA/SYSTEM NAME**									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**
Point No.	**Point Label**	**Desc**	**Type**	**Eng. Unit**	**Access Level**	**Sensor Type**	**Assoc Point**	**Type (M.CR)**	**DI/DO NO/NC**	**Limits**	**Alarm Limit**	**Maint**	**Setpoint**	**Deadband**	**Dev. alarm start**	**NO/NC DA/RA delay**	**Cont's NO/NC**	**Delay succ**	**Heavy motor**	**Auto reset**	**Prog**

1.4 CONTROL NARRATIVE SEQUENCE OF OPERATIONS

.1 Control sequences provided on the mechanical drawings.

1.5 DYNAMIC SYSTEM GRAPHICS

.1 Provide dynamic system graphics incorporating all analog and binary object types within the system. They shall be logically laid out for easy use by the Owner. These graphics shall include but shall not be limited to the following:

.1 Space temperature control graphic for every space showing radiant heating operation, reheat coil operation, temperature sensor, VAV box operation, etc.

.2 Trendlog: All binary and analog object types shall have the capability to be automatically trended. Trend logs shall be set up for all object types. Every point in the database shall be trend logged.

.3 Alarm: All analog inputs (High/Low Limits) and selected binary input alarm points shall be prioritized and routed (locally or remotely) with alarm message per the Owner's requirements. Alarms shall be set up for all analog and binary inputs.

1.6 DYNAMIC ANIMATED COLOUR GRAPHIC DISPLAYS

.1 Colour graphic floor plan displays, and system schematics for each piece of mechanical equipment shall be provided, as specified previously in this specification, in order to optimize system performance analysis, speed alarm recognition, and simplify user interaction. The Division 25 EMCS Contractor shall fully configure the colour graphics and plot all associated control/monitoring points on the screen. Electronic copies of all colour graphics screens shall be provided to the Owner's Representative for approval. The process shall be on-going during the control system installation to enable the Owner's Representative to properly review the graphics. It is the intention that reviews of the colour graphics occur frequently throughout the control system construction period so that the Owner's Representative can comment on and revise the graphics until a satisfactory product is achieved.

.2 Dynamic temperature values, flow values, differential pressure values and status indication shall be shown in their actual respective locations, and shall automatically update to represent current conditions without operator intervention. Damper positions, and airflows shall be animated and shall represent actual, current conditions.

.3 The floor plans shall be colour coded such that all areas served by a respective heating / cooling device are shaded the same colour. In addition, colour coded buttons shall be available on the floor plans to enable penetration directly to the respective VAV system graphic.

.4 The 'As-Built' sequence of operation in text form shall be available for each piece of equipment on its respective graphic through activation of a dedicated 'sequence' button. The text files shall be Microsoft Word documents.

1.7 SYSTEM SELECTION/PENETRATION

.1 The operator graphical interface shall allow users to access the various system schematics and floor plans via a graphical penetration scheme, menu selection, or text-based commands. Floor plans shall display room name and numbers. The operator shall be able to point and click on a room and display an animated flow diagram of the mechanical equipment that serves that room, with all control and monitoring points associated with that piece of equipment, including set points. Set points shall be overridden or modified from this screen. This shall also apply for all mechanical equipment shown on the floor plans.

PART 2 PRODUCTS

2.1 NOT USED

PART 3 EXECUTION

3.1 NOT USED

END OF SECTION

PART 1 GENERAL

1.1 GENERAL

.1 This Section covers items common to Sections of Division 26. This section supplements requirements of Division 1, Division 23, Division 27 and Division 28.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)

- .1 CSA C22.1, Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.
- .2 CAN3-C235, Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

.2 All codes and references referred to in this specification refer to the latest edition therof.

1.3 CARE, OPERATION AND START-UP

.1 Instruct Owner's Representative and operating personnel in the operation, care and maintenance of systems, system equipment and components.

.2 Operating instructions to include following:

- .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
- .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
- .3 Safety precautions.
- .4 Procedures to be followed in event of equipment failure.
- .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.

.3 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

.4 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with all aspects of its care and operation.

1.4 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235

.2 Motors, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

1.5 SUBMITTALS

.1 Submit drawings stamped and signed by the contractor registered or licensed in Province of Newfoundland and Labrador, Canada.

.2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure coordinated installation.

.3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.

.4 Indicate on drawings clearances for operation, maintenance, and replacement of operating equipment devices.

.5 Quality Control: in accordance with Section 01 45 00 - Quality Control.

- .1 Provide CSA certified equipment and material. Where CSA certified equipment and material is not available, submit such equipment and material to authority having jurisdiction for approval before delivery to site.
- .2 Submit test results of installed electrical systems and instrumentation.
- .3 Submit, upon completion of Work, load balance report as described in sentence 3.4.6.
- .4 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Owner's Representative.

.6 Manufacturer's Field Reports: submit to Owner's Representative within seven (7) working days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in paragraph 3.6- FIELD QUALITY CONTROL.

.7 Shop Drawings:

- .1 Indicate details of construction, dimensions, capacities, weights and electrical performance characteristics of equipment or materials.
- .2 Where applicable, indicate wiring, single line and schematic diagrams.
- .3 Include wiring drawings or diagrams showing interconnection with work of other sections.
- .4 Each shop drawing will be stamped and signed by the Contractor before submitting, stating that he has checked the drawings against the requirements as called for in the Contract Documents and also in the case where the equipment is attached to or connects to other equipment, that is has been properly coordinated with this equipment, whether supplied under Division 26 or under other Divisions.
- .5 Each shop drawing for non-catalogue items shall be prepared specifically for this project. If brochures are submitted for catalogue items, the brochures shall be marked deficiently indicating the item or items to be supplied.
- .6 Work shall not be proceeded with on any of the equipment until final review of shop drawings received by the Contractor.
- .7 Shop drawing review is for general compliance with Contract Documents. No responsibility is assumed by the Owner's Representative for correctness of dimensions or details. Corrections or comments, or lack thereof, made on the shop drawings during the Owner Representative's

review does not relieve the Contractor from compliance with the requirements of the drawings and specifications.

.8 If changes are required, notify Owner's Representative of these changes before they are made.

.8 Operation and Maintenance Data:

.1 Provide operation and maintenance data for incorporation into operation and maintenance manuals. Manuals shall be supplied to Section 01 78 00.

.2 Include in operations and maintenance data:

.1 Details of design elements, construction features, component function and maintenance requirements to permit effective start-up operation, maintenance, repair, modification, extension and expansion of any portion or feature of installation.

.2 Technical data, product data, supplemented by bulletins, exploded views, technical description of items and part lists. Advertising or sales literature not acceptable.

.3 Wiring and schematic diagrams and performance curves.

.4 Names and addresses of local suppliers for items included in maintenance manuals.

.5 Copy of reviewed shop drawings.

.9 As-Built Drawings: Submit in accordance with 01 78 00 – Closeout Submittals.

1.6 PERMITS, FEES AND INSPECTION

.1 Submit to Electrical Inspection Division and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.

.2 Pay associated fees.

.3 Owner's Representative will provide drawings and specifications required by Electrical Inspection Division and Supply Authority at no cost.

.4 Notify Owner's Representative of changes required by Electrical Inspection Division prior to making changes.

.5 Furnish Certificates of Acceptance from Electrical Inspection Division or authorities having jurisdiction on completion of work to Owner's Representative.

1.7 CO-ORDINATION

.1 Co-ordinate work with work of other divisions to avoid conflict.

.2 Locate distribution systems, equipment, and materials to provide minimum interference and maximum usable space.

.3 Where interference occurs, Owner's Representative must approve relocation of equipment and materials regardless of installation order.

.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

co-ordination by this Division. The cost of this relocation shall be the responsibility of this Division. The Owner's Representative shall decide the extent of relocation required.

1.8 CUTTING AND PATCHING

.1 Inform all other divisions in time, concerning required openings. Where this requirement is not met, bear the cost of all cutting. Openings of 200 mm or smaller shall be the responsibility of Division 26. Openings larger than 200 mm shall be the responsibility of Division 1. Obtain written approval of Structural engineer before drilling any beams or floors.

1.9 PROTECTION

.1 Protect exposed live equipment during construction for personnel safety.

.2 Shield and mark all live parts "LIVE 120 VOLTS", or with appropriate voltage in English.

.3 Arrange for installation of temporary doors for rooms containing electrical distribution equipment. Keep these doors locked except when under direct supervision of electrician.

1.10 RECORD DRAWINGS

.1 Obtain and pay for three sets of white prints. As the job progresses, mark these prints to accurately indicate installed work. Have the white prints available for inspection at the site at all times and present for scrutiny at each job meeting.

.2 Show on the record drawings the installed inverts of all services entering and leaving the building and the property. Dimension underground services at key points of every run in relation to the structure and building.

.3 Indicate exact location of all services for future work. Show and dimension all work embedded in the structure.

.4 Submit record drawings within 30 days prior to start of commissioning.

1.11 INSPECTION OF WORK

.1 The Owner will make periodic visits to the site during construction to ascertain reasonable conformity to plans and specifications but will not execute quality control. The Contractor shall be responsible for the execution of his work in conformity with the construction documents and with the requirements of the inspection authority.

1.12 SCHEDULING OF WORK

.1 Work shall be scheduled in phases as per other divisions of the contract documents.

.2 Become familiar with the phasing requirements for the work and comply with these conditions.

.3 No additional monies will be paid for contractor's requirement to comply with work phasing conditions.

1.13 FIRE RATING OF PENETRATIONS

.1 Maintain fire ratings around conduits passing through floors, ceilings and fire rated walls.

.2 Use 3M brand or equal fire barrier products at each penetration.

.3 Acceptable products for fire barrier products shall be 3M #CP25 fire barrier caulk, #303 putty, #FS 195 wrap and #CS195 sheet.

.4 Acceptable manufacturers: Nelson, Fire Stop Systems, 3M or approved equal. Material of same manufacturer to be used throughout project.

1.14 DELIVERY, STORAGE AND HANDLING

.1 Material Delivery Schedule: provide Owner's Representative with schedule within 2 weeks after award of Contract.

1.15 SYSTEM START-UP

.1 Instruct Owner's Representative and operating personnel in operation, care and maintenance of systems, system equipment and components.

.2 Arrange and pay for services of manufacturer's factory service engineer to supervise start- up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

.3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant will aspects of its care and operation.

1.16 WASTE MANAGEMENT & DISPOSAL

.1 Separate and recycle waste materials in accordance with Division 01.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal: paper, plastic, polystyrene and corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.

.4 Divert unused wiring and metal materials from landfill to metal recycling facility as approved by Owner's Representative.

.5 Place materials defined as hazardous or toxic waste in designated containers.

.6 Ensure emptied containers are sealed and stored safely for disposal.

.7 Unused materials must not be disposed of into sewer system, streams, lakes, onto ground or in other locations, where it will pose health or environmental hazard.

.8 Do not dispose of preservative treated wood through incineration. Dispose of treated wood, end pieces, wood scraps and sawdust at sanitary landfill approved by Owner's Representative.

.9 Divert unused batteries and antifreeze to appropriate recycling facilities as approved by Owner's Representative.

1.17 EQUIPMENT SUPPORTS AND HOUSEKEEPING PADS

.1 Equipment supports supplied by equipment manufacturer are specified elsewhere in Division 26.

.2 Fabricate equipment supports not supplied by equipment manufacturer from structural grade steel meeting requirements of Division 5. Submit structural calculations with shop drawings. Ensure that supports meet the requirements of the National Building Code.

.3 Mount base mounted equipment on chamfered edge housekeeping pads, minimum of 100 mm high and 50 mm larger than equipment dimensions all around.

1.18 ANCHOR BOLTS AND TEMPLATES

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

1.19 ACCESS DOORS

.1 Supply access doors for concealed electrical equipment to allow operation, inspection, adjusting and servicing.

.2 Use flush mounted 600 x 600 mm for body entry and 300 x 300 mm for hand entry unless otherwise noted. Doors to open 180, have rounded safety corners, concealed hinges, screwdriver latches and anchor straps.

.3 Material:

.1 Use stainless steel with brushed satin or polished finish in special areas such as tiled or marble surfaces and as directed by Owner's Representative.

.2 In remaining areas, use prime coated steel.

.3 Use ULC rated access doors in fire rated walls and ceilings.

.4 Installation

.1 Locate so that concealed items are accessible.

.2 Locate so that hand or body entry (as applicable) is achieved.

.3 Installation is specified in applicable sections.

PART 2 PRODUCTS

2.1 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

.1 Supplier and installer responsibility is indicated in electrical specifications and on electrical drawings and related mechanical responsibility is indicated in Mechanical specifications and on mechanical drawings, where applicable.

.2 Division 26 shall supply and install all conduit and wiring that is required between motor starters and DDC control panels. Terminations at starters are the responsibility of Division 26. Terminations at DDC control panels are the responsibility of Division 25. Coordinate with Division 25 for exact location of DDC control panels.

.3 Items not captured by 2.1.1 or 2.1.2, shall be addressed as follows: Control wiring and conduit is specified in Division 26 including conduit, wiring and connections below 50 V which are related to control systems specified in Division 25 and shown on mechanical drawings. Division 26 – Electrical Contractor is responsible for all conduit, wiring and connections below 50 V which are related to control systems in Division 25 and comply with the requirements of Division 26 for standard of quality. Coordinate with the mechanical contractor, and review all mechanical drawings.

2.2 MATERIALS AND EQUIPMENT

.1 Provide materials and equipment in accordance with Section 01 61 00 - Common Product Requirements.

.2 Equipment and material to be CSA certified. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Electrical Inspection Division.

.3 Factory assemble control panels and component assemblies.

2.3 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

.1 Paint indoor electrical equipment to EEMAC 2Y-1. This includes panelboards, transformers and disconnects.

.2 Confirm exact product material and sheen prior to ordering equipment.

.3 Electrical equipment colours as follows:

.1 Normal 208V: Pantone P 167-4 C Light Green.

.2 Normal 600V: Pantone 304 U. Light Blue.

.3 Emergency 208V: Pantone 2308 XGC Dark Green.

.4 Emergency 600V: Pantone 2152 XGC Dark Blue.

2.4 WARNING SIGNS

.1 As specified and to meet requirements of Electrical Inspection Department and Owner's Representative.

.2 Porcelain enamel decal signs, minimum size 175 x 250 mm.

.3 Install adhesive backed polyester arc flash hazard labels on new electrical panels. Refer to Section 26 05 73 – Power System Studies for further details.

2.5 WIRING TERMINATIONS

.1 Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.

2.6 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates and labels as follows:

.1 Nameplates: Lamicoid 3 mm thick plastic engraving sheet, black face, white core, mechanically attached with self tapping screws.

.2 Sizes as follows:

NAMEPLATE SIZES

Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

.2 Labels:

.1 Embossed plastic labels with 6 mm high letters unless specified otherwise.

.3 Wording on nameplates and labels to be approved by Owner's Representative prior to manufacture.

.4 Allow for average of twenty-five (25) letters per nameplate and label.

.5 Identification to be English.

.6 Nameplates for terminal cabinets and junction boxes to indicate system name and voltage characteristics.

.7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

.8 Terminal cabinets and pull boxes: indicate system name and voltage.

.9 Panelboards: indicate name, voltage, capacity and upstream panel serving mains.

.10 In addition to lamicoid labels, the contractor shall also install adhesive sticker labels on all equipment that include the name and bar code information. The contractor shall be provided with a spreadsheet program to create the specific bar code for each piece of equipment. Using the program to create the bar codes, and the supply and installation of the labels is the contractor's responsibility.

2.7 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour code: to CSA C22.1, Canadian Electrical Code.

.4 Use colour coded wires in communication cables, matched throughout system.

2.8 CONDUIT AND CABLE IDENTIFICATION

.1 Colour code conduits, boxes and metallic sheathed cables.

.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.

.3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

Conduit System	Prime Color
up to 250 V (Normal Power)	Pantone P 167-4 C
Up to 250V (Emergency Power)	Pantone 2308 XGC
up to 600 V (Normal Power)	Pantone 304 U
up to 600 V (Emergency Power)	Pantone 2152 XGC
Telephone and Data	Blue/Green Combination
Fire Alarm (full conduit)	Red
Emergency Voice	Red
Security Systems	Purple
Audio Visual Systems	White

.4 Fire alarm system conduit and emergency voice conduit shall be red from end-to-end, including all boxes. Conduit to be factory painted.

2.9 MATERIAL SPECIFIED

.1 Where additional manufacturers are named under Articles entitled "Approved Manufacturers", the selection of a named manufacturer, in reference to a particular article, shall be the Contractor's responsibility.

.2 Materials or products specified without the clauses "or approved equal" or "approved manufacturers" shall be supplied as specified and no proposed substitution will be considered.

.3 Where approvals are granted for the use of other equipment, any and all changes or additions required for the installation or operation of the approved equipment will be made by the Contractor at their own expense and no claims will be approved for any such changes, notwithstanding approval of shop drawings. Equipment that is accepted and installed and then does not perform as represented by original submitted data shall be replaced by the Contractor with equipment as specified at no charge to the Owner.

.4 Trade names are given as a standard of quality and configuration.

2.10 EXAMINATION OF OTHER WORK

.1 This Division requires the examination of the material and work for all other Divisions under which the work of this Section depends for proper completion. Any defect in work, levels or materials shall be reported to the Owner's Representative. The work of this Division shall not commence until such defects have been corrected. This also applied to existing work installed under other Contracts.

2.11 CUTTING, PATCHING, SLEEVES AND PLATES

.1 All drilling for hangers, rod, inserts and work of similar nature shall be done by Division 26.

.2 Have core drilled openings installed in foundation walls to accommodate the work of this Division. Seal conduit or cable through the cored opening using industrial duty round compression seals sized to suit diameter of conduit or cable. Cable seals to be Roxtec RS type or approved equal.

2.12 HANGERS AND EQUIPMENT SUPPORTS

.1 All equipment provided under the Electrical Division shall be complete with all necessary supports and hangers required for a safe and workmanlike installation and to avoid strain on conduit, etc. Auxiliary supports where required shall be provided under this Division.

.2 Hammer driven hanger supports, eg. staples, nails, etc. will not be used.

.3 Expansion bolts, inserted after concrete has been poured are acceptable.

.4 Paint all hangers, eg. U-bolts, trapeze hangers, etc. BEFORE INSTALLATION.

.5 Wire is not an acceptable conduit support.

.6 Conduit shall not be used as a support.

2.13 TESTING, ACCEPTANCE AND GUARANTEE

.1 The work of this Contract shall be tested and installed and any defects in operation shall be remedied immediately. Tests required by local authorities shall be the responsibility of the Contractor. When the work is completed, it shall be tested in its entirety and shall be in good working order before the Owner's Certificate of Acceptance shall be issued.

.2 A written guarantee shall be supplied to the Owner by the Contractor covering the prompt making good of any and all defects in material and workmanship for the period of one (1) year from the date of acceptance and the making good of any such defects shall be completely the responsibility of the Contractor.

PART 3 EXECUTION

3.1 NAMEPLATES AND LABELS

.1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.2 LOCATION OF OUTLETS

.1 Locate outlets in accordance with Section 26 27 26 – Wiring Devices.

.2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.

.3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.

.4 Locate light switches on latch side of doors. Locate disconnect devices in mechanical rooms on latch side of door.

3.3 CONDUIT AND CABLE INSTALLATION

.1 Install conduit and sleeves prior to pouring of concrete. Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm.

.2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

.3 Install cables, conduits and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.

3.4 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.

.2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

.3 Install electrical at following heights unless indicated otherwise.

- .1 Local switches: 1200 mm.
- .2 Wall receptacles:
  - .1 General: 400 mm.
  - .2 Above top of continuous baseboard heater: 200mm.
  - .3 Above top of counters or counter splash backs: 175 mm.
  - .4 In mechanical rooms: 1400 mm.
- .3 Panelboards: as required by Code or as indicated.
- .4 Data outlets: 400 mm.
- .5 Exit lights: 2400 mm.

3.5 CO-ORDINATION OF PROTECTIVE DEVICES

.1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

3.6 FIELD QUALITY CONTROL

.1 All electrical work to be carried out by qualified, licensed electricians or apprentices as per the conditions of the Provincial Act respecting manpower vocational training and qualification. Employees registered in a provincial apprentices program shall be permitted, under the direct supervision of a qualified licensed electrician, to perform specific tasks – the activities permitted shall be determined based on the level of training attained and the demonstration of ability to perform specific duties.

.2 The work of this division to be carried out by a contractor who holds a valid Code 1 Electrical Contractor License as issued by the Province.

.3 Perform tests in Accordance with this section as noted and Section 01 91 13.13 – Commissioning (Cx) Requirements.

.4 Load Balance:

- .1 Measure phase current to panelboard with normal loads (lighting) operating at time of acceptance. Adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
- .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.

.3 Submit, at completion of work, report listing phase and neutral currents on panelboards, operating under normal load. State hour and date on which each load was measured, and voltage at time of test.

.5 Conduct and pay for the following tests:

.1 Circuits originating from branch distribution panels.

.2 Lighting and its control.

.3 Motors and associated control equipment including sequenced operations of systems where applicable.

.4 Systems: fire alarm system, communications.

.6 Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.

.7 Insulation resistance testing.

.1 Measure and record circuits, feeders and equipment up to 350 V with a 500 V instrument.

.2 Measure and record 350 – 600 V circuits, feeders and equipment with a 1000 V instrument.

.3 Check resistance to ground before energizing and record value.

.8 Carry out tests in presence of Owner's Representative.

.9 Provide instruments, meters, equipment and personnel required to conduct tests during and conclusion of project.

.10 Submit test results for Owner's Representative's review and include in Commissioning Manuals specified in Section 01 91 13.13 – Commissioning (Cx) Requirements.

3.7 PREPERATION FOR FIRESTOPPING

.1 Prepare the space between conduits and adjacent sleeve or fire separation for the use of fire proofing material.

.2 Where cables or conduits pass through fire rated walls or ceilings, sleeve with steel conduit and prepare the opening for fire and smoke sealing and seal with proper fire and smoke rated material.

.3 Where conduits pass through fire or smoke rated partitions, install a junction box in the conduit just prior to exiting the space. Use this junction box to install smoke stopping material.

3.8 PAINTING

.1 Apply at least one coat of corrosion resistant primer paint to ferrous supports and site fabricated work.

.2 Prime and touch up marred finished paintwork to match original.

.3 Restore to new condition, finishes that have been damaged too extensively to be primed and touched up.

3.9 TRIAL USAGE

.1 Owner may use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

.2 Trial usage to apply to following equipment and systems:

- .1 Lighting system.
- .2 Power distribution system.
- .3 Communication systems.
- .4 Security systems.
- .5 Fire alarm system.

3.10 TESTS

.1 Give 24 h written notice of date for tests. Conceal work only after testing and approval by Consultant. Conduct tests in presence of Consultant. Bear costs including re-testing and making good.

.2 Equipment: test as specified in relevant sections.

.3 Prior to tests, isolate all equipment or other parts that are not designed to withstand test pressures or test medium.

3.11 DRAWINGS, CHANGES, ACCESSIBILITY

.1 The drawings shall be considered to show the general character and scope of work and not the exact details of the installation.

.2 The installation shall be complete with all supports and accessories required for a complete operative and satisfactory installation.

.3 The location, arrangement and connection of equipment and materials as shown on the drawings represent a close approximation to the intent and requirements of the Contract.

.4 The right is reserved by the Owner's Representative to make reasonable changes required to accommodate conditions arising during the progress of the work. Such changes shall be done at no extra cost to the Owner unless the location, arrangement or connection is more than 3.0 m from that shown.

.5 Actual location of existing services shall be verified in the field where necessary before work is commenced.

.6 Changes and modifications necessary to ensure co-ordination and to avoid interference or conflicts with other trades, or to accommodate existing conditions, shall be made at no extra cost to the Owner.

3.12 CLEANING

.1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

.3 Complete final cleaning of equipment and work area as acceptable to Owner's Representative.

.4 At time of final cleaning, clean lighting, reflectors, lenses and other lighting surfaces that have been exposed to construction dust and dirt.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 Materials and installation for wire and box connectors.

1.2 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results - Electrical.

1.3 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CAN/CSA-C22.2 No.18, Outlet Boxes, Conduit Boxes and Fittings.

.2 CAN/CSA-C22.2 No.65, Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).

.2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)

.1 EEMAC 1Y-2, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

.3 National Electrical Manufacturers Association (NEMA)

PART 2 PRODUCTS

2.1 MATERIALS

.1 Pressure type wire connectors to: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.

.2 Fixture type splicing connectors to: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.

.3 Bushing stud connectors: to EEMAC 1Y-2 to consist of:

.1 Connector body and stud clamp for stranded copper conductors.

.2 Clamp for copper bar.

.3 Stud clamp bolts.

.4 Bolts for copper bar.

.5 Sized for conductors and bars as indicated.

.4 Clamps or connectors for armoured cable and flexible conduit, as required to: CAN/CSA-C22.2 No.18.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors and:

.1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer.

Installation shall meet secureness tests in accordance with CSA C22.2 No.65.

.2 Install fixture type connectors and tighten. Replace insulating cap.

.3 Install bushing stud connectors in accordance with EEMAC 1Y-2.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.

.2 Refer to drawings for wiring type required under different applications.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CSA C22.2 No .0.3, Test Methods for Electrical Wires and Cables.

.2 CAN/CSA-C22.2 No. 131, Type TECK 90 Cable.

PART 2 PRODUCTS

2.1 BUILDING WIRES

.1 Conductors: stranded for 8 AWG and larger. Minimum size: 12 AWG.

.2 Copper conductors: size as indicated, with 600 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE.

.3 Copper conductors: size as indicated, with thermoplastic insulation type TWH rated at 600 V, typically used for insulated ground wires.

2.2 ARMOURED CABLES

.1 Conductors: insulated, copper, size as indicated.

.2 Type: AC90.

.3 Armour: interlocking type fabricated from aluminum strip.

.4 Connectors: standard as required, complete with anti-short rings.

2.3 CONTROL CABLES

.1 Type LVT: 2 soft annealed copper conductors, sized as indicated, with thermoplastic insulation, outer covering of thermoplastic jacket. Low energy 300 V control cable: stranded annealed copper conductors sized as indicated, with PVC insulation type TW -40° C polyethylene insulation with shielding of tape coated with paramagnetic material wire braid over each conductor and overall covering of PVC jacket.

2.4 MINERAL-INSULATED CABLES

.1 Conductors: solid bare soft-annealed copper, size as indicated.

.2 Insulation: compressed powdered magnesium oxide to form compact homogeneous mass throughout entire length of cable.

.3 Overall covering: annealed seamless copper sheath, Type M1 rated 600 V, 250°C.

.4 Overall jacket: PVC applied over the sheath and compliant to applicable Building Code classification for this project for direct buried and wet locations, as indicated.

.5 Two hour fire rating.

.6 Connectors: watertight, field installed, approved for MI cable.

.7 Termination kits: field installed approved for MI cable.

2.5 TECK CABLE

.1 Cable: to CAN/CSA-C22.2 No. 131.

.2 Conductors:

.1 Grounding conductor: copper.
.2 Circuit conductors: copper, size as indicated.

.3 Insulation:

.1 Cross-linked polyethylene XLPE, rating – 600 V.

.4 Inner jacket: polyvinyl chloride material.

.5 Armour: interlocking steel.

.6 Overall covering: thermoplastic polyvinyl chloride material.

.7 Fastenings:

.1 One hole steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.
.2 Channel type supports for two or more cables at 1500 mm centers.
.3 Threaded rods: 6 mm dia. to support suspended channels.

.8 Connectors:

.1 Watertight and/or type approved for TECK cable, as indicated.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Perform tests using method appropriate to site conditions and to approval of Owner's Representative and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

.4 No splices permitted in panel board feeders.

3.2 GENERAL CABLE INSTALLATION

.1 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1000 V).

.2 Cable Colour Coding: to Section 26 05 00 Common Work Results for Electrical.

.3 Conductor length for parallel feeders to be identical.

.4 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.

.5 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.

.6 Branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment to be 2-wire circuits only, i.e. common neutrals not permitted.

.7 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

.8 All circuits shall have dedicated neutrals.

3.3 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:

.1 In conduit systems in accordance with Section 26 05 34- Conduits, Fastenings and Fittings.

3.4 INSTALLATION OF ARMOURED CABLES (AC-90)

.1 Group cables wherever possible.

.2 Use permitted only for work in movable partitions and vertical power supply drops to lighting fixtures, maximum length of 1.5 meters.

.3 Ensure all cables are terminated and made safe prior to ceiling grid being installed. All lighting drops to be terminated safely, with approved connectors, within an approved box, complete with cover.

.4 All other equipment and systems shall be wired using a conduit system, unless specifically indicated otherwise.

3.5 INSTALLATION OF CONTROL CABLES

.1 Install control cables in conduit as indicated.

.2 Ground control cable shield.

3.6 INSTALLATION OF MINERAL-INSULATED CABLES

.1 Run cable exposed, securely supported by straps.

.2 Support 2 h fire rated cables at 1.22 m intervals.

.3 Make cable terminations by using factory-made kits.

.4 At cable terminations use thermoplastic sleeving over bare conductors.

.5 Where cables are buried in cast concrete or masonry, sleeve for entry and exit of cables.

.6 Do not splice cables.

3.7 INSTALLATION OF TECK CABLE 0-1000 V

.1 Install cables.

.1 Group cables wherever possible on channels.

.2 Install cable concealed, securely supported by straps and hangers, spacing as per CEC.

.3 Teck cable is only permitted for the panelboard feeder.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 91 13 – Commissioning (Cx) Requirements.

.2 Section 26 05 00 – Common Work Results - Electrical.

.3 Grounding conductors for all distribution grounding to be insulated copper.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)

.2 Canadian Standards Association, (CSA)

PART 2 PRODUCTS

2.1 EQUIPMENT

.1 Insulated grounding conductors: green, type TW.

.2 Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.

.3 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:

- .1 Grounding and bonding bushings.
- .2 Protective type clamps.
- .3 Bolted type conductor connectors, as required by local authority having jurisdiction.
- .4 Thermit welded type conductor connectors, as indicated.
- .5 Bonding jumpers, straps.
- .6 Pressure wire connectors.

PART 3 EXECUTION

3.1 INSTALLATION GENERAL

.1 Install complete permanent, continuous grounding system including, conductors, connectors, accessories. Where conduit is used, run insulated copper ground wire in conduit.

.2 Install connectors in accordance with manufacturer's instructions.

.3 Protect exposed grounding conductors from mechanical injury.

.4 Use mechanical connectors for grounding connections to equipment provided with lugs.

.5 Soldered joints not permitted.

.6 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

.7 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.

3.2 EQUIPMENT GROUNDING

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Frames of motors, starters, control panels, panels, transformers.

3.3 GROUNDING BUS

.1 Ground items in telecommunications/data room to ground bus with individual #6 TW copper connections, including: cable tray, conduits, racks, and any and all telecoms equipment.

3.4 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 – Common Work Results - Electrical and Section 01 19 13 – Commissioning (Cx) Requirements.

.2 Perform tests before energizing electrical system.

.3 Disconnect ground fault indicator during tests.

END OF SECTION

PART 1 GENERAL (NOT APPLICABLE)

PART 2 PRODUCTS

2.1 SUPPORT CHANNELS

.1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted, suspended or set in poured concrete walls and ceilings as required.

.2 Acceptable materials:

- .1 Thomas and Betts Superstrut
- .2 B-Line
- .3 Unistrut

PART 3 EXECUTION

3.1 INSTALLATION

.1 Secure equipment to hollow or solid masonry, tile and plaster surfaces with lead anchors or nylon shields.

.2 Secure equipment to poured concrete with expandable inserts.

.3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.

.4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.

.5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

.6 Fasten exposed conduit or cables to building construction or support system using straps.

- .1 One-hole steel straps to secure surface conduits and cables 53 mm and smaller.
- .2 Two-hole steel straps for conduits and cables larger than 53 mm.
- .3 Beam clamps to secure conduit to exposed steel work.
- .4 Strap AC-90 cable at box location plus every 900 mm.

.7 Suspended support systems.

- .1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
- .2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.

.8 For surface mounting of two or more conduits use channels at 1.5 m on centre spacing.

.9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.11 Do not use wire lashing, wood blocking, plastic strap or perforated strap to support or secure raceways or cables.

.12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Owner's Representative.

.13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

.14 For support of mineral insulated cables use channels at 1.22 meter on center spacing.

END OF SECTION

PART 1 GENERAL

1.1 REALTED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 91 13 – General Commissioning (Cx) Requirements.

.3 Section 26 05 00 – Common Work Results – Electrical.

1.2 SUBMITTALS

.1 Submit shop drawings and product data for cabinets.

.2 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Provide drawings stamped and signed by the contractor registered or licensed in the Province of Newfoundland and Labrador, Canada.

PART 2 PRODUCTS

2.1 JUNCTION AND PULL BOXES

.1 Welded steel construction with screw-on flat covers for surface mounting.

.2 Covers with 25 mm minimum extension all around, for flush-mounted pull and junction boxes.

PART 3 EXECUTION

3.1 JUNCTION AND PULL BOXES INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Install pull boxes so as not to exceed 30 m of conduit run between pull boxes.

.3 Ensure all electrical boxes above drywall ceilings are accessible via a properly sized access door installed directly below the box in drywall ceilings. Temporary removal of electrical light fixtures are not considered safe access to above ceiling electrical boxes and shall not be permitted.

3.2 IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results - Electrical.

.2 Install size 2 identification labels indicating system name voltage and phase.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 26 05 00 – Common Work Results – Electrical.

.2 Section 26 05 29 – Hangers and Supports for Electrical Systems.

.3 Section 26 05 34 – Conduits, Conduit Fastenings and Fittings.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CSA C22.1, Canadian Electrical Code, Part 1.

PART 2 PRODUCTS

2.1 OUTLET AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with CSA C22.1.

.2 102 mm square or larger outlet boxes as required for special devices.

.3 Gang boxes where wiring devices are grouped.

.4 Blank cover plates for boxes without wiring devices.

.5 347 V outlet boxes for 347 V switching devices.

.6 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 GALVANIZED STEEL OUTLET BOXES

.1 Electro-galvanized steel single and multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.

.2 102 mm square or octagonal outlet boxes for lighting fixture outlets.

.3 102 mm square outlet boxes with extension and plaster rings for flush mounting devices in finished plaster walls.

2.3 MASONRY BOXES

.1 Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls.

2.4 CONCRETE BOXES

.1 Electro-glavanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

2.5 CONDUIT BOXES

.1 Cast FS or FD aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacle.

2.6 FITTINGS - GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to 35 mm and pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

.5 Double split rings for AC-90 terminations.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Support boxes independently of connecting conduits.

.2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

.3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.

.4 Provide correct size of openings in boxes for conduit and armoured cable connections. Reducing washers are not allowed.

.5 Vacuum clean interior of outlet boxes before installation of wiring devices.

.6 Identify systems for outlet boxes as required.

.7 Provide deep boxes and extension rings as required for applications with thick walls and additional layers of gyproc.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CAN/CSA C22.2 No. 18, Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware, a National Standard of Canada.

.2 CSA C22.2 No. 45, Rigid Metal Conduit.

.3 CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.

.4 CSA C22.2 No. 83, Electrical Metallic Tubing.

.5 CAN/CSA C22.2 No. 227.3, Nonmetallic Mechanical Protection Tubing (NMPT), a National Standard of Canada.

1.2 SUBMITTALS

.1 Product data: submit manufacturer's printed product literature, specifications and datasheets.

.1 Submit cable manufacturing data.

.2 Quality assurance submittals:

.1 Test reports: submit certified test reports.

.2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.3 Instructions: submit manufacturer's installation instructions.

PART 2 PRODUCTS

2.1 CONDUITS

.1 Rigid metal conduit: to CSA C22.2 No. 45, hot dipped galvanized steel threaded.

.2 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.

.3 Flexible metal conduit: to CSA C22.2 No. 56, aluminum liquid-tight flexible metal.

2.2 CONDUIT FASTENINGS

.1 One hole steel straps to secure surface conduits 53 mm and smaller. Two hole steel straps for conduits larger than 53 mm.

.2 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for two or more conduits at 1.5 m oc.

.4 Threaded rods, 6 mm dia., to support suspended channels.

2.3 CONDUIT FITTINGS

.1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.

.2 Factory "ells" where 90°, 45 ° or 22.5 ° bends are required for 27 mm and larger conduits.

.3 Ensure conduit bends other than factory "ells" are made with an approved bender. Making offsets and other bends by cutting and rejoining 90 degree bends are not permitted.

.4 Watertight connectors and couplings for EMT installed in areas exposed to sprinkler heads. Steel set-screw type connectors and couplings for EMT in all other locations. Size as required.

2.4 EXPANSION FITTINGS FOR RIGID CONDUIT

.1 Weatherproof expansion fittings with internal bonding assembly suitable for 100 mm linear expansion.

.2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection in all directions.

.3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.5 FISH CORD

.1 Polypropylene.

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 datasheets.

3.2 INSTALLATION

.1 Install all conduit, conduit fittings and accessories in accordance with the latest edition of the Canadian Electrical Code in a manner that does not alter, change or violate any part of the installed system components or the CSA/UL certification of these components.

.2 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.3 Conceal conduits except in mechanical and electrical service rooms and in unfinished areas.

.4 Surface mount conduits except in finished areas or as indicated.

.5 Use rigid hot dipped galvanized steel threaded conduit for exposed work below 2.4 m above finished floor.

.6 Use electrical metallic tubing (EMT) except in cast concrete and above 2.4 m not subject to mechanical injury, as well as concealed work in masonry construction.

.7 Use flexible metal conduit for connection to motors in dry areas, to surface or recessed light fixtures, or work in movable metal partitions.

.8 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.

.9 Use AC-90 for vertical power supply drops to light fixtures, maximum length of 1.5 meters.

.10 Use explosion proof flexible connection for connection to explosion proof motors.

.11 Install conduit sealing fittings in hazardous areas. Fill with compound.

.12 Minimum conduit size for lighting and power circuits: 21 mm. 16 mm conduit is acceptable for switch leg drops only where one two-wire circuit and ground is required.

.13 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.14 Mechanically bend steel conduit over 21 mm dia.

.15 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.16 Install fish cord in empty conduits.

.17 Run 2 - 27 mm spare conduits up to ceiling space from each flush panel. Terminate these conduits in 152 x 152 x 102 mm junction boxes in ceiling space or in case of an exposed concrete slab, terminate each conduit in flush concrete type box.

.18 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.

.19 Dry conduits out before installing wire.

.20 Conduit shall be installed to maintain a minimum of 100 mm from the roof deck in any location. Do not fasten conduit to the roof deck.

3.3 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.

.3 Run conduits in flanged portion of structural steel.

.4 Group conduits wherever possible on suspended channels.

.5 Do not pass conduits through structural members except as indicated.

.6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Do not install horizontal runs in masonry walls.

.3 Do not install conduits in terrazzo or concrete toppings.

3.5 CLEANING

.1 Proceed in accordance with Section 01 74 00 – Cleaning.

.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 SCOPE

.1 The contractor shall furnish short-circuit and protective device coordination studies as prepared by the electrical equipment manufacturer or an approved engineering firm.

.2 The contractor shall furnish an Arc Flash Hazard Analysis Study per the requirements set forth in CSA Z462 – Workplace Electrical Safety.

.3 The scope of the studies shall include the new panel and the existing panel immediately upstream.

.4 Contractor is responsible to collect all field information required by the Engineer performing the study.

.5 Contractor will be provided with the short circuit information at the upstream panel.

1.2 REFERENCES

.1 American National Standards Institute (ANSI):

.1 ANSI C37.010 – Standard Application Guide for AC High Voltage Circuit Breakers Rated on a Symmetrical Current Basis.

.2 ANSI C37.13 – Standard for Low Voltage AC Power Circuit Breakers Used in Enclosures.

.3 ANSI C 37.41 – Standard Design Tests for High Voltage Fuses, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches and Accessories.

.4 ANSI C57.12.00 – Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers.

.2 CSA Group (CSA)

.1 CSA Z462-15 – Workplace Electrical Safety.

.3 Institute of Electrical and Electronics Engineers, Inc. (IEEE):

.1 IEEE 141 – Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems.

.2 IEEE 241 – Recommended Practice for Electric Power Systems in Commercial Buildings.

.3 IEEE 242 – Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems.

.4 IEEE 399 – Recommended Practice for Industrial and Commercial Power System Analysis.

.5 IEEE 1015 – Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems.

.6 IEEE 1584 – Guide for Performing Arc-Flash Hazard Calculations.

.4 The National Fire Protection Association (NFPA)

.1 NFPA 70 - National Electrical Code.

.2 NFPA 70E – Standard for Electrical Safety in the Workplace.

1.3 SUBMITTALS FOR REVIEW/APPROVAL

.1 The short-circuit and protective device coordination studies shall be submitted to the Owner's Representative prior to receiving final approval of the distribution equipment shop drawings and/or prior to release of equipment drawings for manufacturing. If formal completion of the studies may cause delay in equipment manufacturing and/or project schedule, approval from the Owner's Representative may be obtained for preliminary submittal of sufficient study data to ensure that the selection of device and characteristics will be satisfactory.

1.4 SUBMITTALS FOR CONSTRUCTION

.1 The results of the short-circuit, protective device coordination and arc flash hazard analysis studies shall be summarized in a final report.

.2 The report shall include the following sections:

.1 One-line diagram showing protective device ampere ratings and associated designations, cable size and lengths, transformer kVA and voltage ratings, motor and generator kVA ratings, and switchgear/switchboard/panelboard designations.

.2 Descriptions, purpose, basis and scope of the study.

.3 Tabulations of the worst-case calculated short circuit duties as a percentage of the applied device rating (automatic transfer switches, circuit breakers, fuses, etc.); the short circuit duties shall be upward-adjusted for X/R ratios that are above the device design ratings.

.4 Protective device time versus current coordination curves with associated one line diagram identifying the plotted devices, tabulations of ANSI protective relay functions and adjustable circuit breaker trip unit settings.

.5 Fault study input data, case descriptions, and current calculations including a definition of terms and guide for interpretation of the computer printout.

.6 Incident energy and flash protection boundary calculations.

.7 Comments and recommendations for system improvements, where needed.

.8 Executive Summary including source of information and assumptions made.

1.5 QUALIFICATIONS

.1 The short-circuit, protective device coordination and arc flash hazard analysis studies shall be conducted under the supervision and approval of a Registered Professional Electrical Engineer skilled in performing and interpreting the power system studies.

.2 The Registered Professional Electrical Engineer shall be a full-time employee of the equipment manufacturer or an approved engineering firm and be registered to practice in the Province of Newfoundland and Labrador.

.3 The Registered Professional Electrical Engineer shall have a minimum of five (5) years of experience in performing power system studies.

.4 The equipment manufacturer or approved engineering firm shall demonstrate experience with Arc Flash Hazard Analysis by submitting names of at least ten actual arc flash hazard analysis it has performed.

PART 2 PRODUCTS

2.1 STUDIES

.1 Contractor to furnish short-circuit and protective device coordination studies as prepared by equipment manufacturer or an approved engineering firm. The coordination new and/or modified study shall begin with the utility company's feeder protective device and include all of the electrical protective devices down to and include the largest feeder circuit breaker in the 208 Volt panelboards. Study shall also include variable frequency drives, harmonic filters, power factor correction equipment, transformers and protective devices associated with variable frequency drives, emergency standby generator and distribution switchgear.

.2 The contractor shall furnish an Arc Flash Hazard Analysis Study per CSA Z462.

2.2 DATA COLLECTION

.1 Contractor shall furnish all data as required by the power system studies. The Engineer performing the short-circuit, protective device coordination and arc flash hazard analysis studies shall furnish the Contractor with a listing of required data immediately after award of the contract. The Contractor shall expedite collection of the data to assure completion of the studies as required for final approval of the distribution equipment shop drawings and/or prior to the release of the equipment for manufacturing.

.2 Source combination may include present and future utility supplies, motors, and generators.

.3 If applicable, include fault contribution of existing motors in the study. The Contractor shall obtain required existing equipment data, if necessary, to satisfy the study requirements.

2.3 SHORT-CIRCUIT AND PROTECTIVE DEVICE EVALUATION STUDY

.1 Use actual conductor impedances if known. If unknown, use typical conductor impedances based on IEEE Standard 141, latest edition.

.2 Transformer design impedances and standard X/R ratios shall be used when test impedances are not available.

.3 Provide the following:

.1 Calculation methods and assumptions.

.2 Selected base per unit quantities.

.3 One-line diagram of the system being evaluated with available fault at each bus, and interrupting rating of devices noted.

.4 Source impedance data, including electric utility system and motor fault, contribution characteristics.

.5 Tabulations of calculated quantities.

.6 Results, conclusions, and recommendations.

.4 Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault at each:

.1 Electric utility's supply termination point.

.2 Incoming switchgear.

.3 Unit substation primary and secondary terminals.

.4 Low voltage switchgear.

.5 Standby generators and automatic transfer switches.

.6 Branch circuit panelboards.

.7 Other significant locations throughout the system.

.5 For grounded systems, provide a bolted line-to-ground fault current study for areas as defined for the three-phase bolted fault short-circuit study.

.6 Protective Device Evaluation:

.1 Evaluate equipment and protective devices and compare to short circuit ratings.

.2 Adequacy of switchgear, motor control centers, and panelboard bus bracing to withstand short-circuit stresses.

.3 Adequacy of transformer windings to withstand short-circuit stresses.

.4 Cable and busway sizes for ability to withstand short-circuit heating.

2.4 PROTECTIVE DEVICE COORDINATION STUDY

.1 Proposed protective device coordination time-current curves (TCC) shall be displayed on log-log scale graphs.

.2 Include on each curve sheet, a complete title and one-line diagram with legend identifying the specific portion of the system covered.

.3 Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which device is exposed.

.4 Identify device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.

.5 Plot the following characteristics on the curve sheets, where applicable:

.1 Electric utility's overcurrent protective device.

.2 Medium voltage equipment overcurrent relays.

.3 Medium and low voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.

.4 Low voltage equipment circuit breaker trip devices, including manufacturer's tolerance bands.

.5 Transformer full-load current, magnetizing inrush current, and ANSI through- fault protection curves.

.6 Conductor damage curves.

.7 Ground fault protective devices, as applicable.

.8 Pertinent motor starting characteristics and motor damage points, where applicable.

.9 Pertinent generator short-circuit decrement curve and generator damage point.

.6 Provide adequate time margins between device characteristics such that selective operation is provided, while providing proper protection.

2.5 ARC FLASH HAZARD ANALYSIS

.1 The arc flash hazard analysis shall be performed according to CSA Z462.

.2 The flash protection boundary and the incident energy shall be calculated at all significant locations in the electrical distribution system (switchboards, switchgear, panelboards, busway and splitters) where work could be performed on energized parts.

.3 The Arc-Flash Hazard Analysis shall include all new and/or modified equipment where work could be performed on energized parts.

.4 Safe working distances shall be based upon the calculated arc flash boundary considering an incident energy of 1.2 cal/cm^2.

.5 When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short-circuit and coordination study model. Ground overcurrent relays should not be taken into consideration when determining the clearing time when performing incident energy calculations.

.6 The short-circuit calculations and the corresponding incident energy calculations for multiple system scenarios must be compared and the greatest incident energy must be uniquely reported for each equipment location. Calculations must be performed to represent the maximum and minimum contributions of fault current magnitude for all normal and emergency operating conditions. The minimum calculation will assume that the utility contribution is at a minimum and will assume a minimum motor contribution (all motors off). Conversely, the maximum calculation will assume a maximum contribution from the utility and will assume the maximum amount of motors to be operating.

.7 The incident energy calculations must consider the accumulation of energy over time when performing arc flash calculations on buses with multiple sources. Iterative calculations must take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators should be decremented as follows:

.1 Fault contribution from induction motors should not be considered beyond 3-5 cycles.

.2 Fault contribution from synchronous motors and generators should be decayed to match the actual decrement of each as closely as possible

(e.g. contributions from permanent magnet generators will typically decay from 10 per unit to 3 per unit after 10 cycles).

.8 For each equipment location with a separately enclosed main device (where there is adequate separation between the line side terminals of the main protective device and the work location), calculations for incident energy and flash protection boundary shall include both the line and load side of the main breaker.

.9 Where performing incident energy calculations on the line side of a main breaker (as required per above), the line side and load side contributions must be included in the fault calculation.

.10 Mis-coordination should be checked amongst all devices within the branch containing the immediate protective device upstream of the calculation location and the calculation should utilize the fastest device to compute the incident energy for the corresponding location.

.11 Arc Flash calculations shall be based on actual overcurrent protective device clearing time.

2.6 REPORT SECTIONS

.1 Input data shall include but not be limited to the following:

.1 Utility 3-phase and L-G available contribution with associated X/R ratios.

.2 Feeder input data including feeder type (cable or bus), size, length, number per phase, conduit type (magnetic or non-magnetic) and conductor material (copper or aluminum).

.3 Transformer input data, including winding connections, secondary neutral- ground connection, primary and secondary voltage ratings, kVA rating, impedance, % taps and phase shift.

.4 Reactor data, including voltage rating, and impedance.

.5 Generation contribution data, (synchronous generators and Utility), including short-circuit reactance (X"d), rated MVA, rated voltage, three-phase and single line-ground contribution (for Utility sources) and X/R ratio.

.6 Motor contribution data (induction motors and synchronous motors), including shortcircuit reactance, rated horsepower or kVA, rated voltage, and X/R ratio.

.2 Short-Circuit Output Data shall include, but not be limited to the following reports:

.1 Low voltage Fault Report shall include a section for three-phase and unbalanced fault calculations and shall show the following information for each application location:

.1 Voltage

.2 Calculated fault current magnitude and angle

.3 Fault point X/R ratio

.4 Equivalent impedance

.2 Momentary Duty Report shall include a section for three-phase and unbalanced fault calculations and shall show the following information for each applicable location:

.1 Voltage
.2 Calculated symmetrical fault current magnitude and angle
.3 Fault point X/R ratio
.4 Calculated asymmetrical fault currents
.1 Based on fault point X/R ratio
.2 Based on calculated symmetrical value multiplied by 1.6
.3 Based on calculated symmetrical value multiplied by 2.7
.5 Equivalent impedance.

.3 Interrupting Duty Report shall include a section for three-phase and unbalanced fault calculations and shall show the following information for each applicable location:
.1 Voltage.
.2 Calculated symmetrical fault current magnitude and angle.
.3 Fault point X/R ratio.
.4 No AC Decrement (NACD) Ratio.
.5 Equivalent impedance.
.6 Multiplying factors for 2, 3, 5 and 8 cycle circuit breakers rated on a symmetrical basis.
.7 Multiplying factors for 2, 3, 5 and 8 cycle circuit breakers rated on a total basis.

.3 Recommended Protective Device Settings:

.1 Phase and Ground Relays:
.1 Current transformer ratio.
.2 Current setting.
.3 Time setting.
.4 Instantaneous setting.
.5 Recommendations on improved relaying systems, if applicable.
.2 Circuit Breakers:
.1 Adjustable pickups and time delays (long time, short time, ground)
.2 Adjustable time-current characteristic.
.3 Adjustable instantaneous pickup.
.4 Recommendations on improved trip systems, if applicable.

.4 Incident energy and flash protection boundary calculations:

.1 Arcing fault magnitude.
.2 Protective device clearing time.
.3 Duration of arc.
.4 Arc flash boundary.
.5 Working distance.
.6 Incident energy.
.7 Hazard Risk Category.
.8 Recommendations for arc flash energy reduction.

PART 3 EXECUTION

3.1 FIELD ADJUSTMENT

.1 Adjust relay and protective device settings according to the recommended settings table provided by the coordination study.

.2 Make minor modifications to equipment as required to accomplish conformance with short circuit and protective device coordination studies.

.3 Notify Owner's Representative in writing of any required major equipment modifications.

3.2 ARC FLASH WARNING LABELS

.1 The contractor of the Arc Flash Hazard Analysis shall provide a 90mm x 617mm thermal transfer type label of high adhesion polyester for each work location analyzed.

.2 All labels will be based on recommended overcurrent device settings and will be provided after the results of the analysis have been presented to the owner and after any system changes, upgrades or modifications have been incorporated in the system.

.3 The label shall have an orange header with the working: "WARNING: ARC FLASH HAZARD" and shall include the following information, at a minimum:

- .1 Location designation
- .2 Nominal voltage
- .3 Flash protection boundary
- .4 Hazard risk category
- .5 Incident energy
- .6 Working distance
- .7 Engineering report number, revision number and issue date.

.4 Labels shall be machine printed, with no field markings.

.5 Arc flash labels shall be provided in the following manner and all labels shall be based on recommended overcurrent device settings.

- .1 One arc flash label shall be provided for each new panelboard.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 Materials and installation for standard breaker type panelboards.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 91 13 – General Commissioning (Cx) Requirements.

.3 Section 26 05 00 – Common Work Results - Electrical.

.4 Section 26 28 16.02 - Moulded Case Circuit Breakers.

1.3 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CSA C22.2 No.29, Panelboards and enclosed Panelboards.

1.4 SUBMITTALS

.1 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

PART 2 PRODUCTS

2.1 PANELBOARDS

.1 Panelboards: to CSA C22.2 No.29 and product of one manufacturer.

.1 Install circuit breakers in panelboards before shipment.

.2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

.2 250 and 600 V panelboards: bus and breakers rated for minimum interrupting capacity as indicated on electrical drawings.

.3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.

.4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.

.5 Two keys for each panelboard and key panelboards alike.

.6 Tin plated aluminum bus with neutral of same ampere rating as mains.

.7 Mains: suitable for bolt-on breakers.

.8 Trim with concealed front bolts and hinges.

.9 Trim and door finish: baked enamel, colour as per 26 05 00.

.10 Provide an arc flash and shock hazard label on panel.

.11 Sprinklerproof.

.12 Half size (or mini) breakers are not acceptable.

2.2 BREAKERS

.1 Breakers: to Section 26 28 16.02 - Moulded Case Circuit Breakers.

.2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.

.3 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.

.4 Lock-on devices for fire alarm, emergency, door supervisory, exit light circuits as indicated.

2.3 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results - Electrical.

.2 Nameplate for each panelboard size 4 engraved as indicated.

.3 Nameplate for each circuit in distribution panelboards size 2 engraved as indicated.

.4 Complete circuit directory with typewritten legend showing location and load of each circuit.

2.4 ACCEPTABLE MATERIALS

.1 Cutler Hammer.

.2 Siemens.

.3 Square D.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.

.2 Install surface mounted panelboards on plywood backboards in accordance with Section 06 10 00 - Rough Carpentry. Where practical, group panelboards on common backboard.

.3 Mount panelboards to height specified in Section 26 05 00 – Common Work Results - Electrical or as indicated.

.4 Connect loads to circuits.

.5 Connect neutral conductors to common neutral bus with respective neutral identified.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 Switches, receptacles, wiring devices, poke-through assemblies, cover plates , occupancy sensors and their installation.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 91 13 – General Commissioning (Cx) Requirements.

.3 Section 26 05 00 – Common Work Results - Electrical.

1.3 REFERENCES

.1 Canadian Standards Association (CSA)

- .1 CSA-C22.2 No.42, General Use Receptacles, Attachment Plugs and Similar Devices.
- .2 CSA-C22.2 No.42.1, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
- .3 CSA-C22.2 No.55, Special Use Switches.
- .4 CSA-C22.2 No.111, General-Use Snap Switches (Bi-national standard, with UL 20, twelfth edition).

PART 2 PRODUCTS

2.1 SWITCHES/DIMMERS

.1 Low voltage as indicated to: CSA-C22.2 No.55 and CSA-C22.2 No.111.

.2 Manually-operated low voltage with following features:

- .1 Connected via ethernet cable.
- .2 Port to accept RJ45 connector.
- .3 Manual on/off control.
- .4 Dimmer control.
- .5 White.
- .6 Specification grade.
- .7 Standard of Acceptance: Wattstopper LMSW series, type to match existing.

2.2 RECEPTACLES

.1 Duplex receptacles, CSA type 5-20 R, 125 V, 20 A, U ground, to: CSA-C22.2 No.42 with following features:

- .1 White thermoplastic moulded housing.
- .2 Suitable for No. 10 AWG for back and side wiring.

.3 Break-off links for use as split receptacles.

.4 Eight back wired entrances, four side wiring screws.

.5 Triple wipe contacts and rivetted grounding contacts.

.6 Specification grade.

.2 Single receptacles CSA type 5-20 R, 125 V, 20 A, U ground with following features:

.1 White thermoplastic moulded housing.

.2 Suitable for No. 10 AWG for back and side wiring.

.3 Four back wired entrances, 2 side wiring screws.

.3 Other receptacles with ampacity and voltage as indicated.

.4 Receptacles of one manufacturer throughout project.

.5 Acceptable products:

.1 Hubbell.

.2 Leviton.

.3 Pass and Seymour.

2.3 COVER PLATES

.1 Cover plates for wiring devices to: CSA-C22.2 No.42.1.

.2 Cover plates from one manufacturer throughout project.

.3 Stainless steel cover plates, thickness 2.5 mm for wiring devices mounted in flush-mounted outlet box.

.4 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.

.5 All wiring device cover plates to be labeled using clear adhesive strips with black type identifying panel and circuit number for each device.

2.4 OCCUPANCY SENSORS AND POWER PACKS

.1 Passive infrared technology sensors:

.1 Occupancy sensors:

.1 Ceiling mount.

.2 Self-contained relay, low voltage, push-button programming, surface mounted.

.3 Operating conditions -10ºC to 71ºC temperature, 20 to 90% relative humidity.

.4 Standard range, 20 Ft radial coverage.

.5 Passive infrared technology detection.

.6 Equipped for fail-safe operation.

.7 Timer set for a duration of 15 minutes.

.8 Connected via ethernet cable. Port to accept RJ45 connector.

.9 Standard of Acceptance: Wattstopper DLM, type to match existing.

.2 Room controllers:

.1 Mounts on a 102 mm square junction box.

.2 Mounted in ceiling space in approximate location where indicated, ensure accessibility after installation.

.3 Rated for 347 VAC, 60 Hz, 15 A load.

.4 Capable of operating in conjunction with low voltage dimmer switch to dim 0 - 10 V LED drivers. Capable of operation in conjunction with low voltage occupancy sensors.

.5 Temperature 0ºC to 40ºC.

.6 Equipped for fail-safe operation.

.7 Timer set for a duration of 15 minutes.

.8 Standard of Acceptance: Wattstopper LMRC series, type to match existing.

.3 Isolation interface relays for communication with 3rd party systems such as DDC, HVAC, A/V and Fire Alarm.

.1 Standard of Acceptance: Wattstopper LMRL series, type to match existing.

2.5 POKE-THROUGH ASSEMBLIES

.1 Factory-fabricated and wired assembly of below-floor junction box with multi-channelled, through-floor raceway/firestop unit and detachable matching floor service outlet assembly.

.2 Service outlet assembly: flush type with receptacles, data outlets and A/V devices as indicated on drawings, with channel/barrier divider, and metallic custom colour floor flange.

.3 Size: selected to fit nominal cored holes in floor and matched to floor thickness.

.4 Fire rating: unit to be listed and labelled for fire rating of floor-ceiling assembly.

.5 Closure plug: arranged to close unused cored openings and re-establish fire rating of floor.

.6 Style: fire rated poke-thru device.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Switches:

.1 Install single throw switches with handle in "UP" position when switch closed.

.2 Install switches in gang type outlet box when more than one switch is required in one location.

.3 Mount toggle switches at height in accordance with Section 26 05 00 – Common Work Results - Electrical.

.2 Receptacles:

.1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.

.2 Mount receptacles at height in accordance with Section 26 05 00 – Common Work Results - Electrical.

.3 Where split receptacle has one portion switched, mount vertically and switch upper portion.

.3 Cover plates:

.1 Protect cover plate finish with paper or plastic film until painting and other work is finished.

.2 Install suitable common cover plates where wiring devices are grouped.

.3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

.4 Stainless steel plates for devices flush mounted in walls.

.4 Occupancy Sensors:

.1 Install sensors to optimize area of coverage and such that it does not provide coverage outside the target area.

.2 Refer to Manufacturer's installation instructions prior to roughing in conduit to device location.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 91 13 - General Commissioning (Cx) Requirements.

.3 Section 26 05 00 - Common Work Results – Electrical.

1.2 SUBMITTALS

.1 Include time-current characteristic curves for breakers with ampacity of 400 A and over or with electronic trip modules or adjustable settings.

PART 2 PRODUCTS

2.1 BREAKERS GENERAL

.1 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40°C ambient.

.2 Common-trip breakers: with single handle for multi-pole applications.

.3 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting. Trip settings on breakers with adjustable trips to range from 3-8 times current rating.

.4 Circuit breakers with interchangeable trips as indicated.

.5 Circuit breakers to have minimum symmetrical rms interrupting capacity rating as indicated on drawings.

2.2 THERMAL MAGNETIC BREAKERS

.1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install circuit breakers as indicated.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 91 13 – General Commissioning (Cx) Requirements.

.3 Section 26 05 00 – Common Work Results - Electrical.

PART 2 PRODUCTS

2.1 DISCONNECT SWITCHES

.1 Fusible and non-fusible, disconnect switch in CSA Enclosure type 1, sprinklerproof for interior and type 4X for exterior, size as required.

.2 Provision for padlocking in on-off switch position by three locks.

.3 Mechanically interlocked door to prevent opening when handle in ON position.

.4 Fuses: size as indicated, to Section 26 28 13.01 - Fuses - Low Voltage.

.5 Fuseholders: suitable without adaptors, for type and size of fuse indicated.

.6 Quick-make, quick-break action.

.7 ON-OFF switch position indication on switch enclosure cover.

.8 Heavy duty industrial grade and horsepower rated.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results - Electrical.

.2 Indicate name of load controlled on size 4 nameplate.

2.3 ACCEPTABLE MATERIALS

.1 Cutler Hammer.

.2 Siemens.

.3 Square D.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install disconnect switches complete with fuses where indicated.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 American National Standards Institute (ANSI).

.2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)

.1 ANSI/IEEE C62.41, Surge Voltages in Low-Voltage AC Power Circuits.

.3 American Society for Testing and Materials (ASTM)

.1 ASTM F1137, Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.

.4 United States of America, Federal Communications Commission (FCC)

.1 FCC (CFR47) EM and RF Interference Suppression.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 45 00 - Quality Control.

.3 Section 01 91 13 – General Commissioning (Cx) Requirements.

1.3 SUBMITTALS

.1 Submit complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by Owner's Representative.

.2 Photometric data to include: VCP Table and spacing criterion and luminaire coefficient of utilization (CU) tables.

.3 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.4 Quality assurance submittals: provide the following in accordance with Section 01 45 00 - Quality Control.

.1 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence, cleaning procedures and relamping schedule.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.3 Divert unused metal materials from landfill to metal recycling facility.

1.5 ACCEPTABLE PRODUCTS

.1 Luminaires described in the Lighting Fixture Schedule identify quality, performance criteria and other parameters, as indicated for this project. Named fixtures are acceptable with modifications and accessories, as indicated.

.2 Fixtures from other manufacturers may be acceptable provided:

.1 Appearance and lighting performance are similar.

.2 Quality is equal or better.

.3 Lamp and ballast criteria remain the same.

.4 The fixture is provided with modifications and accessories to provide a complete product in keeping with the intent of the project.

.5 Approval in writing is obtained from the Owner's Representative to the supplier/manufacturer 5 days prior to tender closing date.

PART 2 PRODUCTS

2.1 LAMPS

.1 LED Lamps: as indicated in Lighting Fixture Schedule, refer to drawings. Colour temperature as indicated in the fixture schedule or part number, if not indicated, use 3500 K.

2.2 DRIVERS

.1 LED Driver

.1 Rating: 120 or 347 V, 60 hz, as indicated, with dimming capability.

.2 Tested in accordance with IESNA LM-79

.3 All drivers to be complete with 0 – 10 V dimming capability in addition to full on-off switching.

2.3 FINISHES

.1 Light fixture finish and construction to meet ULC listings and CSA certifications related to intended installation.

.2 Baked enamel Finish: Light fixture finish and construction to meet ULC listings and CSA certifications related to intended installation.

.1 Conditioning of metal before painting:

.1 For corrosion resistance conversion coating to ASTM F1137.

.2 For paint base, conversion coating to ASTM F1137.

.2 Metal surfaces of luminaire housing and reflectors finished with high gloss baked enamel polyester powdercoat alzak aluminum to give smooth, uniform appearance, free from pinholes or defects.

.3 Reflector and other inside surfaces finished as follows:

.1 White, minimum reflection factor 85%.

.2 Color fastness: yellowness factor not above 0.02 and after 250 hours exposure in Atlas fade-ometer not to exceed 0.05.

.3 Film thickness, not less than 0.03 mm average and in no areas less than 0.025 mm.

.4 Gloss not less than 80 units as measured with Gardner 60E gloss meter.

.5 Flexibility: withstand bending over 12 mm mandrel without showing signs of cracking or flaking under 10 times magnification.

.6 Adhesion: 24 mm square lattice made of 3 mm squares cut through film to metal with sharp razor blade. Adhesive cellulose tape applied over lattice and pulled. Adhesion satisfactory if no coating removed.

.4 Alzak finish:

.1 Aluminum sheet fabricated from special aluminum alloys and chemically brightened, subsequently anodically treated to specifications established by Alcoa, to produce:

.1 Finish for mild commercial service, minimum density of coating 7.8 g/m², minimum reflectivity 83% for specular, 80.5% for semi-specular and 75% for diffuse.

.2 Finish for regular industrial service, minimum density of coating 14.8 g/m², minimum reflectivity 82% for specular and 73% for diffuse.

.3 Finish for heavy duty service, minimum density of coating 21.8 g/m², minimum reflectivity 85% for specular, 65% for diffuse.

2.4 LUMINAIRES

.1 As indicated in light fixture schedule on drawings.

.2 Refer to the Lighting Fixture Schedule on the drawing and the floor plans for detailed requirements of luminaires to be supplied and installed under this contract. The referenced manufacturer is given as a standard of acceptance only. Other manufacturers may be accepted provided they comply with the standard of the noted fixture.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Locate and install luminaires as indicated. Install lamps in all fixtures.

.1 Provide adequate support to suit ceiling system.

3.2 WIRING

.1 Connect luminaires to lighting circuits.

.1 Install flexible conduit for vertical power supply drop to luminaires as indicated. Horizontal wiring using flexible conduit is not permitted.

3.3 LUMINAIRE SUPPORTS

.1 For suspended ceiling installations support luminaires directly from structure independently of ceiling.

3.4 LUMINAIRE ALIGNMENT

.1 Align luminaires mounted in continuous rows to form straight uninterrupted line.

.2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

3.5 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 – Common Work Results - Electrical and Section 01 91 13 – General Commissioning (Cx) Requirements.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 74 00 - Cleaning.

.3 Section 01 91 13.13 - Commissioning (Cx) Requirements.

.4 Section 26 05 00 - Common Work Results – Electrical.

1.2 REFERENCES

.1 Atomic Energy Control Board Regulations

.2 Canadian Code for Preferred Packaging

.3 Canadian Standards Association (CSA)

.1 CSA C22.2 No.141, Unit Equipment for Emergency Lighting.

.2 CSA C860, Performance of Internally-Lighted Exit Signs.

.4 National Fire Protection Association (NFPA)

.1 NFPA 101, Life Safety Code.

1.3 SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheets and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Manufacturer's Instructions: Provide to indicate special handling criteria, installation sequence, cleaning procedures and disposal.

1.4 WARRANTY

.1 For batteries, the ten years warranty period is extended to 120 months, with no-charge replacement during the first 5 years and pro-rate charge on the second 5 years from the date of Substantial Completion.

PART 2 PRODUCTS

2.1 SELF-POWERED UNITS

.1 Exit lights: to CSA C22.2 No.141 and CSA C860, packaged in accordance with the Canadian Code for Preferred Packaging guidelines.

.2 Housing: die cast aluminum construction.

.3 Face and back plates: edge lit style.

.4 Lamps: multiple - , LED over 500,000 hours.

.5 Operation: designed for 25 years of continuous operation without relamping.

.6 Running man pictogram.

.7 Supply voltage: 347 V and 120 Vac, as indicated by circuiting on floor plan.

.8 Output voltage: 12 V dc.

.9 Operating time: minimum 90 minutes.

.10 Recharge time: 12 hours

.11 Battery: sealed, maintenance free.

.12 Charger: solid state, voltage/current regulated, inverse temperature compensated, short circuit protected, with regulated output of plus or minus 0.01 V for plus or minus 10% V input variation.

.13 Solid state transfer circuit.

.14 Signal lights: solid state, for 'AC Power ON'.

.15 Mounting: suitable for universal mounting directly on junction box and c/w knockouts for conduit. Removable or hinged front panel for easy access to batteries.

.16 Cabinet: finish: standard.

.17 Auxiliary equipment:

- .1 Lamp disconnect switch.
- .2 Test switch.
- .3 AC/DC output terminal blocks inside cabinet.
- .4 RFI suppressor.
- .5 Capable of being hardwired.
- .6 Self-test diagnostics.

2.2 DESIGN

.1 Recessed, wall, end to wall, ceiling mounting as indicated.

.2 Single or double face with face plate to remain captive for relamping as indicated.

.3 Arrow: right or left as indicated. Where arrows indicated both directions, two signs shall be installed.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install exit lights to manufacturer's recommendations, listing requirements, NFPA standard and local regulatory requirements.

.2 Connect fixtures to exit light circuits using RW90 wire in EMT conduit.

.3 Ensure that exit light circuit breaker is locked in on position.

.4 Provide tests in accordance with Section 26 05 00 – Common Work Results - Electrical and Section 01 91 13 – General Commissioning (Cx) Requirements.

3.2 CLEANING

.1 Proceed in accordance with Section 01 74 00 – Cleaning.

.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 SCOPE OF WORK

.1 Testing and commissioning are called for throughout the individual specifications. This does not relieve this trade from providing all testing and commissioning necessary to ensure that systems and equipment operate as required and that they interface with other systems and equipment as required.

1.2 SECTION INCLUDES

.1 Commissioning of all building electrical systems and component including:

- .1 Testing and adjustment.
- .2 Demonstrations and Training.
- .3 Instructions of all procedures for Owner's personnel.
- .4 Updating as-built data.
- .5 Co-ordination of Operation and Maintenance material.

1.3 RELATED SECTION

.1 Section 01 77 00 – Closeout Procedures.

.2 Section 01 91 13 – General Commissioning (Cx) Requirements.

.3 Section 26 05 00 – Common Work Results - Electrical.

1.4 REFERENCES

.1 CSA (Canadian Standards Association).

.2 Underwriters Laboratories of Canada.

1.5 QUALITY ASSURANCE

.1 Provide qualified trades persons, certified testing agencies, factory trained and approved by the Commissioning Team Leader.

.2 Submit the names of all personnel to be used during the Commissioning activities for Owner Approval.

1.6 COMMISSIONING

.1 The purpose of the commissioning process is to fully test all building systems including architectural, mechanical and electrical components and operating procedures by challenging these systems to realistic operation conditions.

.2 The Commissioning activities shall be co-ordinated by the General Contractor.

.3 Commissioning activities for the electrical systems must have available up to date as-built drawing information and accurate Operations and Maintenance Manuals. These documents shall be a major part of this activity.

.4 Contractor shall be responsible to update all documentation with information and any changes duly noted during the Commissioning exercise.

.5 Contractor shall arrange for all outside suppliers, equipment manufacturers, test agencies and others as identified in the commissioning sections of this specification. The cost associated with this requirement shall be included as part of the tender price.

1.7 SUBMITTALS

.1 A commissioning document shall be prepared by the Owner's Representative prior to conducting these activities for use by the Commissioning Team.

.2 The electrical sub-contractor shall be responsible for ensuring all activities are properly documented in this manual and co-ordinated through the General Contractor.

.3 As-built drawings and data books must be available two weeks prior to commissioning for review and use by the consultant and Commissioning Team prior to the start of the commissioning activities.

1.8 PREPARATION

.1 Provide test instruments required for all activities as defined in the commissioning documents.

.2 Verify all systems are in compliance with the requirements of the commissioning documents prior to the precommissioning check out operation.

.3 Confirm all scheduled activities have identified personnel available.

.4 Where systems or equipment do not operate as required, make the necessary corrections or modifications, re-test and re-commission.

1.9 SYSTEM DESCRIPTION

.1 Perform all start up operations, control adjustment, trouble shooting, servicing and maintenance of each item of equipment as defined in the commissioning documentation.

.2 Owner will provide list of personnel to receive instructions and will co-ordinate their attendance at agreed upon times.

.3 Prepare and insert additional data in the operations and maintenance manuals and update as-built drawings when need for additional data becomes apparent during the commissioning exercise.

.4 Where instruction is specified in the commissioning manual, instruct personnel in all phases of operation and maintenance using operation and maintenance manuals as the basis of instruction.

.5 Conduct presentation on Owner's premises. Owner will provide space.

1.10 FINAL REPORT

.1 This trade shall assemble all testing data and commissioning reports and submit them to the Owner.

.2 Each form shall bear signature of recorder, and that of supervisor of reporting organizer.

1.11 SCHEDULE OF ACTIVITIES

.1 Commissioning activities shall be conducted based on pre-established schedule with all members of the commissioning team, refer to Section 01 91 13 – General Commissioning (Cx) Requirements.

.2 In addition, there will be two meetings held through the contract duration to introduce the parties of the commissioning team, establish the schedules and deadlines for the various activities and review the Commissioning Manual.

.3 Adhering to the established schedule is very important as the co-ordination and scheduling of the participants will be difficult to alter once this is established. Close co-ordination of this schedule is important.

.4 In the event project cannot be commissioned in the allotted time slot, the contractor shall pay for all costs associated with assembling the Commissioning Team at a later date. If the contractor has not performed his duties to reach commissioning stage as outlined earlier, he will incur all expenses of other trades and the Commissioning Team due to his non-compliance.

END OF SECTION

PART 1 GENERAL

1.1 GENERAL

.1 This section describes the extent of services to be provided for wiring of equipment supplied by others.

.2 Within the context of this section, Others means:

- .1 Other divisions of this specification.
- .2 The Owner, as defined in the Contract.
- .3 Other contractors supplying and installing equipment to the contract.

1.2 EXTENT OF SERVICES PROVIDED

.1 The work of this contract is to include all power and control wiring of equipment which is provided by Division 26.

.2 All power and control wiring above 50 V for equipment supplied by Division 25 will be the responsibility of this contractor. Coordinate with Integrated Automation contractor for exact requirements.

.3 For all control wiring 50 V and less refer to Section 26 05 00 2.1 for responsibility.

.4 All power and control wiring associated with equipment supplied by Division 01 will be the responsibility of this contractor. Coordinate with general contractor for exact requirements.

.5 Final connection of all wiring to equipment provided by others will be by division 26. Coordinate with the provider for connection instructions.

1.3 RESPONSIBILITY OF DIVISION 26

.1 It is the responsibility of the Division 26 subcontractor to verify final requirements for wiring of all equipment noted. Verification of wiring requirements to include:

- .1 Confirmation of electrical characteristics.
- .2 Location of connection point.
- .3 Method of connection (i.e. direct or plug-in etc.)

.2 Obtain and become familiar with shop drawings for all relevant equipment.

.3 No claim for extra will be entertained for wiring equipment which has been indicated, or changes to installed wiring where installation proceeded prior to verification of electrical requirements.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 91 13 - General Commissioning (Cx) Requirements.

.2 Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets.

.3 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

.4 Section 27 05 36 - Cable Trays for Communications Systems.

.5 Section 27 20 00 - Data Communications.

.6 The MUNet specifications shall be followed and are part of this contract. Refer to the appendix. The Division 27 communications sections and MUNet section are intended to be read in conjunction with one another, where discrepancies occur, contractor shall follow the most stringent requirement. If any contractual requirements are unclear, the contractor is required to submit all clarification requests during the tender and in accordance with the tender requirements.

1.2 SYSTEM DESCRIPTION

.1 Telecommunications raceway system for telecommunication, security, and A/V consists of outlet boxes, cover plates, terminal and distribution cabinets, conduits, cable tray, pull boxes, sleeves and caps, fish wires, service poles, service fittings, as indicated.

.2 Data system provided as a complete operational system as per Section 27 20 00 – Data Systems.

PART 2 PRODUCTS

2.1 MATERIAL

.1 Conduits: EMT type, in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

.2 Pull boxes, cabinets type E: in accordance with Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets.

.3 Outlet boxes flush mounted type, conduit boxes size, and fittings: in accordance with Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets.

.4 Fish wire: polypropylene.

.5 Cable trays: in accordance with Section 27 05 36 - Cable Trays for Communications Systems.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install raceway system, including distribution system, fish wire, terminal cabinets, outlet boxes, floor boxes, pull boxes, cover plates, conduit, cable tray, sleeves and caps, miscellaneous and positioning material to constitute complete system, as indicated.

.2 For each data drop there shall be a dedicated conduit from the outlet box to the cable tray system.

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 Section Includes:

.1 Wire-basket cable trays.

1.3 ACTION SUBMITTALS

.1 Product Data: For each type of cable tray.

.1 Include data indicating dimensions and finishes for each type of cable tray indicated.

.2 Shop Drawings: For each type of cable tray.

.1 Show fabrication and installation details of cable trays, including plans, elevations, and sections of components and attachments to other construction elements. Designate components and accessories, including clamps, brackets, hanger rods, splice-plate connectors, expansion-joint assemblies, straight lengths, and fittings.

.2 Detail fabrication, including anchorages and attachments to structure and to supported cable trays.

1.4 INFORMATION SUBMITTALS

.1 Coordination Drawings: Floor plans and sections, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

.1 Include scaled cable tray layout and relationships between components and adjacent structural, electrical, and mechanical elements.

.2 Vertical and horizontal offsets and transitions.

.3 Clearances for access above and to side of cable trays.

.4 Vertical elevation of cable trays above the floor or below bottom of ceiling structure.

.2 Field quality-control reports.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

.1 Delegated Design: Engage a qualified professional engineer to design cable tray supports.

2.2 GENERAL REQUIREMENTS FOR CABLE TRAYS

.1 Cable Trays and Accessories: Identified as defined in the CEC and marked for intended location, application, and grounding.

.1 Source Limitations: Obtain cable trays and components from single manufacturer.

.2 Sizes and Configurations: Refer to the Drawings for specific requirements for types, materials, sizes, and configurations.

.3 Structural Performance: See articles for individual cable tray types for specific values for the following parameters:

.1 Uniform Load Distribution: Capable of supporting a uniformly distributed load on the indicated support span when supported as a simple span and tested according to NEMA VE 1.

.2 Concentrated Load: A load applied at midpoint of span and centerline of tray.

.3 Load and Safety Factors: Applicable to both side rails and rung capacities.

2.3 WIRE-BASKET CABLE TRAYS

.1 Manufacturers: Subject to compliance with requirements, provide products by one of the following:

.1 Allied Tube & Conduit; a Tyco International Ltd. Co.

.2 Cablofil/Legrande.

.3 Cooper B-Line, Inc.

.4 Mono-Systems, Inc.

.5 MP Husky.

.6 Snaketray.

.2 Description:

.1 Configuration: Wires are formed into a standard 5-by-10 cm (2-by-4-inch) wire mesh pattern with intersecting wires welded together. Mesh sections must have at least one bottom longitudinal wire along entire length of section.

.2 Materials: High-strength-steel longitudinal wires with no bends.

.3 Safety Provisions: Wire ends along wire-basket sides (flanges) rounded during manufacturing to maintain integrity of cables and installer safety.

.4 Sizes:

.1 Straight sections shall be furnished in standard 3 m (120-inch) lengths.

.2 Wire-Basket Depth: 10 cm (4-inch) usable loading depth by 30.5 cm (12 inches) wide.

.5 Connector Assemblies: Bolt welded to plate shaped to fit around adjoining tray wires and mating plate. Mechanically joins adjacent tray wires to splice sections together or to create horizontal fittings.

.6 Connector Assembly Capacity: Splices located within support span shall not diminish rated loading capacity of cable tray.

.7 Hardware and Fasteners: ASTM F 593 and ASTM F 594 stainless steel, Type 316.

2.4 MATERIALS AND FINISHES

.1 Steel:

.1 Straight Section and Fitting Side Rails and Rungs: Steel complies with the minimum mechanical properties of ASTM A 1011/A 1011M, SS, Grade 33.

.2 Steel Tray Splice Plates: ASTM A 1011/A 1011M, HSLAS, Grade 50, Class 1.

.3 Fasteners: Steel complies with the minimum mechanical properties of ASTM A 510/A 510M, Grade 1008.

.4 Finish: Mill galvanized before fabrication.

.1 Standard: Comply with ASTM A 653/A 653M, G90.

.2 Hardware: Galvanized, ASTM B 633.

.5 Finish: Factory-standard primer, ready for field painting, with chromium-zinc-plated hardware according to ASTM F 1136.

.6 Finish: Black oxide finish for support accessories and miscellaneous hardware according to ASTM D 769.

.2 Aluminum:

.1 Materials: Alloy 6063-T6 according to ANSI H 35.1/H 35.1M for extruded components and Alloy 5052-H32 according to ANSI H 35.1/H 35.1M for fabricated parts.

.2 Hardware: Stainless steel, Type 316, ASTM F 593 and ASTM F 594.

.3 Hardware for Aluminum Cable Tray Used Outdoors: Stainless steel, Type 316, ASTM F 593 and ASTM F 594.

2.5 CABLE TRAY ACCESSORIES

.1 Fittings: Tees, crosses, risers, elbows, and other fittings as indicated, of same materials and finishes as cable tray.

.2 Covers: Ventilated-hat type made of same materials and with same finishes as cable tray.

.3 Barrier Strips: Same materials and finishes as for cable tray.

.4 Cable tray supports and connectors, including bonding jumpers, as recommended by cable tray manufacturer.

2.6 WARNING SIGNS

.1 Lettering: 38 mm (1-1/2-inch) high, black letters on yellow background with legend "Warning! Not To Be Used as Walkway, Ladder, or Support for Ladders or Personnel."

2.7 SOURCE QUALITY CONTROL

.1 Testing: Test and inspect cable trays according to NEMA FG 1.

PART 3 EXECUTION

3.1 CABLE TRAY INSTALLATION

.1 Install cable trays according to NEMA FG 1.

.2 Install cable trays as a complete system, including fasteners, hold-down clips, support systems, barrier strips, adjustable horizontal and vertical splice plates, elbows, reducers, tees, crosses, cable dropouts, adapters, covers, and bonding.

.3 Install cable trays so that the tray is accessible for cable installation and all splices are accessible for inspection and adjustment.

.4 Remove burrs and sharp edges from cable trays.

.5 Join aluminum cable tray with splice plates; use four square neck-carriage bolts and locknuts.

.6 Fasten cable tray supports to building structure and install seismic restraints.

.7 Design fasteners and supports to carry cable tray, the cables, and a concentrated load of 90 kg (200 lb.). Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems." Comply with seismic-restraint details according to Section 260548.16 "Seismic Controls for Electrical Systems."

.8 Place supports so that spans do not exceed maximum spans on schedules and provide clearances shown on Drawings. Install intermediate supports when cable weight exceeds the load-carrying capacity of the tray rungs.

.9 Construct supports from channel members, threaded rods, and other appurtenances furnished by cable tray manufacturer. Arrange supports in trapeze or wall-bracket form as required by application.

.10 Support bus assembly to prevent twisting from eccentric loading.

.11 Install center-hung supports for single-rail trays designed for 60 versus 40 percent eccentric loading condition, with a safety factor of 3.

.12 Locate and install supports according to NEMA FG 1. Do not install more than one cable tray splice between supports.

.13 Support wire-basket cable trays with trapeze hangers or wall brackets.

.14 Support trapeze hangers for wire-basket trays with 3/8-inch diameter rods.

.15 Make connections to equipment with flanged fittings fastened to cable trays and to equipment. Support cable trays independent of fittings. Do not carry weight of cable trays on equipment enclosure.

.16 Install expansion connectors where cable trays cross building expansion joints and in cable tray runs that exceed dimensions recommended in NEMA FG 1. Space connectors and set gaps according to applicable standard.

.17 Make changes in direction and elevation using manufacturer's recommended fittings.

.18 Make cable tray connections using manufacturer's recommended fittings.

.19 Seal penetrations through fire and smoke barriers. Comply with requirements in Division 07.

.20 Install capped metal sleeves for future cables through firestop-sealed cable tray penetrations of fire and smoke barriers.

.21 Install cable trays with enough workspace to permit access for installing cables.

.22 Install barriers to separate cables of different systems, such as power, communications, and data processing; or of different insulation levels, such as 600, 5000, and 15 000 V.

.23 Install permanent covers, if used, after installing cable. Install cover clamps according to NEMA VE 2.

.24 Clamp covers on cable trays installed outdoors with heavy-duty clamps.

.25 Install warning signs in visible locations on or near cable trays after cable tray installation.

3.2 CABLE TRAY GROUNDING

.1 Ground cable trays according to the CEC and as specified. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

.2 Cable trays with communications cable shall be bonded together with splice plates listed for grounding purposes or with listed bonding jumpers.

.3 Cable trays with control conductors shall be bonded together with splice plates listed for grounding purposes or with listed bonding jumpers.

.4 When using epoxy- or powder-coat painted cable trays as a grounding conductor, completely remove coating at all splice contact points or ground connector attachment. After completing splice-to-grounding bolt attachment, repair the coated surfaces with coating materials recommended by cable tray manufacturer.

.5 Bond cable trays to power source for cables contained within with bonding conductors sized according to the CEC.

3.3 CABLE INSTALLATION

.1 Install cables only when each cable tray run has been completed and inspected.

.2 Fasten cables on horizontal runs with cable clamps or cable ties according to NEMA VE 2. Tighten clamps only enough to secure the cable, without indenting the cable jacket. Install cable ties with a tool that includes an automatic pressure-limiting device.

.3 Fasten cables on vertical runs to cable trays every 45 cm (18 inches).

.4 Fasten and support cables that pass from one cable tray to another or drop from cable trays to equipment enclosures. Fasten cables to the cable tray at the point of exit and support cables independent of the enclosure. The cable length between cable trays or between cable tray and enclosure shall be no more than 1.8 m (72 inches).

.5 Tie MI cables down every 1 m (36 inches) where required to provide a 2-hour fire rating and every 1.8 m (72 inches) elsewhere.

.6 In existing construction, remove inactive or dead cables from cable trays.

3.4 CONNECTIONS

.1 Remove paint from all connection points before making connections. Repair paint after the connections are completed.

.2 Connect pathways to cable trays according to requirements in NEMA VE 2 and NEMA FG 1.

3.5 FIELD QUALITY CONTROL

.1 Perform the following tests and inspections:

.1 After installing cable trays and after electrical circuitry has been energized, survey for compliance with requirements.

.2 Visually inspect cable insulation for damage. Correct sharp corners, protuberances in cable trays, vibrations, and thermal expansion and contraction conditions, which may cause or have caused damage.

.3 Verify that the number, size, and voltage of cables in cable trays do not exceed that permitted by the CEC. Verify that communications or data-processing circuits are separated from power circuits by barriers or are installed in separate cable trays.

.4 Verify that there are no intruding items such as pipes, hangers, or other equipment in the cable tray.

.5 Remove dust deposits, industrial process materials, trash of any description, and any blockage of tray ventilation.

.6 Visually inspect each cable tray joint and each ground connection for mechanical continuity. Check bolted connections between sections for corrosion. Clean and retorque in suspect areas.

.7 Check for improperly sized or installed bonding jumpers.

.8 Check for missing, incorrect, or damaged bolts, bolt heads, or nuts. When found, replace with specified hardware.

.9 Perform visual and mechanical checks for adequacy of cable tray grounding; verify that all takeoff raceways are bonded to cable trays. Test entire cable tray system for continuity. Maximum allowable resistance is 1 ohm.

.2 Prepare test and inspection reports.

3.6 PROTECTION

.1 Protect installed cable trays and cables.

.1 Install temporary protection for cables in open trays to safeguard exposed cables against falling objects or debris during construction. Temporary protection for cables and cable tray can be constructed of wood or metal materials and shall remain in place until the risk of damage is over.

.2 Repair damage to galvanized finishes with zinc-rich paint recommended by cable tray manufacturer.

.3 Repair damage to paint finishes with matching touchup coating recommended by cable tray manufacturer.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 78 00 - Closeout Submittals.

.3 Section 06 10 53 – Miscellaneous Rough Carpentry.

.4 Section 27 05 28 - Pathways for Communications Systems.

.5 Section 27 20 00 - Data Communications.

.6 The MUNet specifications shall be followed and are part of this contract. Refer to the appendix. The Division 27 communications sections and MUNet section are intended to be read in conjunction with one another, where discrepancies occur, contractor shall follow the most stringent requirement. If any contractual requirements are unclear, the contractor is required to submit all clarification requests during the tender and in accordance with the tender requirements.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CSA-C22.2 No. 214, Communications Cables (Bi-National standard with UL 444).

.2 CSA-C22.2 No. 232, Optical Fiber Cables.

.2 Telecommunications Industry Association (TIA)/Electronic Industries Alliance (EIA)

.1 TIA/EIA-568-B.1, Commercial Building Telecommunications Cabling Standard, Part 1: General Requirements.

.2 TIA/EIA-568-B.2, Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted-Pair Cabling Components.

.3 TIA/EIA-568-B.3, Optical Fiber Cabling Components Standard.

.4 TIA/EIA-606-A, Administration Standard for the Commercial Telecommunications Infrastructure.

.5 TIA TSB-140, Telecommunications Systems Bulletin - Additional Guidelines for Field-Testing Length, Loss and Polarity of Optical Fiber Cabling Systems.

.6 TIA-598-C, Optical Fiber Cable Color Coding.

1.3 DEFINITIONS

.1 Refer to TIA/EIA-598-C, Annex A for definitions of terms: optical-fiber interconnect, distribution, and breakout cables.

1.4 SYSTEM DESCRIPTION

.1 Structured telecommunications wiring system consist of unshielded-twisted-pair and optical fiber cables, terminations, connectors, cross-connection hardware

and related equipment installed inside building for occupant's telecommunications systems, including voice (telephone), data, and image.

.2 Installed in physical star configuration with separate horizontal and backbone sub-systems.

.1 Horizontal cables link work areas to telecommunications rooms located on same floor.

.2 Telecommunications rooms linked to main terminal/equipment room (MT/ER) by backbone cables.

.3 MT/ER also linked to Entrance Room by backbone cables.

.4 All systems to be a complete end-to-end operational system.

.5 Data cables, outlets, jacks, coverplates, patch panels and patch cords shall be supplied and installed under this contract. Carry all costs. All data equipment to be rated for Cat 6A/6.

1.5 SUBMITTALS

.1 As-built Records and Drawings:

.1 Provide Microsoft Access database reflecting cable installation and cross-connections.

.2 Provide electronic drawings in AutoCAD format, latest edition, depicting all construction.

.3 Provide two (2) bound complete hard-copy sets of as-built records to the Owner's Representative.

.1 Provide and place one hard copy of as-built records for each telecommunications room in plan holder in each telecommunications room.

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.

PART 2 PRODUCTS

2.1 FOUR-PAIR 100 Ω BALANCED TWISTED PAIR CABLE

.1 Four-pair, 100 ohm balanced unshielded-twisted-pair (UTP) cable, flame test classification FT6 or MPP or CMP, FT4 or MPG or CMG to: CSA-C22.2 No. 214, Category 6a (Cat 6a) for WAP N8G outlets and Category 6 (Cat 6) for data/card access system to: TIA/EIA-568-B.2.

.2 Cabling for all systems to be green.

.3 Outlet colours as follows:

.1 Data - blue.

.2 Card Access - blue.

.3 WAP - red.

2.2 WORK AREA UTP 4-PAIR MODULAR JACK

.1 Eight-position modular jack ("RJ-45"), type T568B Category 6A/6 for data system to: TIA/EIA-568-B.2:

.1 Mounted in compatible faceplate, flush entry, number of gangs as per details.

.2 Multi-user telecommunications outlet assembly (MUTOA), each port equipped with factory installed "RJ-45" jacks, type T568B Category 6a for WAP N8G outlets and Category 6 for data to: TIA/EIA-568-B.2.

2.3 CROSS-CONNECT WIRE

.1 Fiber, single mode, type to match existing.

2.4 UTP PATCH CORDS

.1 1.5 and 3.0 meters long, with factory-installed male plug at one end to mate with "RJ-45" jack and with factory-installed male plug at other end to mate with "RJ-45" jack Category 6a and 6, 4 pairs to: TIA/EIA-568-B.2. Patch cord length as follows:

.1 One 3.0 meter Cat 6 patch cord per Cat 6 wall plate cable.

.2 One 1.5 meter Cat 6 patch cord per Cat 6 wall plate cable.

.3 One 3.0 meter Cat 6A patch cord per WAP ceiling drop cable.

.4 One 1.5 meter Cat 6A patch cord per WAP ceiling drop cable.

2.5 UTP EQUIPMENT CABLE

.1 4 pair "cable", 3.0 meters long, with factory-installed male plug on one end to mate with "RJ-45" jack and other end equipped with factory-installed male plug to mate with "RJ-45" jack: Category 6a/6 to: TIA/EIA-568-B.2. Coordinate equipment cable length with owner prior to order.

2.6 UTP WORK AREA CORDS

.1 3.0 meters long, each end equipped with "RJ-45" plug Category 6a and 6 to: TIA/EIA-568-B.2. Coordinate work area cord length with owner prior to order.

2.7 OPTICAL-FIBER CABLE

.1 Distribution, with conductive members, single mode 50/125, 500 MHz km capacity, 50/125, laser-optimized, 2000 MHz km capacity, 8.3 micron single mode, multi strands to: CSA-C22.2 No. 232 and TIA/EIA-568-B.3, flame test classification FT6 or FT4, as indicated, each end terminated with duplex SC connectors.

2.8 CONSOLIDATION POINT FOR OPTICAL FIBER

.1 Consolidation point, terminates 12 optical-fiber horizontal cables from telecommunications room on duplex SC compatible adapters.

2.9 OPTICAL-FIBER CONNECTORS AT WORK AREA

.1 Faceplate equipped with Duplex SC compatible adapters to: TIA/EIA-568-B.1.

2.10 OPTICAL-FIBER PATCH PANEL

.1 Mounted in rack, rack units, with lockable cover, capable of terminating sufficient fiber, equipped with duplex SC compatible adapters.

2.11 OPTICAL-FIBER PATCH CORDS

.1 Interconnect cable, 2 strands, 2.0 meters long, each end equipped with duplex SC connectors. Single mode 50/125, 500 MHz km capacity, 50/125, laser-optimized, 2000 MHz km capacity, or single mode to: TIA/EIA-568-B.3.

2.12 OPTICAL-FIBER WORK AREA CORDS

.1 Interconnect cable, 2 strands, 2.0 meters long, each end equipped with Duplex SC connectors. Single mode 50/125, 500 MHz km capacity, 50/125, laser-optimized, 2000 MHz km capacity, or single mode to: TIA/EIA-568-B.3.

PART 3 EXECUTION

3.1 INSTALLATION OF TERMINATION AND CROSS-CONNECT HARDWARE

.1 Install termination and cross-connect hardware in rack and according to manufacturers' instructions. Identify and label as indicated to: TIA/EIA-606-A.

.2 Install consolidation points, as indicated according to manufacturer's instructions. Identify and label as indicated to: TIA/EIA-606-A.

3.2 INSTALLATION OF HORIZONTAL DISTRIBUTION CABLES

.1 Install horizontal cables as indicated in conduits from telecommunication rooms to consolidation point. Identify and label as indicated to: TIA/EIA-606-A.

.2 Terminate horizontal cables in telecommunications room and at consolidation point.

.1 Identify and label as indicated to: TIA/EIA-606-A.

.3 Harness slack cable in cabinets, racks, and wall-mounted termination and cross-connection hardware.

3.3 INSTALLATION OF BACKBONE CABLES

.1 Install backbone cables from each telecommunications room to main terminal/equipment room (MT/ER) according to manufacturers' instructions, using single mode fiber cable in a physical star arrangement, type to match existing.

.1 Identify and label as indicated to: TIA/EIA-606-A.

.2 Install backbone cables from MT/ER to carrier demarcation point in Entrance Room as indicated and according to manufacturer's instructions.

.1 Identify and label as indicated to: TIA/EIA-606-A.

3.4 INSTALLATION OF EQUIPMENT CABLES

.1 Install equipment cables from equipment terminal strips or patch panel as indicated.

.1 Identify and label as indicated to: TIA/EIA-606-A.

3.5 IMPLEMENT CROSS-CONNECTIONS

.1 Implement cross-connections using patch cords as specified.

3.6 FIELD QUALITY CONTROL

.1 Test horizontal UTP cables as specified below and correct deficiencies provide record of results as hard copy and electronic record on CD.

.1 Perform tests for Permanent Link on installed cables, including spares:

.1 Category 6a using certified level III tester to: TIA/EIA-568-B.2.

.2 Perform tests for Permanent Link on 20% of cross-connected data horizontal cabling installed from each telecommunications room, including shortest and longest drops from each telecommunications room: should more than 5% of tested cables fail, test remaining cross-connected data cables.

.1 Category 6a using certified level III tester to: TIA/EIA-568-B.2.

.2 Test backbone UTP cables as specified below and correct deficiencies: provide record of results as hard copy and electronic record on CD.

.1 Perform tests for Permanent Link on 4-pair cables:

.1 Category 6a using certified level III tester to: TIA/EIA-568-B.2.

.2 Perform Wire Map tests on multi-pair UTP cables to: TIA/EIA-568-B.1.

.3 Test Optical-fiber strands for attenuation to: TIA/EIA-568-B.1 and correct deficiencies: provide record of results as hard copy and electronic record on CD.

.1 Test horizontal links at only one wavelength (850 nm or 1300 nm) and in one direction.

.1 Attenuation to be less than 2.0 dB, unless consolidation point is used.

.2 If consolidation point is used, attenuation test result to be less than 2.75 dB when testing between horizontal cross-connect and telecommunications outlet/connector.

.2 Test backbone links in both directions. Backbone links:

.1 Test single-mode fiber at both applicable wavelengths (1550 nm and 1310 m).

.3 Maximum attenuation: Cable attenuation + Connector loss + Splice loss.

.1 Single-mode fiber attenuation coefficients at both 1310 nm and 1550 nm:

.1 1.0 db/km for inside plant cable; and

.2 0.5 db/km for outside plant cables.

.2 Maximum connector insertion loss: 0.75 db per pair and maximum splice insertion loss: 0.3 db.

.4 Perform additional Tier 2 tests using optical time domain reflectometer (OTDR) on backbone fiber pairs to: TSB-140.

.1 Correct deficiencies.

.2 Provide record of results as described in SUBMITTALS.

.5 Provide record of results as hard copy and electronic record on CD to: TIA/TSB-140.

3.7 OUTLET LABELS

.1 Provide adhesive style labels on each outlet plate. Label names to be confirmed with Owner prior to fabrication.

END OF SECTION

PART 1 GENERAL

1.1 SYSTEM DESCRIPTION

.1 Data system includes data outlets and wiring for office applications.

.2 Data system equipment consists of:

- .1 Data outlets.
- .2 UTP cabling.
- .3 Patch Panels.
- .4 Patch Cords.
- .5 Line Cords.
- .6 Conduit System.
- .7 Fiber cabling and hardware.

.3 All data equipment to be Category 6a for WAP and Cat 6 for regular data, fiber for backbone and cross connect network.

.4 All work associated with the data system to be completed by Plexus under this contract.

1.2 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 91 13 – General Commissioning (Cx) Requirements.

.3 Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.

.4 Section 27 05 28 – Pathways for Communications Systems.

.5 Section 27 11 19 – Structured Cabling for Communications Systems.

.6 The MUNet specifications shall be followed and are part of this contract. Refer to the appendix. The Division 27 communications sections and MUNet section are intended to be read in conjunction with one another, where discrepancies occur, contractor shall follow the most stringent requirement. If any contractual requirements are unclear, the contractor is required to submit all clarification requests during the tender and in accordance with the tender requirements.

1.3 REFERENCES

.1 Canadian Standards Association (CSA)

- .1 CAN/CSA-C22.2 No. 182.4, Plugs, Receptacles, and Connectors for Communication Systems.
- .2 CAN/CSAC-22.2 No. 214, Communications Cables.
- .3 CAN/CSA-T529, Design Guidelines for Telecommunications Wiring System in Commercial Buildings.

.4 CAN/CSA-T530, Building Facilities, Design Guidelines for Telecommunications.

.2 Electronic Industries Association (EIA)

.1 EIA/TIA Bulletin TSB-36, Technical Systems Bulletin Additional Cable Specifications for Unshielded Twisted Pair Cables.

.3 Building Industry Consulting Services International (BICSI) Telecommunications Distribution Methods Manual (TDMM).

1.4 SUBMITTALS

.1 Shop drawings to include the following items as minimum:

.1 Outlets.
.2 UTP Patch Panels.
.3 Labels.
.4 UTP Wire.
.5 Patch Cords.
.6 Line Cords.
.7 Fiber cabling and hardware.
.8 Cable Management Equipment.

.2 All new equipment to match existing.

1.5 MAINTENANCE AND OPERATION

.1 Provide maintenance and operation data for incorporation in manual specified in Section 01 78 00 – Closeout Submittals.

1.6 WARRANTY

.1 Ensure each piece of equipment installed including wiring is warranted by the manufacturer to be free of defects in operation, material and workmanship for a period of 15 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 OUTLETS

.1 One 8 position RJ45 jack with T568A (ISDN) wiring.

2.2 COVER PLATES

.1 Provide flush mount type to accept data outlet.

.2 Indicate outlet number of "Data" cover plate. Provide labeling as indicated and to Owner's requirement.

.3 Color: to match existing.

.4 Construction: Themo – plastic.

2.3 PATCH PANELS

.1 Modular (RJ45) style patch panels.

.2 Designed for high speed data, cross connect and interconnect specifications.

.3 48 ports per panel suitable for modular jacks.

.4 Provide each port with a T568A (ISDN) eight pin jack as per par. 2.1 – outlets as necessary to accommodate number of runs.

.5 Designed for mounting in rack. Provide one horizontal cable manager for each 48 port patch panel.

.6 Retaining rings on panel to facilitate patch cord management.

.7 Provide patch panels in each data rack, quantity of panels as required to connect each data outlet to a corresponding patch panel port with a minimum of 10 spare ports.

.8 Patch panels to be in sufficient quantity to accommodate all systems and all connections.

2.4 CABLE MANAGEMENT

.1 Cable management at data racks:

.1 Horizontal cable management channels, one for every 48 ports, five (5) per rack minimum.

.2 Vertical cable management channels two (2) per rack.

.2 Cable management throughout building:

.1 Cable to be installed in conduit or laid in tray throughout building.

2.5 PATCH AND LINE CORDS

.1 Provide patch and line cords for connection of individual room equipment and for connection of Owner's equipment.

.2 Provide 3 m long line cords. 24 gauge, solid conductor, category 6A/6 T586A ISDN wired.

Quantity: one per data outlet plus ten spares.

.3 Provide patch cords. 24 gauge, solid, conductor, category 6A/6 T586A ISDN wired.

.4 Cords must be from same manufacturer as connectivity components.

2.6 LABELS

.1 Provide indicating labels on UTP wiring and outlet assemblies.

.2 Labels to be:

.1 Outlet identification labels. Computer printable type: indicating "Data Outlet".

.2 Labeling on wire from outlet to patch panel: heat shrink labels sized for data cables indicating data outlet # and port # on respective ends.

.3 Coordinate labeling with Owner prior to fabrication.

2.7 UTP WIRING

.1 4 pair, 24 gauge, solid conductor, unshielded twisted pairs, CSA FT4 fire rating, Category 6A/6, guaranteed for 10 Giga bytes per second transmission/receiving rate.

.2 Provide one cable from each data outlet back to patch panel.

2.8 CONDUIT SYSTEMS

.1 Install conduit for data wiring including:

.1 Dedicated conduits from cable tray to outlets.

2.9 FIBRE OPTIC COMPONENTS

.1 Provide single mode rated fiber optic cable, type to match existing.

.2 Provide rack mounted patch panel with hinged fiber drawer and six (6) SC adapters. Provide one at each end of fiber optic cables.

2.10 ACCEPTABLE MANUFACTURERS

.1 Panduit, no acceptable alternates.

PART 3 PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install data system wiring and components.

.2 Install patch panels in data racks in data room locations as indicated. Coordinate layout of components in racks with owner.

.3 Terminate UTP and fiber optic cables at outlets and patch panel as indicated. Ensure that the minimum number of twists per inch in the cable pairs is maintained at each connection point.

.4 Ensure that manufacturer's bending radius limitations are adhered to.

.5 Protect cables from damage during installation.

.6 Conduits to be run from data outlets to cable tray. Provide insulated conduit bushing at end of conduits at cable tray.

.7 Turn over UTP patch and line cords to Owner.

3.2 CONDUIT SYSTEM RESTRICTIONS

.1 Conduit drops from the cable tray to the outlet/device shall be installed such that it minimizes the total length of the overall run of cable. Run conduit from outlet/device to the section of tray that achieves the shortest run length of cable overall.

.2 Do not provide pull boxes in lieu of conduit bends.

.3 LB connectors not permitted.

.4 Provide inside radius bends to a minimum of 6 times the internal diameter for conduits 53 mm and smaller.

.5 Ensure conduits terminations are free from sharp edges and fitted with insulated bushings.

.6 Ream individual lengths of conduit to remove sharp edges.

.7 Provide sufficient conduit size to permit maximum 50% fill capacity.

3.3 TESTING GENERAL

.1 Cabling and connectors to be tested by an experienced company employing trained technicians with minimum 15 years experience in data cabling industry. Experience to be acceptable to the Owner.

3.4 TESTING UTP CABLING

.1 System to meet continuity and attenuation tests outlined in IBDN Testing Note: IBDN-TESTS-9104.

.2 Category 6A/6 cable to meet ANSI standard x3T9.5 (capable of data transmission up to 10 G. bps).

.3 Perform system and channel tests after UTP cable installation o ensure that installation meets standard indicated above and values indicated in the IBDN design guide issue 2 (IBDN-DG-9202). Tests to be performed using a Level IV tester. Minimum tests to be performed.

- .1 Continuity.
- .2 Attenuation.
- .3 Near and Crosstalk.
- .4 Resistance.
- .5 Pair Assignment Test.
- .6 Low Band Noise.
- .7 High Band Noise.
- .8 Mid Band Noise.
- .9 Length of Cable.
- .10 Return loss
- .11 ELFEXT
- .12 Propagation delay.

.13 Deby skew.

Perform permanent link tests to cover all equipment wiring including patch panels and line cords. Perform tests from data closet outwards to data outlet line cord.

.4 Provide to construction manager written copy of the testing sequence to be performed, testing equipment to be used, and standards to which cable is being tested.

.5 Provide a written report to the Construction Manager indicating each cable tested and the results of the testing. Provide printout from the Level IV tester for each cable.

.6 Replace cable and/or connection equipment that fails tests.

.7 Provide additional testing in accordance with Section 01 91 13 – General Commissioning (Cx) Requirements.

3.5 WIRELESS ACCESS POINTS (WAPS)

.1 Provide a dual data drop at each WAP location.

END OF SECTION

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

.1 This section covers power for door hardware and conduit for 24 VDC hardware wiring.

.2 Door hardware equipment provided by the door hardware supplier.

.3 Door hardware low voltage (24VDC) wiring supplied & installed by this division, conduit for door hardware low voltage wiring by this division.

1.2 RELATED SECTIONS

.1 Section 08 71 00 – Door Hardware.

.2 Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.

1.3 EQUIPMENT SUPPLIED BY DIVISION 26

.1 Provide all 120 VAC wiring in conduit system for power supply.

.2 Provide wiring and conduit system with pull cords for installation of low voltage door hardware wiring

.3 Provide all wiring for card access system, installed in conduit.

1.4 COORDINATION

.1 Co-ordinate with door hardware supplier to ensure that equipment, boxes, wiring and conduit are located correctly.

1.5 CONNECTION TO FIRE ALARM PANEL

.1 Door power supplies shall be wired to normally closed contacts in the fire alarm panel to release door locks on activation of fire alarm.

1.6 CERTIFICATE OF COMPLIANCE

.1 Provide a letter of verification stating that the system has been checked out and is operational in advance of the Substantial Completion inspection.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 EXECUTION

.1 Install 120 VAC power to door power supplies.

.2 Install wiring in conduit system c/w pull cords for door hardware low voltage wiring.

.3 Install card access system wiring in conduit.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 The contractor is to ensure that all related work is coordinated among all specification sections and that the tender price includes all related work.

.2 Furnish, deliver and install all Card Access System Components for all doors indicated, refer to drawings for doors with card access and Architectural Division 08 71 00 for door hardware integration. Also supply and install all card access related hardware as specified in this section and required by actual conditions at the project site.

.3 The mechanical door hardware shall be supplied under Section 08 71 00 and shall include the furnishing of all necessary screws, bolts, expansion shields and all other devices necessary for the proper application of the hardware.

.4 This section shall include final electrical connections and terminations at all card access system devices as detailed in Part 2. Factory wiring for card access devices shall be terminated at electrical boxes supplied with equipment under this contract. Wiring between card access system devices and between card access system and the hardware related devices will be provided under this contract.

.5 Electrical contractor is responsible for the complete supply and installation of all card access system components, including all conduit and wiring associated with this system.

1.2 REQUIREMENTS OF REGULATORY AGENCIES

.1 Hardware certified by a Canadian Certification Organization accredited by Standards Council of Canada.

.2 Supply only hardware which is in compliance with Government of Newfoundland and Labrador Building Accessibility Regulations.

.3 Prior to supplying hardware items, review hardware groups and report to Engineer/Architect any hardware specified which is not in compliance with regulatory agencies.

1.3 DESCRIPTON OF SYSTEM

.1 The card access system will consist of the following components:

- .1 Site Controller;
- .2 Card readers;
- .3 Proximity type cards;
- .4 Electric hinges and hardware;
- .5 Door controllers;
- .6 Power supplies.
- .7 Door contacts.

.8 Request to exit devices.

.2 All materials to be supplied and installed under this contract.

.3 A complete end to end system is required.

.4 All system components to match and be compatible with the existing system, and connected and integrated into the existing system.

1.4 SEQUENCE OF OPERATION

.1 On entering the area the cardholder holds his card against the reader. If the card is valid, the electric hardware operates and the person is allowed to enter.

.2 On exiting an area, under all conditions exiting is unrestricted.

.3 The card access system will be operational 24 hours a day and programmed to meet the Owner's requirements, to be determined on site.

1.5 CARE OPERATION ENGINEER AND START-UP

.1 Manufacturer's factory service engineer to instruct the owner on use and maintenance of system.

1.6 FACILITIES COMMISSIONING

.1 The specified performance rating, components and/or assemblies addressed herein will be subject to testing, certification of compliance, and operational/maintenance demonstration under the provisions of Division 1. The contractor shall supply personnel to facilitate this commissioning process in accordance with the requirements of Division 1.

1.7 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

.2 Include riser diagram and block diagram of complete card access control system.

.3 Local supplier must be an authorized distributor of the product specified. A copy of all local service technicians certifications by the manufacturer of the product must be provided prior to the acceptance of the product.

1.8 SUPPLIER QUALIFICATIONS

.1 Supplier must be an authorized distributor of the product specified and have readily available local service technicians to provide ongoing maintenance support to Owner. A copy of all local service technicians' certifications by the manufacturer of the product must be provided prior to the acceptance of the product.

.2 Supplier must have at least 5 years experience in the installation of such systems on similar projects. Provide list indicating past experience on similar projects. Where the supplier does not have five (5) years experience with the installation

of such systems on similar projects, that supplier shall provide the services of a manufacturer's service technician to assist with and certify the installations prior to commissioning and to participate in the commissioning process.

1.9 PROTECTION

.1 All hardware shall be protected against damage from paint, or plaster or other defacing materials. Whenever possible manufacturers protective covering, when provided, shall not be removed until final project cleaning takes place. Material not protected by manufacture shall be covered or removed from door during painting or any other adjustments that can cause damage to hardware.

1.10 MAINTENANCE OPERATION DATA

.1 Provide operation and maintenance data for card access control system for incorporation into manual specified in Division 1.

.2 Include description of system operation.

.3 Include parts list using component identification numbers standard to the electronics industry.

.4 Provide the following:

.1 Maintenance instructions for any hardware item requiring maintenance;

.2 Catalogue information for each product.

.3 Copies of template drawings as required.

.4 Copies of all wiring diagrams.

.5 Name and address of supplier.

.6 Name and address of manufacturer.

.7 Manufacturer's parts list (where applicable).

1.11 MAINTEANCE MATERIALS

.1 Supply the following materials in addition to that required for installation into doors and frames;

.1 One set of manufacturer's installation tools provided with hardware items. Tools can be recovered from the job site provided tools are in good condition.

.2 All material, indicated elsewhere as spare, delivered as part of this contract shall be turned over to Owner at completion of project.

1.12 WARRANTY

.1 All material shall be provided with a minimum one year warranty against defects in material and workmanship from the date of substantial completion of the project.

1.13 SYSTEM REQUIREMENTS

.1 System must be compatible with and capable of being connected into the existing systems at the Core Science building.

PART 2 PRODUCTS

2.1 GENERAL

.1 Access control devices are as indicated by the part number in the applicable specification section. All components shall be manufactured by the same manufacturer wherever possible to ensure compatibility and warranty protection. Access control equipment shall be complete with all relays and devices to provide the functionality required.

.2 The Contractor shall provide all mounting hardware and supports for devices installed under this contract. Coordinate mounting locations and method with Engineer/Architect before proceeding with work.

.3 Service:

.1 Access Control to be supported by local authorized distributor to provide servicing of system Software, Programming, Cards and Parts.

.4 Hardware:

.1 This supplier to coordinate with Division 1 to ensure all electrical door hardware is compatible with Access Control equipment. The Contractor is to include for any additional components relays and power supplies required to properly operate all hardware devices, door control devices, remote control devices and any special cables or wiring to connect all parts to the system.

.5 Site Visits:

.1 Card Access System supplier shall arrange a System Review meeting with the Owner, to confirm final function and operation of each opening and confirm all wiring and electrical requirements.

.2 Manufacturer's representative to visit job site at completion of all connections to ensure that system is working properly and instruct Owner's representative in the complete operation and capabilities of the system.

.3 The supplier of the Card Access System shall include any cost for these visits as part of this section.

2.2 SITE CONTROLLER

.1 Powered from card access system power supply.

.2 Minimum of 100 door controllers per site controller.

.3 2,000 event log, with 24 hour battery backup of RAM memory.

.4 Designed for stand alone operation or communications with a central computer.

.5 RS-485 and RS-232 communications between server and site controllers.

.6 System supplier shall determine exact location for Site Controller.

2.3 DOOR CONTROLLER

.1 Control of 1 door (entry only) per controller.

.2 2000 event, stored in RAM memory with a minimum of 24 hours backup.

.3 Suitable for use with proximity type card readers as specified in Section 2.4.

.4 8 NO/NC monitoring points. 2 SPOT Form C dry contacts.

.5 Communication with site controllers via RS-485 protocol.

.6 9-14 Vdc input power supply, from card access power supply.

.7 Supervised fused outputs for battery, reader, auxiliary power, AC power and lock power.

.8 Designed for stand alone operation or communication with the central computer.

.9 Mount door controller in enclosure specified in 2.8.

2.4 CARD READER

.1 Proximity type card readers.

.2 Read range 200 mm for readers.

.3 Cards coded to prevent duplication.

.4 Suitable for mounting on mullion or other surfaces.

.5 Rugged, weatherized polycarbonate enclosure designed to withstand harsh environments, high degree of vandal resistance.

.6 Lifetime warranty.

2.5 ELECTRIC DOOR HARDWARE

.1 Electric door hardware to be supplied and installed by arch div and wired by Division 26.

.2 Shall include, electric hinges, electric strikes with builtin contact, power supplies, magnetic locks and hold open devices.

.3 Electronic locking devices shall be released on fire alarm. Interconnect these devices to the fire alarm system.

2.6 POWER SUPPLY

.1 Card access power supply.

.2 120 Vac input, fuse protection on power supply.

.3 13.8 Vdc output, regulated and filtered.

.4 Battery backup by two 6 v, 8 Amp lead acid type batteries, fuse protection.

.5 Enclosure with hinged door.

2.7 CARD ACCESS DEVICE ENCLOSURES

.1 For mounting of door controller unit.

.2 Screw mounted cover.

2.8 INTERFACE

.1 Quantity as required to interface card access system devices to door operators.

2.9 DOOR CONTACTS

.1 Sealed magnetic switch.

.2 Suitable for recessed mounting into a steel frame and door, 3/4" diameter.

.3 With leads for connection into card access system.

2.10 REQUEST TO EXIT DETECTOR

.1 Suitable for mounting on top of door frame, hinge side.

.2 Targetting beam allowing monitor of personnel approaching doorway.

.3 With leads for connection into card access system.

2.11 ACCEPTABLE MATERIALS

.1 To match existing, no acceptable alternates.

PART 3 EXECUTION

3.1 GENERAL WORKMANSHIP

.1 All work shall be installed in a neat and workmanlike manner by skilled technicians using the latest standard practices in the industry. All wiring shall be as a minimum in accordance with local codes and standards. All wiring shall be installed in conduit.

3.2 EQUIPMENT INSTALLATION

.1 Door Controller and Site Controllers:

.1 Mount in locations as detailed on the drawings, or as determined on site.

.2 Insure adequate access is provided to service equipment.

.2 Card Readers:

.1 Mount card readers as indicated on drawings.

3.3 IDENTIFICATION

.1 All system items shall be properly identified using lamencoid labels.

3.4 CONFIGURATION AND TESTING

.1 The successful bidder shall be responsible to demonstrate to the Engineer that the equipment and programs supplied for this contract meet the requirements of this specification.

.2 Contractor shall include in the tender amount, an allowance for the manufacturer's representative to verify operation of all devices, programming and set up system to meet Owner's requirements. Submit a report to the engineer indicating that the system was set up as per Owner's requirement and that testing was carried out.

.3 Supply services of a qualified technician to instruct operating and maintenance personnel on operation of system.

END OF SECTION

PART 1 GENERAL

1.1 RELATED WORK

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 78 00 - Closeout Procedures.

.3 Section 01 91 13 - General Commissioning (Cx) Requirements.

.4 Section 26 05 00 - Common Work Results - Electrical.

.5 Section 26 05 21 - Wires and Cables (0 - 1000 V).

.6 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

1.2 REFERENCES

.1 Government of Canada

- .1 NBC, National Building Code of Canada, latest edition.
- .2 TB OSH Chapter 3-3, Treasury Board of Canada, Occupational Safety and Health, Chapter 3-3, Fire Protection Standard for Electronic Data Processing Equipment.
- .3 TB OSH Chapter 3-4,Treasury Board of Canada, Occupational Safety and Health, Chapter 3-4, Standard for Fire Alarm Systems.

.2 Underwriter's Laboratories of Canada (ULC)

- .1 CAN/ULC-S524, Installation of Fire Alarm Systems.
- .2 CAN/ULC-S525, Audible Signal Appliances for Fire Alarm.
- .3 CAN/ULC-S526, Visual Signal Appliances, Fire Alarm.
- .4 CAN/ULC-S527, Control Units, Fire Alarm.
- .5 CAN/ULC-S528, Manual Pull Stations.
- .6 CAN/ULC-S529, Smoke Detectors, Fire Alarm.
- .7 CAN/ULC-S530, Heat Actuated Fire Detectors, Fire Alarm.
- .8 CAN/ULC-S536, Inspection and Testing of Fire Alarm Systems.
- .9 CAN/ULC-S537, Verification of Fire Alarm Systems.

1.3 SYSTEM DESCRIPTION

.1 Existing system consists of a Chubb fire alarm control panel. All new materials and programming completed as part of the contract shall be by Chubb.

1.4 REQUIREMENTS OF REGULATORY AGENCIES

.1 System:

- .1 Subject to Provincial Fire Commissioner's approval.
- .2 Subject to FC inspection for final acceptance.
- .3 To electrical inspection approval.

.2 System components: listed by ULC and comply with applicable provisions of National Building Code and meet requirements of local authority having jurisdiction.

1.5 SUBMITTALS

.1 Include:

.1 Details for devices.

1.6 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance data for fire alarm system for incorporation into manual specified in Section 01 78 00- Closeout Submittals.

.2 Include:

.1 Instructions for complete fire alarm system to permit effective operation and maintenance.

.2 Technical data - illustrated parts list with parts catalogue numbers.

.3 Copy of approved shop drawings with corrections completed and marks removed except review stamps.

1.7 WARRANTY

.1 Provide manufacturer produce warranty against defects in operation, material and workmanship for 1 year from date of substantial completion.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Equipment and devices: ULC listed and labeled and supplied by single manufacturer.

.2 Audible signal devices: to CAN/ULC-S524.

.3 Visual signal devices: to CAN/ULC-S526.

.4 Manual pull stations: to CAN/ULC-S528.

.5 Thermal detectors: to CAN/ULC-S530.

.6 Smoke detectors: to CAN/ULC-S529.

2.2 SYSTEM OPERATION: TWO STAGE

.1 Existing to remain, make modifications and add modules/relays as required. Provide system programming as required.

2.3 CONTROL PANEL

.1 Existing to remain, make modifications and add modules/relays as required. Provide system programming as required.

2.4 INITIATING/INPUT CIRCUITS

.1 Receiving circuits for alarm initiating devices such as manual pull stations, smoke detectors, and heat detectors wired in DCLA configuration to central control unit.

.2 Alarm receiving circuits (active and spare): compatible with smoke detectors and open contact devices.

.3 Actuation of alarm initiating device: cause system to operate as specified in "System Operation".

.4 Receiving circuits for supervisory, N/O devices. Devices: wired in DCLA configuration to central control unit.

.5 Actuation of supervisory initiating device: cause system to operate as specified in "System Operation".

.6 Confirm exact wiring configuration requirements with system supplier prior to installation.

2.5 ALARM OUTPUT CIRCUITS

.1 Alarm output circuit: connected to signals, wired in configuration to match existing to central control unit.

.1 Signal circuits operation to follow system programming; capable of sounding horns continuously. Each signal circuit: rated at 2 A, 24 V DC; fuse-protected from overloading/overcurrent.

2.6 AUXILIARY CIRCUITS

.1 Auxiliary contacts for control functions.

.2 Actual status indication (positive feedback) from controlled device.

.3 Alarm or supervisory trouble on system to cause operation of programmed auxiliary output circuits.

.4 Upon resetting system, auxiliary contacts to return to normal or to operate as pre-programmed.

.5 Auxiliary circuits: rated at 2 A, 24 V DC or 120 V AC, fuse-protected.

.6 Auxiliary contacts for release of electronic door hardware.

2.7 WIRING

.1 Multi-conductor cable assemblies with dedicated bonding wire CSA FAS105 and FT-4 rated. Standard of acceptance: Securex I, twisted copper conductors, rated 300 V.

.2 To initiating circuits: 18 AWG minimum, and in accordance with manufacturer's requirements.

.3 To signal circuits: 16 AWG minimum, and in accordance with manufacturer's requirements.

.4 To control circuits: 14 AWG minimum, and in accordance with manufacturer's requirements.

.5 Fire alarm cables to be run in conduit.

2.8 MANUAL ALARM STATIONS

.1 Addressable manual pull station.

.1 Pull lever, break glass rod, semi-flush wall mounted type, single action, two stage with key to initiate 2nd stage and reset functions, electronics to communicate station's status to addressable module/transponder over 2 wires and to supply power to station. Station address to be set on station in field.

.2 Standard of acceptance: To match existing.

2.9 AUTOMATIC ALARM INITIATING DEVICES

.1 Addressable thermal fire detectors, combination fixed temperature and rate of rise, non-restorable fixed temperature element, self-restoring rate of rise, fixed temperature 57°C, rate of rise 8.3 °C per minute.

.1 Electronics to communicate detector's status to addressable module/transponder.

.2 Detector address to be set on detector in field.

.3 Standard of acceptance: To match existing.

.2 Addressable variable-sensitivity smoke detectors.

.1 Photo-electric type.

.2 Electronics to communicate detector's status to addressable module/transponder.

.3 Detector address to be set on detector in field.

.4 Standard of acceptance: To match existing.

.3 Sensitivity settings: 3 settings, determined and operated by control panel. No shifting in detector sensitivity due to atmospheric conditions (dust, dirt) within certain parameters.

.4 Ability to annunciate minimum of 2 levels of detector contamination automatically with trouble condition at control panel.

2.10 AUDIBLE SIGNAL DEVICES

.1 Speaker: flush mounted, 90 dBA minimum.

.1 Standard of acceptance: To match existing.

2.11 VISUAL ALARM SIGNAL DEVICES

.1 Strobe: flashing white, 24 V dc semi-flush mounted in finished areas, red housing.

.2 Designed for surface mounting on ceiling and walls as indicated on drawings.

.3 Standard of acceptance: To match existing.

2.12 AUDIBLE/VISUAL DEVICES

.1 Combination speaker/strobes: 90dB, 115 cd output, adjustable light output.

.2 Standard of acceptance: To match existing.

2.13 END-OF-LINE DEVICES

.1 End-of-line devices to control supervisory current in signaling circuits sized to ensure correct for each circuit. Open, short or ground fault in any circuit will alter supervisory current in that circuit, producing audible and visible alarm at main control panel and remotely as indicated.

2.14 ADDRESSABLE CONTROL/MONITOR MODULES

.1 Addressable modules with address set in field for control/monitoring of external circuits.

.2 Applications: ventilation unit shut down, sprinkler device monitoring, control of magnetic door hold open devices, door electric strikes, interface to electronic door hardware controllers to facilitate door control functions when required.

.3 Ensure that control circuits connected to addressable relay dry contacts are protected by fuse to limit current within manufacturer's requirements.

.4 Single zone, dual zone and programmable relays, as required.

.5 Standard of acceptance: To match existing.

2.15 ISOLATION MODULES

.1 Isolation modules for segmenting of fire alarm detection loop as indicated.

2.16 PASSIVE GRAPHIC DISPLAY

.1 Existing passive graphic displays shall be modified to reflect new fire alarm zones.

.2 If existing displays cannot be modified, they shall be replaced with new, in the same location, size and type to match existing. Total of three (3).

2.17 ACCEPTABLE MANUFACTURERS

.1 Acceptable manufacturers shall be:

.1 Chubb.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install systems in accordance with CAN/ULC-S524 and TB OSH Chapter 3-4.

.2 Run all fire alarm wiring in conduit.

.3 Install central control unit and connect to ac power supply.

.4 Install manual alarm stations and connect to alarm circuit wiring.

.5 Locate and install detectors and connect to alarm circuit wiring. Do not mount detectors within 1 m of air outlets. Maintain at least 600 mm radius clear space on ceiling, below and around detectors.

.6 Connect alarm circuits to main control panel.

.7 Install speakers and visual signal devices and connect to signaling circuits.

.8 Connect signaling circuits to main control panel.

.9 Install end-of-line devices at end of circuits where required.

.10 Splices are not permitted.

.11 Ensure that wiring is free of opens, shorts or grounds, before system testing and handing over.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 – Common Work Results - Electrical and Section 01 91 13 – General Commissioning (Cx) Requirements.

.2 Fire alarm system:

.1 Test each device and alarm circuit to ensure manual stations, thermal and smoke detectors transmit alarm to control panel and actuate general alarm and ancillary devices.

.2 Check annunciator panels to ensure alarms are shown correctly.

.3 Simulate grounds and breaks on alarm and signaling circuits to ensure proper operation of system.

.4 Addressable circuits system style DCLA:

.1 Test each conductor on all DCLA addressable links for capability of providing 3 or more subsequent alarm signals on each side of single open-circuit fault condition imposed near midmost point of each link. Operate Acknowledge/Silence switch after reception of each of the 3 signals. Correct imposed fault after completion of each series of tests.

.2 Test each conductor on all DCLA addressable links for capability of providing 3 or more subsequent alarm signals during ground-fault condition imposed near midmost point of each link. Operate Acknowledge/Silence switch after reception of each of the 3

signals. Correct imposed fault after completion of each series of tests.

.3 Provide final PROM program re-burn for system incorporating program changes made during construction.

.4 Provide programming for system to provide identification of alarm and trouble conditions to satisfaction of the owner. Coordinate with the owner prior to programming display items.

END OF SECTION

APPENDIX F – MEMORIAL UNIVERSITY INTERIOR

SIGNAGE MANUAL 2.0

2024

Signage Manual

Memorial University

Interior Signage Manual 2.0

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C.38 Rib - Strip
C.39 Rib - Band
C.40 Rib - Band Gradient
C.41 Rib - Full Gradient
C.42 Coast - Strip
C.43 Coast - Band
C.44 Coast - Band Gradient
C.45 Coast - Full Gradient
C.46 Route - Strip
C.47 Route - Band
C.48 Route - Band Gradient
C.49 Route - Full Gradient
C.50 Linear - Black Lines
C.51 Rib - Black Lines
C.52 Coast - Black Lines
C.53 Route - Black Lines

Types
A - Standard
B - Portrait
C - Linear

Purpose of Manual

This manual is intended to itemize the Memorial University of Newfoundland's interior signage components and related materials in an easy to follow format. It will detail their application, usage, materials, and outline manufacturing. It will cover the application of graphics and the maintenance of these products.

Importance of Signage

The signage of an area is an important aspect of an institution's visual identity. The different signage elements, of which it is composed, associate the principal function of information and orientation with image confirmation. Signage must organize space by defining the direction and flow of users as well as their behaviour across a common area. The development of interior signage standards demonstrates the desire for improvement and constant modernization of Memorial University. The standardization of the signage system brings coherence, flexibility and visual harmony to the entirety of the campuses.

In wanting to establish and define interior signage standards in all buildings across campuses, Memorial University is proud to publish this document, in which are discussed principles and guidelines to follow.

Purpose of Signage

The purpose of signage is to guide users comfortably and clearly, using legible information which can be understood universally. For visitors, students and employees, signage at Memorial University must be informative, navigable, and inclusive, communicating a welcoming and structured image throughout the campus.

Our Identity

Memorial University's identity reflects the idea of transformation, offering the freedom to explore and experience your ingenuity. It is inspired by the raw beauty of the province, by our ingenuity in thriving in challenging circumstances, by the unique educational experiences we offer and by freedom, for Memorial University was built in homage to fallen war heroes and embraces at its core the spirit of freedom. In other words, Memorial is the natural place for people and ideas to become.

The Design

The design is based on current code requirements and accessibility standards closely coordinated between Facilities Management, Marketing and Communications to maintain the university brand standards.

Refer to the Facilities Management website for chargeable vs. non-chargeable signage:
www.mun.ca/facilities-management

Policies

Signage must comply with Memorial University's policies and procedures, which include (but are not limited to) the Student Code of Conduct, the Sexual Harassment and Sexual Assault Policy, the Respectful Workplace Policy and, where appropriate, the Procedure for Alcohol-related Advertising.

Any signage deemed to be in violation of any university policy or procedure, or which is deemed to be non-university related, will be removed immediately. The university reserves the right to remove signage at any time.

Requests

Signage Request
Display a Flag Form

Resources

Brand Standards
Mun.ca Brand Colours
Flag Policy
Visual Identity Policy
Poster Guidelines
CNIB Standards
Accessible Signage Guidelines
Smoking Policy
Indigenous Translations (future)
Room Numbering (future)
Insert Templates (future)

Typography

Avenir
Memorial University's primary sans serif typeface

Signage Use
Sans serif typefaces are building code required or considered best practice because of their legibility at different scales. Some signage will require raised text with Unified English Braille for visual impairments.

Approach
Statements, sentences or phrases to be written in sentence case form, where only the first letter of a sentence and proper nouns are capitalized.

Titles and proper nouns to be written in title case, where the first letter of every word is capitalized except shorter words such as 'the', 'a', and 'on'.

Avenir 35 Light
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890

Avenir 45 Book
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890

Avenir 55 Roman
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890

Arial Regular (Substitute)
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890

Avenir 65 Medium
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890

Avenir 85 Heavy
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890

Avenir 95 Black
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
1234567890

Unified English Braille

***4.5.6.2 Tactile Characters**
a. Raised 0.8-1.5mm above surface
b. Sans serif
c. 16-50mm in height
d. Accompanied by braille near bottom edge of sign. If text is multi-lined, place all braille at min. 9.5 mm below the entire raised text

***4.5.6.3 Tactile Pictograms and Symbols**
a. Raised 0.8-1.5mm above surface
b. Min. 150 mm in height
c. Accompanied by braille near bottom edge

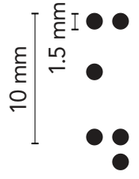
****1.3 Braille Signage General**
All text and braille on signs should be left-aligned and set horizontally

****2.1 Braille Signage**
a. Base diameter of each dot 1.5-1.6mm
b. Each dot height 0.6-0.9mm
c. Distance between dots from cell to cell below should be 10-10.2mm

Raised Primary Characters

Raised Secondary Characters

Regulatory Braille



Regulatory Characters

Indigenous Characters

*2023 Canadian Standards Association
**2016 by Braille Literacy Canada

Colours

Claret

Pantone 202 is Memorial University's colour found in the logo along with Pantone Cool Grey 10

Signage Use

Signage needs to be of contrast such that visitors with visual impairments can identify and read the text on signage. Print letters and numerals need to have a tonal contrast of at least 70% with their background and be finished with a matte or glare-free surface.* This allows visitors with limited visual capacity to still determine signage even if they cannot read the copy and may need to physically adjust their distance.

Primary

Claret
PMS 202
C0 M100 Y61 K43
R134 G38 B51
HEX 862633

Cool Grey 10
C61 M53 Y48 K19
R99 G102 B106
HEX 63666A

Cool Grey
(Specialized)
C43 M35 Y35 K1
R151 G153 B155
HEX 97999B

Warm Grey 6
C36 M35 Y38 K1
R165 G156 B148
HEX A59C94

Warm Grey 8
C45 M44 Y48 K7
R140 G130 B121
HEX 8C8279

Charcoal (Garbage)
C0 M0 Y0 K90
R65 G64 B66
HEX 404041

Black
C30 M20 Y20 K100
R35 G31 B32
HEX 231F20

White (Paper)
C0 M0 Y0 K0
R255 G255 B255
HEX FFFFFF

**Notices & Coding

PMS 185
(Prohibition)
C1 M100 Y92 K0
R228 G0 B43
HEX E4002B

Yellow (Warning/
Hazardous)
C0 M4 Y100 K0
R255 G221 B0
HEX FEDD00

PMS 2736
(Mandatory/Plastic)
C100 M91 Y0 K0
R48 G127 B170
HEX 1E22AA

Green PMS 341c
(Safe Cond./Compost)
C95 M5 Y82 K24
R0 G122 B83
Avery Bright Green
SC 900-722-0

Glass Film

Polymeric Etch Film
Lead Crystal
C24 M20 Y27 K0
R195 G191 B180
HEX C2BFB5
PMS 20-0087

MUNnel

MUNnel Orange
Orange 021
C0 M82 Y100 K0
R254 G80 B0
HEX FE5000

MUNnel Yellow
C1 M37 Y100 K0
R249 G171 B0
HEX F9AB00

MUNnel Blue
PMS 2935c
C100 M52 Y0 K0
R0 G87 B184
3M Intense Blue
220-47

MUNnel Green
C95 M5 Y82 K24
R0 G122 B83
Avery Bright Green
SC 900-722-0

Secondary Palette

Rhodamine Red
C5 M97 Y1 K0
R225 G0 B152
HEX E10098

PMS 185
C1 M100 Y92 K0
R228 G0 B43
HEX E4002B

Orange 021
C0 M82 Y100 K0
R254 G80 B0
HEX FE5000

PMS 1235
C0 M32 Y95 K0
R255 G184 B28
HEX FFB81C

Yellow
C0 M4 Y100 K0
R255 G221 B0
HEX FEDD00

PMS 396
C16 M1 Y100 K0
R225 G224 B0
HEX E1E000

PMS 368
C57 M0 Y100 K0
R120 G190 B32
HEX 78BE20

PMS 3275
C95 M0 Y47 K0
R0 G179 B152
HEX 00B398

PMS 3125
C83 M0 Y21 K0
R0 G174 B199
HEX 00AEC7

PMS 2727
C71 M42 Y0 K0
R48 G127 B226
HEX 307FE2

PMS 2736
C100 M91 Y0 K0
R48 G127 B170
HEX 1E22AA

PMS Purple
C34 M88 Y0 K0
R187 G41 B187
HEX BB29BB

Facilities Management Palette

Benjamin Moore
New Lime
2025-30

Benjamin Moore
Neon Red
2087-10

Benjamin Moore
Naples Blue
2057-30

Benjamin Moore
Yellow Flash
2021-10

Benjamin Moore
Starry Night Blue
2067-20

Benjamin Moore
Pre-Dawn Sky
2075-30

*2023 Canadian Standards Association
**2006 Canadian Standards Association CFW/CSA-Z321-96

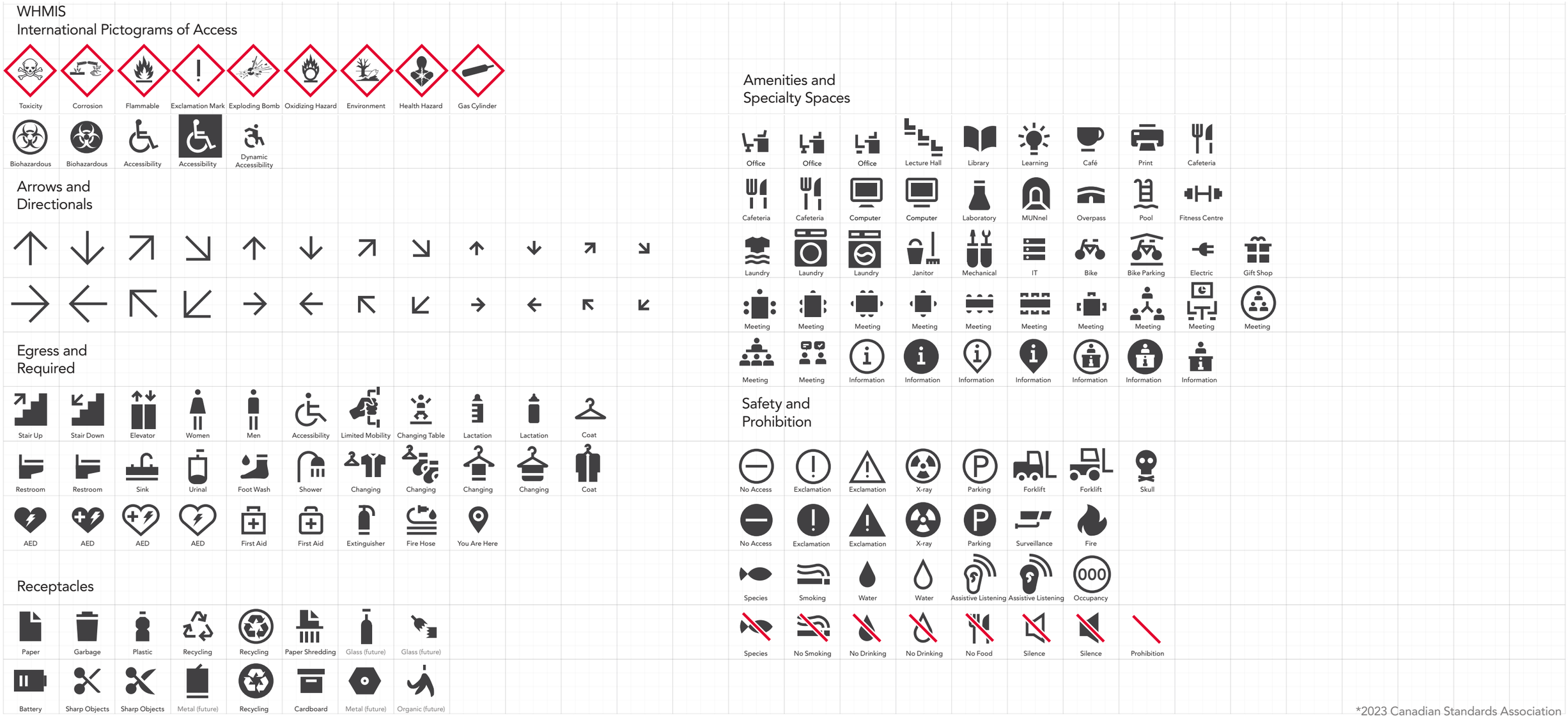
Pictograms

Pictogram Usage

Pictograms will be a key element to the design as they will have a large impact on the signs from a visual perspective but also from an informational standpoint as these should be universally understood by anyone

*4.5.6.3 Tactile Pictograms and Symbols

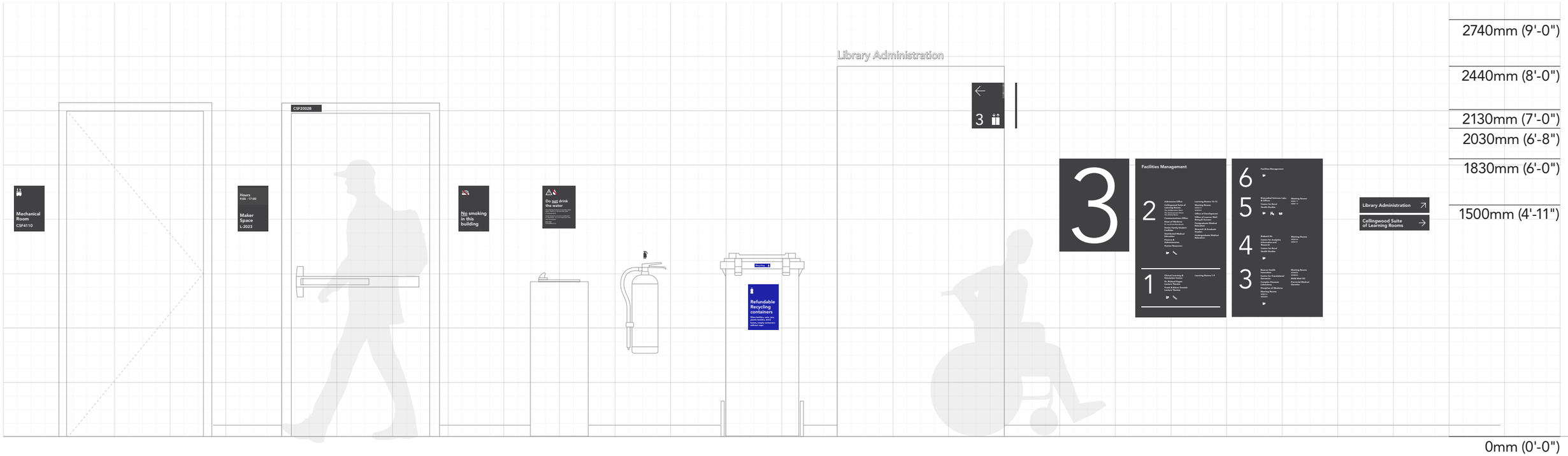
a. Raised between 0.8-1.5mm above surface
b. At least 150mm in height
c. Accompanied by uncontracted braille below pictogram
d. Colour-contrasted with background by at least 70%



*2023 Canadian Standards Association

Signage Family

Purpose
High level understanding of how the signage family works in tandem



A.01 Room Identification

A.05 Insertable Identification

A.06 Door Identification

A.12 Regulatory & Warning

A.31 Temporary Notices

A.13 Fire & AED

A.21 Receptacle Identification

B.01 Entrance Identification

B.20 Blade Signage

B.11 Floor Level

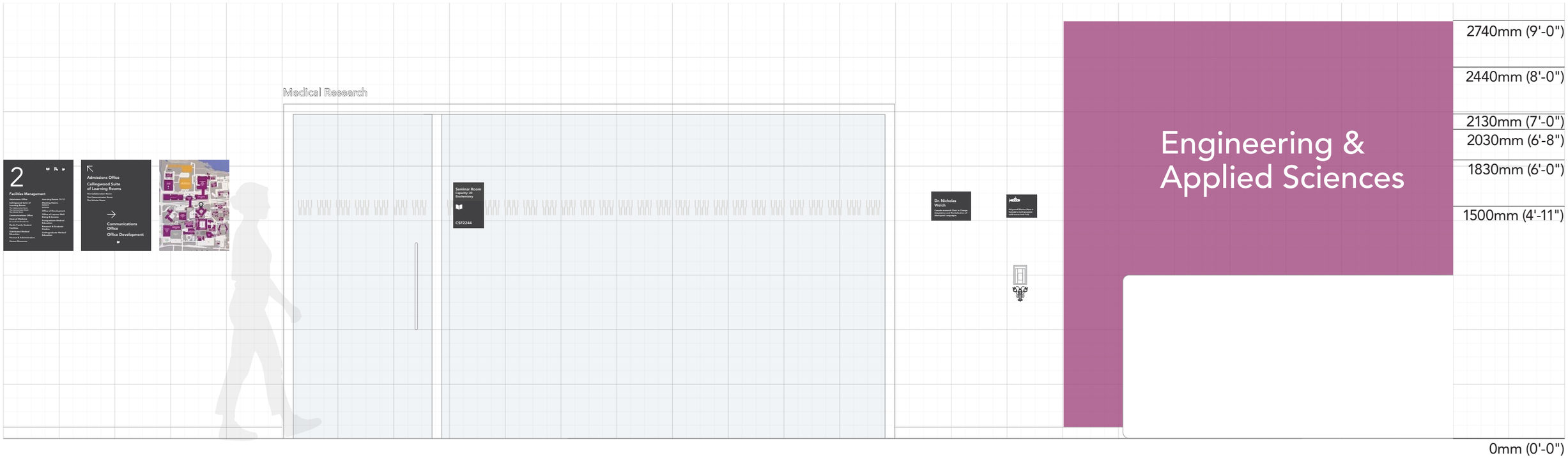
B.31 Building Directory

B.22 Directional

Front View
Scale: 1:25

Signage Family

Purpose
High level understanding of how the signage family works in tandem



B.32 Floor Directory

B.21 Directional

B.41 Maps

B.01 Entrance Identification

A.05 Room Identification

C.38 Glass Film

C.01 Donor & Dedication

C.1 Infographic

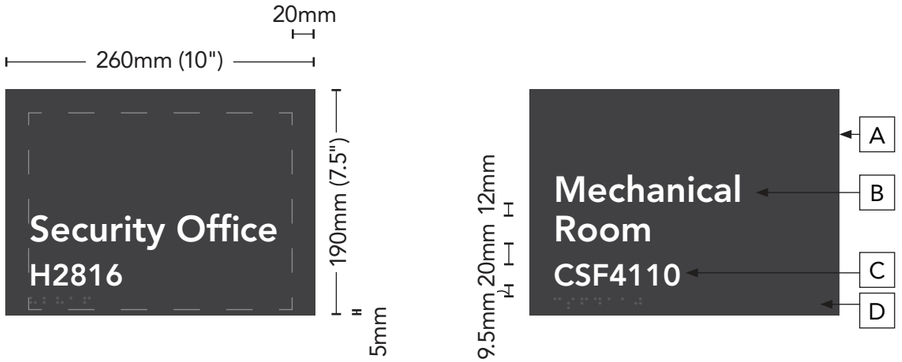
C.2 Surface Colour

B.03 Entrance Identification

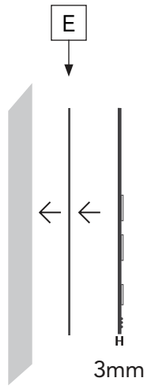
Front View
Scale: 1:25

A.01 Room ID - A

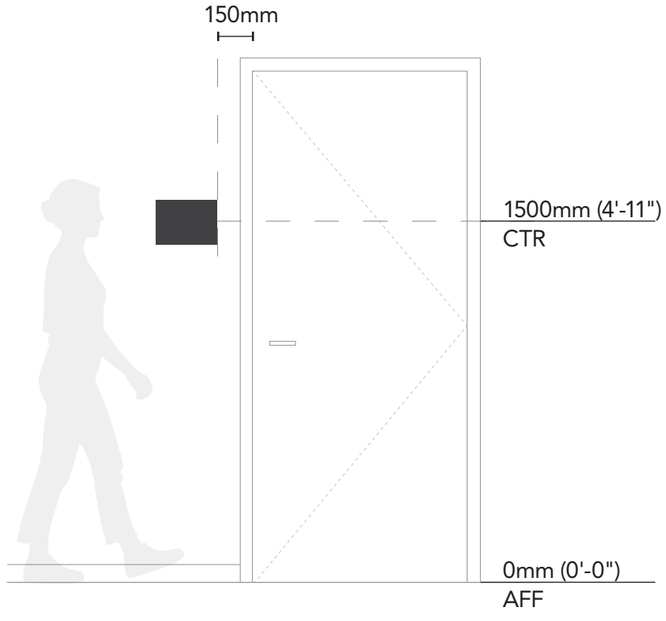
Standard



1 **Layout**
Scale: 1:5



2 **Section**
Scale: 1:5



3 **Elevation**
Scale: 1:25

Description

A 3mm-thick acrylic panel; Charcoal colour; Returns to match panel colour; Mounted to wall surface securely

B Avenir LT Std; 85 Heavy; 22.5mm cap-height; Optical kerning; Tracking (0); Left aligned; White; Raised 0.8mm from panel

C Avenir LT Std; 85 Heavy; 18mm cap-height; Optical kerning; Tracking (0); Left aligned; White; Raised 0.8mm from panel

D Braille; 10mm cap-height; Colour to match panel; Raised 0.8mm from panel; Message to include both room name and room number

E When mounted to glass surface, vinyl backer to be applied to same side of glass as sign to hide adhesive; Backer to match sign colour

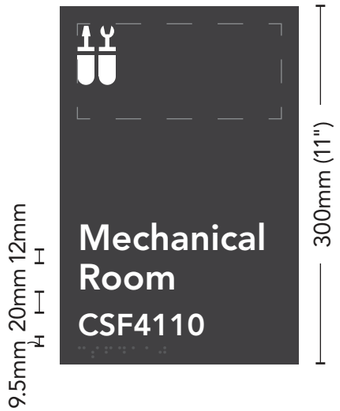
Use

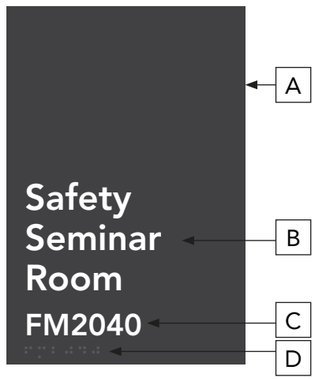
Sign for standard room identification with a fixed use, ie. Custodial Rooms, Mechanical Rooms, Security Office.

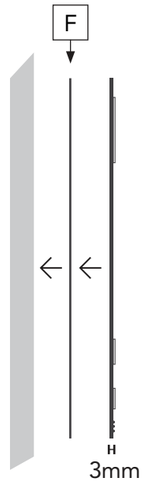
A.02 Room ID - B

Portrait

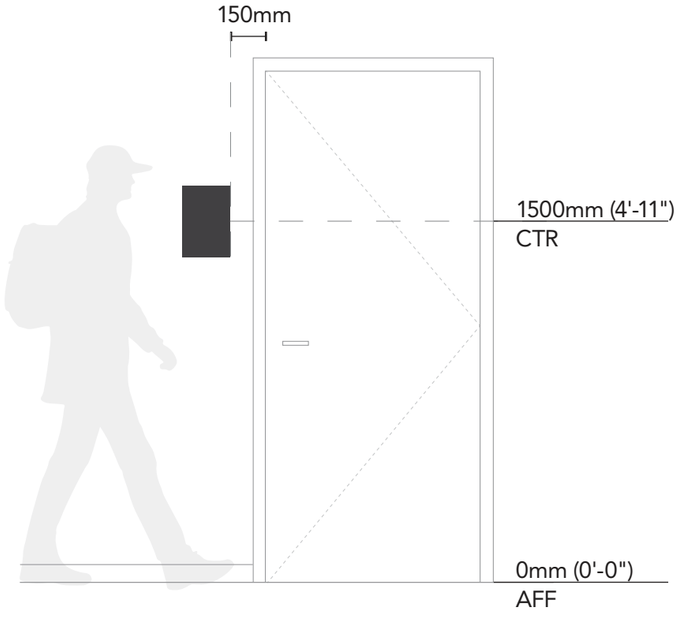
1 Layout
Scale: 1:5







2 Section
Scale: 1:5



3 Elevation
Scale: 1:25

Description

A — 3mm-thick acrylic panel; Charcoal colour; Returns to match panel colour; Mounted to wall surface securely

B — Avenir LT Std; 85 Heavy; 22.5mm cap-height; Optical kerning; Tracking (0); Left aligned; White; Raised 0.8mm from panel

C — Avenir LT Std; 85 Heavy; 18mm cap-height; Optical kerning; Tracking (0); Left aligned; White; Raised 0.8mm from panel

D — Braille; 10mm cap-height; Colour to match panel; Raised 0.8mm from panel; Message to include both room name and room number

E — Pictogram; White; Direct print or vinyl; Size relative to signage layout in scale

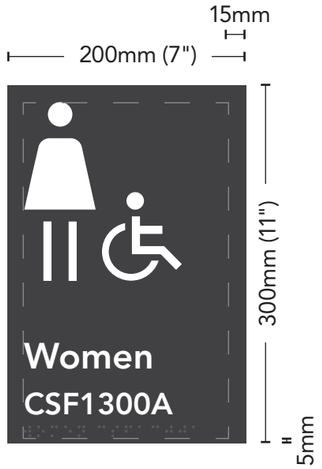
F — When mounted to glass surface, vinyl backer to be applied to same side of glass as sign to hide adhesive; Backer to match sign colour

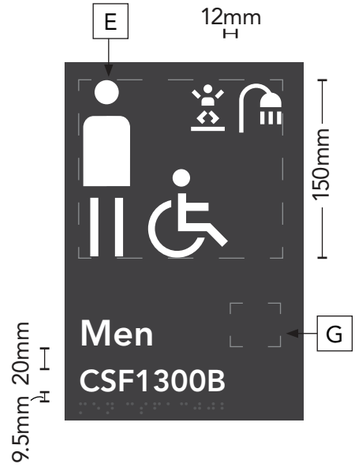
Use

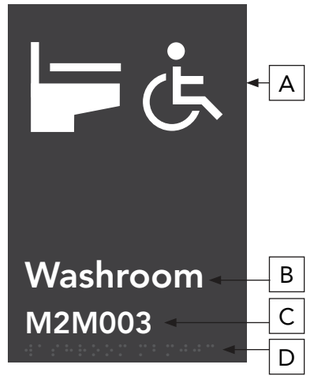
Sign for standard room identification with a permanent description and additional icon/pictogram for added clarity and information. Used for public rooms, accessed my more than one unit with a fixed use, ie. Lecture Rooms, Classrooms.

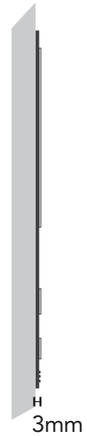
A.03 Room ID Public Amenities - B

Restroom



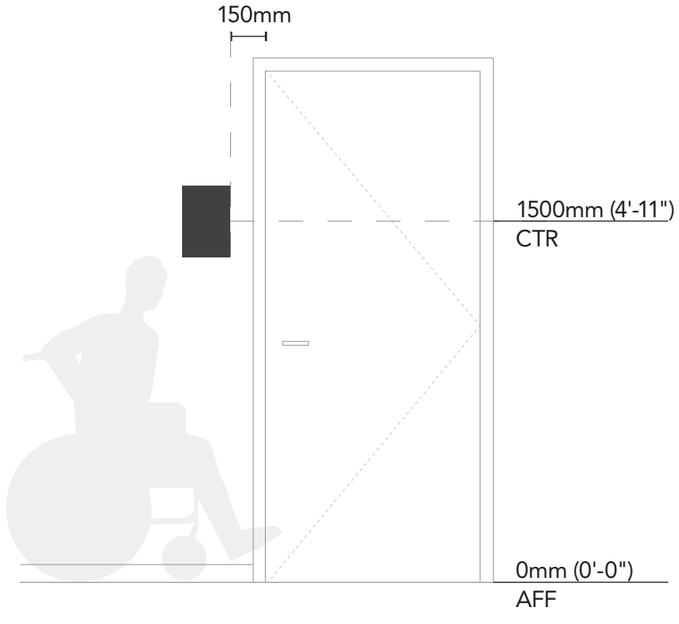






1 **Layout**
Scale: 1:5

2 **Section**
Scale: 1:5



3 **Elevation**
Scale: 1:25

Description

A — 3mm-thick acrylic panel; Charcoal colour; Returns to match panel colour; Mounted to wall surface securely

B — Avenir LT Std; 85 Heavy; 22.5mm cap-height; Optical kerning; Tracking (0); Left aligned; White; Raised 0.8mm from panel

C — Avenir LT Std; 85 Heavy; 18mm cap-height; Optical kerning; Tracking (0); Left aligned; White; Raised 0.8mm from panel

D — Braille; 10mm cap-height; Colour to match panel; Raised 0.8mm from panel; Message to include both room name and room number

E — Pictogram; White; Raised 0.8mm from panel

F — Pictogram; White; Direct print or Vinyl; Size relative to signage layout in scale

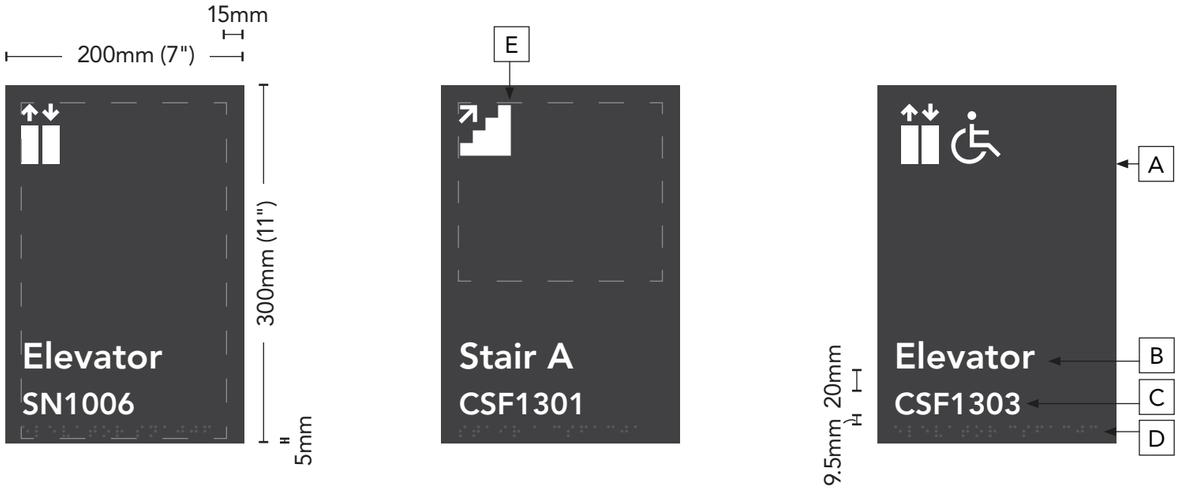
G — Avenir LT Std; 65 Medium; 7.5mm cap-height; Optical kerning; Tracking (0); Left aligned; White; Direct print or vinyl; (future)

Use

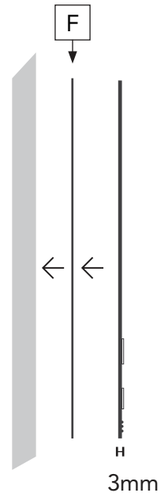
Sign for public amenity room identification, including pictogram, permanent description, braille translations of the description, ie. Elevators, Stairs, Washroom.

A.03 Room ID Public Amenities - B

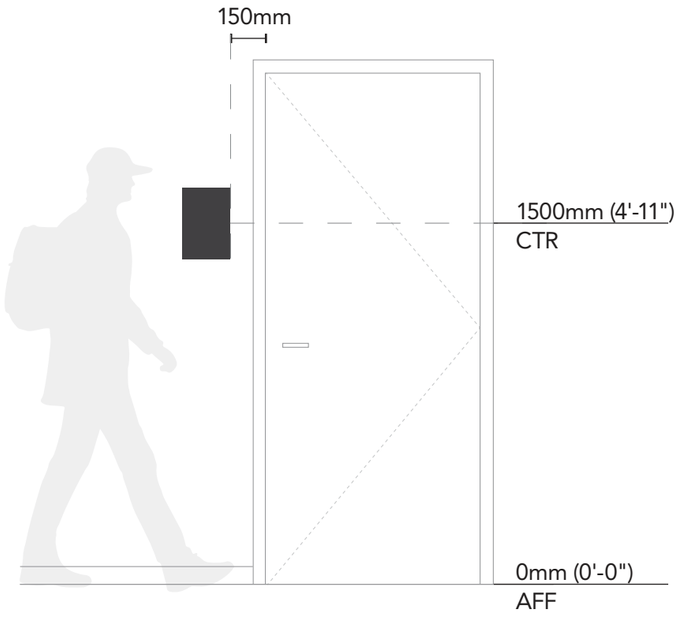
Circulation



1 Layout
Scale: 1:5



2 Section
Scale: 1:5



3 Elevation
Scale: 1:25

Description

A — 3mm-thick acrylic panel; Charcoal colour; Returns to match panel colour; Mounted to wall surface securely

B — Avenir LT Std; 85 Heavy; 22.5mm cap-height; Optical kerning; Tracking (0); Left aligned; White; Raised 0.8mm from panel

C — Avenir LT Std; 85 Heavy; 18mm cap-height; Optical kerning; Tracking (0); Left aligned; White; Raised 0.8mm from panel

D — Braille; 10mm cap-height; Colour to match panel; Raised 0.8mm from panel, Message to include both room name and room number

E — Pictogram; White; Direct print or vinyl; Size relative to signage layout in scale

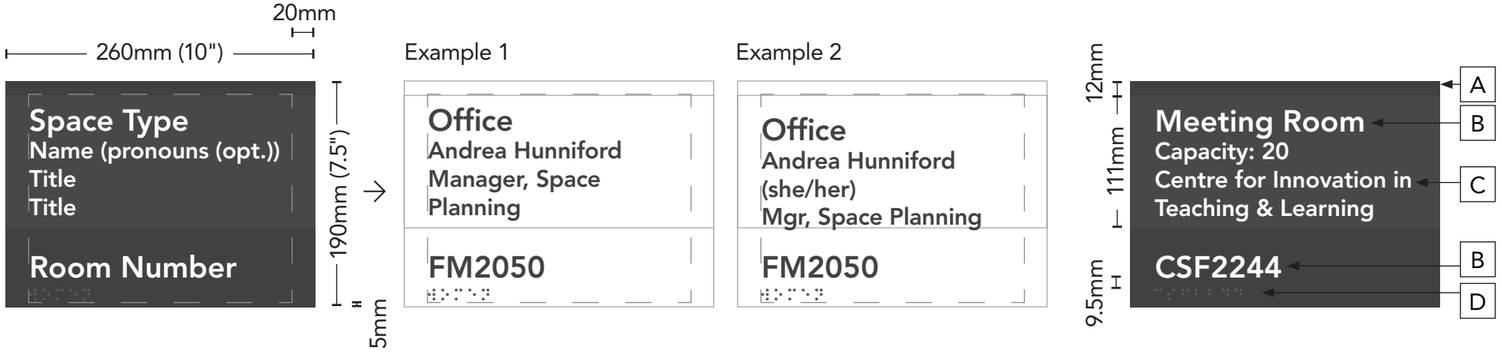
F — When mounted to glass surface, vinyl backer to be applied to same side of glass as sign to hide adhesive; Backer to match sign colour

Use

Sign for public amenity room identification, including pictogram, permanent description, braille translations of the description, ie. Elevators, Stairs, Washrooms.

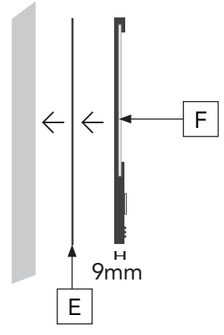
A.04 Room ID with Insert - A

Standard



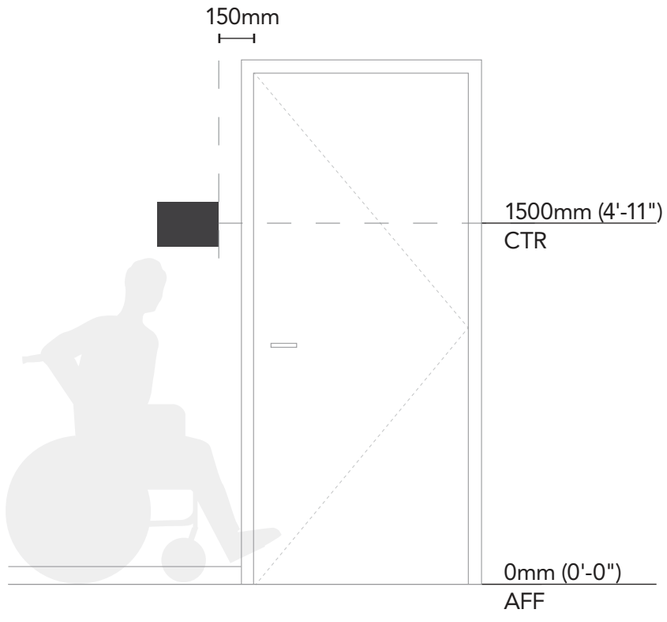
1 Layout

Scale: 1:5



2 Section

Scale: 1:5



3 Elevation

Scale: 1:25

Description

A — 9mm-thick acrylic panel; Charcoal colour; Returns to match panel colour; Mounted to wall surface securely

B — Avenir LT Std; 85 Heavy; 18mm cap-height; Optical kerning; Tracking (0); Left aligned; White; Raised 0.8mm from panel (not on inserts)

C — Avenir LT Std; 85 Heavy; 14mm cap-height; Optical kerning; Tracking (0); Left aligned; White; Printed

D — Braille; 10mm cap-height; Colour to match panel; Raised 0.8mm from panel; Message to include both room name and room number

E — When mounted to glass surface, vinyl backer to be applied to same side of glass as sign to hide adhesive; Backer to match sign colour

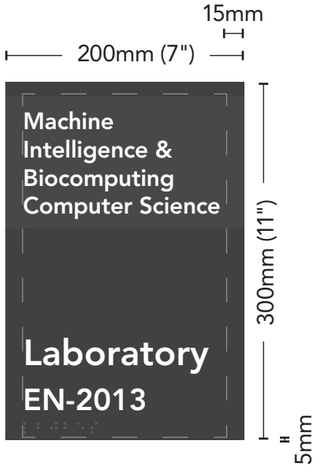
F — White cardstock insert printed with background to match panel

Use

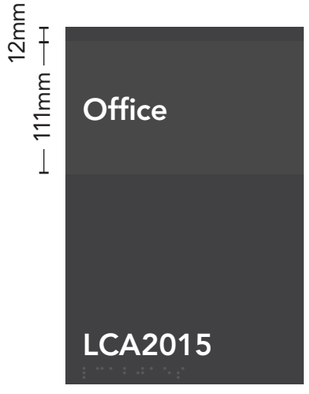
Sign for offices and small meeting room identification, where a paper insert is used to identify the room type, perhaps the occupant, and capacity description, all as per the insert template.

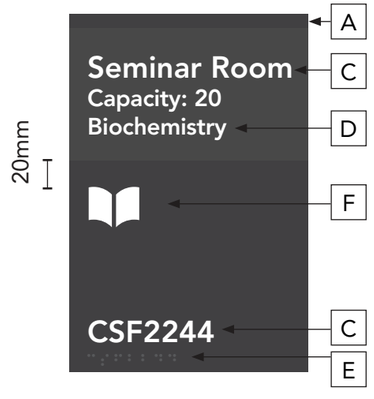
A.05 Room ID with Insert - B

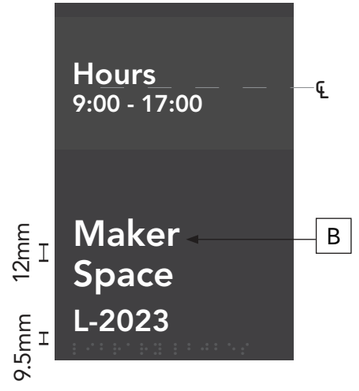
Portrait

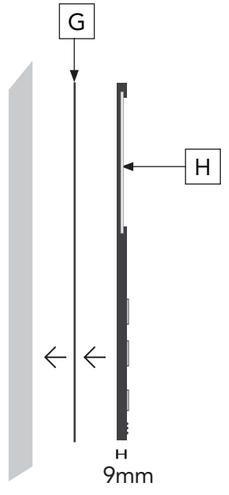


1 **Layout**
Scale: 1:5

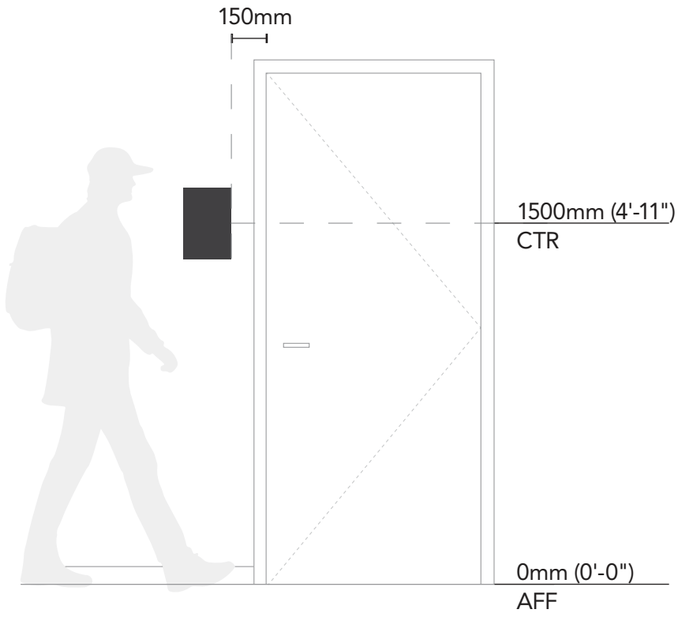








2 **Section**
Scale: 1:5



3 **Elevation**
Scale: 1:25

Description

A 9mm-thick acrylic panel; Charcoal colour; Returns to match panel colour; Mounted to wall surface securely

B Avenir LT Std; 85 Heavy; 22.5mm cap-height; Optical kerning; Tracking (0); Left aligned; White; Raised 0.8mm from panel

C Avenir LT Std; 85 Heavy; 18mm cap-height; Optical kerning; Tracking (0); Left aligned; White; Raised 0.8mm from panel, (not on inserts)

D Avenir LT Std; 85 Heavy; 14mm cap-height; Optical kerning; Tracking (0); Left aligned; White; Printed

E Braille; 10mm cap-height; Colour to match panel; Raised 0.8mm from panel; Message to include both room name and room number

F Pictogram; white; Direct print or vinyl; Size relative to signage layout in scale

G When mounted to glass surface, vinyl backer to be applied to same side of glass as sign to hide adhesive; Backer to match sign colour

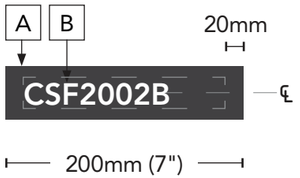
H White cardstock insert printed with background to match panel

Use

Sign for large meeting rooms and public spaces where the sign can be used to identify the room type, perhaps some additional permanent information about the space using pictograms, and the insert can be used to add additional pertinent information as per the insert template.

A.06 Door ID - C

Standard



1 **Layout**
Scale: 1:5

2 **Section**
Scale: 1:5

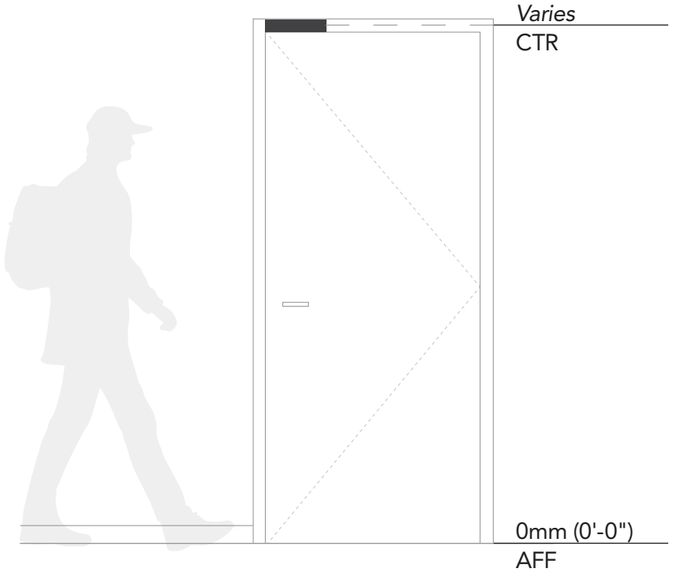
Description

A 3mm-thick acrylic panel; Charcoal colour; Returns to match panel colour; Mounted to door frame securely

B Avenir LT Std; 85 Heavy; 18mm cap-height; Optical kerning; Tracking (0); Left aligned; White; Direct print or vinyl

Use

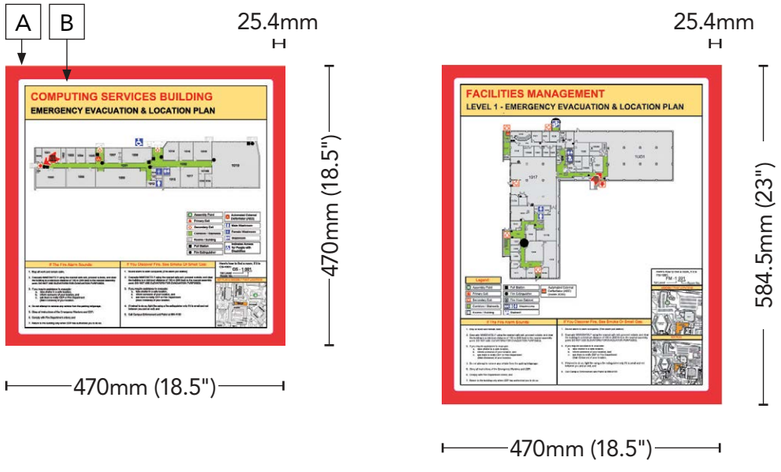
Sign for when just a room number is required for reference, including closets, small storage rooms, cold rooms, and secondary entrances.



3 **Elevation**
Scale: 1:25

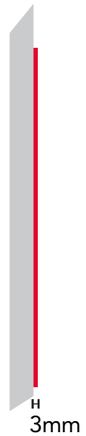
A.10 Location and Egress Maps

Standard



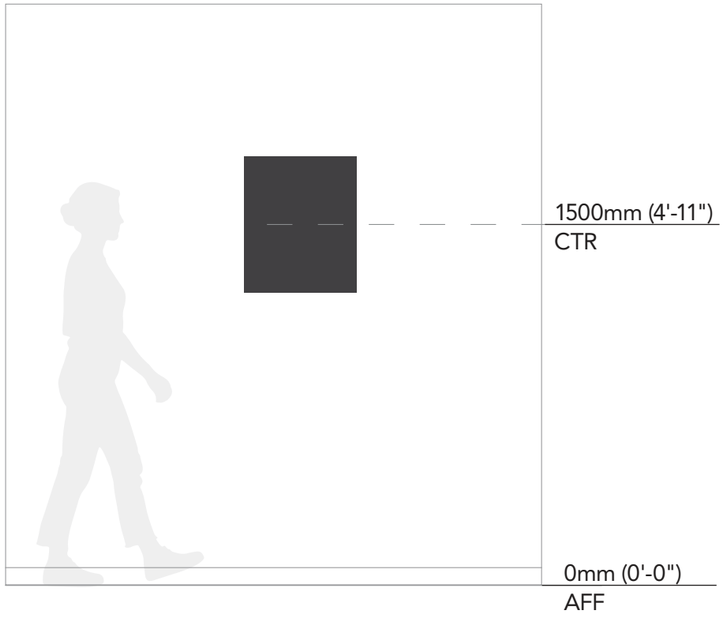
1 Layout

Scale: 1:10



2 Section

Scale: 1:10



3 Elevation

Scale: 1:25

Description

A 3mm-thick acrylic panel or similar; MUN PMS 185 colour; Returns to match panel colour; Mounted securely to surface

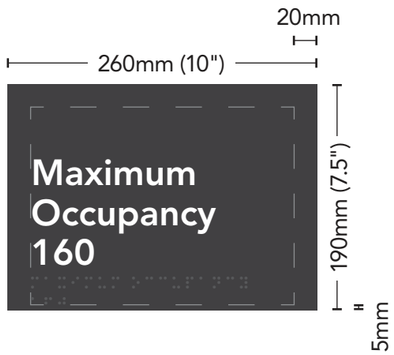
B Printed vinyl onto acrylic panel or similar

Use

Egress maps help make sure that in the event of an emergency, everyone in the building has a clear evacuation plan.

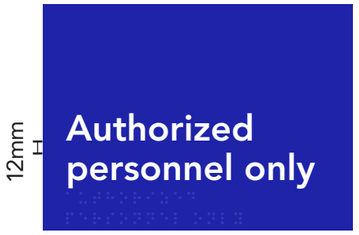
A.11 Public Regulatory & Warning - A

Standard: Colour Coded



1 **Layout**
Scale: 1:5

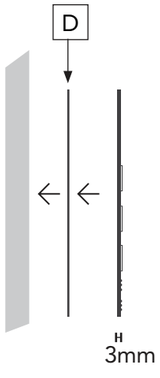
2 **Prohibition**
Scale: 1:5



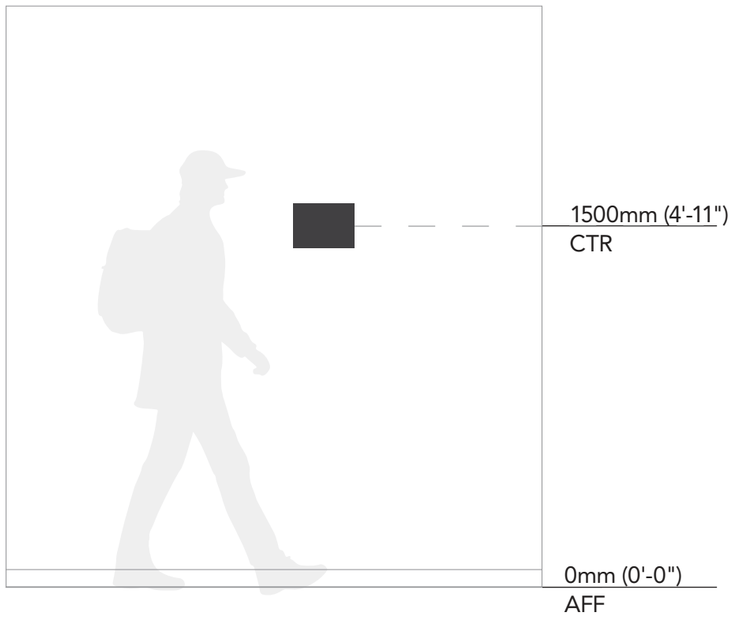
3 **Mandatory**
Scale: 1:5

4 **Warning**
Scale: 1:5

5 **Safety**
Scale: 1:5



6 **Section**
Scale: 1:5



7 **Elevation**
Scale: 1:25

Description

A 3mm-thick acrylic panel; colour to change per sign; Returns to match panel colour; Mounted to wall surface securely

B Avenir LT Std; 85 Heavy; 22.5mm cap-height; Optical kerning; Tracking (0); Left aligned; White or Black; Raised 0.8mm from panel

C Braille; 10mm cap-height; Colour to match panel; Raised 0.8mm from panel

D When mounted to glass surface, vinyl backer to be applied to same side of glass as sign to hide adhesive; Backer to match sign colour

Use

Sign for standard public regulatory and warnings, where the sign can be used to communicate different messages, ie. Prohibition, Mandatory, Warning and Safety.

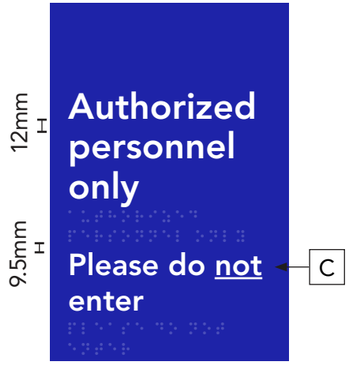
A.12 Public Regulatory & Warning - B

Portrait: Colour Coded

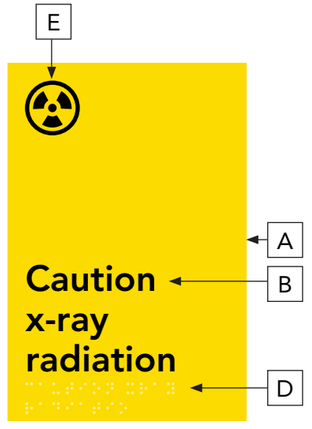
1 Layout
Scale: 1:5

2 Prohibition
Scale: 1:5

3 Prohibition
Scale: 1:5

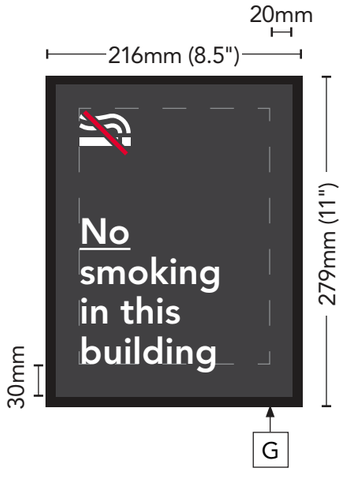


4 Mandatory
Scale: 1:5

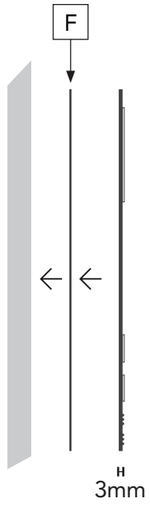


5 Warning
Scale: 1:5

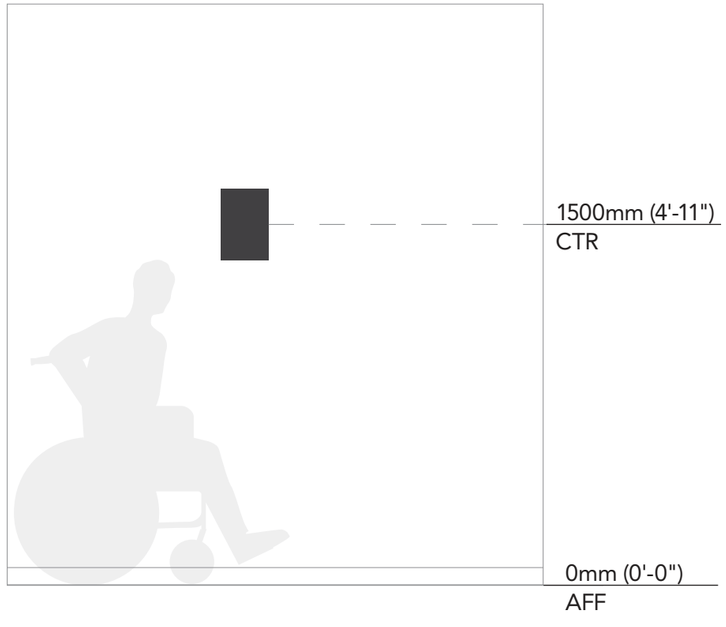
6 Safety
Scale: 1:5



7 Frame
Scale: 1:5



8 Section
Scale: 1:5



9 Elevation
Scale: 1:25

Description

A — 3mm-thick acrylic panel; colour to change per sign; Returns to match panel colour; Mounted to wall surface securely

B — Avenir LT Std; 85 Heavy; 22.5mm cap-height; Optical kerning; Tracking (0); Left aligned; White or Black; Raised 0.8mm from panel

C — Avenir LT Std; 85 Heavy; 18mm cap-height; Optical kerning; Tracking (0); White or Black; Left aligned; Raised 0.8mm from panel

D — Braille; 10mm cap-height; Colour to match panel; Raised 0.8mm from panel

E — Pictogram; White or Black; Direct print or vinyl; Size relative to signage layout in scale

F — When mounted to glass surface, vinyl backer to be applied to same side of glass as sign to hide adhesive; Backer to match sign colour

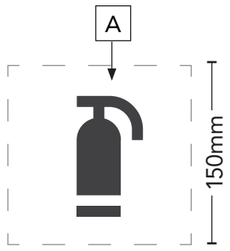
G — Poster frame; Black aluminum or similar

Use

Sign for standard public regulatory and warnings, where the sign can be used to communicate different messages, ie. Prohibition, Mandatory, Warning and Safety; perhaps some additional permanent information about the content using pictograms, can be used to add additional pertinent information.

A.13 Public Safety Amenities

Standard

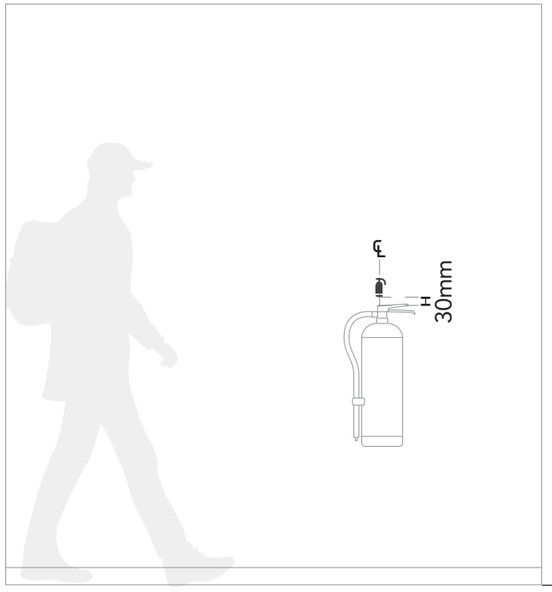


1 **Fire Extinguisher**
Scale: 1:5

2 **Fire Hose**
Scale: 1:5

3 **AED**
Scale: 1:5

4 **First Aid**
Scale: 1:5



4 **Elevation**
Scale: 1:25

Description

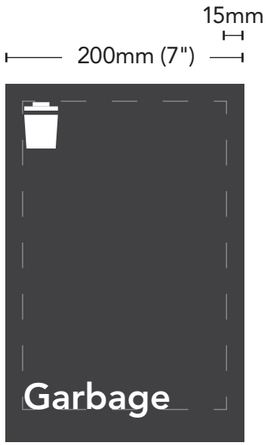
A Die-cut vinyl decal; Charcoal colour (White if needs contrast); Size relative to signage layout in scale

Use

Icon that works as visual support to easily identify any for standard public safety amenities.

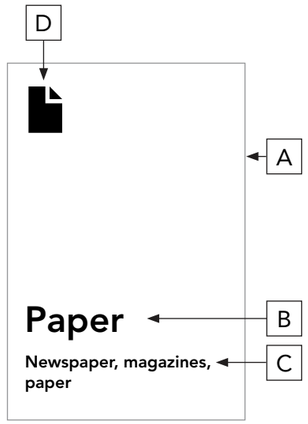
A.21 Receptacles ID - A

Standard



1 Garbage
Scale: 1:5

2 Plastic
Scale: 1:5

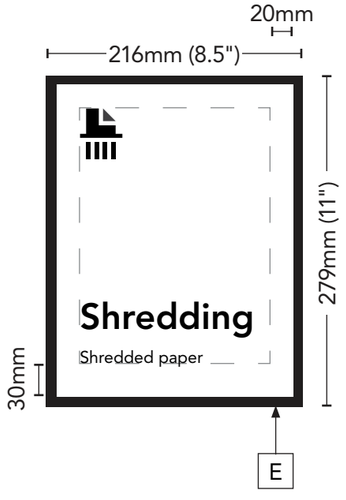


3 Paper
Scale: 1:5

4 Hazardous
Scale: 1:5

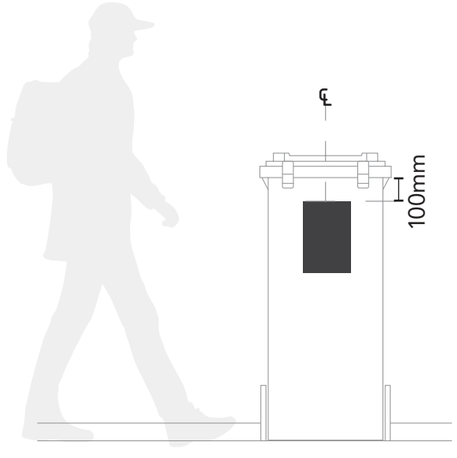
5 Compost (Future)
Scale: 1:5

6 Specialized (Future)
Scale: 1:5



7 Frame
Scale: 1:5

8 Panel Section
Scale: 1:5



9 Elevation
Scale: 1:25

Description

A — Vinyl sticker or 3mm-thick acrylic panel; Returns to match panel colour; Colour to change per sign; Mounted to surface securely

B — Avenir LT Std; 85 Heavy; 22.5mm cap-height; Optical kerning; Tracking (0); Left aligned; White or Black

C — Avenir LT Std; 85 Heavy; 10mm cap-height; Optical kerning; Tracking (0); Left aligned; White or Black

D — Pictogram; White or Black; Direct print or vinyl; Size relative to signage layout in scale

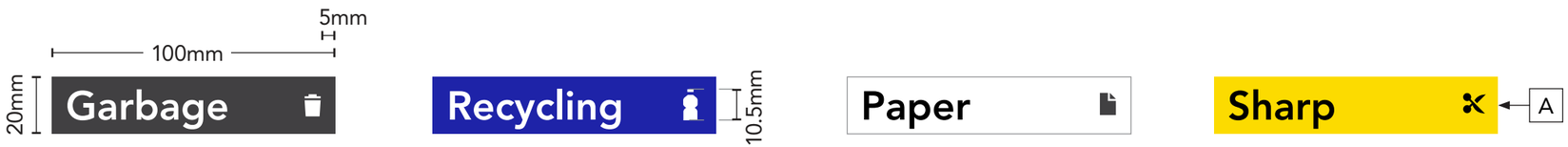
E — Poster frame; Black aluminum or similar

Use

Sign for receptacles, where the sign can be used to communicate different types of bins, ie. Garbage, Plastic, Paper, Hazardous; and to encourage MUN's recycling program; perhaps some additional permanent information about the content using pictograms, can be used to add pertinent information.

A.22 Receptacles ID - C

Compact

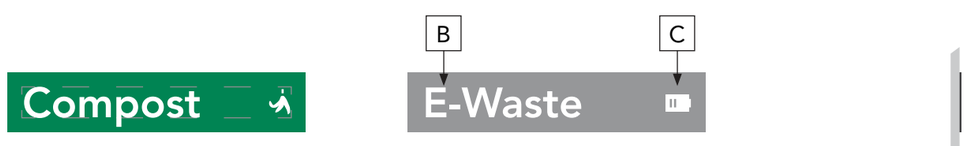


1 Garbage
Scale: 1:2

2 Plastic
Scale: 1:2

3 Paper
Scale: 1:2

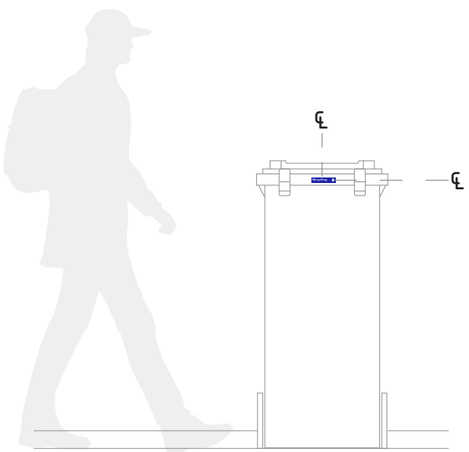
4 Hazardous
Scale: 1:2



5 Compost (Future)
Scale: 1:2

6 Specialized (Future)
Scale: 1:2

7 Section
Scale: 1:2



8 Elevation
Scale: 1:25

Description

A Vinyl sticker; Colour to change per sign

B Avenir LT Std; 85 Heavy; 10mm cap-height; Optical kerning; Tracking (0); Left aligned; White or Black

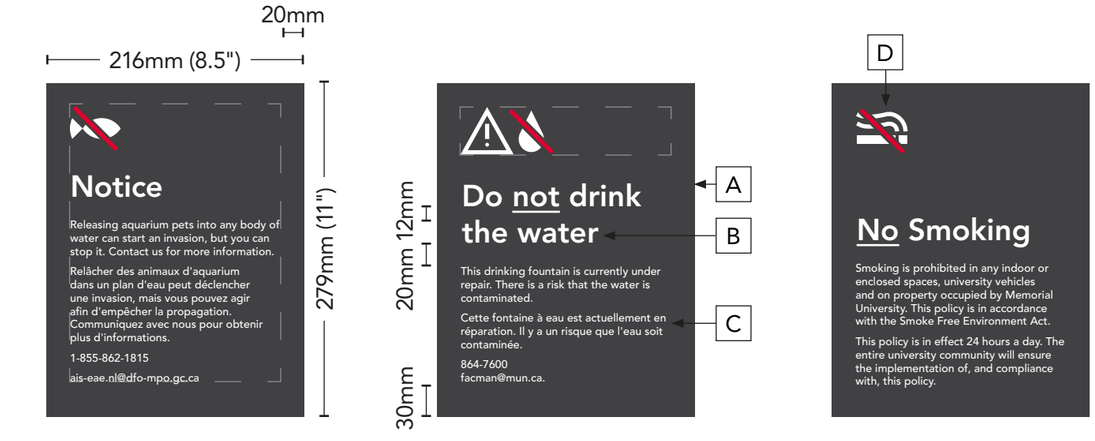
C Pictogram; White or Black; Direct print or vinyl; Size relative to signage layout in scale

Use

Sign for receptacles, where the sign can be used to communicate different types of bins, ie. Garbage, Plastic, Paper, Hazardous; and to encourage MUN's recycling program; perhaps some additional permanent information about the content using pictograms, can be used to add pertinent information.

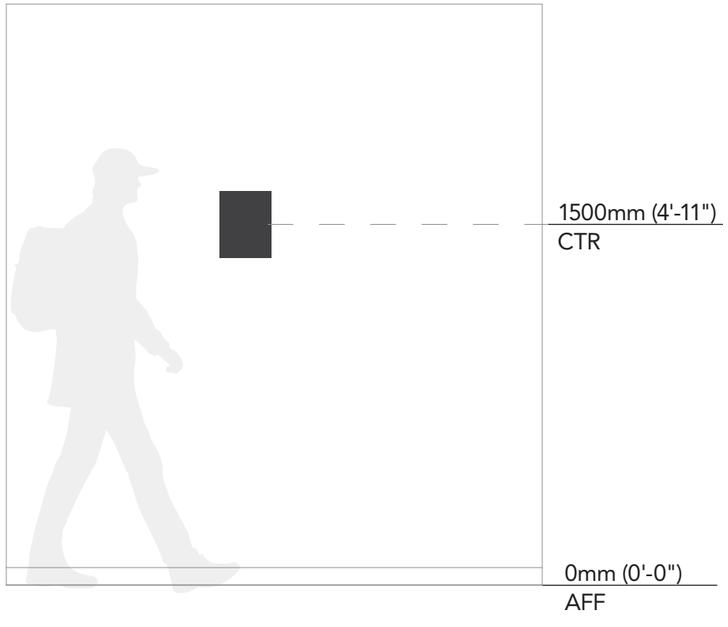
A.31 Temporary Notices

Standard



1 **Layout**
Scale: 1:5

2 **Frame**
Scale: 1:5



3 **Elevation**
Scale: 1:25

Description

A White cardstock tabloid paper; Charcoal colour print

B Avenir LT Std; 85 Heavy; 18mm cap-height; Optical kerning; Tracking (0); Left aligned; White

C Avenir LT Std; 65 Medium; 7mm cap-height; Optical kerning; Tracking (0); Left aligned; White

D Pictogram; White and/or PMS 185; Direct print; Size relative to signage layout in scale

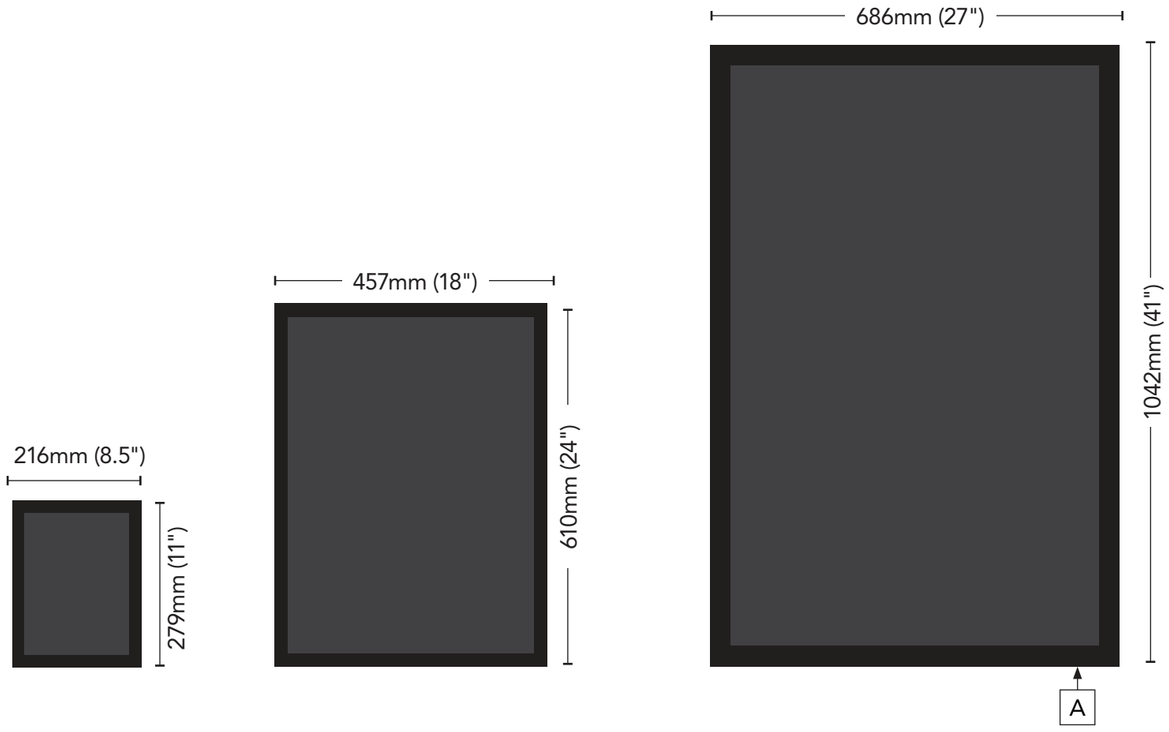
E Poster frame; Black aluminum or similar; Required certificates (future)

Use

Sign for temporary notices, where the sign can be used to communicate different types of messages; perhaps some additional information about the content using pictograms can be used to add pertinent information. These are to be non-permanent for ease of fabrication and to easily update signage for end users.

C.32 Framing

Standard



1 **Frames**
Scale: 1:10

Description

A Poster frame; Black aluminum or similar.

Potential specification https://www.uline.ca/BL_1594/Snap-Edge-Frame-Signs?keywords=frames

Use

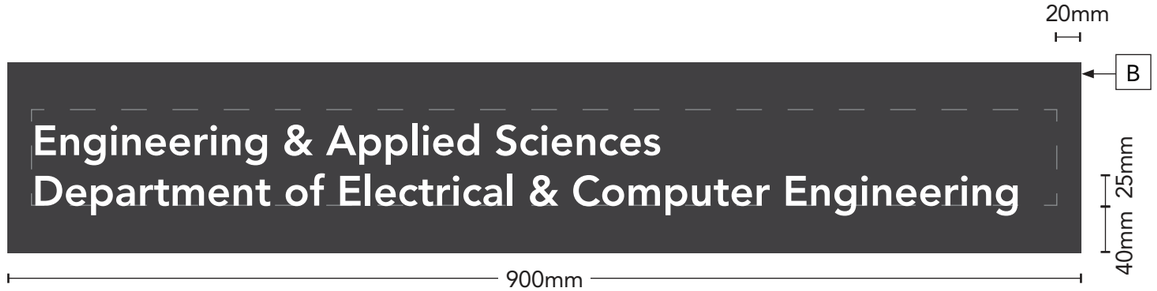
Frames can be used to temporarily display signs or to allow for an interchangeable solution when a sign has to be updated and communicate different types of messages, giving the ability to easily change signage for fabricators, as well as end users.

B.01 Entrance ID

Compact

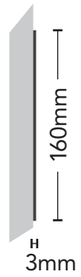
1 **Layout: One Line**
Scale: 1:5

2 **Layout: Two Lines**
Scale: 1:5

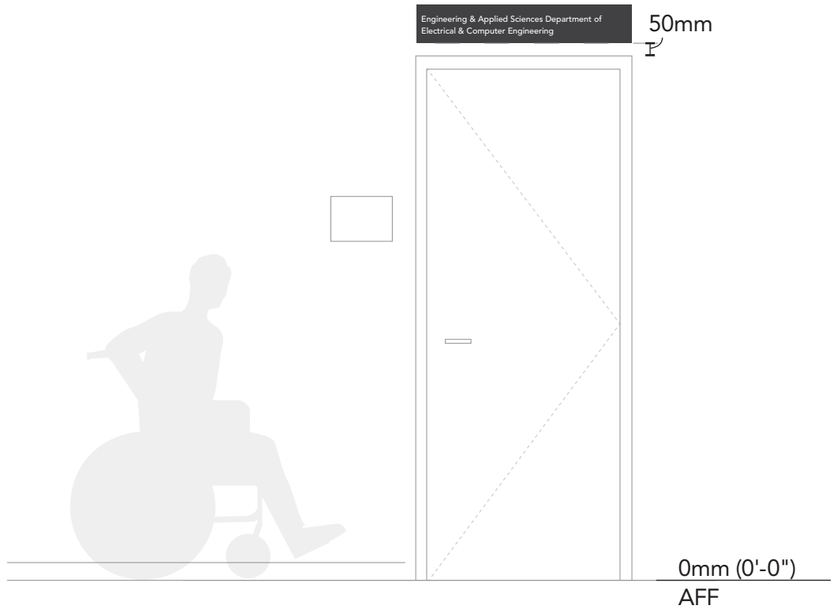


4 **Layout: Panel**
Scale: 1:5

3 **Section: Letter**
Scale: 1:5



5 **Section: Panel**
Scale: 1:5



6 **Elevation**
Scale: 1:25

Description

A Vinyl or 6mm-deep acrylic; Avenir LT Std; 85 Heavy; 25mm cap-height; Left aligned; white (Charcoal if needs contrast); Left aligned; Mounted to wall surface securely; Flush to wall surface; Prioritize location above doors; Installed vertically if space above door is not adequate

B Vinyl sticker or 3mm-thick acrylic panel; Colour to change per sign; Returns to match panel colour; Mounted to wall surface securely

Use

Entrance identifications where the sign can be used to recognize the entry to a specific space, department or area.

B.02 Entrance ID

Standard

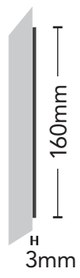
1 Layout: One Line
Scale: 1:5

3 Section: Letter
Scale: 1:5

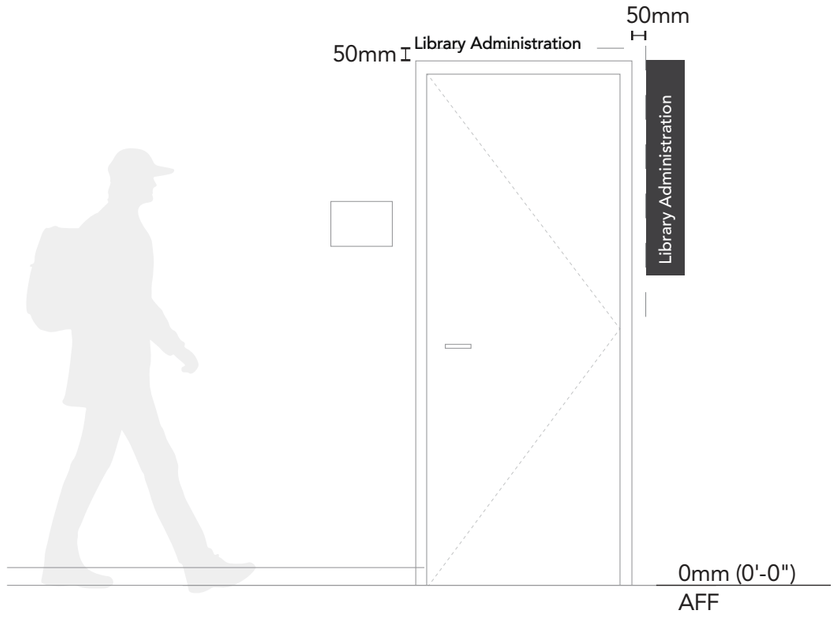
Engineering & Applied Sciences
Department of Electrical & Computer Engineering

2 Layout: Two Lines
Scale: 1:5

4 Layout: Panel
Scale: 1:5



5 Section: Panel
Scale: 1:5



6 Elevation
Scale: 1:25

Description

A Vinyl or 6mm-deep acrylic; Avenir LT Std; 65 Medium; 50mm cap-height; Left aligned; White (Charcoal if needs contrast); Left aligned; Mounted to wall surface securely; Flush to wall surface; Prioritize location above doors; Installed vertically if space above door is not adequate

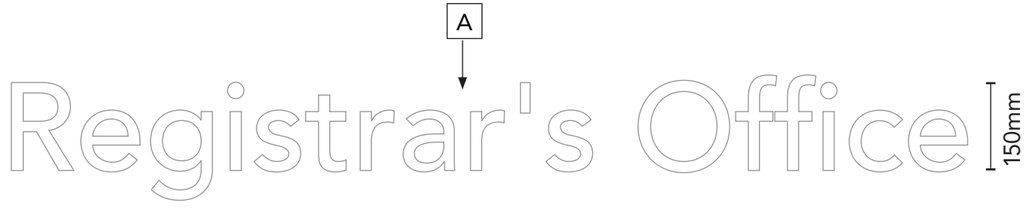
B Vinyl sticker or 3mm-thick acrylic panel; Colour to change per sign; Returns to match panel colour; Mounted to wall surface securely

Use

Entrance identifications where the sign can be used to recognize the entry to a specific space, department or area.

B.03 Entrance ID

Large



1 **Layout**
Scale: 1:10

2 **Section: Letter**
Scale: 1:10

3 **Layout: Panel**
Scale: 1:10

4 **Section: Panel**
Scale: 1:10

5 **Elevation**
Scale: 1:25

Description

A Vinyl, 8mm-deep acrylic, or 50mm-deep illuminated channel letters (future); Avenir LT Std; 65 Medium; 150mm cap-height; Left aligned; White (Charcoal if needs contrast); Mounted to wall surface securely; Flush to wall surface; Prioritize location above doors; Installed vertically if space above door is not adequate

B Vinyl Sticker or 3mm-thick acrylic panel; Returns to match panel colour; Colour to change per sign; Mounted to wall surface securely

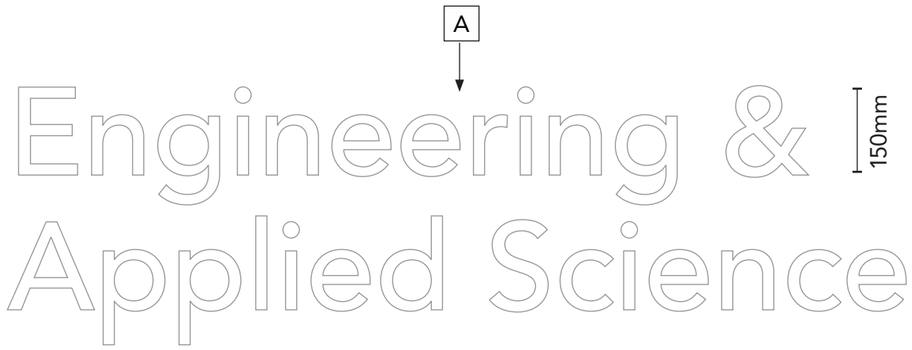
C Margin to remain at 80mm from the cap-height and length of message; Panel to adjust with message

Use

Entrance identifications where the sign can be used to recognize the entry to a specific space, department or area.

B.03 Entrance ID

Large



1 Layout
Scale: 1:10

2 Section: Letter
Scale: 1:10

Description

A Vinyl, 8mm-deep acrylic, or 50mm-deep illuminated channel letters (future); Avenir LT Std; 65 Medium; 150mm cap-height; Left aligned; White (Charcoal if needs contrast); Mounted to wall surface securely; Flush to wall surface; Prioritize location above doors; Installed vertically if space above door is not adequate

B Vinyl Sticker or 3mm-thick acrylic panel; Returns to match panel colour; Colour to change per sign; Mounted to wall surface securely

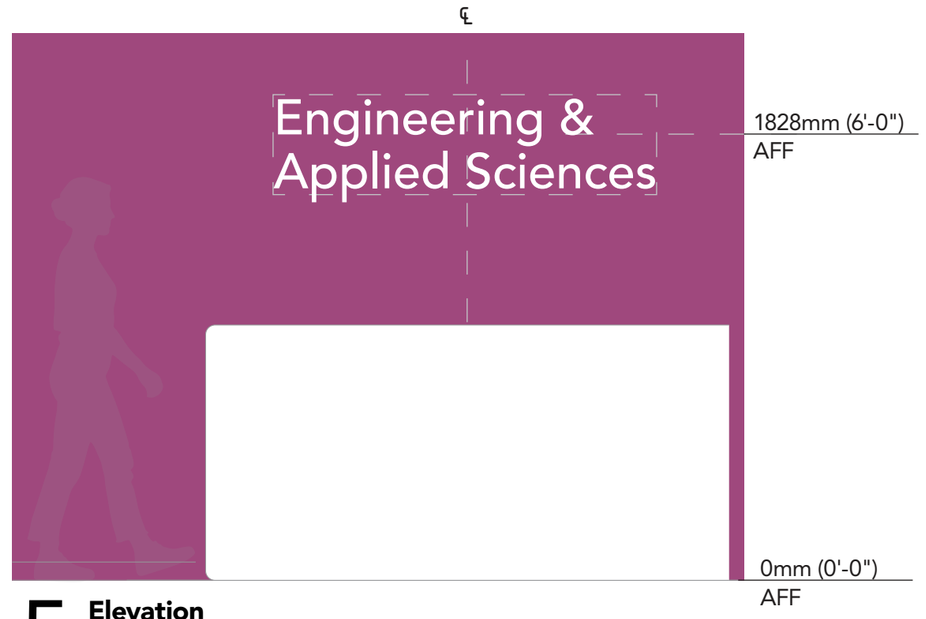
C Margin to remain at 80mm from the cap-height and length of message; Panel to adjust with message

Use

Entrance identifications where the sign can be used to recognize the entry to a specific space, department or area.

3 Layout: Panel
Scale: 1:10

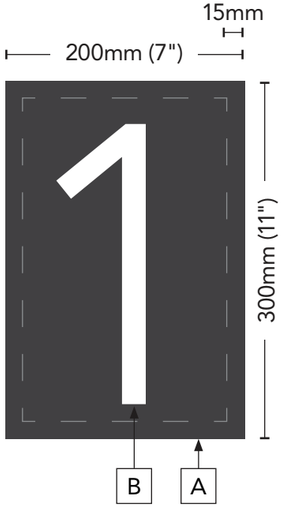
4 Section: Panel
Scale: 1:10



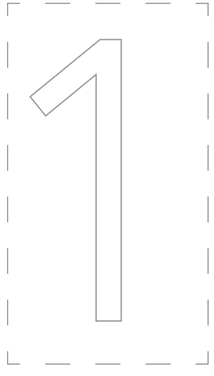
5 Elevation
Scale: 1:25

B.11 Floor Level

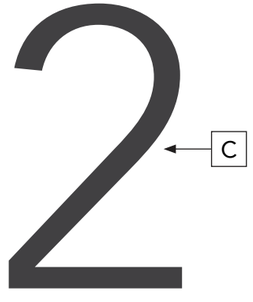
Compact

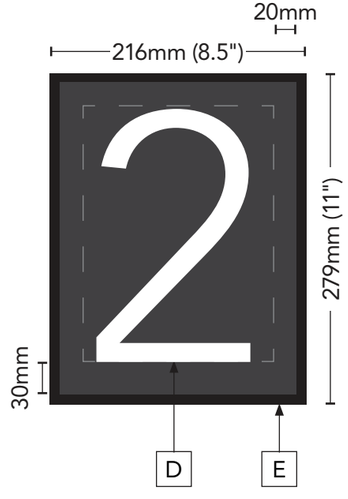


1 **Vinyl Layout**
Scale: 1:5



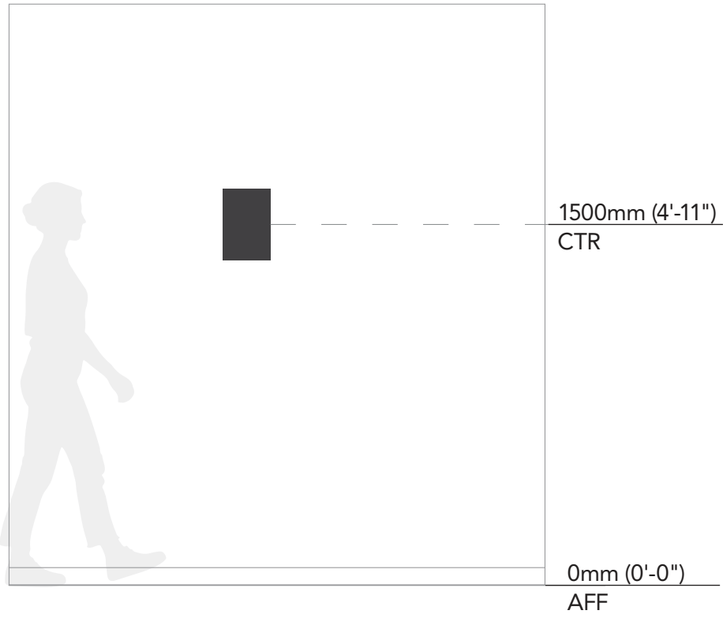
2 **Vinyl Layout**
Scale: 1:5





3 **Frame**
Scale: 1:5

4 **Section**
Scale: 1:5



5 **Elevation**
Scale: 1:25

Description

A 3mm-thick acrylic panel; Charcoal colour; Returns to match panel colour; Mounted to wall surface securely

B Avenir LT Std; 35 Light; 234mm cap-height; Optical kerning; Tracking (0); White; Direct print or vinyl

C Avenir LT Std; 35 Light 234mm cap-height; Optical kerning; Tracking (0); White (Charcoal if needs contrast); Die-cut vinyl

D Avenir LT Std; 35 Light; 210mm cap-height; Optical kerning; Tracking (0); Charcoal

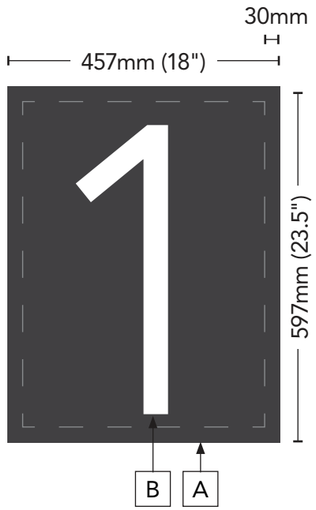
E Poster frame; Black aluminum or similar

Use

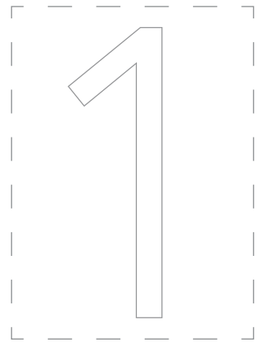
Floor number signs, where the sign can be used to communicate the floor you are located on; give users the confidence to navigate spaces intuitively.

B.12 Floor Level

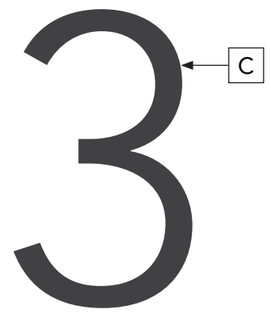
Standard

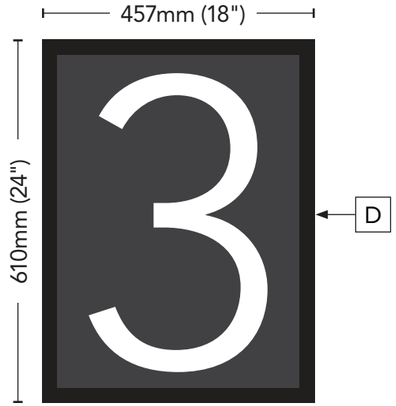


1 Layout
Scale: 1:10

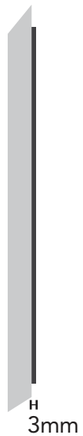


2 Layout: Number
Scale: 1:10

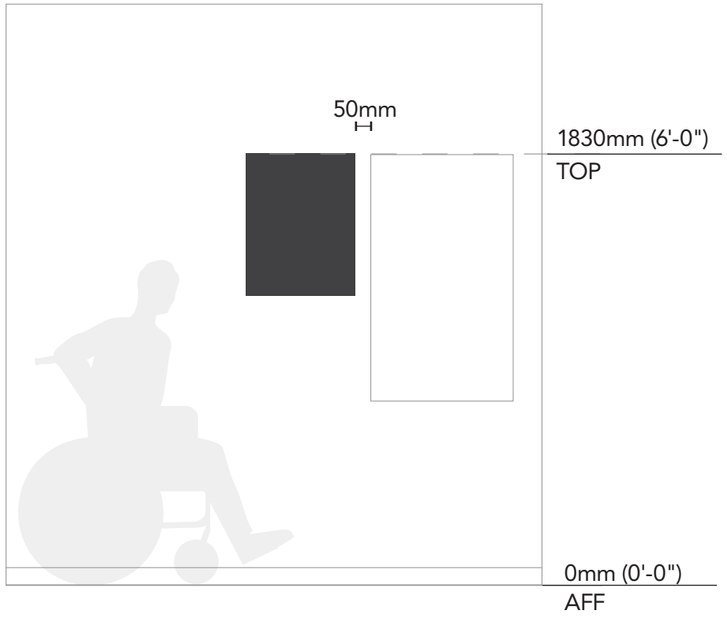




3 Frame
Scale: 1:10



4 Section
Scale: 1:10



5 Elevation
Scale: 1:25

Description

A 3mm-thick acrylic panel; Charcoal colour; Returns to match panel colour; Mounted to wall surface securely

B Avenir LT Std; 35 Light; 500mm cap-height; Optical kerning; Tracking (0); White; Direct print or vinyl

C Avenir LT Std; 35 Light; 500mm cap-height; Optical kerning; Tracking (0); White (Charcoal if needs contrast); Die-cut vinyl

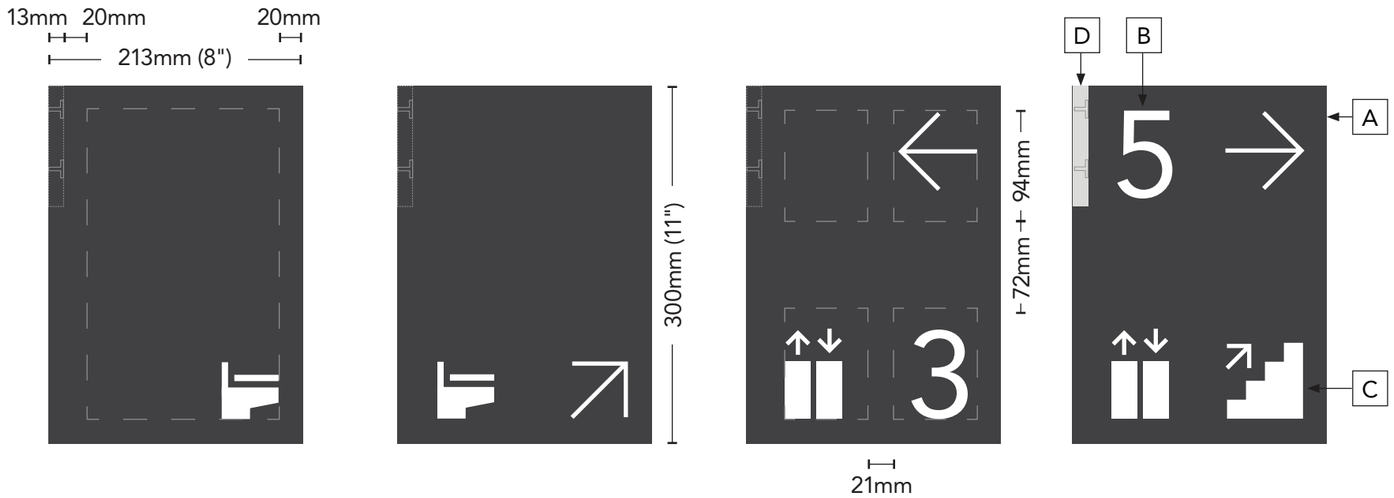
D Poster frame; Black aluminum or similar

Use

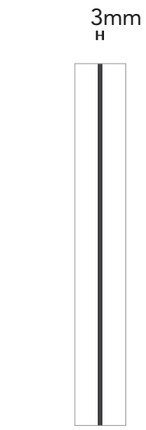
Floor number signs, where the sign can be used to communicate the floor you are located on; give users the confidence to navigate spaces intuitively.

B.20 Blade Signage

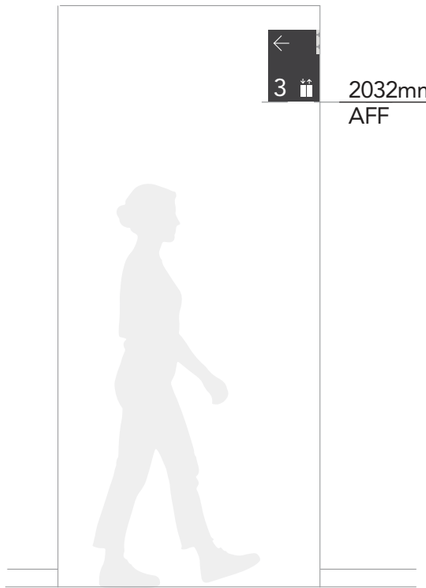
Standard



1 Layout
Scale: 1:5



2 Section
Scale: 1:5



3 Elevation
Scale: 1:25

Description

A — 3mm-thick acrylic panel; Charcoal colour; Returns to match panel colour; Mounted to wall surface securely

B — Avenir LT Std; 55 Roman; 75mm cap-height; Optical kerning; Tracking (0); Left aligned; White; Direct print or vinyl

C — Pictogram; White; Direct print or vinyl; Prioritize arrows opposite to the wall side; Prioritize icons to the bottom first, then opposite to the wall side; Size relative to signage layout in scale

D — Fastened to wall with screws at top and bottom of sign or similar; Fastenings to be concealed; To match panel colour

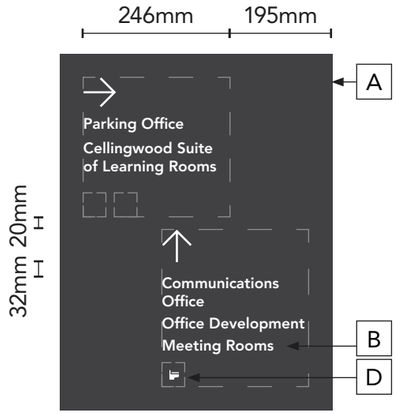
Use

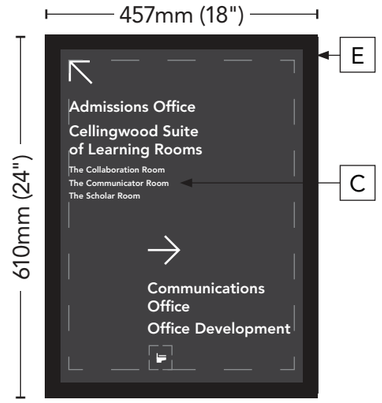
Blade signs, where the sign can be used to communicate different types of spaces, ie. Elevators, Washrooms; give users the confidence to navigate spaces intuitively.

B.21 Directional

Standard

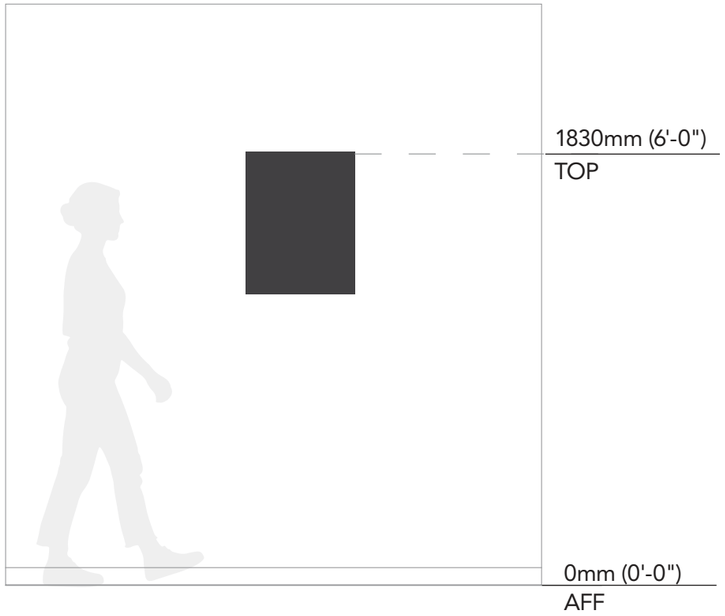
1 **Layout**
Scale: 1:10





2 **Frame**
Scale: 1:10

3 **Section**
Scale: 1:10



4 **Elevation**
Scale: 1:25

Description

A 3mm-thick acrylic panel; Charcoal colour; Returns to match panel colour; Mounted to wall surface securely

B Avenir LT Std; 85 Heavy; 18mm cap-height; Optical kerning; Tracking (0); Left aligned; White; Direct print or vinyl

C Avenir LT Std; 85 Heavy; 10mm cap-height; Optical kerning; Tracking (0); Leading 6.5mm; Left aligned; White; Direct print or vinyl

D Pictogram; White; Direct print or vinyl

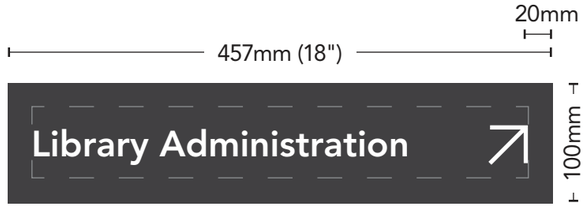
E Poster frame; Black aluminum or similar

Use

Directional signs, where the sign can be used to communicate different types of spaces, departments or areas, give users the confidence to navigate spaces intuitively.

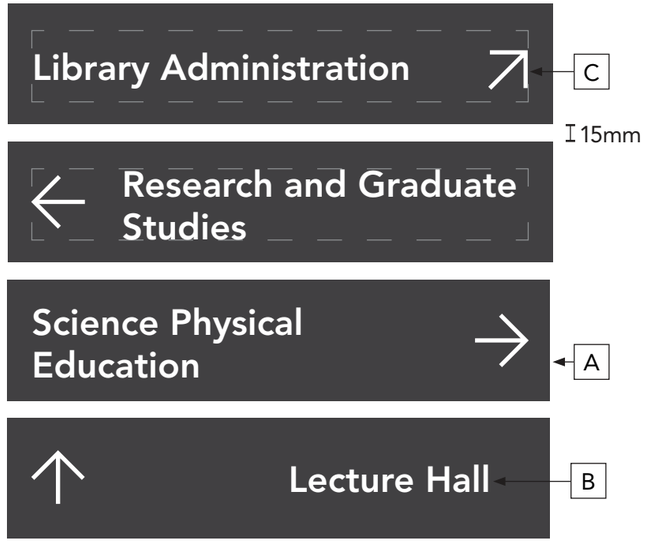
B.22 Directional

Compact



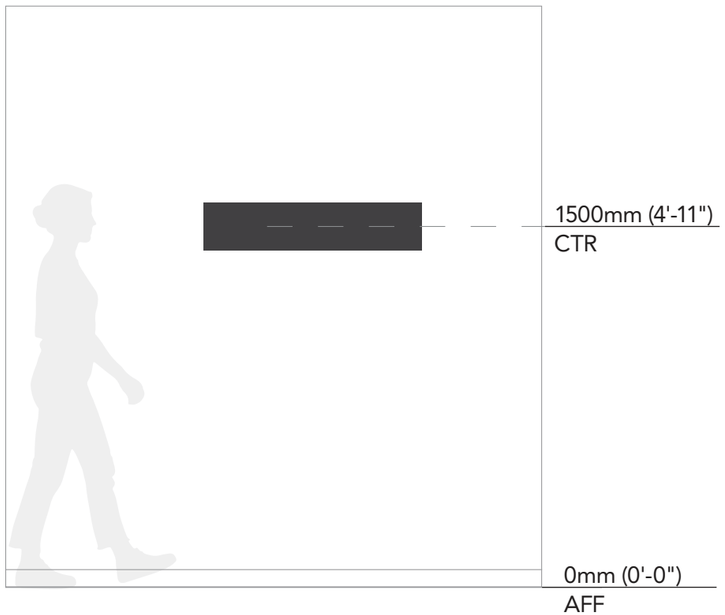
1 **Layout: One Line**
Scale: 1:5

2 **Layout: Two Line**
Scale: 1:5



3 **Layout: Stacked**
Scale: 1:5

4 **Section**
Scale: 1:5



5 **Elevation**
Scale: 1:25

Description

A 3mm-thick acrylic panel; Charcoal colour; or MUNnel colours; Returns to match panel colour; Mounted to wall surface securely

B Avenir LT Std; 85 Heavy; 22.5mm cap-height; Optical kerning; Tracking (0); Left aligned; white; Direct print or vinyl

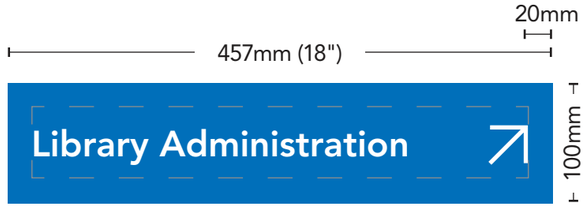
C Arrows; White; Direct print or vinyl; Size relative to signage layout in scale

Use

Directional signs, where the sign can be used to communicate different types of spaces, departments or areas, give users the confidence to navigate spaces intuitively.

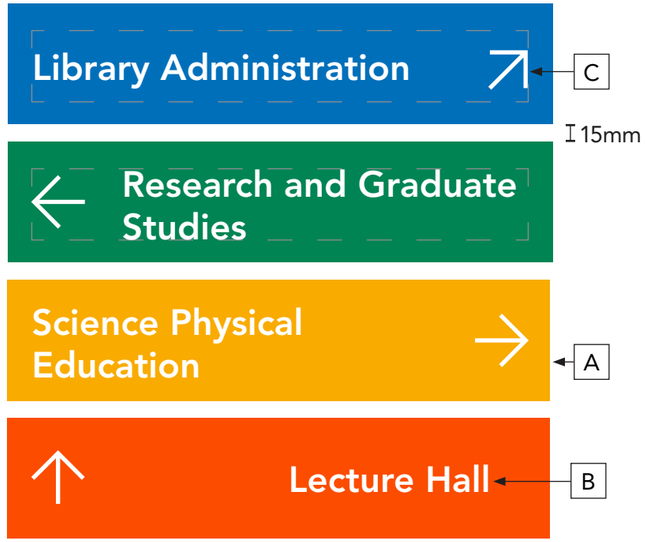
B.23 Directional

MUNnel



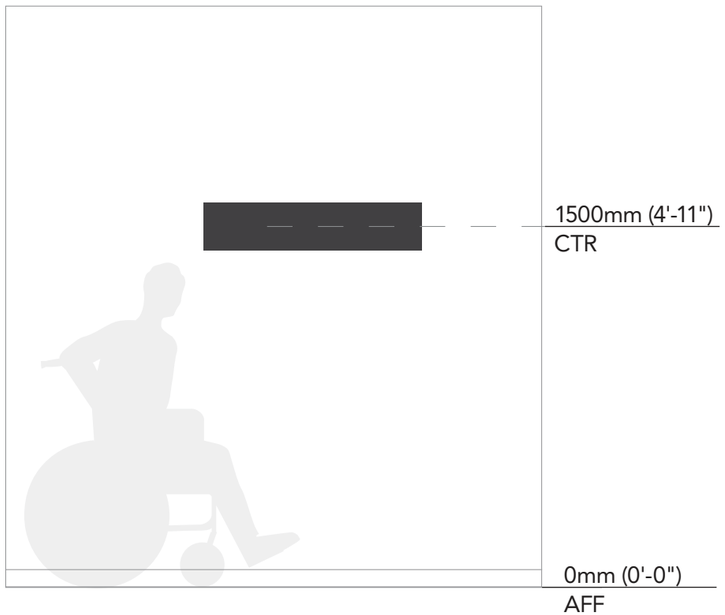
1 **Layout: One Line**
Scale: 1:5

2 **Layout: Two Line**
Scale: 1:5



3 **Layout: MUNnel**
Scale: 1:5

4 **Section**
Scale: 1:5



5 **Elevation**
Scale: 1:25

Description

A 3mm-thick acrylic panel; Charcoal colour; or MUNnel colours; Returns to match panel colour; Mounted to wall surface securely

B Avenir LT Std; 85 Heavy; 22.5mm cap-height; Optical kerning; Tracking (0); Left aligned; white; Direct print or vinyl

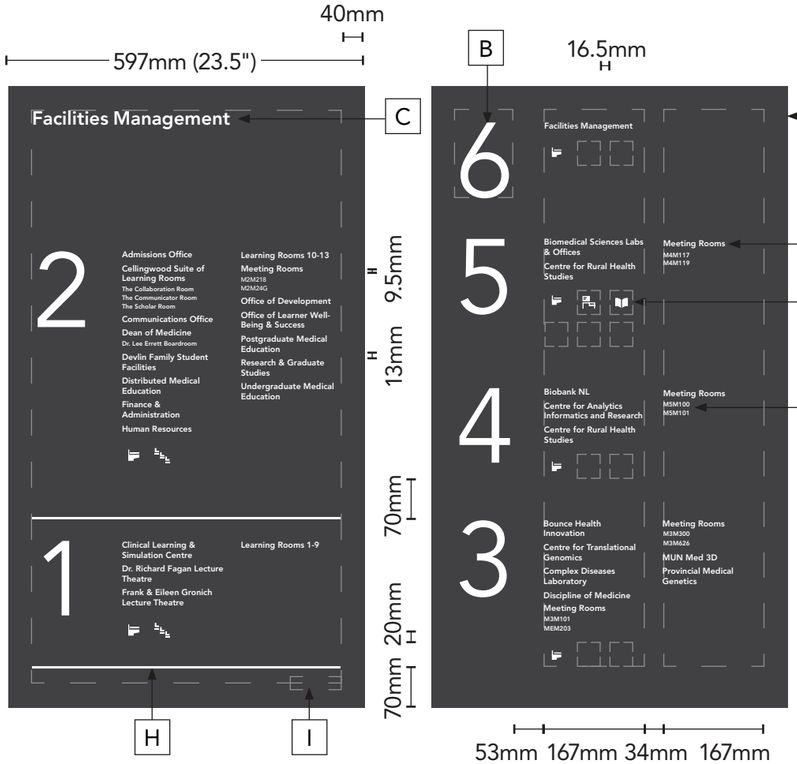
C Arrows; White; Direct print or vinyl; Size relative to signage layout in scale

Use

Directional signs, where the sign can be used to communicate different types of spaces, departments or areas, give users the confidence to navigate spaces intuitively.

B.31 Building Directories

Standard

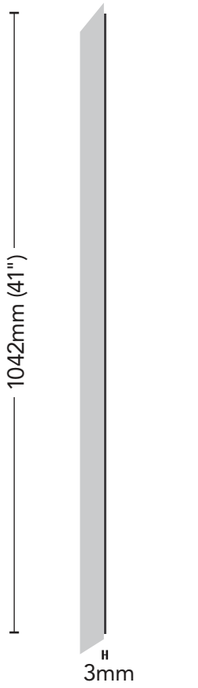


1 **Layout**

Scale: 1:10

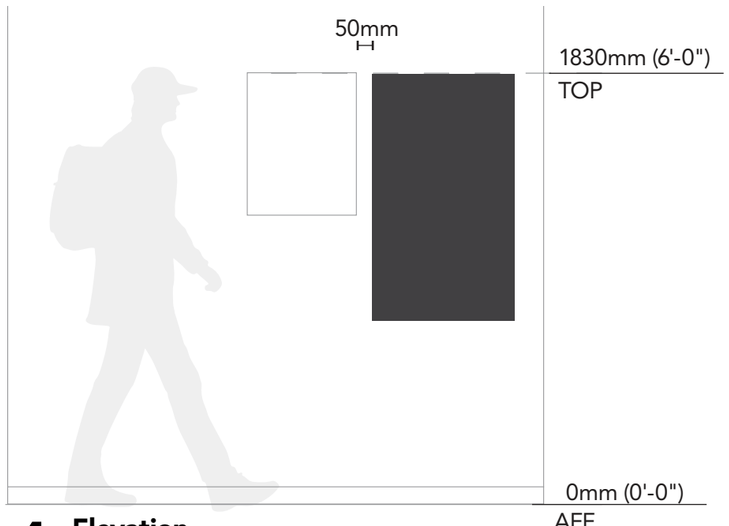
2 **Frame**

Scale: 1:10



3 **Section**

Scale: 1:10



4 **Elevation**

Scale: 1:25

Description

A 3mm-thick acrylic panel; Charcoal colour; Returns to match panel colour; Mounted to wall surface securely

B Avenir LT Std; 45 Book; 108mm cap-height; Optical kerning; Tracking (0); Left aligned; White; Direct print or vinyl

C Avenir LT Std; 85 Heavy; 22.5mm cap-height; Optical kerning; tracking (0); Left aligned; White; Direct print or vinyl

D Avenir LT Std; 85 Heavy; 10mm cap-height; Optical kerning; Tracking (0); Leading 6.5m; Left aligned; White; Direct print or vinyl

E Avenir LT Std; 85 Heavy; 7.5mm cap-height; Optical kerning; Tracking (0); Leading 6.5mm; Left aligned; White; Direct print or vinyl

F Pictogram; White; Direct print or vinyl; Size relative to signage layout in scale

G Poster frame; Black aluminum or similar

H Line indicating floor location; White; Direct print or vinyl

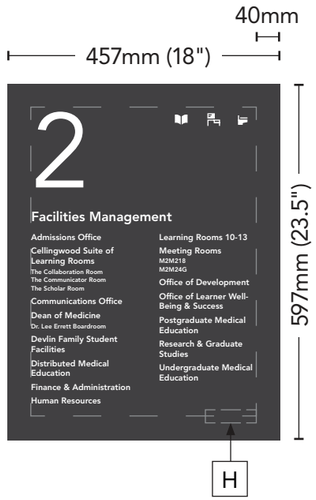
I Logo; White; Direct print or vinyl (future)

Use

Directories, where the sign can be used to communicate different types of spaces, departments or areas located in each floor, give users the confidence to navigate spaces intuitively.

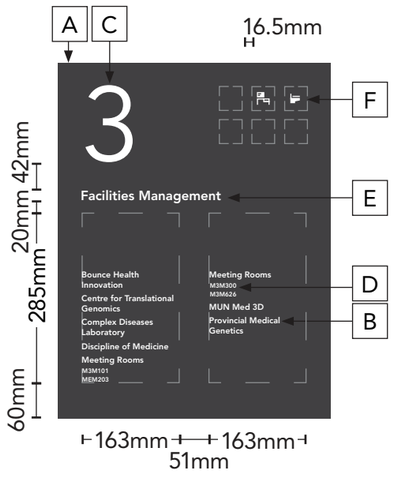
B.32 Floor Directories

Standard



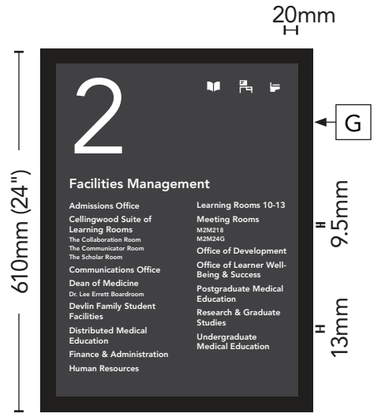
1 Layout

Scale: 1:10



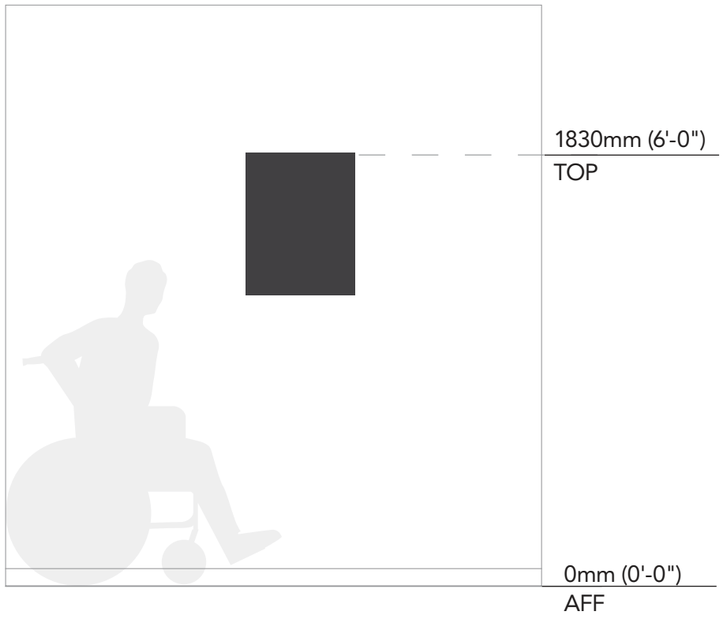
2 Frame

Scale: 1:10



3 Section

Scale: 1:10



4 Elevation

Scale: 1:25

Description

A — 3mm-thick acrylic panel; Charcoal colour; Returns to match panel colour; Mounted to wall surface securely

B — Avenir LT Std; 85 Heavy; 10mm cap-height; Optical kerning; Tracking (0); Leading 6.5mm; Left aligned; White; Direct print or vinyl

C — Avenir LT Std; 45 Book; 127mm cap-height; Optical kerning; Tracking (0); Left aligned; White; Direct print or vinyl

D — Avenir LT Std; 85 Heavy; 7.5mm cap-height; Optical kerning; Tracking (0); Leading 6.5mm; Left aligned; White; Direct print or vinyl

E — Avenir LT Std; 85 Heavy; 16mm cap-height; Optical kerning; Tracking (0); Leading 6.5mm; Left aligned; White; Direct print or vinyl

F — Pictograms; White; Direct print or vinyl; Size relative to signage layout in scale

G — Poster frame; Black aluminum or similar; Insert to be printed on white cardstock

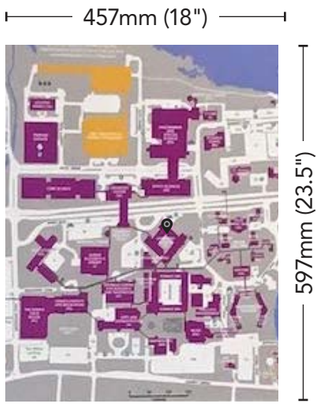
H — Logo; White; Direct print or vinyl (future)

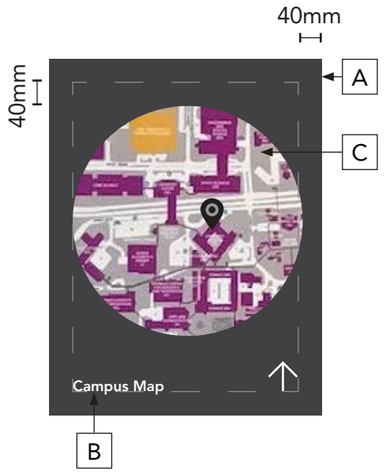
Use

Directories, where the sign can be used to communicate different types of spaces, departments or areas located on each floor, give users the confidence to navigate spaces intuitively.

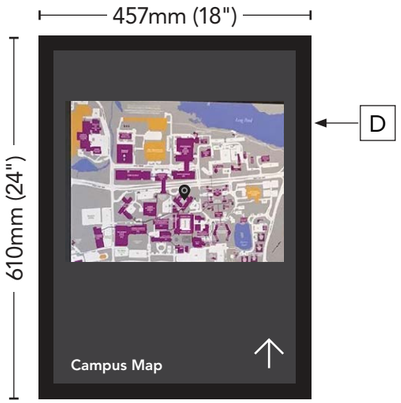
B.41 Maps

Standard



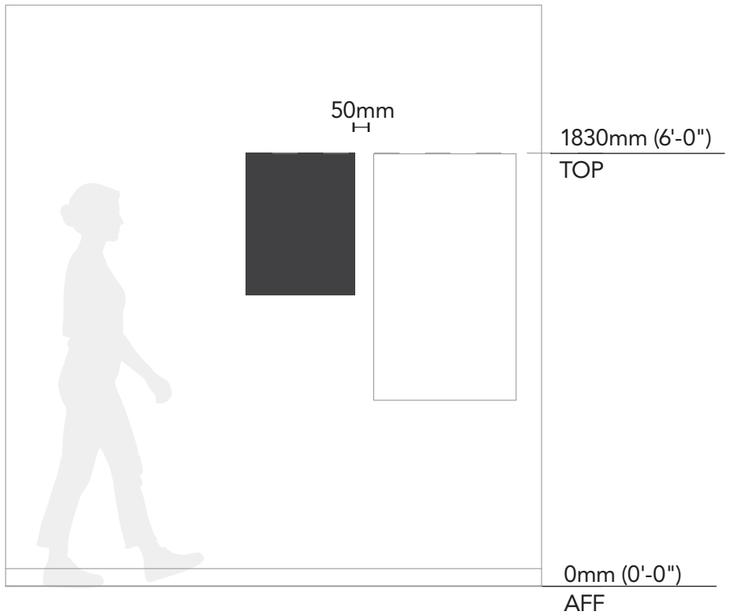


1 Layout
Scale: 1:10



2 Frame
Scale: 1:10

3 Section
Scale: 1:10



4 Elevation
Scale: 1:25

Description

A 3mm-thick acrylic panel; Charcoal colour; Returns to match panel colour; Mounted to wall surface securely

B Avenir LT Std; 85 Heavy; 18mm cap-height; Optical kerning; Tracking (0); Left aligned; White; Direct print or vinyl

C Map; Printed on vinyl or similar

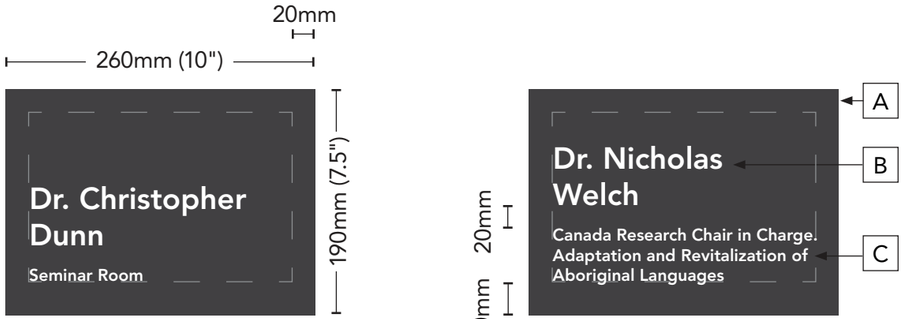
D Poster frame; Black aluminum or similar

Use

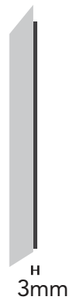
Sign, where a campus map can be used to display exact locations, give users the confidence to navigate intuitively.

C.01 TD & D - A

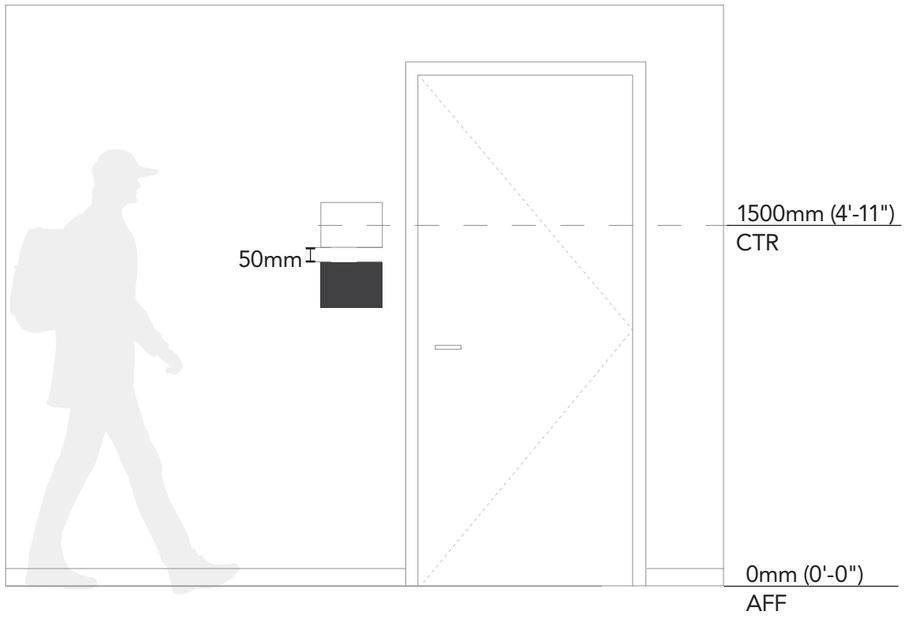
Standard



1 Layout
Scale: 1:5



2 Section
Scale: 1:5



3 Elevation
Scale: 1:25

Description

A 3mm-thick acrylic panel; Charcoal colour; Returns to match panel colour; Mounted to wall surface securely

B Avenir LT Std; 85 Heavy; 18mm cap-height; Optical kerning; Tracking (0); Left aligned; White; Direct print or vinyl

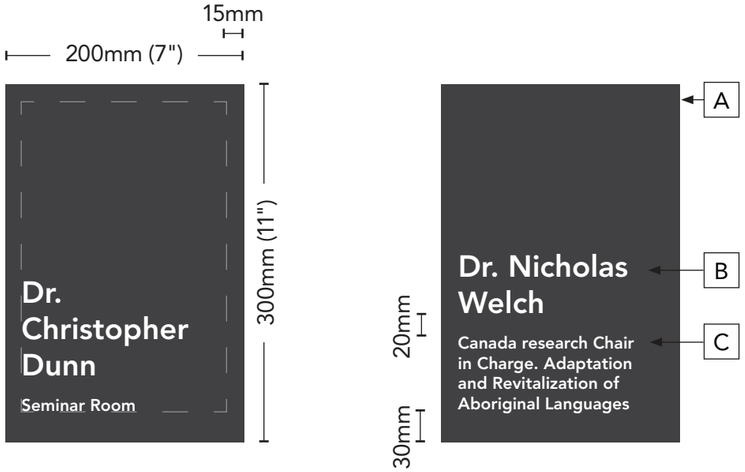
C Avenir LT Std; 85 Heavy; 10mm cap-height; Optical kerning; Tracking (0); Left aligned; White; Direct print or vinyl

Use

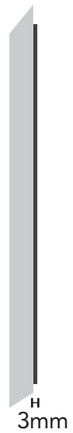
Title, dedication and donor signs can be used to acknowledge distinguished and important, faculty, staff projects, or historic accomplishments.

C.02 TD & D - B

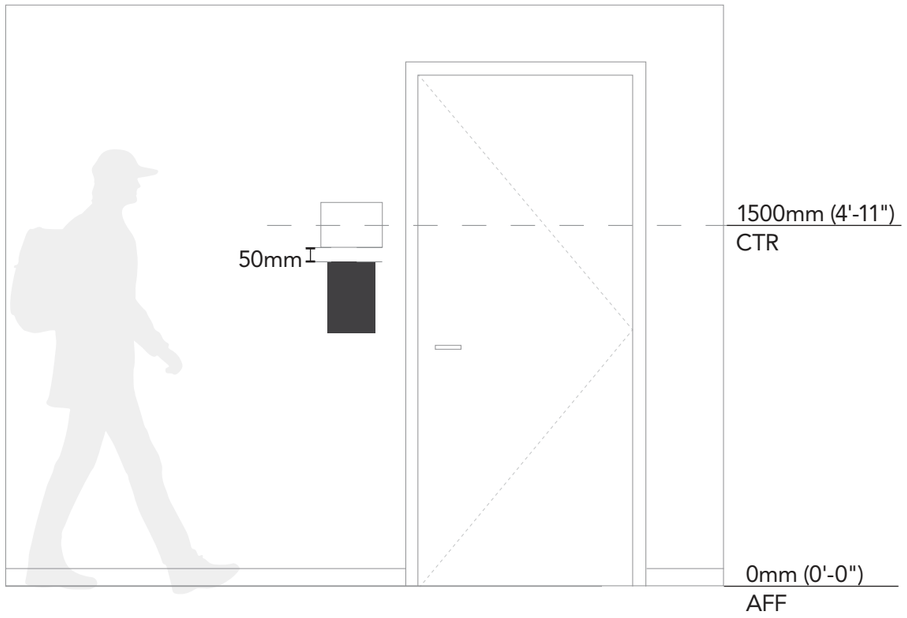
Portrait



1 Layout
Scale: 1:5



2 Section
Scale: 1:5



3 Elevation
Scale: 1:25

Description

A 3mm-thick acrylic panel; Charcoal colour; Returns to match panel colour; Mounted to wall surface securely

B Avenir LT Std; 85 Heavy; 18mm cap-height; Optical kerning; Tracking (0); Left aligned; White; Direct print or vinyl

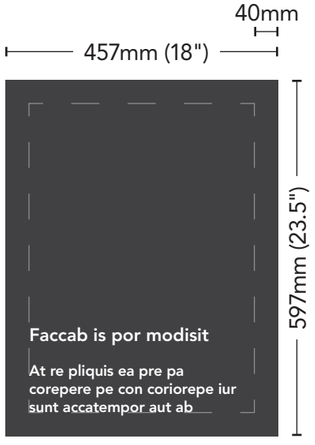
C Avenir LT Std; 85 Heavy; 10mm cap-height; Optical kerning; Tracking (0); Left aligned; White; Direct print or vinyl

Use

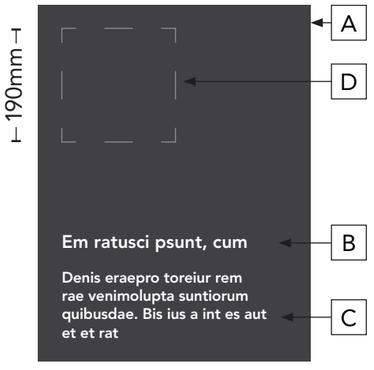
Title, dedication and donor signs can be used to acknowledge distinguished and important, faculty, staff projects, or historic accomplishments.

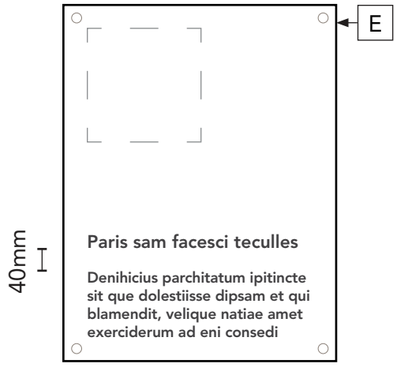
C.03 Donor

Portrait



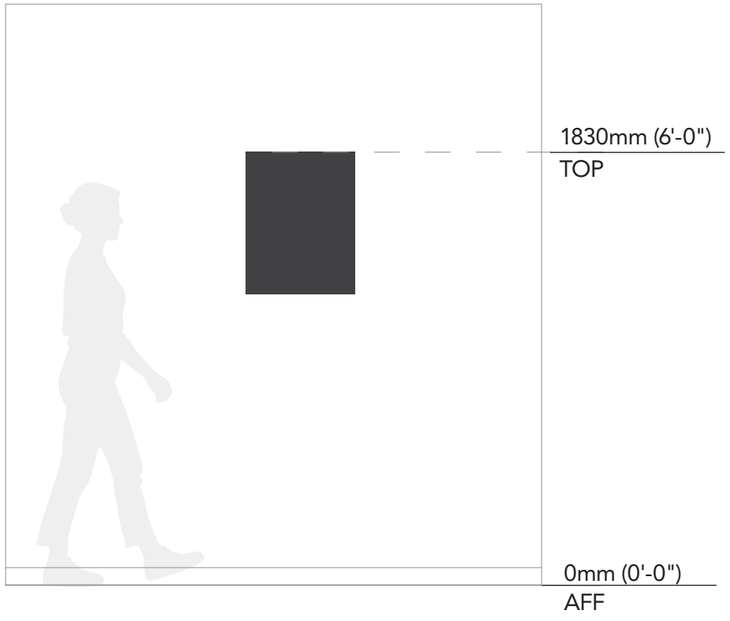
1 **Layout**
Scale: 1:10





2 **Layout: Glass**
Scale: 1:10

3 **Section**
Scale: 1:10



4 **Elevation**
Scale: 1:25

Description

A 3mm-thick acrylic panel; Charcoal colour; Returns to match panel colour; Mounted to wall surface securely

B Avenir LT Std; 85 Heavy; 22.5mm cap-height; Optical kerning; Tracking (0); Left aligned; White or black; Direct print or vinyl

C Avenir LT Std; 85 Heavy; 18mm cap-height; Optical kerning; Tracking (0); Left aligned; White or black; Direct print or vinyl

D Photography; Direct print or vinyl; color to be defined by Office of Development

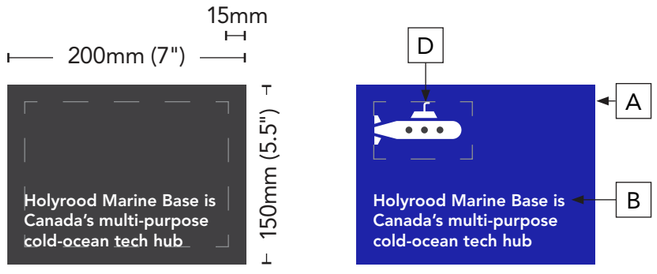
E 2.4mm glass panel; Mounted to wall surface securely with standoffs

Use

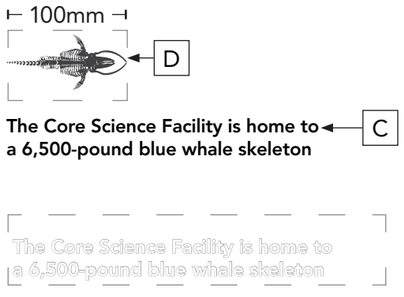
Donor signs can be used to acknowledge, reward and recognize donors, their accomplishments and encourage prospective ones. For further details confirm with the Office of Development.

C.1 Infographics

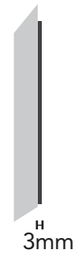
Info



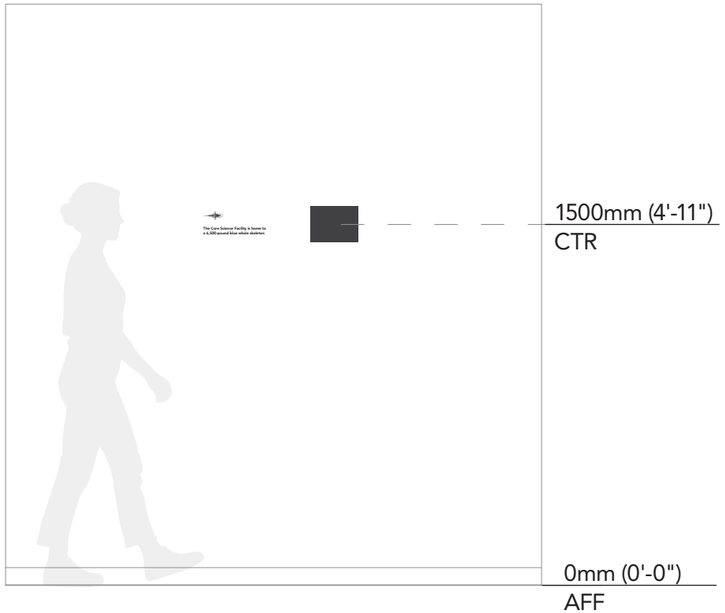
1 Layout
Scale: 1:5



2 Layout: Vinyl
Scale: 1:5



3 Section
Scale: 1:5



4 Elevation
Scale: 1:25

Description

A — 3mm-thick acrylic panel; colour to change per sign; Returns to match panel colour; Mounted to wall surface securely

B — Avenir LT Std; 85 Heavy; 10mm cap height; Optical kerning; Tracking (0); Left aligned; White

C — Avenir LT Std; 85 Heavy; 12mm cap height; Optical kerning; Tracking (0); Left aligned; Charcoal (White if needs contrast); Die-cut vinyl

D — Pictogram; White (Charcoal if needs contrast); Direct print or die-cut vinyl; Size relative to signage layout in scale

Use

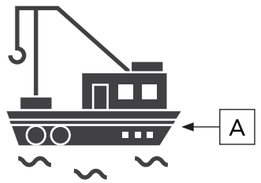
Infographics, as a way to showcase MUN's extensive history and culture. These are specific moments of discovery that educate users and can have a wayfinding purpose.

C.1 Infographics

Graphics

1 **Lobster**
Scale: NTS

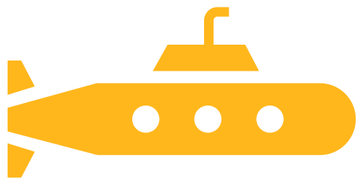
2 **Whale**
Scale: NTS



3 **Fishing Boat**
Scale: NTS

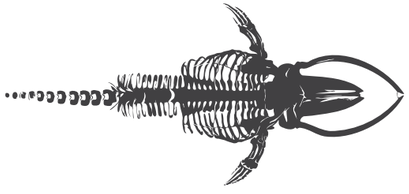
4 **Sea-Hawk**
Scale: NTS

5 **Scuba Diver**
Scale: NTS

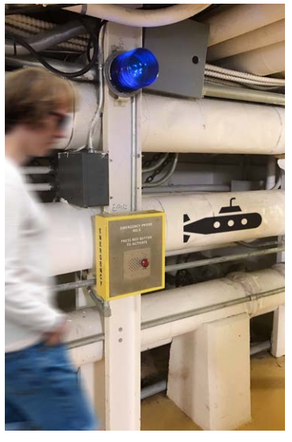


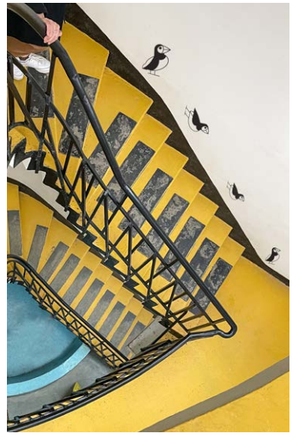
6 **Submarine**
Scale: NTS

7 **Puffins**
Scale: NTS



8 **CSF Whale**
Scale: NTS





Description

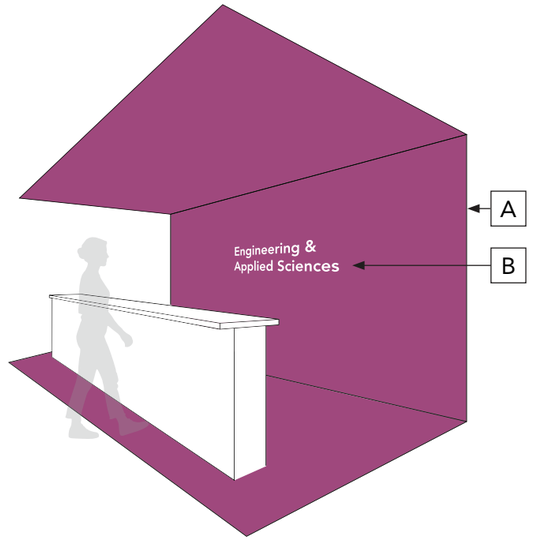
A Die-cut vinyl decal; Charcoal or colour of choice; Size to be defined depending on the specific location

Use

Infographics, as a way to showcase MUN's extensive history and culture. These are specific moments of discovery that educate users and can have a wayfinding purpose.

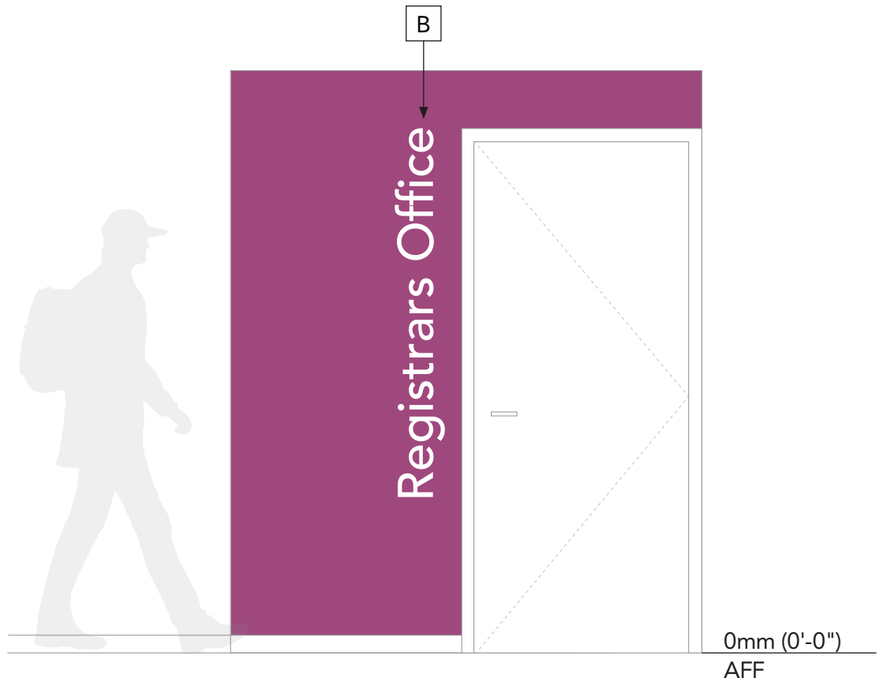
C.2 Surface Colour

Paint



1 Axonometrics

Scale: NTS



2 Elevation

Scale: 1:25

Description

A Painted wall, ceiling and/or floor with the Facilities Management Palette Colour that corresponds to the specific department

B Refer to Sign Type B.03 for text specifications

Use

Surface colours used as a background to recognize and identify the entry of a specific department or area and can have a wayfinding purpose.

Facilities Management Palette

Benjamin Moore
Starry Night Blue
2067-20

Benjamin Moore
Pre-Dawn Sky
2075-30

Benjamin Moore
Yellow Flash
2021-10

Benjamin Moore
Neon Red
2087-10

Benjamin Moore
New Lime
2025-30

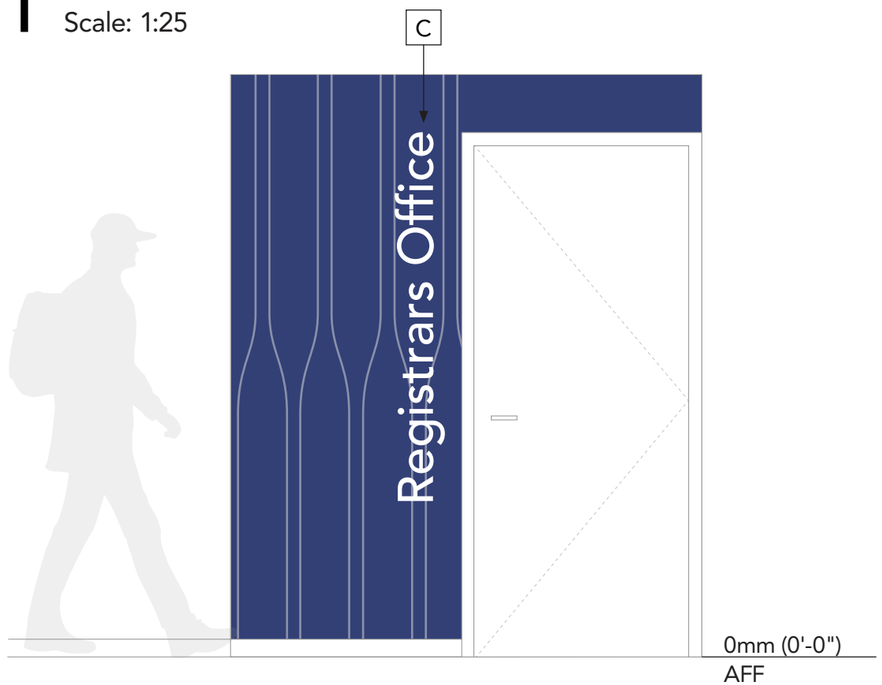
Benjamin Moore
Naples Blue
2057-30

C.2 Surface Graphics

Wallcovering

1 **Elevation**

Scale: 1:25



2 **Elevation: Entry**

Scale: 1:25

Description

A DreamScape wall covering or similar; finish to have a durable dry wall quality; installed with no visible seams; artwork to be requested

B All wall edges to have J-bead guards from floor to ceiling when not butted up against another wall

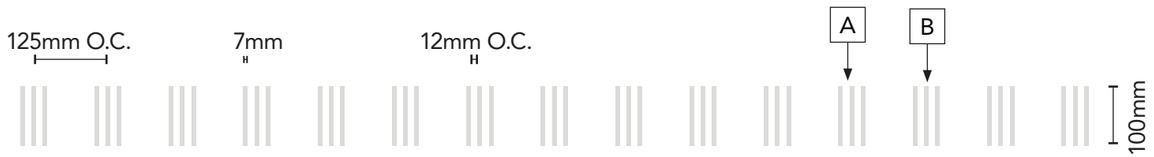
C Refer to Sign Type B.03 for text specifications

Use

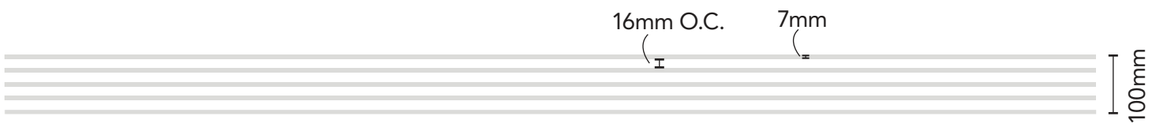
Surface graphics used to recognize and identify the entry of a specific department or area, this incorporates MUN's brand and culture through custom patterns and can have a wayfinding purpose.

C.30 C.31 Glass Film

Linear



1 **Layout: C.30 Strip Vertical**

Scale: 1:10

2 **Layout: C.31 Strip Horizontal**

Scale: 1:10

Description

A Die-cut Polymeric Etch Film or graphic printed in Polymeric Etch Film colour on optically clear vinyl sheet

B Installed on second surface (interior side of glass); Film to be installed with no visible seams

Use

Glass film, required per code, on all glass surfaces. Designs relate to MUN's brand and culture.

C.30, C.31 Glass Film

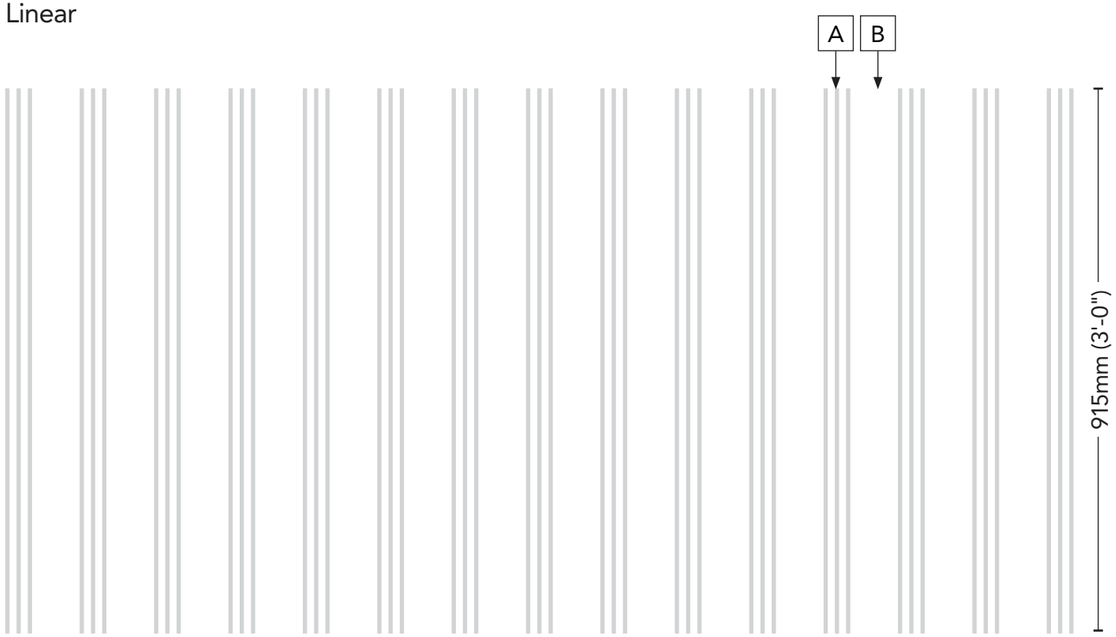
Linear

1 **Elevation: C.30 Strip Vertical**
Scale: 1:25

2 **Elevation: C.31 Strip Horizontal**
Scale: 1:25

C.32, C.33 Glass Film

Linear



1 **Layout: C.32 Band Vertical**
Scale: 1:10

2 **Layout: C.33 Band Horizontal**
Scale: 1:10

Description

A Die-cut Polymeric Etch Film or graphic printed in Polymeric Etch Film colour on optically clear vinyl sheet

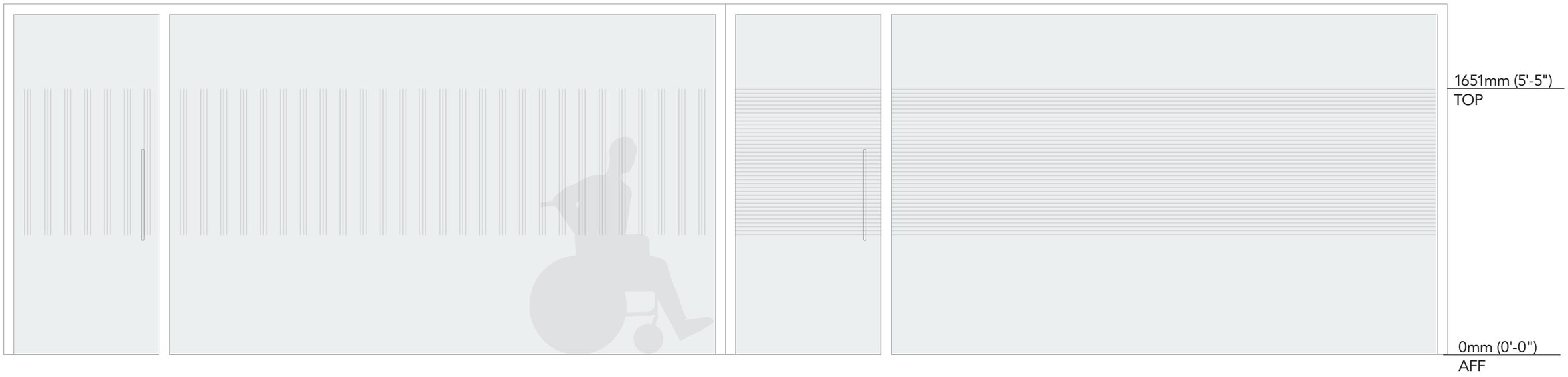
B Installed on second surface (interior side of glass); Film to be installed with no visible seams

Use

Glass film, required per code, on all glass surfaces. Designs relate to MUN's brand and culture.

C.32, C.33 Glass Film

Linear

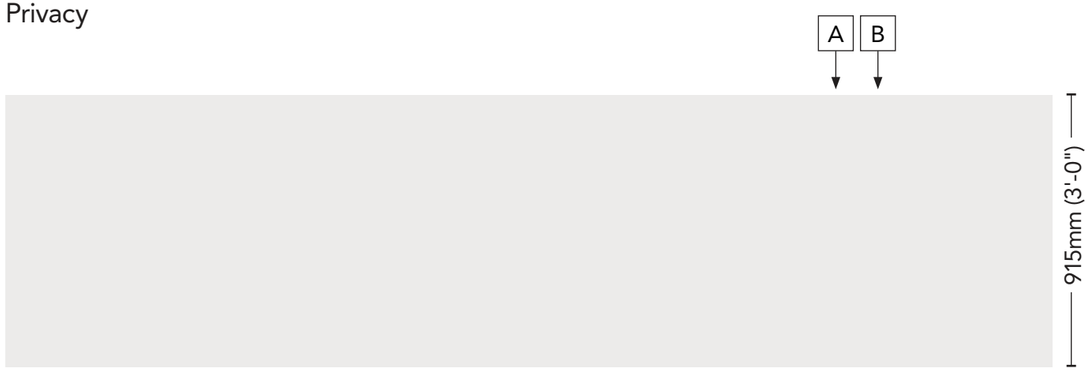


1 **Elevation: C.32 Band Vertical**
Scale: 1:25

2 **Elevation: C.33 Band Horizontal**
Scale: 1:25

C.34, C.35 Glass Film

Privacy



1 **Layout: C.34 Band**
Scale: 1:20

2 **Layout: C.35 Band Gradient**
Scale: 1:20

Description

A Polymeric Etch Film or graphic printed in Polymeric Etch Film colour on optically clear vinyl sheet

B Installed on second surface (interior side of glass); Film to be installed with no visible seams

Use

Glass film, required per code, on all glass surfaces. Designs relate to MUN's brand and culture and these to provide privacy.

C.34, C.35 Glass Film

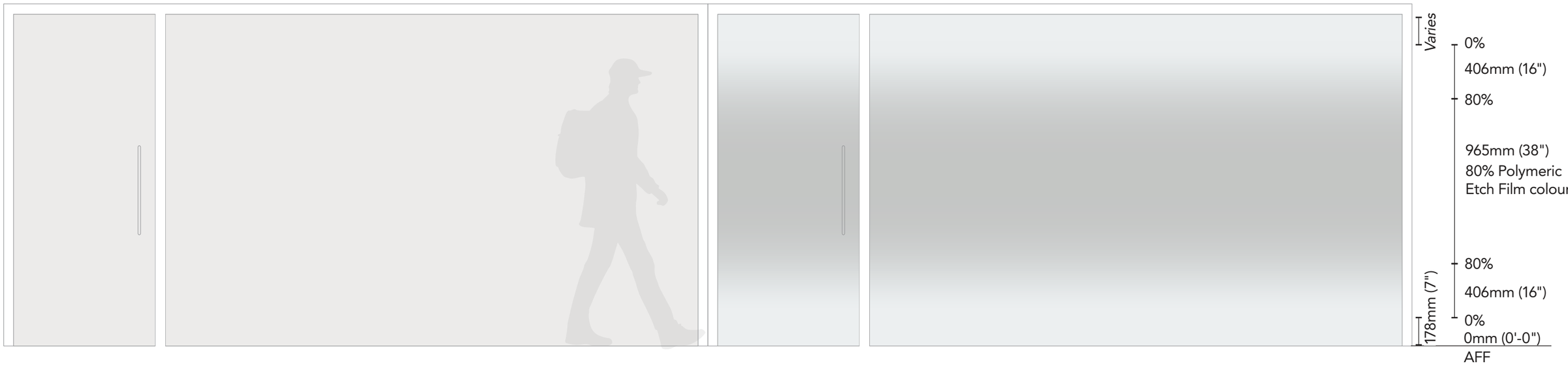
Privacy

1 **Elevation: C.34 Band**
Scale: 1:25

2 **Elevation: C.35 Band Gradient**
Scale: 1:25

C.36, C.37 Glass Film

Privacy



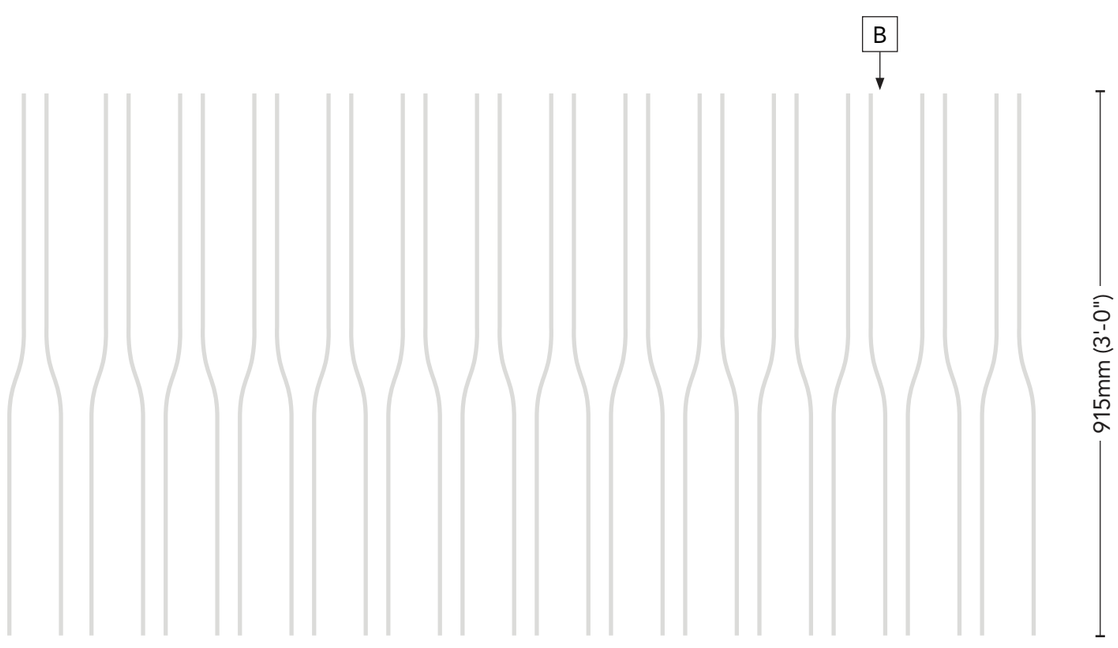
1 **Elevation: C.36 Full**
Scale: 1:25

2 **Elevation: C.37 Full Gradient**
Scale: 1:25

C.38, C.39 Glass Film

Rib

1 **Layout: C.38 Strip**
Scale: 1:10



2 **Layout: C.39 Band**
Scale: 1:10

Description

A Die-cut Polymeric Etch Film or graphic printed in Polymeric Etch Film colour on optically clear vinyl sheet

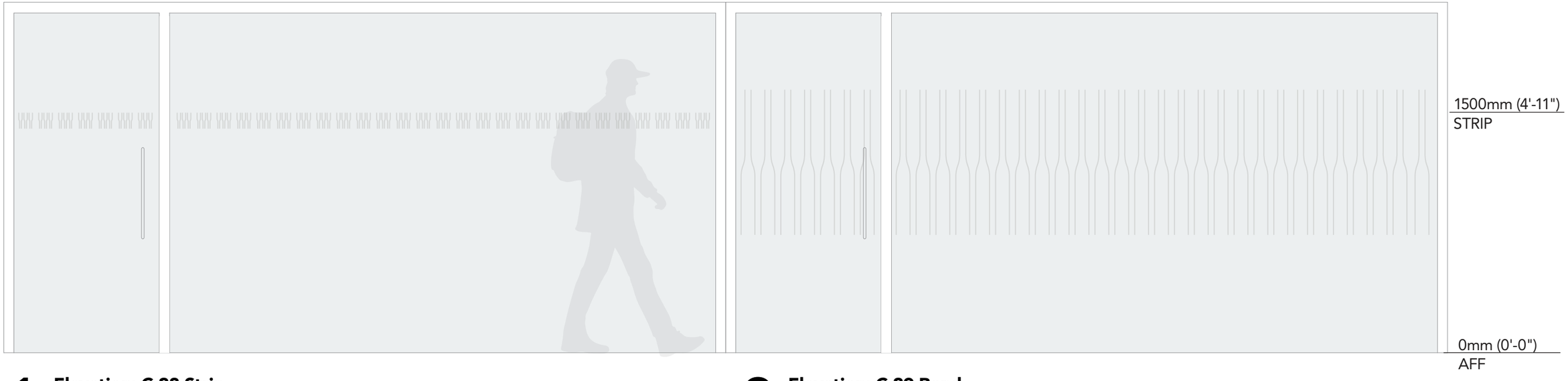
B Installed on second surface (interior side of glass); Film to be installed with no visible seams

Use

Glass film, required per code, on all glass surfaces. Designs relate to MUN's brand and culture.

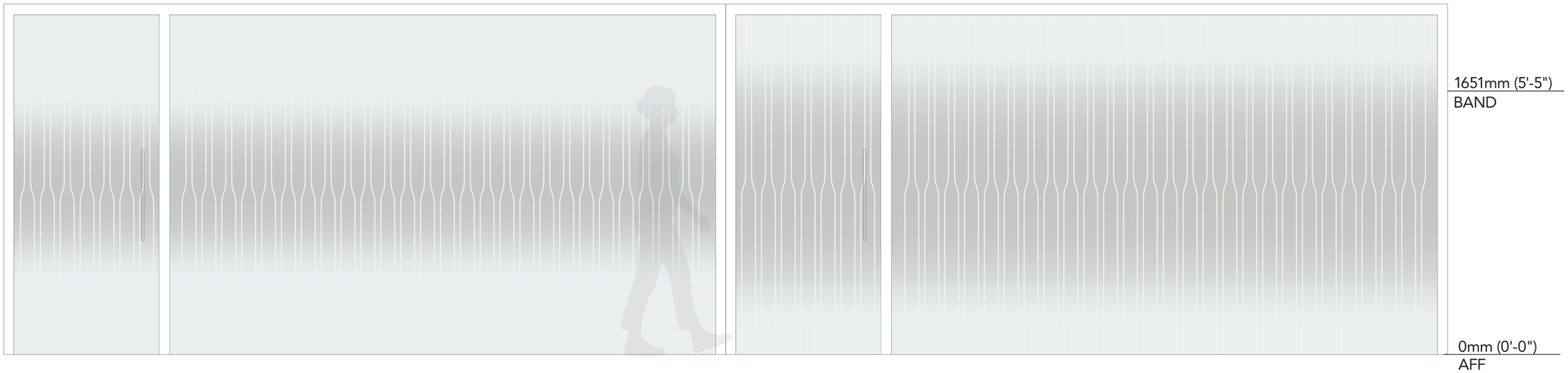
C.38, C.39, C.40, C.41 Glass Film

Rib



1 **Elevation: C.38 Strip**
Scale: 1:25

2 **Elevation: C.39 Band**
Scale: 1:25



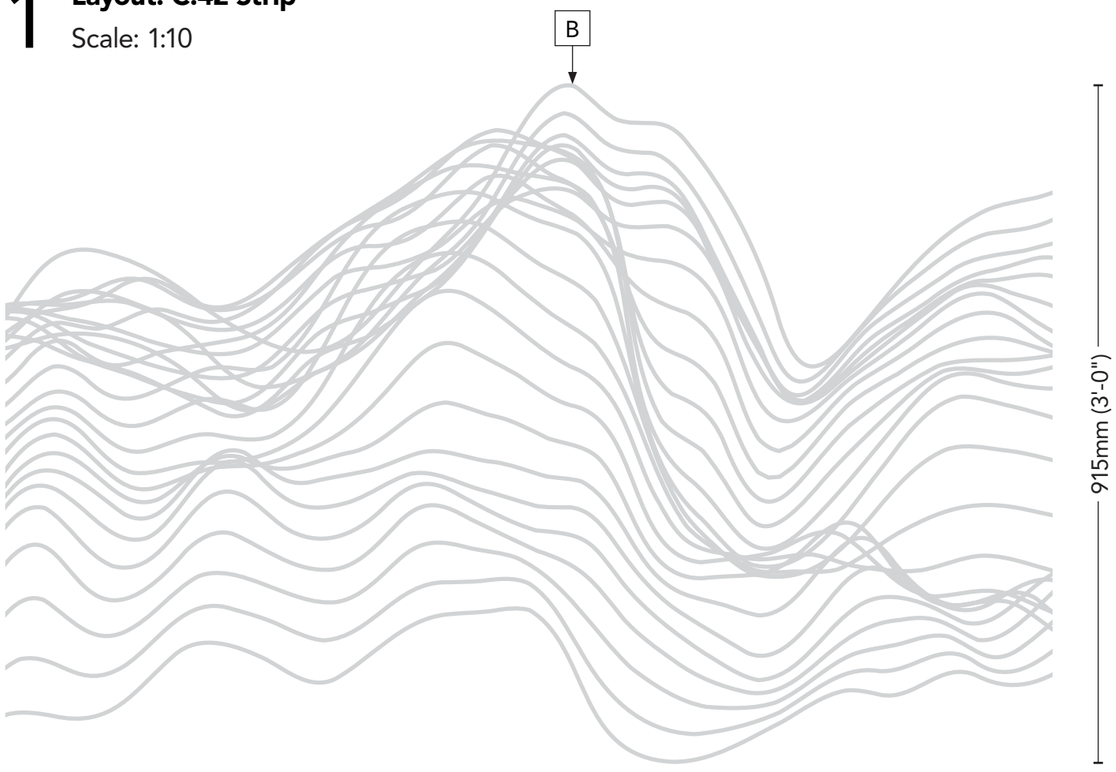
3 **Elevation: C.40 Band Gradient**
Scale: 1:25

4 **Elevation: C.41 Full Gradient**
Scale: 1:25

C.42, C.43 Glass Film

Coast

1 **Layout: C.42 Strip**
Scale: 1:10



2 **Layout: C.43 Band**
Scale: 1:10

Description

A Die-cut Polymeric Etch Film or graphic printed in Polymeric Etch Film colour on optically clear vinyl sheet

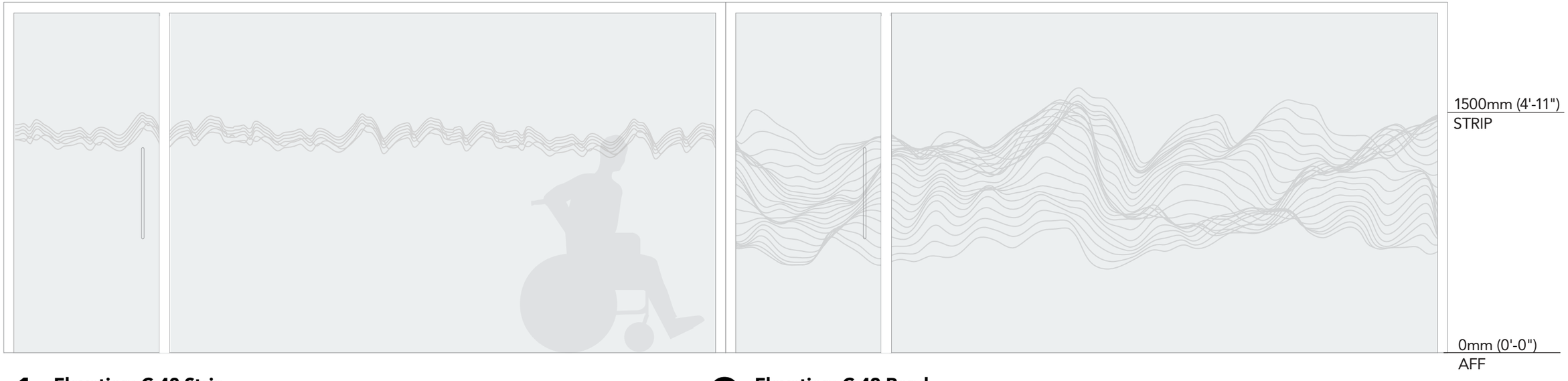
B Installed on second surface (interior side of glass); Film to be installed with no visible seams

Use

Glass film, required per code, on all glass surfaces. Designs relate to MUN's brand and culture.

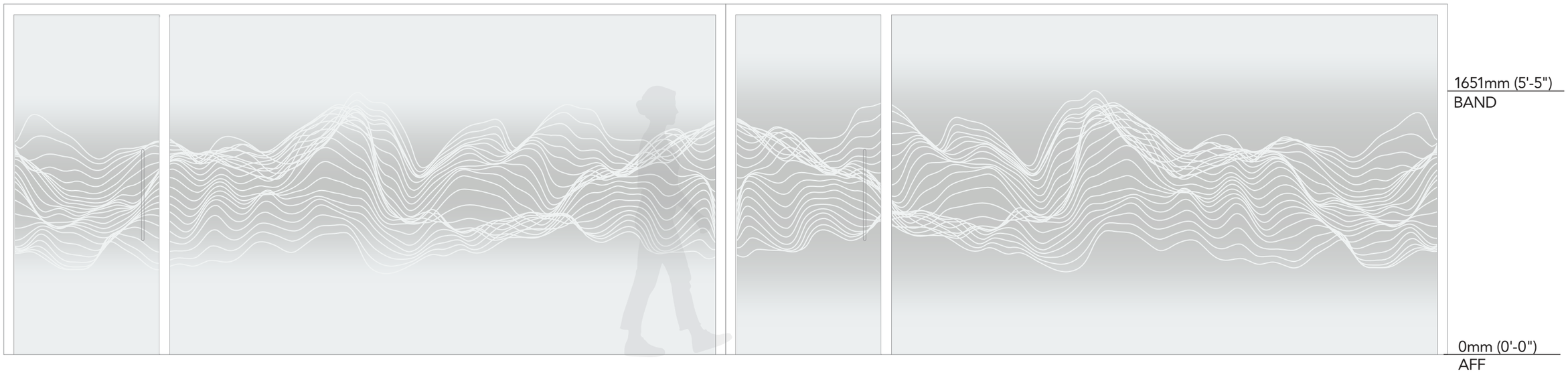
C.42, C.43, C.44, C.45 Glass Film

Coast



1 **Elevation: C.42 Strip**
Scale: 1:25

2 **Elevation: C.43 Band**
Scale: 1:25



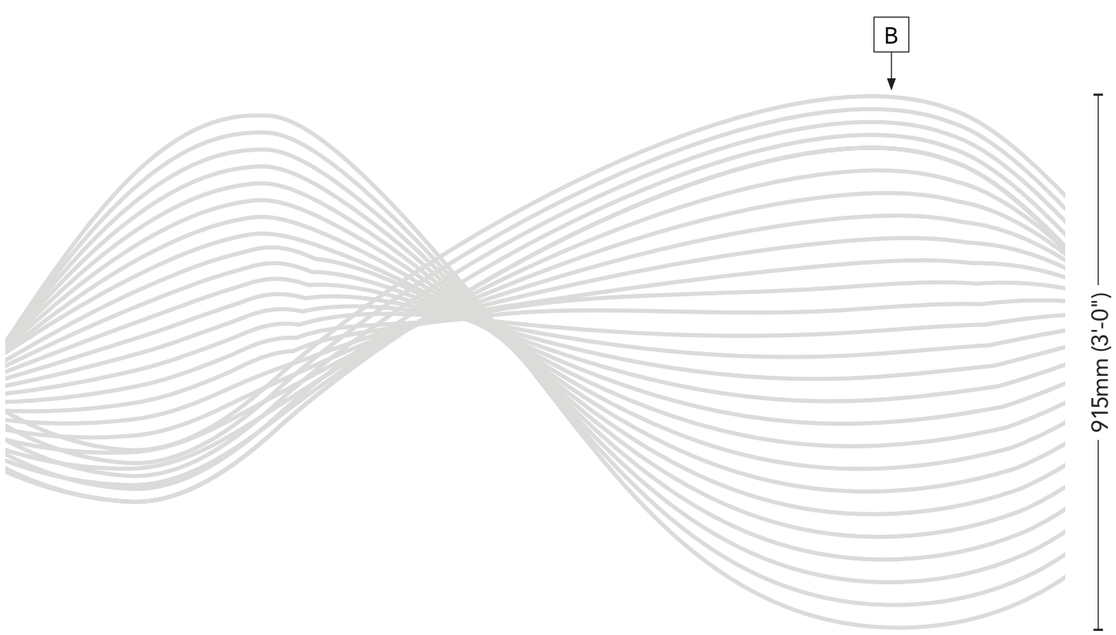
3 **Elevation: C.44 Band Gradient**
Scale: 1:25

4 **Elevation: C.45 Full Gradient**
Scale: 1:25

C.46, C.47 Glass Film

Route

1 **Layout: C.46 Strip**
Scale: 1:10



2 **Layout: C.47 Band**
Scale: 1:10

Description

A Die-cut Polymeric Etch Film or graphic printed in Polymeric Etch Film colour on optically clear vinyl sheet

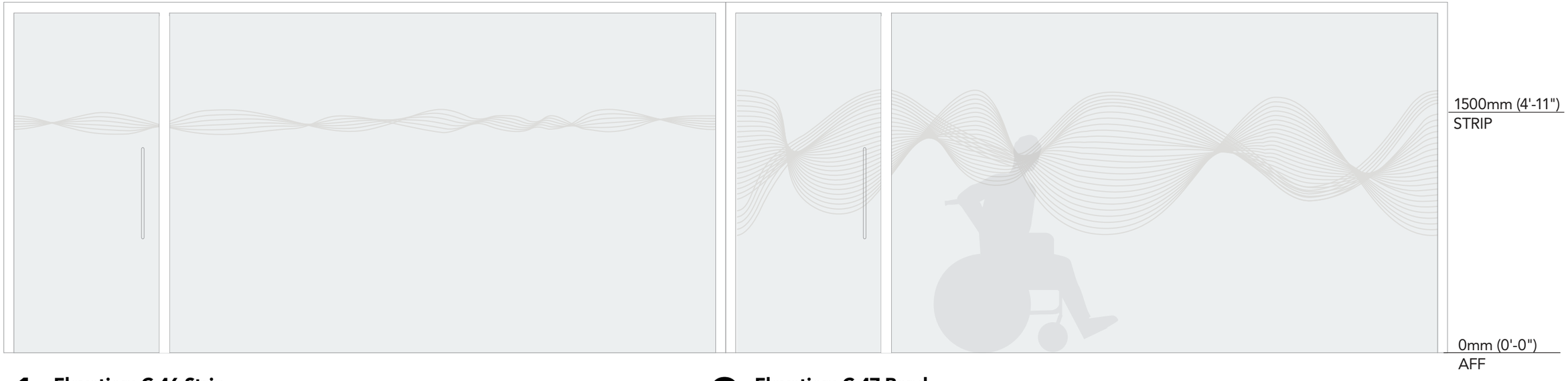
B Installed on second surface (interior side of glass); Film to be installed with no visible seams

Use

Glass film, required per code, on all glass surfaces. Designs relate to MUN's brand and culture.

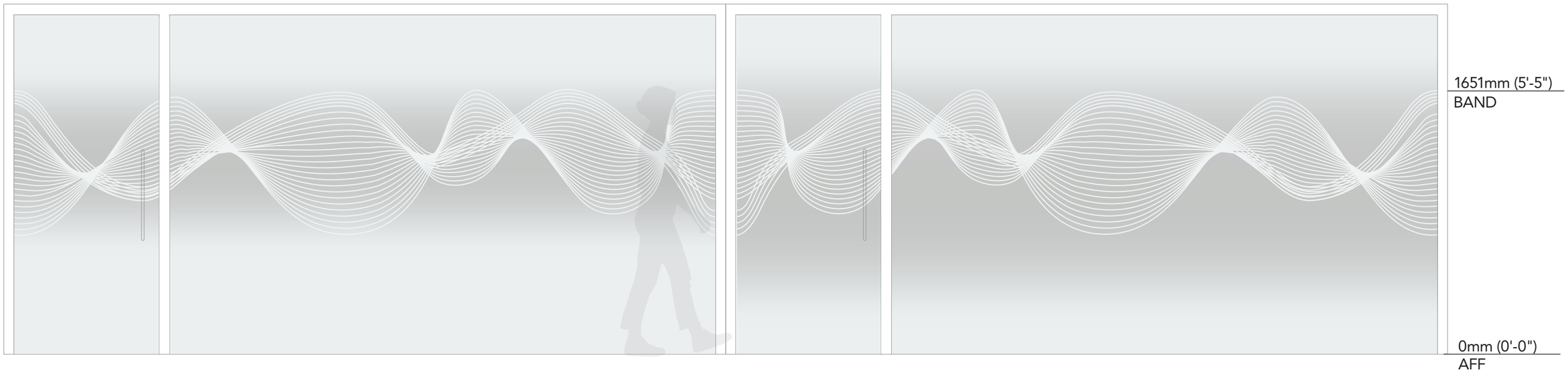
C.46, C.47, C.48, C.49 Glass Film

Route



1 **Elevation: C.46 Strip**
Scale: 1:25

2 **Elevation: C.47 Band**
Scale: 1:25

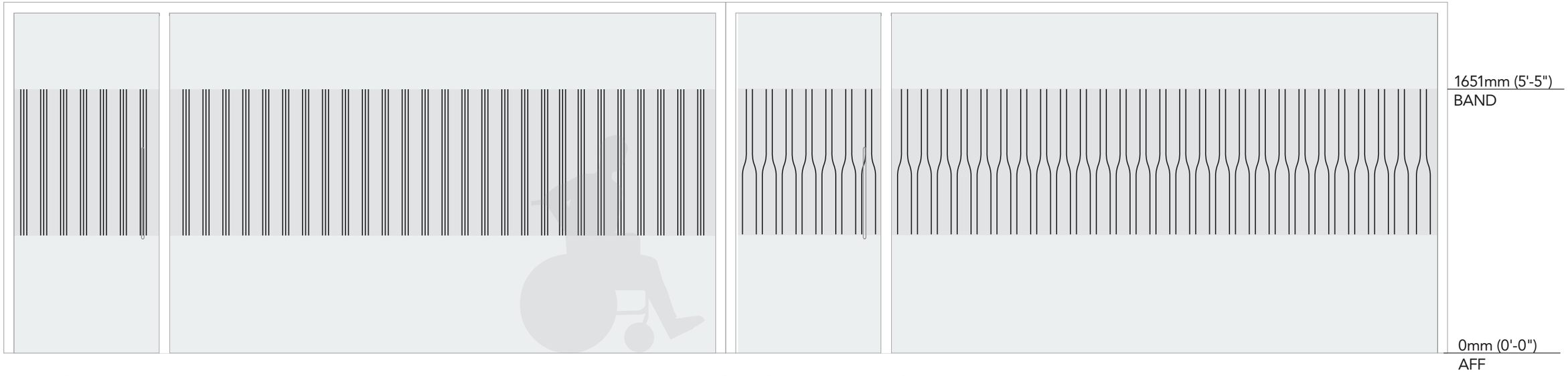


3 **Elevation: C.48 Band Gradient**
Scale: 1:25

4 **Elevation: C.49 Full Gradient**
Scale: 1:25

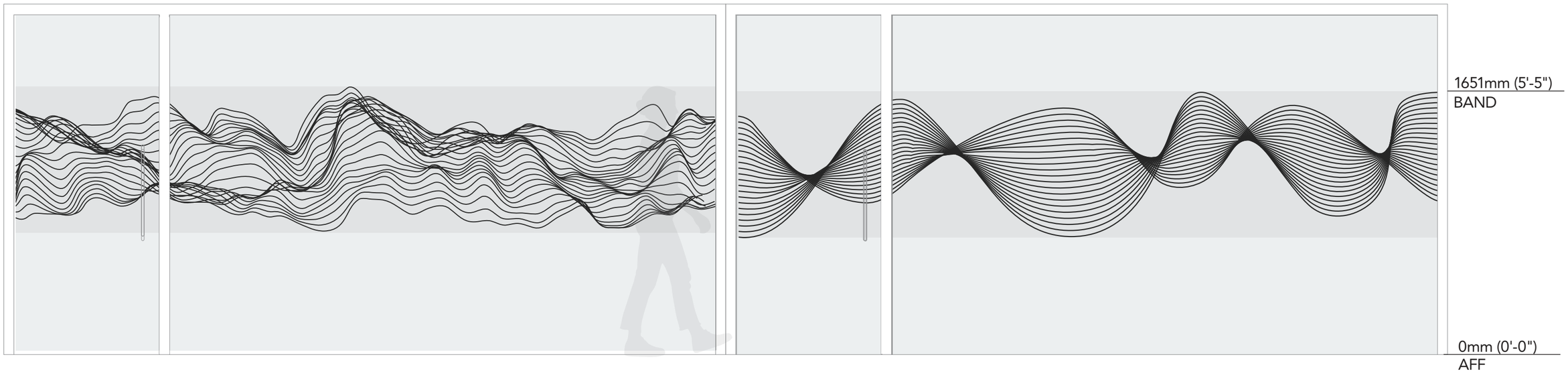
C.50, C.51, C.52, 53 Glass Film

Privacy Black Lines



1 **Elevation: C.50 Linear**
Scale: 1:25

2 **Elevation: C.51 Rib**
Scale: 1:25



3 **Elevation: C.52 Coast**
Scale: 1:25

4 **Elevation: C.53 Route**
Scale: 1:25

Appendix (Future)

Currently not included in
Interior Signage Manual 1.0

Indigenous Pictograms

Pictogram Usage

Pictograms will be a key element to the design as they will have a large impact on the signs from a visual perspective but also from an informational standpoint as these should be universally understood by anyone

*4.5.6.3 Tactile Pictograms and Symbols

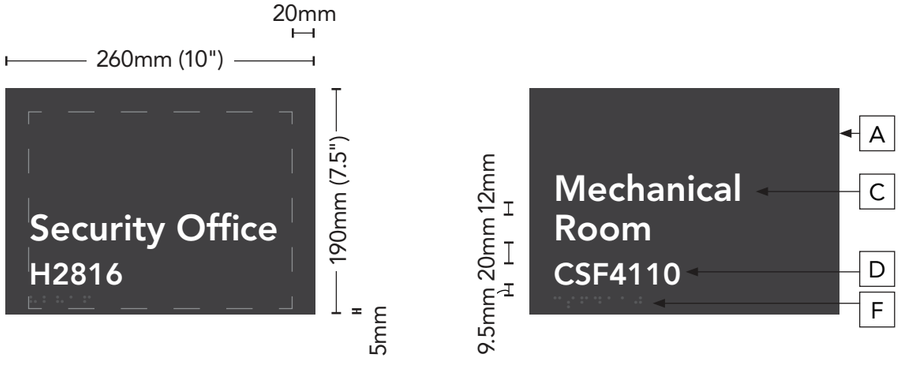
a. Raised between 0.8-1.5mm above surface
b. At least 150mm in height
c. Accompanied by uncontracted braille below pictogram
d. Colour-contrasted with background by at least 70%

Indigenous (Future)

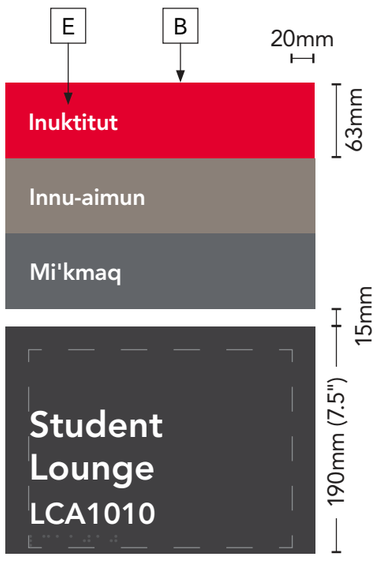
*2023 Canadian Standards Association

Room ID - A

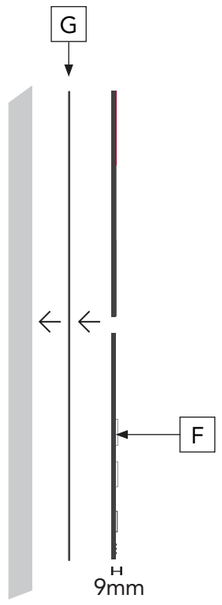
Standard



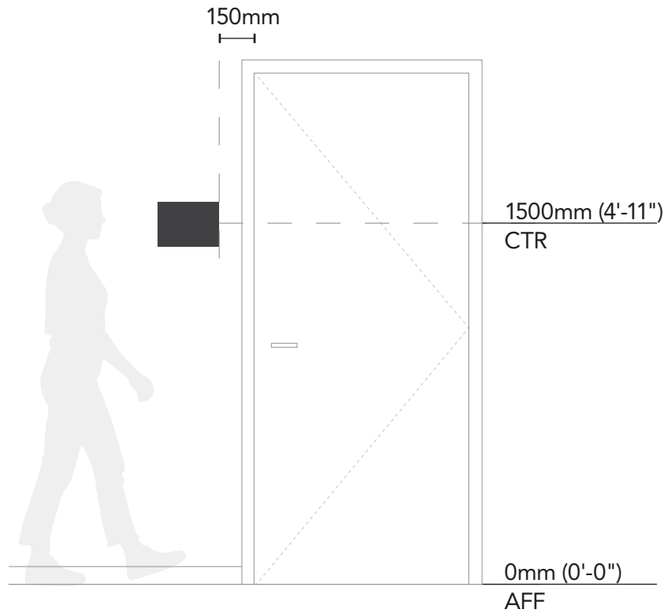
1 Layout
Scale: 1:5



2 Layout: Translations
Scale: 1:5



3 Section
Scale: 1:5



4 Elevation
Scale: 1:25

Description

A — 3mm-thick acrylic panel; Charcoal colour; Returns to match panel colour; Mounted to wall surface securely

B — 3mm-thick acrylic panel; Charcoal colour; Vinyl sticker with translation colour specifications applied to surface of panel; Mounted to wall surface securely

C — Avenir LT Std; 85 Heavy; 22.5mm cap-height; Optical kerning; Tracking (0); Left aligned; White; Raised 0.8mm from panel

D — Avenir LT Std; 85 Heavy; 18mm cap-height; Optical kerning; Tracking (0); Left aligned; White; Raised 0.8mm from panel

E — Avenir LT Std; 85 Heavy; 14mm cap-height; Optical kerning; Tracking (0); Left aligned; White; Direct print or vinyl

F — Braille; 10mm cap-height; Colour to match panel; Raised 0.8mm from panel; Message to include both room name and room number

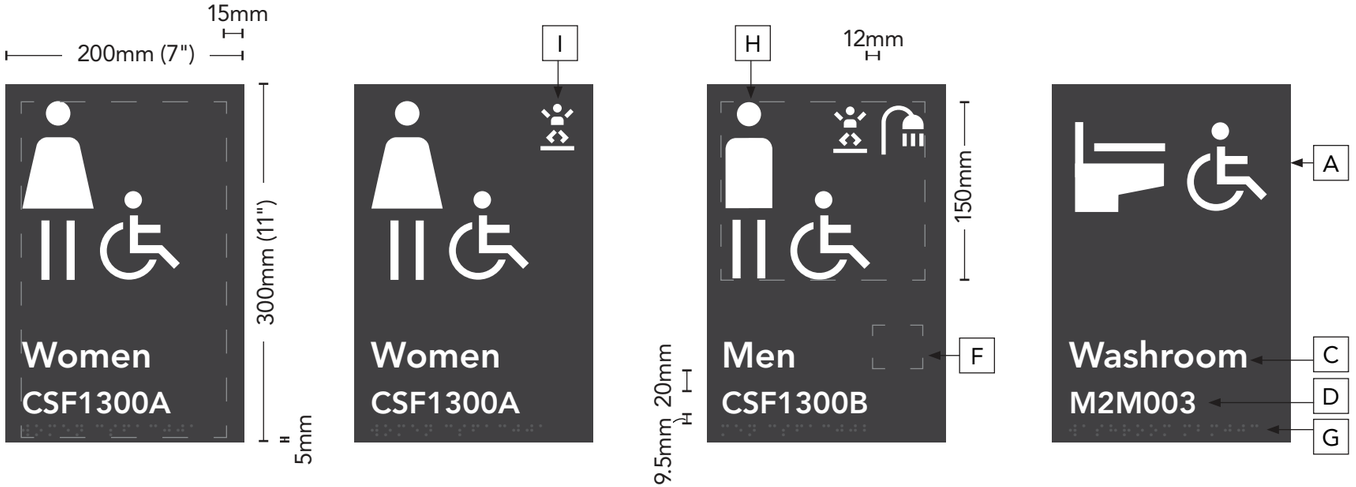
G — When mounted to glass surface, vinyl backer to be applied to same side of glass as sign to hide adhesive; Backer to match sign colour

Use

Sign for standard room identification with a fixed use, ie. Custodial Room, Security Office. Translations can be included at special request and are to be coordinated with the Office of Indigenous Affairs.

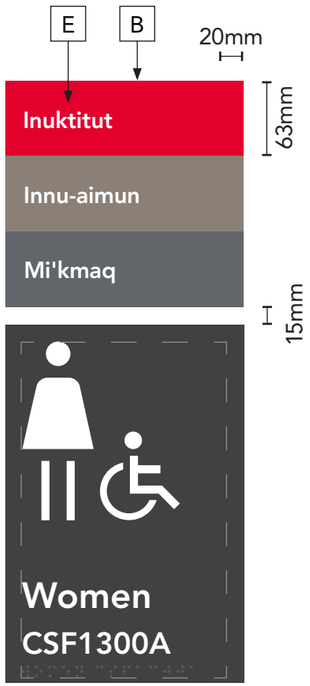
Room ID - B

Restroom



1 Layout

Scale: 1:5

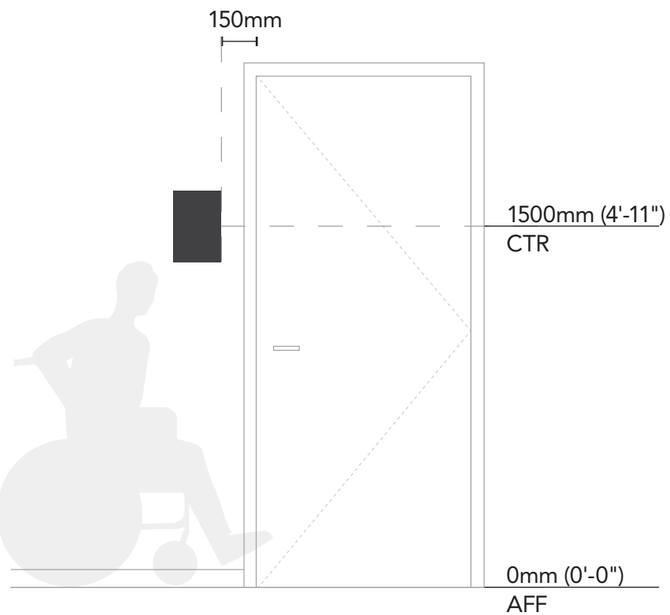


2 Layout: Translations

Scale: 1:5

3 Section

Scale: 1:5



4 Elevation

Scale: 1:25

Description

A — 3mm-thick acrylic panel; Charcoal colour; Returns to match panel colour; Mounted to wall securely

B — 3mm-thick acrylic panel; Charcoal colour; Vinyl sticker with translation colour specifications applied to surface of panel; Mounted to wall surface securely

C — Avenir LT Std; 85 Heavy; 22.5mm cap-height; Optical kerning; Tracking (0); Left aligned; White; Raised 0.8mm from panel

D — Avenir LT Std; 85 Heavy; 18mm cap-height; Optical kerning; Tracking (0); Left aligned; White; Raised 0.8mm from panel

E — Avenir LT Std; 85 Heavy; 14mm cap-height; Optical kerning; Tracking (0); Left aligned; White; Direct print or vinyl

F — Avenir LT Std; 65 Medium; 7.5mm cap-height; Optical kerning; Tracking (0); Left aligned; White; Direct print or vinyl; (future)

G — Braille; 10mm cap-height; Colour to match panel; Raised 0.8mm from panel; Message to include both room name and room number

H — Pictogram; White; Raised 0.8mm from panel; Size relative to signage layout in scale

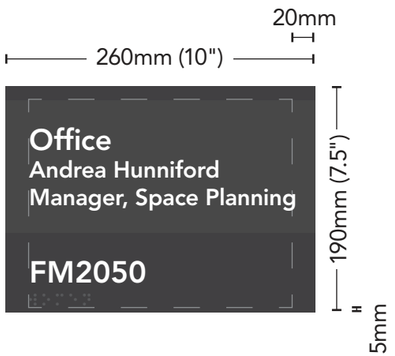
I — Pictogram; White; Direct print or vinyl; Size relative to signage layout in scale

Use

Sign for public amenity rooms, including pictogram, permanent description, braille translations, ie. stairs, washrooms.

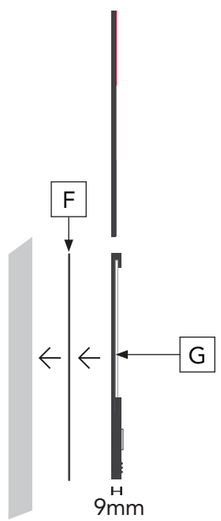
Room ID with Insert - A

Standard

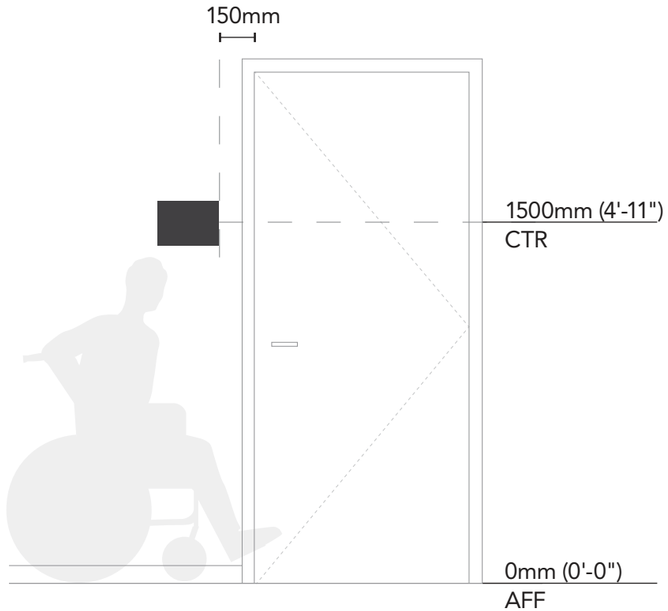


1 **Layout**
Scale: 1:5

2 **Layout: Translations**
Scale: 1:5



3 **Section**
Scale: 1:5



4 **Elevation**
Scale: 1:25

Description

A — 9mm-thick acrylic panel; Charcoal colour; Returns to match panel colour; Mounted to wall surface securely

B — 3mm-thick acrylic panel; Charcoal colour; Vinyl sticker with translation colour specifications applied to surface of panel; Mounted to wall surface securely

C — Avenir LT Std; 85 Heavy; 18mm cap-height; Optical kerning; Tracking (0); Left aligned; White; Raised 0.8mm from panel (not on inserts)

D — Avenir LT Std; 85 Heavy; 14mm cap-height; Optical kerning; Tracking (0); Left aligned; White; Printed

E — Braille; 10mm cap-height; Colour to match panel; Raised 0.8mm from panel

F — When mounted to glass surface, vinyl backer to be applied to same side of glass as sign to hide adhesive; Backer to match sign colour

G — White cardstock insert printed with background to match panel

Use

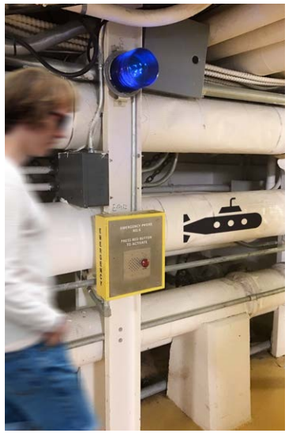
Sign for offices and small meeting room identification, where a paper insert is used to identify the room type, perhaps the occupant, and capacity description, all as per the insert template.

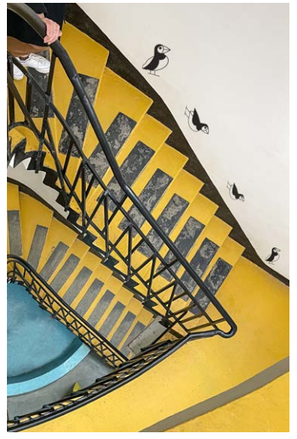
Infographics

Graphics

1 **Indigenous (future)**

Scale: NTS





Description

A Die-cut vinyl decal; Charcoal or colour of choice; Size relative to signage layout in scale

Use

Use of Indigenous infographics and symbols are to be coordinated with the Office of Indigenous Affairs.

APPENDIX G – MUNET SPECIFICATION

REVISION B – 19 MARCH 1997

MUNet Specification

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1. Overview

1.1 General

The objective of this document is to provide a framework for incorporating changes to the MUNet Cable Plant. These changes will include drop additions, drop removals and drop moves.

Changes to the MUNet Cable Plant must be incorporated in a controlled manner in order to maintain the integrity of the cable plant on an on-going basis. Items to be addressed include:

- conduit materials & installation
- raceway materials & installation
- cable tray materials & installation
- utility column materials & installation
- data cabling materials & installation
- data closet arrangements
- testing
- documentation
- labelling

New buildings and major renovations of telecommunications spaces and pathways are beyond the scope of this document but should conform to CAN/CSA T530. In cases of renovations in historic or otherwise restrictive buildings, where it is impossible to follow the aforementioned guidelines, the exceptions must not modify the maximum distances set forth in CAN/CSA T529 and must not in any way affect the performance of the cabling system. Modification to these issues require written approval from purchaser and certifying manufacturer.

1.2 Notice

The MUNet Data Network is an operational, campus wide, high performance computer network used by the entire Memorial University community - faculty, staff and students. The objective of this document is to address Moves, Adds and Changes to the Physical Cable Plant for the MUNet Data Network.

It is critical that all personnel involved with both the Design and Installation effort addressed by this document take the necessary care and attention to ensure that network operation is not impacted by any of their activities. All work must be coordinated with both the Computing & Communications and Facilities Management Departments of the University.

All work must be approved by the Computing & Communications Department of the University.

1.3 Description of Work

Work is defined on drawings and includes but is not limited to:

- Supply, installation, removal of data cabling conduit system.
- Supply, installation, removal, testing and documentation of NORDX/CDT IBDN Data Cabling for the MUNet Data Network at Memorial University of Newfoundland. This includes moves, adds and deletions of data drops.
- Products include cabling, faceplates, patch panels, interbay panels

All work necessary for the completion of the work whether shown or not on the drawings shall be part of the contract.

1.4 Quality Assurance

1.4.1 Qualification of Vendor

The Customer shall be referred to as the purchaser.

The successful bidder shall be referred to as the Vendor. The installer shall be either employees of the vendor or subcontractors.

Manufacturer refers to the company that manufactures the components and is responsible for the design and installation guidelines used by the vendor to complete this cabling system installation. The manufacturer along with the vendor is responsible for the final warranty and certification of the application assurance.

The vendor shall show proof of a contractual relationship with the manufacturer, and shall pass through the manufacturer's certification to purchaser.

All cabling, termination hardware, and connecting cords shall be sourced from the certifying manufacturer to assure quality control and validity of the manufacturer's warranty.

The vendor, will accept complete responsibility for the design, installation, certification, and support of the cabling system. Vendor must show proof that vendor has the certifying manufacturer's support on all of these issues.

In the event that subcontractors are used for any portion of the work or technical support, the customer will look to the vendor for all corrective action.

All work shall be performed and supervised by telecommunications technicians and project managers who are qualified to install voice, data, and image cabling systems and to perform related tests as required by the manufacturer in accordance with the manufacturer's methods.

The telecommunications technicians employed shall be fully trained and qualified by the manufacturer on the installation and testing of the equipment to be installed. Evidence that the vendor is a current, certified installer of the manufacturer must be provided in writing prior to commencing work on the structured cabling for the building.

The vendor, including any subcontractor, shall have a proven record in cabling projects. This must be shown by the inclusion of details of at least three projects involving Category 5 cabling and optical fiber which have been completed by the vendor in the last two years. Names, addresses, and phone numbers of references for the three projects shall be included.

1.4.2 Qualification of System

The Cabling System will be covered by a two-part certification program provided by a single manufacturer and that manufacturer's certified vendor. The first part is an assurance that the certified system will support the applications for which it is designed (including ATM 155 Mbps for certified Category 5), during the lifetime of the certified system. The second portion of the certification is a fifteen-year warranty provided by the manufacturer and the vendor on all products within the system (i.e., cords, telecommunications outlet/connectors, cables, cross-connects, and baluns). Manufacturer shall administer a follow up program through the vendor to provide support and service to the purchaser.

Should the certified system cease to support the application(s) designed to run on the category of cabling installed, whether at the time of cutover, during normal use or when upgrading (e.g., ATM), the manufacturer and vendor shall commit to take prompt corrective action.

The cabling system must conform to the current issue of industry standard CAN/CSA T529. All performance requirements of this document must be followed. In addition, workmanship and installation methods used shall be equal to or better than those found in the BICSI (Building Industry Consulting Service International) TDM manual.

Purchaser demands strict adherence to the performance specifications listed in CAN/CSA T529.

Manufacturer shall maintain ISO 9001 Quality Control certification for the facilities the manufacturer of the product used in this cabling system.

The cabling system must conform to applicable building and electrical safety codes.

1.4.3 End User Responsibility

The vendor shall provide an end user's manual describing the essential system elements, as well as the end user's responsibility for maintaining the integrity of the cabling system over time. This Manual shall include, as a minimum, guidelines for system expansion and modification (i.e., moves, additions, changes of service) as well as labeling and record keeping.

1.4.4 Submittals

Vendor shall submit:

● A complete telecommunications cabling system layout, including cable routing, telecommunications closet(s) and telecommunications outlet/connector designations. The layout shall detail locations of all equipment and indicate all wiring pathways.

● Manufacturer's technical documentation on all devices used in cabling system.

● Manufacturer supplied end user's manual (at completion of project).

● Manufacturer supplied application guidelines for required applications (at completion of project).

It is recommended that the design and engineering performed for the cabling system be approved by an accredited RCDD (Registered Communications Distribution Designer) as defined by BICSI (Building Industry Consulting Service International). As built drawings shall be provided.

1.4.5 Qualified Vendor List (QVL)

The Computing & Communications Department of the University will maintain a list of qualified vendors and/or installers for the MUNet cable plant. Only those vendors/installers shall be able to bid on work required for changes to the cable plant.

1.5 Reference Documents

- Canadian Standards Association CAN/CSA-T527
- Canadian Standards Association CAN/CSA-T528
- Canadian Standards Association CAN/CSA-T529
- Canadian Standards Association CAN/CSA-T530
- Building Industry Consulting Service International (BICSI) Telecommunications Distribution Methods Manual (TDMM)
- MUNet Data Network As-Built Drawings

2. Design

2.1 Notice

The MUNet Data Network is an operational, campus wide, high performance computer network used by the entire Memorial University community - faculty, staff and students. The objective of this document is to address Moves, Adds and Changes to the Physical Cable Plant for the MUNet Data Network.

It is critical that all personnel involved with both the Design and Installation effort addressed by this document take the necessary care and attention to ensure that network operation is not impacted by any of their activities. All work must be coordinated with both the Computing & Communications and Facilities Management Departments of the University.

All work must be approved by the Computing & Communications Department of the University.

2.2 System Overview

The MUNet Data Network provides data connections to the St. John's campus of Memorial University of Newfoundland including the University Medical School in the Health Sciences Center and the Ocean Sciences Center in Logy Bay. It does not include the Residences in Paton College and Burton's Pond.

The network infrastructure includes:

26 buildings
26 building entrance data closets
45 building riser data closets
fiber optic backbone cabling
fiber optic riser/computer room cabling
4300 data drops (dual Cat5 RJ45)

2.2.1 Backbone

The function of the backbone is to provide a mechanism for linking all buildings on campus. This is accomplished through an extensive fiber optic cable system and radio links where fiber was not cost effective (OSC, Corte Real and Clark Place).

One of the primary design considerations for the backbone system is to provide a pathway system (excluding closets) that provides maximum physical protection of the backbone fiber optic cable. This is accomplished through the use of a combination of conduit and cable tray to support and protect the installed cable. All conduit bends are large radius to ensure that the fiber optic cable does not exceed its rated bend radius specification at any time during installation or operation.

The backbone fiber optic cable is a hybrid design providing both 12 multimode and 6 singlemode fiber connections to each building.

As part of the backbone system each building has a dedicated entrance closets. These closets house the fiber optic termination, the active network equipment and distribution components as required. All entrance closets provide UPS power for the installed equipment, in addition the

Engineering, Chemistry/Physics and Henrietta Harvey buildings are connected to the University's emergency power grid.

The entrance closets in Engineering and Chemistry/Physics are the main North and South Campus network hubs and are equipped with dedicated air conditioning to handle the additional heat load in these closets.

2.2.2 Riser

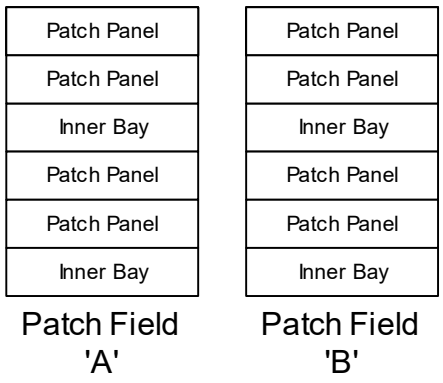
The riser closets are connected to the building entrance closets using 12 fiber multimode cable in a physical star arrangement. In addition the Engineering, CERR and Chemistry Physics buildings have computer rooms connected back to the entrance closet also with 12 fiber multimode cable.

2.2.3 Horizontal Distribution

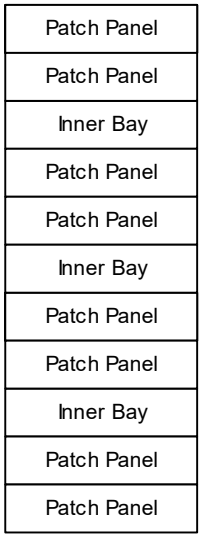
The horizontal cable distribution consists of two four pair Unshielded Twisted Pair (UTP) Category 5 cables, terminated in accordance with CSA T529 and EIA/TIA 568A using the preferred 'A' pin out only.

The dual cables are designated as A and B runs and are terminated on dual RJ45 jacks at the drop location and on separate A and B RJ45 patch fields in the closet. The A and B patch fields may be oriented either horizontally or vertically as dictated by the closet layout. The patch fields should expand bidirectionally from the center. Cable management is an integral part of the patch field through the use of inner bay panels at the center and after every two 24 port patch panels.

Horizontal Configuration

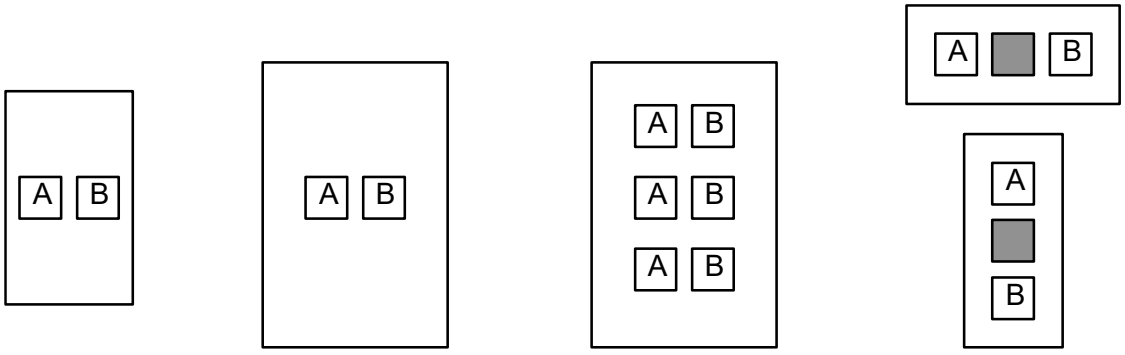


Vertical Configuration



2.2.4 Drops

Each data drop consists of dual RJ45 jacks. Drops may be combined in a single faceplate where required. Drops are not allowed on modular furniture partitions but may be supported using utility poles. Typical drop arrangements are shown below:



Surface Mount - Dual

Flush Mount - Dual

Flush Mount - Six

DECO Mount - Dual

2.2.5 Closets

As part of the horizontal distribution system each building has dedicated riser closets or in smaller buildings a combination entrance and riser closet. These closets house the fiber optic termination,

the active network equipment and distribution components as required. All riser closets provide UPS power for the installed equipment and backboard space for cable termination.

All data closets are existing, it is beyond the scope of this document to define requirements for new data closets.

Building	Closet Designator	Room Number	Closet Type
Library	L-1.1	L1004	Entrance
	L-1.2	L1015A	Riser
	L-2.1	L2027B	Riser
	L-3.1	L3017A	Riser
	L-5.1	L5001A	Riser
Henrietta Harvey	HH-2.1	HH2034	Entrance
	HH-3.1	HH3023	Riser
Chemistry/Physics	C-1.1	C1034	Entrance
	C-1.2	C1017A	Riser
	C-2.1	C2043A	Riser
	C-4.1	C4020A	Riser
	C-4.2	C4043A	Riser
	C-C.1	C4063A	Computer Room
Spencer Hall	SP-0.1	SP002	Entrance
	SP-1.1	SP1000A	Riser
	SP-2.1	SP2000C	Riser
	SP-3.1	SP3021	Riser
	SP-4.1	SP4011	Riser
Science	S-1.1	S1029A	Entrance
	S-1.2	S1079	Riser
	S-2.1	S2105A	Riser
	S-2.2	S2026A	Riser
	S-2.3	S2048A	Riser
	S-4.1	S4021A	Riser
	S-4.2	S4079A	Riser
TSC	T-2.1	SC2022R	Entrance
	T-2.2	SC2014	Riser
Hatcher	H9-3.1	9-313A	Entrance
OSC	OS-4.1	OS4000A	Entrance
OSC Annex	AX-3.1	AX3003	Riser
St. John's Coll.	J-3.1	J3006	Entrance
T10	PA-1.1	PA1013B	Entrance

Biotech	BT-4.1	BT4000C	Entrance
Music	MU-1.1	MU1046A	Entrance
	MU-2.1	MU2004A	Riser
Corte Real	BP-2.1	BP2011A	Entrance
CERR	ER-1.1	ER1000D	Entrance
	ER-3.1	ER3021	Riser
	ER-4.1	ER4022A	Riser
	ER-4.2	ER4067	Riser
	ER-6.1	ER6016	Riser
	ER-C.1	ER4057	Riser
Arts & Admin.	A-1.1	A1047	Entrance
	A-2.1	A2066	Riser
	A-3.1	A3097	Riser
	A-3.2	A3045	Riser
	A-4.1	A4072	Riser
Centrifuge	CF-2.1	CF2021	Entrance
C-CORE	K-2.1	K2028	Entrance
Engineering	X-1.1	X1039	Entrance
	X-1.2	X1053	Riser
	X-1.3	En1035F	Riser
	X-3.1	X3034	Riser
	X-C.1	X3029B	Computer Room
Education	E-1.1	E1003A	Entrance
	E-2.1	E2003A	Riser
	E-3.1	E3004A	Riser
	E-4.1	E4011A	Riser
	E-5.1	E5009D	Riser
Bus. Admin	B-1.1	BU1015A	Entrance
	B-3.1	BU3011B	Riser
Feild	GH-2.1	GH2021	Entrance
Phys Ed.	G-1.1	PE1001	Entrance
	G-1.2	PE1015A	Riser
T12	CS-1.1	CS1002	Entrance
6 Clark Place	6CL-2.1	2G-A	Entrance
4 Clark Place	4CL-1.1	4CL-1000A	Entrance

Services	SV-1.1	FM2015A	Entrance
HSC	HS-1.1	HS1803-C	Riser
	HS-1.2	HS1901-A	Riser
	HS-1.3	HS1602-B	Riser
	HS-1.4	HS1205-D	Riser
	HS-2.1		Riser
	HS-2.2		Riser
	HS-2.3	HS2404-A	Riser
	HS-3.1	HS3301-A	Entrance
	HS-3.2		Riser
	HS-5.1	HS5508-A	Riser
Queen's College	Q-4.1	Q4013	Entrance

2.3 Ceiling Pathways

2.3.1 General

Ceiling areas will be used as the pathway for the MUNet data cable. Rules covering installations in both air plenums and nonplenum hollow ceiling systems are found in the applicable electrical and building codes.

2.3.2 Design Guidelines

Inaccessible ceiling areas such as lock-in-type ceiling tiles, drywall, or plaster shall not be used as a pathway. Ceiling distribution systems shall meet the following conditions:

(a) the ceiling tiles shall be of the removable or lay-in-type and placed at a maximum height of 3350 mm (11 ft) above the floor;

(b) adequate and suitable space shall be available in the ceiling area for the distribution layout recommended; and

(c) raceways shall be provided where required by codes or design.

The design shall provide a suitable means and method for supporting cables and wires from the telecommunications closet to the work station to be served. The suspended ceiling support wire/rod shall not be used for this purpose. Wire/cable shall not be laid directly on the ceiling tile or rails.

A minimum of 75 mm (3 in) clear vertical space shall be available above the ceiling tiles for the distribution wiring and pathway.

2.3.2.1 Zones

The floor area to be served shall be divided into telecommunications "zones", each consisting of approximately 35 to 55 m2 (365 to 600 ft2) (between four adjacent building columns). Wiring to each zone may be placed without the use of raceway in the ceiling, where permitted by applicable codes, or installed in a conduit sized per Section 2.4.2.3, and extending from the telecommunications closet to the midpoint of the zone. From that point, cables shall be extended to the top of wall conduit, wall raceway or utility columns, and down to the work station locations. Loose cables from each zone to the telecommunications closet shall be grouped and tied.

2.3.2.2 Trays

When a tray is used in the ceiling area, conduit from the tray to outlets or zones shall be provided unless loose wiring is permitted by the *Canadian Electrical Code, Part I.*

2.3.2.3 Telecommunications Closet Termination

Trays and zone conduit within the ceiling shall protrude into the closet from 25-50 mm (1-2 in), without a bend, and above the 2400 mm (8 ft) level.

2.3.2.4 Wall/Partition Wiring

Where demountable partitions are used to conceal the cables, a snap-in panel or cover shall be provided. Alternatively, a hollow wall may be used to conceal the cable if an accessible space or conduit of sufficient size is provided.

2.3.2.5 Cable Support

Where zone conduit or cable tray is not available in a suspended ceiling space, and where telecommunications cables may acceptably be placed loosely in the ceiling, adequate open-top cable supports, located on 1220 mm (48 in) centres, shall be provided. Where larger quantities of cable (eg, 50-75 cables) are bunched together in the ceiling at a congested area, such as near the telecommunications closet, special supports shall be designed and installed to carry the additional weight.

Note that bridle rings or similar products are not allowed. These products do not provide adequate support to the cable to prevent kinking or crushing which will impact transmission performance.

2.4 Conduit

2.4.1 General

Conduit types include electrical metallic tubing, rigid metal conduit, and rigid PVC. Conduit shall be of the types permitted under the appropriate electrical codes. Aluminum conduit is not allowed.

Metal flex conduit is not recommended, due to cable abrasion problems, and is allowed only for locations where structural obstructions prevent use of other types. However where used it shall be sized one size larger.

The conduits shall be run in the shortest straight runs wherever possible. Minimum requirements for installed conduit, such as support, end protection, and continuity, are found in the following sections. No section of conduit shall be longer than 30 m (100 ft) or contain more than two 90 bends between pull points or pull boxes (a double offset is equal to one 90 degree bend).

All conduits shall be rigidly installed, adequately supported and properly reamed at both ends. Sections of conduit shall be joined with approved couplings and conduit terminations in outlet boxes, pull boxes, etc., shall be made using approved fittings. All conduits and fittings must be adequately anchored to permit pulling in of cables.

2.4.2 Design Guidelines

2.4.2.1 Bends

The inside radius of a bend in conduit shall be at least 6 times the internal diameter. When the conduit size is greater than 50 mm (2 in), the inside radius shall be at least 10 times the internal diameter of the conduit. For fiber optic cable, the inside radius of a bend shall always be at least 10 times the internal diameter of the conduit.

LB connectors are not allowed.

Pull boxes are not to be used in lieu of a bend.

2.4.2.2 Pull Cords

A pull cord shall be installed in all conduit runs. The pull cord shall be 3 mm braided nylon waterproof cord. A pull cord shall be left in all conduits following installation.

2.4.2.3 Conduit Runs

Any single conduit run extending from a telecommunications closet shall not serve more than three outlets. Areas with more than three outlets shall be served with dedicated zone conduit as per section 2.3.2.1. Conduit shall be sized per the following table and shall be incrementally increased in size from the furthest outlet toward the telecommunications closet.

Conduit Sizing

Conduit	Trade Size	Number of cables	Number of drops

Internal diameter mm	Internal diameter in	mm	in	Wire OD mm 5.2 in 0.205	2 cables per drop
20.9	0.82	20	¾	4	2
26.6	1.05	25	1	8	4
35.1	1.38	30	1-1/4	12	6
40.9	1.61	40	1-1/2	16	8
52.5	2.07	50	2	24	12
62.7	2.47	60	2-1/2	38	19
77.9	3.07	75	3	54	27
90.1	3.55	90	3-1/2	TBD	TBD
102.3	4.02	100	4	TBD	TBD

2.4.2.4 Conduit Termination

Conduit shall be reamed to eliminate sharp edges and terminated with an insulated bushing. Conduit protruding through the floor shall be terminated 25-50 mm (1-2 in) above the floor surface.

2.4.2.5 Conduit Condition

All conduits shall be left clean, dry and free of debris or other obstructions.

2.4.2.6 Pull Boxes

Pull boxes shall be used for the following purposes:

(i) fishing the conduit run;

(ii) pulling the cable to the box and then looping the cable to be pulled into the next length of conduit

Pull boxes shall be placed in an exposed location, and readily accessible. Where boxes are installed above suspended T-bar ceilings they shall be located immediately above the ceiling and the location of the pull box shall be identified with blue coloured labels attached to the T-bar grid. Pull boxes shall not be placed in a fixed false ceiling space, unless immediately above a suitably marked hinged panel. Pull boxes shall not be placed in a metal linear ceiling space.

A pull box shall be placed in a conduit run where

(i) the length is over 30 M (100 ft);

(ii) there are more than two 90 degree or equivalent bends; or

(iii) if there is a reverse bend in the run.

Boxes shall be placed in a straight section of conduit, and not used in lieu of a bend. The corresponding ends of the conduit are to be aligned with each other in two planes.

Conduit fittings shall not be used in place of pull boxes.

Where a pull box is required, it shall be sized per the following table:

Pull Box Sizing

Conduit trade size	Width		Length		Depth		Width increase for each additional conduit	
	mm	in	mm	in	mm	in	mm	in
1	300	12	300	12	100	4	75	3
1-1/4	350	14	350	14	125	5	100	4
1-1/2	400	16	400	18	150	6	100	4
2	450	18	500	20	200	8	100	4
2-1/2	600	24	600	24	200	8	150	6
3	600	24	750	30	250	10	150	6
3-1/2	600	24	900	36	250	10	150	6
4	600	24	1200	48	300	12	200	8

2.4.2.7 Outlet Boxes

Outlet boxes shall be no smaller than 50 mm wide, 75 mm high, 64 mm deep (2 in, 3 in, 2-1/2 in). This box will accommodate one or two 3/4 trade size conduit. Where a larger trade size conduit is required the box size shall be increased accordingly. A maximum 1-1/4 trade size conduit will require a 120 x 120 x 64 mm (4-11/16 x 4-11/16 x 2-1/2 in) outlet box. Where a No. 1 trade size conduit is required, a minimum 100 x 100 x 57 mm (4 x 4 x 2-1/4 in) box shall be used. Specialty boxes are alternatively permitted as appropriate.

2.4.2.8 Conduit System Identification

All conduit shall be clearly labelled at both ends to designate the floor closet by number (eg, 6A-3), which shall include the sequential numbering of the conduit originating at that closet (ie, -3). Conduit length shall also be indicated on the label. Pull boxes shall be labelled on the exposed exterior.

2.5 Raceway

2.5.1 General

Perimeter pathways serve work stations where telecommunications devices can be reached from walls at convenient levels. Surface metal and surface nonmetal raceways shall be limited to use in dry locations. For other requirements see appropriate building and electrical codes.

2.5.2 Design Guidelines

A surface raceway, consisting of a base, cover, couplings, elbows, and similar fittings mounts directly onto wall surfaces at appropriate work levels to provide a continuous perimeter pathway. Telecommunications outlets are located in cover fittings along the raceway and may be moved or added after initial installation.

Multichannel raceway provides perimeter pathways for different systems in combination, such as telecommunications, power, and lighting circuits. The same relative location of each channel is maintained for each system throughout the premises. In multichannel metal raceways, dividers that separate compartments shall be bonded to ground.

The determining factor for all perimeter pathway usage shall be room size, since the devices in the room depend on services from fixed wall areas. In larger rooms with partitions or modular furniture, perimeter pathways are extended to the work station to provide continuous pathways to telecommunications outlets.

The practical capacity for telecommunications wiring in perimeter raceways shall range from 30% to 60% fill, depending on cable bending radius. The pathway size shall be calculated as follows: the cross-sectional area of each cable shall be multiplied by the number of cables, and then divided by the per cent of fill. Fill rate not to exceed manufacturers recommendations for Category 5 Data Grade 4 pair UTP cable.

Surface metal and surface nonmetal raceways shall be limited to use in dry locations. For other requirements see appropriate building and electrical codes.

All raceway and fittings must be screwed to wall surface, adhesive mounting is not acceptable.

Raceway must provide 1 inch minimum bend radius control for cables.

Note that raceways must be selected based on the data wiring components.

Standard of Acceptance - Panduit Pan-Way Products, Single Channel Types CD,LD, LDP and Multichannel Type T.

2.6 Cable Tray

2.6.1 General

Cable trays and wireways are rigid structures for the containment of telecommunications cables. These pathways shall be installed in accordance with the applicable electrical code.

2.6.2 Design Guidelines

The rule of thumb for general office space, based on the assumption of three devices per work station and one work station per 10 m (100 ft), shall be to provide 650 mm (1 in) of cross-sectional area of the tray or wireway per 10 M (1 00 ft) of usable floor space. Where it is known that the number of devices per work station or the work station floor space allocation differs from this rule, the sizing shall be adjusted. This rule of thumb shall apply to both feeder and distribution trays, as applicable. Care shall be exercised not to exceed the loading and depth requirements.

Cable trays and wireways may be divided by a barrier to allow the placement of both power and telecommunications cables as required by the *Canadian Electrical Code, Part I.*

Trays and wireways may be located below or above the ceiling in either plenum or nonplenum applications.

Loading of cable trays and wireways shall comply with the *Canadian Electrical Code, Part I.*

Cable trays are supported by three basic support devices: cantilever brackets, trapeze, and individual rod suspension. Supports are located where practicable so that connections between sections of the tray fall between the support points and the quarter sections of the span. The support centres shall be in accordance with the load and span as specified in the *Canadian Electrical Code, Part I,* for the applicable class. Ideally, a support shall be placed within 610 mm (2 ft) on each side of any connection to a fitting. Wireways shall be supported on 1500 mm (5 ft) centres unless designed for greater lengths.

The fittings used include elbows, reducers, crossovers, and tees. These fittings are used to change direction or size of the tray or wireway.

2.7 Utility Columns

2.7.1 General

Utility columns provide pathways for the wires and cables from the ceiling to the work station. Utility columns used for both telecommunications and power distribution shall comply with the *Canadian Electrical Code, Part I.*

2.7.2 Design Guidelines

The utility columns shall be of extruded aluminum to CSA HA Series - M1980 with an anodized finish of 10 micrometres thickness. They shall be approximately 50 mm square with snap-on covers to provide access to wiring without removing unit. Barrier to isolate power from communication system is required for columns used for both telecommunications and power. The utility columns shall have a minimum of two knockouts to fit NORDX/CDT DECO inserts, that is to provide two dual outlet drops (4 cables).

Utility columns shall be attached to and supported by main ceiling support channels; the utility columns shall not be attached to the transverse or short length channels unless they are also rigidly secured to the main support channel. When utility columns are used, the main ceiling rails shall be rigidly installed and braced to overcome movement, both vertical and horizontal.

All electrical wiring for power to be supplied and installed by the electrical contractor. All data wiring to be supplied supplied and installed by the data contractor.

Standard of Acceptance: Wiremold NP600-2-10-6

2.8 Cabling

2.8.1 General

2.8.2 Design Guidelines

All telecommunications outlet/connectors, patch panels, cross connects, cabinets, plywood backboard, and other components shall be labeled using a mechanically imprinted label or a system as defined by the purchaser. Regardless of the numbering scheme, every cable shall have the same permanent identifier on its termination hardware at both ends.

All four pairs of each unshielded twisted pair (UTP) cable shall be terminated on a single port. The splitting of cable pairs between different jacks is not permitted. Terminating resistors required in certain applications shall be placed externally to the telecommunications outlet/connector.

Terminating cable pairs (Category 5) shall have a maximum of 13 mm (0.5 in.) of cable untwisted before termination.

Each distribution rack shall be connected to the ground bus in the TCs in accordance with the applicable code requirements as per CSA T527.

All voice and data equipment shall be properly grounded in the telecommunications closets to meet the manufacturer's requirements.

Cable trays shall be provided and utilized in the MC, IC, and TC's to manage cable in an orderly fashion. Cable management should be installed in racks and on walls as per manufacturer's recommendations.

Appropriate fire barriers shall be placed around the cables in the sleeves, and unused sleeves shall be properly fire stopped.

Installation should be performed in a professional manner using the best practices in the industry. Best practices shall include, but not be limited to, the following points:

- Backbone cabling utilizing a shield shall be bonded at each sheath opening.

- All grounding conductors must be rated CMP and must be neatly tied in bundles and fastened to the under-slab or metal structure at intervals not to exceed six feet.

- All cabling shall be continuous without joins, or splices from the work area to the TCs.

- All cables installed by vendor or subcontractor shall be properly contained in conduit, cable tray, raceway, or duct. Where none of these support media are available, the individual cables shall be formed into cable harnesses, neatly run, properly dressed, supported and secured with appropriate cable ties to the under-slab or metal structure at intervals not to exceed six feet.

- All exposed cabling is to be installed and routed in a neat and professional manner. Proper manufacturer systems training provides instruction in this area. All exposed cable bundles to be tie-wrapped at a maximum of every 12 in. All cable-ties used shall be hand tightened only to a point where the sheath does not kink.

- If conduit is used, the maximum number of bends between cable pulling points shall be two ninety degree bends over a maximum of 100 ft.

● Horizontal fill ratios for conduit, cable trays, raceways and ducts shall conform with standards and manufacturer recommendations.

● Standards for separation distances from sources of electromagnetic interference are currently under study. Minimum clearance between cables and power sources is shown in the following table:

Separation Distances from EMI Sources

Condition	Minimum Separation		
	<2kVA	2-5kVA	>5kVA
Unshielded power lines or electrical equipment in proximity to open/nonmetal pathway	127 mm 5 in.	305 mm 12 in.	610 mm 24 in.
Unshielded power lines or equipment in proximity to a grounded metal conduit pathway.	64 mm 2.5 in	152 mm. 6 in.	305 mm 12 in.
Power lines enclosed in shielded or grounded metallic conduit in proximity to a grounded metal conduit pathway	0 mm. 0 in.	76 mm. 3 in.	152 mm. 6 in.
Transformers & electrical motors	1016 mm. 40 in.		
Fluorescent light (coil or electric start)	305 mm. 12 in.		

● All optical fiber and copper cables shall be handled, installed, and supported in accordance with the manufacturer's guidelines. During the laying of the cable, installer shall take care not to overstress the cable. After the cable is installed, installer shall make sure that all parts of the cable are supported properly and shall be stress free at both ends and throughout their length.

● Appropriate attention shall be given to the handling of Category 5 copper and optical fiber cables to ensure that bending radius conforms to the manufacturer's requirements. At no time shall the cable's static or dynamic bending radius be exceeded.

● All telecommunications outlet/connectors shall be securely mounted at all work area locations and shall be located so that the cable required to reach the work area equipment will be no longer than three meters.

● The total optical attenuation through the cross-connect from any terminated fiber to any other terminated fiber shall not exceed 2.0 dB.

● Optical fiber splices, fusion or mechanical, shall not exceed a maximum optical attenuation of 0.3 dB when measured in accordance with ANSI/TIA/EIA-455 -34.

2.9 Documentation

2.9.1.1 General

Design documentation will consist of this specification or portions of it, plus electrical, mechanical and architectural drawings covering the work to be done.

3. Installation

3.1 Notice

The MUNet Data Network is an operational, campus wide, high performance computer network used by the entire Memorial University community - faculty, staff and students. The objective of this document is to address Moves, Adds and Changes to the Physical Cable Plant for the MUNet Data Network.

It is critical that all personnel involved with both the Design and Installation effort addressed by this document take the necessary care and attention to ensure that network operation is not impacted by any of their activities. All work must be coordinated with both the Computing & Communications and Facilities Management Departments of the University.

All work must be approved by the Computing & Communications Department of the University.

3.2 Ceiling Pathways

3.2.1 General

Ceiling areas will be used as a pathway for the MUNet data cable. Rules covering installations in both air plenums and nonplenum hollow ceiling systems are found in the applicable electrical and building codes.

Inaccessible ceiling areas such as lock-in-type ceiling tiles, drywall, or plaster shall not be used as a pathway

3.2.2 Products

Standard of acceptance - Caddy CableCat Clip, Category 5 Cable support clips
- Part Numbers CAT21, CAT32, CATHBA and Assemblies

3.2.3 Execution

Where zone conduit or cable tray is not available in a suspended ceiling space, and where telecommunications cables may acceptably be placed loosely in the ceiling, adequate open-top cable supports, located on 1220-1525 mm (48-60 in) centres, shall be provided. Where larger quantities of cable (eg, 50-75 cables) are bunched together in the ceiling at a congested area, such as near the telecommunications closet, special supports shall be designed and installed to carry the additional weight.

The design shall provide a suitable means and method for supporting data cables from the telecommunications closet to the work station to be served. The suspended ceiling support wire/rod shall not be used for this purpose. Data cable shall not be laid directly on the ceiling tile or rails.

A minimum of 75 mm (3 in) clear vertical space shall be available above the ceiling tiles for the distribution wiring and pathway.

3.3 Data Conduit

3.3.1 General

The conduits shall be run in the shortest straight runs wherever possible. Minimum requirements for installed conduit, such as support, end protection, and continuity, are found in the following sections. No section of conduit shall be longer than 30 m (100 ft) or contain more than two 90 bends between pull points or pull boxes (a double offset is equal to one 90 degree bend).

All conduits shall be rigidly installed, adequately supported and properly reamed at both ends. Sections of conduit shall be joined with approved couplings and conduit terminations in outlet boxes, pull boxes, etc., shall be made using approved fittings. All conduits and fittings must be adequately anchored to permit pulling in of cables.

3.3.2 Products

3.3.2.1 Conduit

1. Use EMT conduit unless specified otherwise.

2. Factory bends where 90 degree bends are required for 30 mm and larger conduits.

3. Conduit Sizing

Conduit		Trade Size		Number of cables	Number of drops
Internal diameter				Wire OD mm 5.2	2 cables per drop
mm	in	mm	in	in 0.205	
20.9	0.82	20	¾	4	2
26.6	1.05	25	1	8	4
35.1	1.38	30	1-1/4	12	6
40.9	1.61	40	1-1/2	16	8
52.5	2.07	50	2	24	12
62.7	2.47	60	2-1/2	38	19
77.9	3.07	75	3	54	27
90.1	3.55	90	3-1/2	TBD	TBD
102.3	4.02	100	4	TBD	TBD

3.3.2.2 Conduit Fittings

1. Steel set screw connectors and couplings for EMT. Die cast connectors and couplings are not acceptable.

2. LB fittings are not allowed.

3. All bushings and connectors shall have have nylon insulated throats.

4. Fittings to be manufactured for use with conduit specified.

3.3.2.3 Conduit Fastenings and Supports

1. One hole steel straps to secure surface conduits smaller than 50 mm. Two hole steel straps for 50 mm conduits.

2. Beam clamps to secure conduits to exposed steel work.

3. Channel type supports for two or more conduits.

4. Six mm dia threaded rods to support suspended channels.

5. Channels will be U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted where required. Galvanized complete with accessories as required.

3.3.2.4 Conduit Boxes

1. Outlet Boxes - Outlet boxes shall be no smaller than 50 mm wide, 75 mm high, 64 mm deep (2 in, 3 in, 2-1/2 in). This box will accommodate one or two 3/4 trade size conduit. Where a larger trade size conduit is required the box size shall be increased accordingly. A maximum 1-1/4 trade size conduit will require a 120 x 120 x 64 mm (4-11/16 x 4-11/16 x 2-1/2 in) outlet box. Where a No. 1 trade size conduit is required, a minimum 100 x 100 x 57 mm (4 x 4 x 2-1/4 in) box shall be used.

   Cast FS or FD boxes with factory-threaded hubs and mounting feet for surface wiring of data outlets on concrete surfaces.

2. Pull Boxes - Where a pull boxes are required, they shall be sized per the following table:

Pull Box Sizing

Conduit trade size	Width		Length		Depth		Width increase for each additional conduit	
	mm	in	mm	in	mm	in	mm	in
1	300	12	300	12	100	4	75	3
1-1/4	350	14	350	14	125	5	100	4
1-1/2	400	16	400	18	150	6	100	4
2	450	18	500	20	200	8	100	4
2-1/2	600	24	600	24	200	8	150	6
3	600	24	750	30	250	10	150	6
3-1/2	600	24	900	36	250	10	150	6
4	600	24	1200	48	300	12	200	8

3.3.3 Execution

3.3.3.1 Conduit

1. Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

2. Use EMT conduit except where specified otherwise.

3. Bends - The inside radius of a bend in conduit shall be at least 6 times the internal diameter. When the conduit size is greater than 50 mm (2 in), the inside radius shall be at least 10 times the internal diameter of the conduit. For fiber optic cable, the inside radius of a bend shall always be at least 10 times the internal diameter of the conduit.

   Bend conduit cold. Replace conduit if kinked or flattened more than 10 per cent of it's original diameter.

Mechanically bend steel conduit over 19mm dia. Conduits 32mm and larger to be bent using a hydraulic bender or use factory bends. Conduits found to be bent using methods other than indicated above will be removed.

4. Install fish cord in empty conduits.

5. All circuits indicated on these drawings will be run in new conduit.

6. Minimum size conduit to be used on this project is 19mm, 12mm conduit is unacceptable.

7. Run parallel or perpendicular to building lines.
   Run conduits in flanged portion of structural steel.

8. Group conduits wherever possible on surface channels.

9. Do not pass conduits through structural members except as indicated.

10. Do not locate conduits less than 75 mm parallel to steam or hot water lines with a minimum of 25 mm at crossovers.

11. A pull cord shall be installed in all conduit runs. The pull cord shall be 3 mm braided nylon waterproof cord.

12. Any single conduit run extending from a telecommunications closet shall not serve more than three outlets. Conduit shall be sized per Section 3.3.2.1and shall be incrementally increased in size from the furthest outlet toward the telecommunications closet.

13. Conduit shall be reamed to eliminate sharp edges and terminated with an insulated bushing. Conduit protruding through the floor shall be terminated 25-50 mm (1-2 in) above the floor surface.

14. All conduits shall be left clean, dry and free of debris or other obstructions.

15. Pull boxes shall be used for the following purposes:

    15.1. fishing the conduit run;

    15.2. pulling the cable to the box and then looping the cable to be pulled into the next length of conduit

16. Pull boxes shall be placed in an exposed location, and readily accessible. Where boxes are installed above suspended T-bar ceilings they shall be located immediately above the ceiling and the location of the pull box shall be identified with blue coloured labels attached to the T-bar grid. Pull boxes shall not be placed in a fixed false ceiling space, unless immediately above a suitably marked hinged panel. Pull boxes shall not be placed

in a metal linear ceiling space, unless immediately above a suitably marked hinged panel.

17. A pull box shall be placed in a conduit run where

    17.1.1. the length is over 30 M (100 ft);

    17.1.2. there are more than two 90 degree or equivalent bends; or

    17.1.3. if there is a reverse bend in the run.

18. Boxes shall be placed in a straight section of conduit, and not used in lieu of a bend. The corresponding ends of the conduit are to be aligned with each other.

19. Conduit fittings shall not be used in place of pull boxes.

20. All conduit shall be clearly labelled at both ends to designate the floor closet by number (eg, CP2.1-1), which shall include the sequential numbering of the conduit originating at that closet (ie, -3). Conduit length shall also be indicated on the label. Pull boxes shall be labelled on the exposed exterior.

3.3.3.2 Conduit Fittings

3.3.3.3 Conduit Fastenings and Supports

1. Secure equipment to hollow masonry, tile and plaster surfaces with nylon shields.

2. Secure equipment to poured concrete with expandable inserts.

3. Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.

4. Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.

5. Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

6. Fasten exposed conduit or cables to building construction or support system using straps.
   6.1. One-hole steel straps to secure surface conduits smaller than 50 mm.
   6.2. Two-hole steel straps for 50 mm conduits.
   6.3. Beam clamps to secure conduit to exposed steel work.

7. Suspended support systems.
   7.1. Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
   7.2. Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.

8. For surface mounting of two or more conduits use channels at code spacing.

9. Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

10. Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

11. Do not use wire lashing or perforated strap to support or secure raceways or cables.

12. Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Consultant.

13. Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturers installation recommendations.

3.3.3.4 Conduit Boxes

1. Support boxes independently of connecting conduits.

2. Fill boxes with paper, sponges or foam or similar approved material to prevent entry of construction material.

3. For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.

4. Provide correct size of openings in boxes for conduit, reducing washers not allowed.

3.4 Raceway

3.4.1 General

Perimeter pathways serve work stations where telecommunications devices can be reached from walls at convenient levels. Surface metal and surface nonmetal raceways shall be limited to use in dry locations. For other requirements see appropriate building and electrical codes.

3.4.2 Products

1. Single Channel Raceway - A single channel raceway, consisting of a base, cover, couplings, elbows, and similar fittings mounts directly onto wall surfaces at appropriate work levels to provide a continuous perimeter pathway. Telecommunications outlets are located in cover fittings along the raceway and may be moved or added after initial installation.

2. Multichannel Raceway - Multichannel raceway provides perimeter pathways for different systems in combination, such as telecommunications, power, and lighting circuits. The same relative location of each channel is maintained for each system throughout the premises. In multichannel metal raceways, dividers that separate compartments shall be bonded to ground.

3. Raceway must provide 1 inch minimum bend radius control for cables.

4. Standard of Acceptance - Panduit Pan-Way Products, Single Channel Types CD,LD, LDP and Multichannel Type T.

3.4.3 Execution

1. All raceway and fittings must be screwed to wall surface, adhesive mounting is not acceptable.

2. Fill rate not to exceed manufacturers recommendations for Category 5 Data Grade 4 pair UTP cable.

3.5 Cable Tray

3.5.1 General

Cable trays and wireways are rigid structures for the containment of telecommunications cables. These pathways shall be installed in accordance with the applicable electrical code.

3.5.2 Products

Channel cable tray: a prefabricated structure with a one-piece ventilated bottom or solid bottom channel section not exceeding 150 mm (6 in) wide.

Ladder cable tray: a prefabricated structure consisting of two side rails connected by individual transverse members.

Solid bottom cable tray: a prefabricated structure consisting of a solid bottom within longitudinal side rails.

Ventilated or trough cable tray: a prefabricated structure greater than 100 mm (4 in) in width and consisting of a ventilated bottom within two side rails. (See Figure 4.5-1.)

Wireway: a prefabricated structure available in 64 x 64 mm (2-1/2 x 2-1/2 in), 100 x 100 mm (4 x 4 in), and 150 x 150 mm (6 x 6 in). The structure shall consist of a 16 AWG metal trough equipped with a hinged cover. (See Figure 4.5-2.)

Accessories used with cable trays and wireways, include such items as covers, hold-down devices, dropouts, conduit adapters, and dividers.

Cable trays and wireways may be divided by a barrier to allow the placement of both power and telecommunications cables as required by the *Canadian Electrical Code, Part I.*

3.5.3 Execution

1. Trays and wireways may be located below or above the ceiling in either plenum or nonplenum applications.

2. Cable trays are supported by three basic support devices: cantilever brackets, trapeze, and individual rod suspension. Supports are located where practicable so that connections between sections of the tray fall between the support points and the quarter sections of the span. The support centres shall be in accordance with the load and span as specified in the *Canadian Electrical Code, Part I,* for the applicable class. Ideally, a support shall be placed within 610 mm (2 ft) on each side of any connection to a fitting. Wireways shall be supported on 1500 mm (5 ft) centres unless designed for greater lengths.

3. The fittings used include elbows, reducers, crossovers, and tees. These fittings are used to change direction or size of the tray or wireway.

4. The inside of the cable tray or wireway shall be free of burrs, sharp edges, or projections which could damage cable insulation. When a wireway passes through a partition or wall it shall be an unbroken length and if necessary, firestopped. Telecommunications cables shall not exceed 40% of the available cross-sectional area. Metal cable trays and wireways shall

be bonded to ground. Cable trays and wireways shall not be used as walkways or ladders unless specifically designed and installed for that purpose.

5. A minimum of 300 mm (12 in) access headroom shall be provided and maintained above a cable tray. Care shall be taken to ensure that other building components, eg, air conditioning ducts, do not restrict access to trays or wireways.

3.6 Utility Columns

3.6.1 General

Utility columns provide pathways for the wires and cables from the ceiling to the work station. Utility columns used for both telecommunications and power distribution shall comply with the *Canadian Electrical Code, Part I.*

3.6.2 Products

1. Indoor service poles: extruded aluminum sections to CSA HA Series - M1980 anodized finish of 10 micrometres thickness.

2. Nominal length of poles: 3m in areas with TBar ceilings, 4.3m in areas with exposed ceilings and other miscellaneous heights as required.

3. Service poles approximately 50 mm square with snap-on covers to provide access to wiring without removing unit. Barrier to isolate power from communication system where required.

4. Service poles with fastening accessories at top of pole to secure to inverted T-Bar ceiling using Bet screws to permit relocation. Flange at ceiling to conceal wiring.

5. Metal or PVC sleeve at bottom of pole to conceal vertical adjustment. Reversible grip-tight devices for carpet and tile floors to prevent movement of poles.

6. Service poles with dual knockouts to fit DECO inserts, data wiring supplied and installed by the data contractor.

7. Standard of Acceptance: Wiremold NP600-2-10-6

3.6.3 Execution

1. Utility columns shall be attached to and supported by main ceiling support channels; the utility columns shall not be attached to the transverse or short length channels unless they are also rigidly secured to the main support channel. When utility columns are used, the main ceiling rails shall be rigidly installed and braced to overcome movement, both vertical and horizontal.

2. Install service poles as indicated and as directed on site by Engineer.

3. Install service poles in accordance with manufacturer's recommendations. Secure to ceiling and to finished floor. Adjust length as required.

4. Re-adjust service poles as required after data cabling is installed.

3.7 Copper Cabling

3.7.1 General

3.7.2 Products

Products shall be NordX/CDT Category 5 only. This includes the following items:

- Bulk Cable
- Patch Cables
- Faceplates
- Data Jacks
- Patch Panels
- Interbay Panels

3.7.3 Execution

1. All telecommunications outlet/connectors, patch panels, cross connects, cabinets, plywood backboard, and other components shall be labeled using a mechanically imprinted label or a system as defined by the purchaser. Regardless of the numbering scheme, every cable shall have the same permanent identifier on its termination hardware at both ends.

2. All four pairs of each unshielded twisted pair (UTP) cable shall be terminated on a single port. The splitting of cable pairs between different jacks is not permitted. Terminating resistors required in certain applications shall be placed externally to the telecommunications outlet/connector.

3. Terminating cable pairs (Category 5) shall have a maximum of 13 mm (0.5 in.) of cable untwisted before termination.

4. Each distribution rack shall be connected to the ground bus in the TCs in accordance with the applicable code requirements as per CSA T527.

5. All voice and data equipment shall be properly grounded in the telecommunications closets to meet the manufacturer's requirements.

6. Cable trays shall be provided and utilized in the MC, IC, and TC's to manage cable in an orderly fashion. Cable management should be installed in racks and on walls as per manufacturer's recommendations.

7. Appropriate fire barriers shall be placed around the cables in the sleeves, and unused sleeves shall be properly fire stopped.

8. Installation should be performed in a professional manner using the best practices in the industry. Best practices shall include, but not be limited to, the following points:

9. Backbone cabling utilizing a shield shall be bonded at each sheath opening.

10. All grounding conductors must be rated CMP and must be neatly tied in bundles and fastened to the under-slab or metal structure at intervals not to exceed six feet.

11. All cabling shall be continuous without joins, or splices from the work area to the TCs.

12. All cables installed by vendor or subcontractor shall be properly contained in conduit, cable tray, raceway, or duct. Where none of these support media are available, the individual cables shall be formed into cable harnesses, neatly run, properly dressed, supported and secured with appropriate cable ties to the under-slab or metal structure at intervals not to exceed six feet.

13. All exposed cabling is to be installed and routed in a neat and professional manner. Proper manufacturer systems training provides instruction in this area. All exposed cable bundles to be tie-wrapped at a maximum of every 12 in. All cable-ties used shall be hand tightened only to a point where the sheath does not kink.

14. If conduit is used, the maximum number of bends between cable pulling points shall be two ninety degree bends over a maximum of 100 ft.

15. Horizontal fill ratios for conduit, cable trays, raceways and ducts shall conform with standards and manufacturer recommendations and shall not exceed 40%.

16. A pull cord shall be left in all conduit runs after cable installation.

17. Cable management shall be provided in all closets for both bulk cable and patch cables. This will be accomplished with D-rings and interbay panels.

18. All closet terminations shall maintain congruence between A and B patch fields. That is each drop will have the same termination position on both patch panels.

19. All drop terminations shall maintain a logical numbering sequence.

20. All optical fiber and copper cables shall be handled, installed, and supported in accordance with the manufacturer's guidelines. During the laying of the cable, installer shall take care not to overstress the cable. After the cable is installed, installer shall make sure that all parts of the cable are supported properly and shall be stress free at both ends and throughout their length.

21. Appropriate attention shall be given to the handling of Category 5 copper cables to ensure that bending radius conforms to the manufacturer's requirements. At no time shall the cable's static or dynamic bending radius be exceeded.

22. All telecommunications outlet/connectors shall be securely mounted at all work area locations and shall be located so that the cable required to reach the work area equipment will be no longer than three meters.

23. The total optical attenuation through the cross-connect from any terminated fiber to any other terminated fiber shall not exceed 2.0 dB.

24. Optical fiber splices, fusion or mechanical, shall not exceed a maximum optical attenuation of 0.3 dB when measured in accordance with ANSI/TIA/EIA-455 -34.

25. Minimum clearance between cables and power sources are shown below:

Separation Distances from EMI Sources

Condition	**Minimum Separation**		
	<2kVA	**2-5kVA**	**>5kVA**
Unshielded power lines or electrical equipment	127 mm	305 mm	610 mm

in proximity to open/nonmetal pathway		5 in.	12 in.	24 in.
Unshielded power lines or equipment in proximity to a grounded metal conduit pathway.		64 mm 2.5 in	152 mm. 6 in.	305 mm 12 in.
Power lines enclosed in shielded or grounded metallic conduit in proximity to a grounded metal conduit pathway		0 mm. 0 in.	76 mm. 3 in.	152 mm. 6 in.
Transformers & electrical motors	1016 mm. 40 in.			
Fluorescent light (coil or electric start)	305 mm. 12 in.			

3.7.3.1 Housekeeping

All closets and terminal facilities must be free of cable clippings, empty reels, cartons or other refuse resulting from the installation.

3.8 Data Closets

All data closets are existing, locations are listed in following table:

Building	Closet Designator	Room Number	Closet Type
Library	L-1.1	L1004	Entrance
	L-1.2	L1015A	Riser
	L-2.1	L2027B	Riser
	L-3.1	L3017A	Riser
	L-5.1	L5001A	Riser
Henrietta Harvey	HH-2.1	HH2034	Entrance
	HH-3.1	HH3023	Riser
Chemistry/Physics	C-1.1	C1034	Entrance
	C-1.2	C1017A	Riser
	C-2.1	C2043A	Riser
	C-4.1	C4020A	Riser
	C-4.2	C4043A	Riser
	C-C.1	C4063A	Computer Room
Spencer Hall	SP-0.1	SP002	Entrance
	SP-1.1	SP1000A	Riser
	SP-2.1	SP2000C	Riser
	SP-3.1	SP3021	Riser
	SP-4.1	SP4011	Riser
Science	S-1.1	S1029A	Entrance
	S-1.2	S1079	Riser
	S-2.1	S2105A	Riser
	S-2.2	S2026A	Riser
	S-2.3	S2048A	Riser
	S-4.1	S4021A	Riser
	S-4.2	S4079A	Riser
TSC	T-2.1	SC2022R	Entrance
	T-2.2	SC2014	Riser
Hatcher	H9-3.1	9-313A	Entrance
OSC	OS-4.1	OS4000A	Entrance
OSC Annex	AX-3.1	AX3003	Riser
St. John's Coll.	J-3.1	J3006	Entrance
T10	PA-1.1	PA1013B	Entrance
Biotech	BT-4.1	BT4000C	Entrance

Music	MU-1.1	MU1046A	Entrance
	MU-2.1	MU2004A	Riser
Corte Real	BP-2.1	BP2011A	Entrance
CERR	ER-1.1	ER1000D	Entrance
	ER-3.1	ER3021	Riser
	ER-4.1	ER4022A	Riser
	ER-4.2	ER4067	Riser
	ER-6.1	ER6016	Riser
	ER-C.1	ER4057	Riser
Arts & Admin.	A-1.1	A1047	Entrance
	A-2.1	A2066	Riser
	A-3.1	A3097	Riser
	A-3.2	A3045	Riser
	A-4.1	A4072	Riser
Centrifuge	CF-2.1	CF2021	Entrance
C-CORE	K-2.1	K2028	Entrance
Engineering	X-1.1	X1039	Entrance
	X-1.2	X1053	Riser
	X-1.3	En1035F	Riser
	X-3.1	X3034	Riser
	X-C.1	X3029B	Computer Room
Education	E-1.1	E1003A	Entrance
	E-2.1	E2003A	Riser
	E-3.1	E3004A	Riser
	E-4.1	E4011A	Riser
	E-5.1	E5009D	Riser
Bus. Admin	B-1.1	BU1015A	Entrance
	B-3.1	BU3011B	Riser
Feild	GH-2.1	GH2021	Entrance
Phys Ed.	G-1.1	PE1001	Entrance
	G-1.2	PE1015A	Riser
T12	CS-1.1	CS1002	Entrance
6 Clark Place	6CL-2.1	2G-A	Entrance
4 Clark Place	4CL-1.1	4CL-1000A	Entrance
Services	SV-1.1	FM2015A	Entrance

HSC	HS-1.1	HS1803-C	Riser
	HS-1.2	HS1901-A	Riser
	HS-1.3	HS1602-B	Riser
	HS-1.4	HS1205-D	Riser
	HS-2.1		Riser
	HS-2.2		Riser
	HS-2.3	HS2404-A	Riser
	HS-3.1	HS3301-A	Entrance
	HS-3.2		Riser
	HS-5.1	HS5508-A	Riser
Queen's College	Q-4.1	Q4013	Entrance

3.9 Fiber Optic Cable

3.9.1 General

The supply and installation of fiber optic cable and components is beyond the scope of this document. The following section is included for reference only.

3.9.2 Products

Products shall be as shown below:

- Bulk Cable — Chromatics Technology
- Patch Cables — Sumitomo
- Termination Equipment — ADC FL-2000 Series
- Connectors — Siecor Uni-Cam Series

Products to match existing components.

3.9.3 Execution

1. All telecommunications outlet/connectors, patch panels, cross connects, cabinets, plywood backboard, and other components shall be labeled using a mechanically imprinted label or a system as defined by the purchaser. Regardless of the numbering scheme, every cable shall have the same permanent identifier on its termination hardware at both ends.

2. All multimode fiber termination shall use SC connectors. All singlemode fiber termination shall use SC connectors.

3. Cable trays shall be provided and utilized in the MC, IC, and TC's to manage cable in an orderly fashion. Cable management should be installed in racks and on walls as per manufacturer's recommendations.

4. Appropriate fire barriers shall be placed around the cables in the sleeves, and unused sleeves shall be properly fire stopped.

5. Installation should be performed in a professional manner using the best practices in the industry.

6. All grounding conductors must be rated CMP and must be neatly tied in bundles and fastened to the under-slab or metal structure at intervals not to exceed six feet.

7. All cables installed by vendor or subcontractor shall be properly contained in conduit, cable tray, raceway, or duct. Where none of these support media are available, the individual cables shall be formed into cable harnesses, neatly run, properly dressed, supported and secured with appropriate cable ties to the under-slab or metal structure at intervals not to exceed six feet.

8. All exposed cabling is to be installed and routed in a neat and professional manner. Proper manufacturer systems training provides instruction in this area. All exposed cable bundles to be tie-wrapped at a maximum of every 12 in. All cable-ties used shall be hand tightened only to a point where the sheath does not kink.

9. If conduit is used, the maximum number of bends between cable pulling points shall be two ninety degree bends over a maximum of 100 ft.

10. Horizontal fill ratios for conduit, cable trays, raceways and ducts shall conform with standards and manufacturer recommendations and shall not exceed 40%.

11. All optical fiber and copper cables shall be handled, installed, and supported in accordance with the manufacturer's guidelines. During the laying of the cable, installer shall take care not to overstress the cable. After the cable is installed, installer shall make sure that all parts of the cable are supported properly and shall be stress free at both ends and throughout their length.

12. Appropriate attention shall be given to the handling of fiber optic cables to ensure that bending radius conforms to the manufacturer's requirements. At no time shall the cable's static or dynamic bending radius be exceeded.

13. The total optical attenuation through the cross-connect from any terminated fiber to any other terminated fiber shall not exceed 2.0 dB.

14. Optical fiber splices, fusion or mechanical, shall not exceed a maximum optical attenuation of 0.3 dB when measured in accordance with ANSI/TIA/EIA-455 -34.

3.9.3.1 Housekeeping

All closets and terminal facilities must be free of cable clippings, empty reels, cartons or other refuse resulting from the installation.

3.10 Documentation

3.10.1.1 As-built Drawings

Revisions to the MUNet Data Drawings in CAD format are required. As-built data shall include all electrical, architectural and data work performed. Data drops shall show patch panel termination position information. Data drop location shall be accurate to within 12 inches. Drawings shall be delivered in hardcopy and softcopy format. Softcopy shall be AutoCAD Release 13 (DWG files) on 3-1/2 inch floppy disks in Microsoft Windows compatible format. Hardcopy shall be in D-size format with one copy in reproduceable master and two copies in blueprint form.

3.10.1.2 Test Data

1. Commissioning verification, inspection and certification shall be provided.

2. End-to-end testing for UTP copper shall be conducted for 100% of pairs and shall identify pair reversal, crossed pairs, opens, and shorts. The test results shall be documented, corrections implemented and retesting conducted and documented. In addition documentation shall be presented to show the length of the cable between the data closet and the data drop in the work area.

3. Attenuation testing for optical fiber shall be done after the fiber is installed.

4. Optical time domain reflectometer (OTDR) testing of all optical fiber cables is optional at installation. However, if the optical fiber is suspected by the customer or manufacturer in any network problems, then vendor will provide at reasonable additional cost, OTDR testing during the troubleshooting process. Vendor shall quote optical fiber testing costs as a separate line item along with response to Request For Proposal (RFP).

5. Verify labeling of all wiring at all termination points.

6. Written verification confirming that the testing and inspection has been completed and that all cable runs have passed shall be provided. Document that all defects have been identified, corrected, and retested successfully.

7. Purchaser shall be notified before testing is carried out so that the purchaser can witness all tests.

8. Final testing shall be carried out only after substantial completion.

9. Test data shall be delivered primarily in softcopy format. Individual link tests will be submitted in Comma Separated Value (CSV) format on 3-1/2 floppy disks in Microsoft Windows compatible format, no hardcopy required. Summary data cross referencing data drop to room number shall be delivered in both hardcopy and softcopy format.

3.11 Labelling

3.11.1 General

All distribution panels, cross-connects, cables and faceplates will be marked with appropriate labels, approval by Computing and Communications, in accordance with the Cable Schedule.

Labels will be installed as follows:

One label at each end of each cable prior to pulling. These labels will not survive stripping back the cable sheath
One label at each end of the cable sheath after stripping.
One label on the inside of each outlet box, plus labelling on the outside of each faceplate in the space provided.

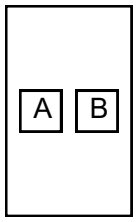
3.11.2 Implementation:

The labelling system used for all drops is a ten character alpha numeric string (10 for buildings with two character identifiers, 9 for buldings with one character identifiers). The label is formatted in the following manner, **L51-5001A**, and contains embedded information to allow easy identification of the following items:

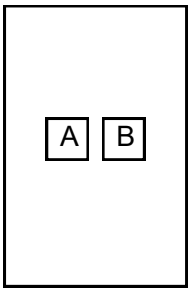
Building	**L**	this may consist of one or two characters and conforms to the MUNet Building identification plan.
Closet	**51**	closets are identified by their own floor and sequence number.
Field Separator	**-**	
Floor	**5**	floor on which drop is located
Sequence	**001**	three digit sequence number
Field	**A**	this may be either A or B and is the termination field identifier in closet. The majority of MUNet faceplates support two drops, each of which is terminated on a separate patch field in the closet

The drop labels consist of a two section white label with black lettering. The first section contains the Building and Closet information. The second section contains the Floor, Sequence and Field information. The total label size is approximately 1/2 x 1-1/2 inches (12 x 38 mm).

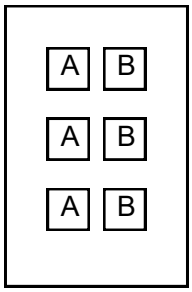
The following diagram illustrates the MUNet faceplate types and the typical label locations for each type.



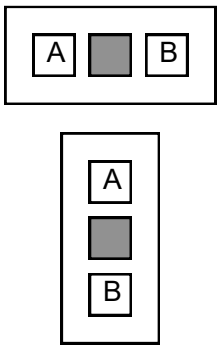
Surface Mount - Dual



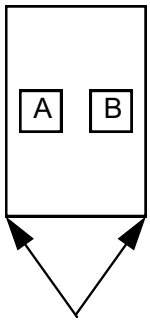
Flush Mount - Dual



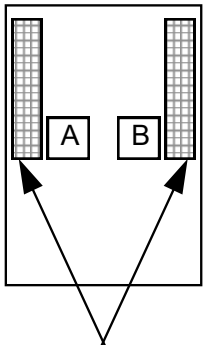
Flush Mount - Six



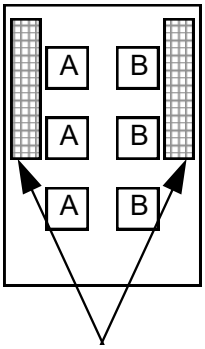
DECO Mount - Dual



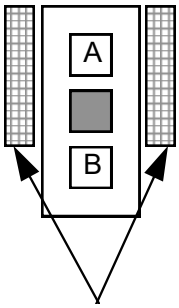
Label to be located on sides.



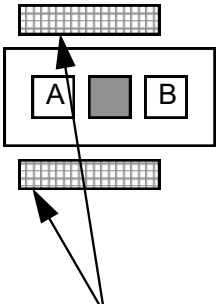
Label locations.



Label locations.



Label to be located on mounting assembly.



Label to be located on mounting assembly.

ADDENDUM A

January 30, 2008

The attached addendum supersedes the original Information and Specifications regarding the MUNet Specification Revision B dated 18 March 1997, where it adds to, deletes from, clarifies or otherwise modifies them. All other conditions and previous addendums shall remain unchanged.

1.1 General

The overall objective of the original MUNet Specification hasn't changed. It was intended to supply information to various personel involving minor alterations to the existing MUNet Cable Plant where changes are made to existing installed infrastructure.

New infrastructure requirements are still to be considered outside the objective of this publication, but in saying that some updated information will be supplied within this addendum.

1.2 Notice

Some Recommendations should be addressed.

- Never assume, always check
- Follow recommendations outlined in MUNet Specification
- Use BICSI TDMM manual guidelines
- Follow proper cabling standards
- Approval from Computing & Communications Department

1.3 Description of Work

Nordx/CDT IBDN Cabling is still an approved manufacturer to supply products to be used in the MUNet cable plant . Other manufacturers must adhere to the strict manufacturing guidelines followed by top tier suppliers such as Nordx/CDT. These manufacturers must meet approval from the Department of Computing & Communications.

1.4.2 Qualification of System

The certification supplied from the manufacturer must now reflect a Category 6 level that must be capable of Gigabit Transmission over the full design criteria of 100M.

2.2.1 Backbone

The use of Radio links and Wireless Transmission are not accepted as a means to supply backbone support to buildings seeking MUNet services. Where dedicated Fiber optic services are deemed not cost effective other services may be supplied

with the approval of the Department of Computing and Communications.

The backbone system will consist of two 24 Singlemode fiber connections supplied in redundant fibers using a redundant path configuration. These backbone cables and routing must be done in coordination the Department of Computing & Communications.

The purpose of this backbone fiber will be considered for sole use of the MUNET cable system, additional service requirements by other interests should be considered in addition to and in coordination with interested parties.

2.2.2 Riser

The riser closets shall be connected to the building entrance closets using a 12 strand Singlemode configuration wired in a physical star arrangement.

2.2.3 Horizontal Distribution

New building or new closet builds should reflect the advancement of cabling technologies. Horizontal cables should consist of at least two four pair Unshielded Twisted Pair (UTP) Category 6 Cables terminated in accordance with CSA T529 and EIA/TIA 568B-2006 using the preferred 568A pinout wiring. These wires will be considered exclusively for MUNet purposes and any extra services (eg Telephone or fax services) must include additional cables.

Patch Panel layout and placement must be approved by the Department of Computing and Communications prior to installation.

2.5.2 Design Guidelines

Fill rates should now reflect the use of Category 6 cabling and its increased diameter.

2.8.2 Cabling Design Guidelines

Design Guidelines should now reflect the use of Category 6 UTP cabling in its criteria.

2.8.3 Entrance Facilities

All entrance facilities and riser closets must be provided with a connection to a UPS system that will be designed and installed in coordination with both the Department of Facilities Management and the Department of Computing and Communications. This system must also be connected to the Emergency power grid or provided some source of emergency power.

3.2.2 Products

Products should reflect the use of Category 6 UTP Cabling.

3.4.3 Execution

Products should reflect the use of Category 6 UTP Cabling.

3.7.2 Products

Products shall be Category 6 specification. This includes the following items:

- Bulk Cable
- Patch Panels
- Faceplates
- Data jacks
- Patch Cables
- Interbay panels

3.7.3 Execution

Products should reflect the use of Category 6 UTP Cabling.

3.9.1 General

Products shall conform to exceed performance of listed products. Variances from the products listed may be granted at the discretion of the department of Computing and Communications.

3.10.2 Test Data

Testing shall be in accordance with the ANSI/TIA/EIA 568-2006 specification. Labeling shall be in accordance to the ANSI/TIA/EIA 606 (A)standard and the MUNet scheme outlined in the MUNet Specification. Testing of Category6 cabling shall be accomplished using level IIe or higher field testers and measured to be able to Pass Gigabit 1000baset transmission requirements. Testing of Multimode fiber cabling should be done in accordance with the ANSI/EIA/TIA-526-14A:OFSTP-14A procedure guidelines. Testing of Singlemode fiber cabling should be done in accordance with the ANSI/EIA/TIA-526-7 procedure guidelines.

4.0 Conclusion

4.1 Consideration

Although the premise of this document is to provide a guideline to parties involved in duties which may include providing access to the MUNet Cabling system, it should not be treated as a building design tool. All products and procedures outlined in the preceding document are in reference to a Data network named MUNet and should be considered as just that. Although the provisions for this network can be placed in conjunction with the overall building design procedures, it should be treated as an “entity” upon itself. Overall building network installations should follow the TIA/EIA 568B-2006 standard and those illustrated in the BICSI TDMM (Telecommunications Distribution Methods Manual).

4.2 Emerging technologies

With the advent of new technologies such as VOIP (Voice over internet protocol),POE(Power over Ethernet), IPVideo (Video over Ethernet) and various Wireless Ethernet protocols consideration should be given on a case by case scenario. Each has associated with them various standards and guidelines of their own which may need to be considered when merging with the MUNet Cabling System. The Department of Computing and Communications can assist further if any of these technologies are being considered.

Important note:

This document should be treated as a living document and is to be amended as technologies change. Please send your suggestions to:

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APPENDIX H – CORE SCIENCE FACILITY RENOVATIONS TO CSF-5109, BUILDING CODE ANALYSIS

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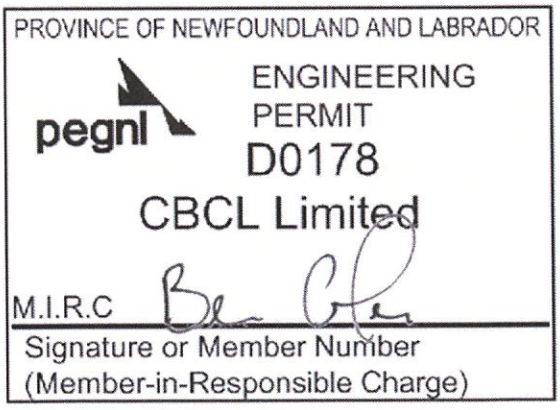
Fougere Menchenton Architecture Inc.

Core Science Facility Renovations to CSF-F109
St. John's, NL

Building Code Analysis



1	24299.00 Sealed BCA Revised R250611	Victoria Griffin, PTech	Ben Coles, M.Sc., P.Eng., FEC	11-Jun-2025	Sarah Greenlaw
	24299.00 Sealed BCA R250611	Victoria Griffin, PTech	Ben Coles, M.Sc., P.Eng., FEC	11-Jun-2025	Sarah Greenlaw
Rev.	Issue	Prepared By:	Reviewed By:	Date	Issued By:

RJ Bartlett Engineering

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Project No.: 24299

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1 Introduction

Fougere Menchenton Architecture Inc. (FMAI) has retained RJ Bartlett Engineering, A Division of CBCL Limited (RJBE) to complete a building code report that identifies the major fire and life safety requirements specific to the renovation of a suite located within Pavillion C on Level 5 of the Memorial University Core Science Facility located at 45 Arctic Avenue in St. John's, NL.

The project involves an interior fit-up to support the development of a computer research lab, office space and student workstations.

This report considered the 2020 National Building Code of Canada (NBC) and the 2024 NPFA 101, *"Life Safety Code"* as it pertains to egress and exiting and is based on a review of the "Issued for Tender" architectural drawings prepared by FMAI dated June 5, 2025, and consideration for previously developed alternative solution assumptions and implemented measures as well as previously developed engineering judgments.

This review has not considered the health, barrier-free and accessibility requirements governed by the NBC/CSA as amended by the Consolidated Newfoundland and Labrador Regulation 1140/96.

This report is intended for use of the design team members and the Authority Having Jurisdiction (AHJ) to assist in applying the NBC/LSC and past alternative solution assumptions to this project.

2 Applicable Codes and Standards

The applicable Codes and Standards that have been considered for this review, with respect to fire protection and life safety, include but are not limited to, the following:

- National Building Code of Canada, 2020 (NBC).
- National Fire Code of Canada, 2020 (NFC).
- NFPA 10, *"Standard for Portable Fire Extinguishers",* 2013 Edition.
- NFPA 13, "*Standard for the Installation of Sprinkler Systems*", 2019 Edition.
- NFPA 80, *"Standard for Fire Doors and Other Opening Protectives",* 2013 Edition.
- NFPA 101, *"Life Safety Code",* 2024 Edition.

- NFPA 105, *"Standard for Smoke Door Assemblies and Other Opening Protectives",* 2013 Edition.
- CAN/ULC-S115-11, *"Fire Tests of Firestop Systems".*
- CAN/ULC-S524-19, "*Standard for the Installation of Fire Alarm Systems*".
- CAN/ULC-S537-19*, "Verification of Fire Alarm Systems".* CAN/ULC-S561-18, *"Standard for the Installation and Services for Fire Signal Receiving Centres and Systems".*
- CAN/ULC-S1001-11, *"Integrated Systems Testing of Fire Protection and Life Safety Systems".*

3 Building Description

The Core Science Facility (CSF) has a building (footprint) area of approximately 8,600 m^2 and is six storeys in building height with an interstitial floor space and a mechanical penthouse. A pedway/link is also provided which connects the CSF to the adjacent University Centre (UC) building.

The building does not qualify as a high building by Subsection 3.2.6. of the NBC as the height measured between grade and the floor level of Level 5 is approximately 25 m with the Penthouse floor at a height of approximately 30 m from grade. The building is not a high building by way of the cumulative occupant load measurement as shown in Table 1 below, which indicates the 300 person limit is not exceeded. Note that this cumulative calculation table has been updated from the original code analysis to account for a shift in aggregate widths and occupant loading.

Table 1: Cumulative Load Factor Calculation

Level	Occupant Load (On or Above)	Exit Minimum Aggregate Width (mm)	Cumulative Occupant Load Factor
5	1,098 persons	8,720	70
4	1,737 persons	8,720	111
3	2,367 persons	8,720	151
2	3,297 persons	8,720	211
1	3,930 persons	8,720	251

The building is of noncombustible construction and is equipped with sprinkler protection, fire detection and alarm, and standpipe systems throughout.

General occupancy use throughout the MCS base building has been previously established as a combination of research and teaching laboratories/classrooms, complete with subsidiary support. Whereas the functional program has envisioned in excess of 50 persons congregating in one space within the fit-up, the major occupancy has been established as Assembly; It was originally envisioned that Group D and Group F, Division 3 tenancies would reside on this upper storey but the inclusion of Assembly is not problematic so far as major construction requirements and fire separations are concerned. The suite renovation will consist of student workspaces, computer lab spaces, an office, and a meeting room.

Broadly speaking, the CSF is considered to have multiple major occupancies: Group D (Business and Personal Services), Group F, Division 3 (Low Hazard Industrial) and Group A, Division 2 (Assembly).

The building is bounded by the following:

- Arctic Avenue to the north,
- Parking and the University Centre to the east,
- Prince Philip Drive to the south, and
- Westerland Road to the west.

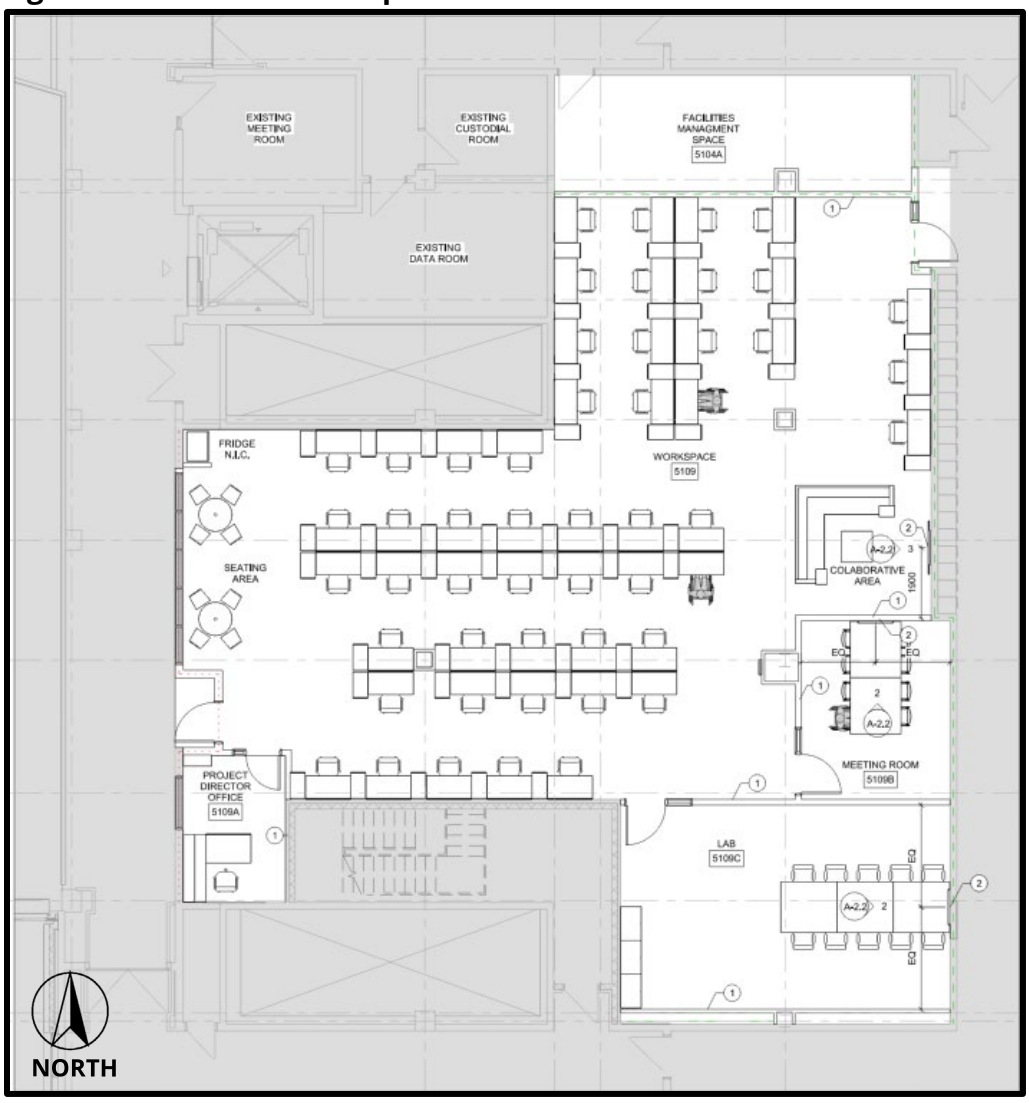
Refer to Figure 1 below for an aerial site plan of the building.

Figure 1: Aerial Site Plan

The building features two atriums that span Levels 1 through 5, creating three pavilions. Each pavilion on each level is served by two fire rated exit stairs which discharge to the exterior on the first storey. These two fire rated exit stairs will be connected by a public corridor system that will accommodate future tenant fit-ups. Additional access to exits is available for 5C via the elevated walkway to Pavilion 5B.

This report will focus on the suite fit-up occurring on Level 5 in Pavilion C of the CSF. Refer to Figure 2 for a floor plan of the CSF-5109 suite fit-up.

Figure 2: Pav 5C 5109 Fit-Up Floor Plan



It is acknowledged that RJBE has completed past reviews of the 5A fit-up entitled, *"22265 Sealed BCA R220922"* and the entirety of the CSF entitled, *"14024 Sealed Design Development Building Code Analysis R170119".*

RJBE has also developed several engineering judgements/alternative solutions which addressed:

- The interconnected floor space, entitled *"14336 Sealed FPE Analysis R170119",*
- The contemplated departure from the acceptable solution requirements specific to public corridor/access to exits, entitled *"22265 Sealed L230223",*
- The application of NFPA 30/45/55 for lab areas in lieu of the NFC, entitled *"14024 Final L141028",*

- The exercise of reducing as-built exit stair widths into the egress model assumptions originally established, entitled *"19083 Sealed Readdressed L191128",* and

- The use of window sprinklers as a means of achieving rated fire separations, entitled *"19083 Sealed L210809".*

The impacts of these alternative solutions on the subject tenant suite fit-up, have been considered in this review and applicable information is provided where appropriate. Any future Engineering Judgement or Alternative Solution developed by RJBE, or others, shall consider this analysis.

4 Code Review

4.1 Construction Requirements

The various functional uses of the base MCS building have previously been established into three major NBC occupancy classifications as per below.

- Group A, Division 2 – Assembly.

- Group D – Business and Personal Services.

- Group F, Division 3 – Low-Hazard, Industrial.

Group D and F3 major occupancies were previously established specifically for Level 5, and the proposed fit-up will consistent of an assembly occupancy as the room exceeds an occupant load of 50 persons.

Based on the building height, building area, and major occupancy classification, the following construction requirements are applicable (NBC Article 3.2.2.56.):

- Automatic sprinkler protection throughout,

- Be of noncombustible construction,

- Floor assemblies constructed as fire separations having a minimum fire-resistance rating not less than 2 h,

- Mezzanines have a fire-resistance rating of not less than 1 h, and

- Loadbearing members have a fire-resistance rating of not less than that required for the supported assembly.

Combustible components used in this building, including the protection of foamed plastic insulation, are required to comply with NBC Subsection 3.1.5.

4.2 Spatial Separation

The exterior wall construction (materials, fire-resistance rating, and quantity of unprotected openings) is a function of the following:

- The area of the exterior wall in a fire compartment (exposing building face),
- The limiting distance measured to a property line or a line between adjacent buildings,
- The occupancy classification of the fire compartment, and
- The presence of sprinkler protection.

It is in the understanding of RJBE that the exterior of the building will remain untouched during the Level 5 suite fit-up and as such, the existing conditions are acceptable.

4.3 Fire Separations

4.3.1 Fire-Resistance Ratings

The rating of a material, assembly of materials or a structural member that is required to have a fire-resistance rating, is to be determined on the basis of the results of tests conducted in conformance with CAN/ULC-S101 (NBC Sentence 3.1.7.1.(1)).

Rooms and areas are to be separated from the remainder of the building as indicated in Table 2.

Table 2: Room/Area Fire Separations

Room/Area Description	Fire-Resistance Rating	NBC Reference
Exits	2 h	Sentence 3.4.4.1.(1)
Exit Stair from Penthouse	2 h	Sentence 3.4.4.1.(1)
Elevator Hoistways	2 h	Sentence 3.5.3.1.(1)
Elevator Machine Rooms	2 h	Sentence 3.5.3.3.(1)
Vertical Service Spaces	1 h	Sentence 3.6.3.1.(1)
Tenant Suite from Balance of Pavilion C[(a)]	1 h	Articles 3.3.1.1. / 3.1.3.1.
Public Corridor Serving Multiple Tenant Suites	0 h	Sentence 3.3.1.4.(3)/3.3.2.6.(3)
Service Rooms[(b)]	1 h	Sentence 3.6.2.1.(1)
Electrical Rooms/Data Room[(c)]	1 h	Sentence 3.6.2.1.(6)
Pav C from Atrium Space (West Wall of Suite)	2 h	Per RJBE Alternative Solution
Janitor Room	Non-Rated	Sentence 3.3.1.22.(3)

(a) The occupancy classification of adjacent tenant fit-ups will determine if a fire-resistance rating is required for suite-to-suite separations. Certain combinations of occupancy types\ require a min 1 h fire-resistance rating. For the consideration of future flexibility, it is recommended that the subject tenant fit-up be separated from the balance of Pavilion C with a 1 h fire separation.

(b) Service rooms containing fuel-fired appliances such as boilers.

(c) Electrical rooms containing electrical equipment that is required to be located in a service room according to CSA C22.1.

4.3.2 Closures

NBC Article 3.1.8.4. requires openings within a fire separation to be protected with listed closures having a fire-protection rating in accordance with Table 3.

Table 3: Fire-Protection Rating of Closures

Fire-Resistance Rating of Fire Separation	Minimum Fire-Protection Rating of Closure
1 h	45 min
2 h	1.5 h

A door assembly having a fire-protection rating of 20 min is permitted to be used as a closure in a fire separation required to have a fire-resistance rating of 1 h or less, between a suite and the public corridor (NBC Article 3.1.8.12).

Any wall, partition or floor assembly required to be a fire separation is to be constructed as a continuous element and have a fire-resistance rating as specified in Table 1 of this report (NBC Sentence 3.1.8.1.(1)).

The size of an opening in an interior fire separation required to be protected with a closure is not to be more than 22 m^2, with no dimension more than 6 m (NBC Sentence 3.1.8.6.(2)).

Closures and penetrations within required fire separations are required to conform to NBC Subsection 3.1.8.

Except where exempted by NBC Article 3.1.8.8., ducts or air-transfer openings that penetrate an assembly required to be a fire separation are to be equipped with listed fire dampers having a fire-protection rating as noted in Table 2 (NBC Sentence 3.1.8.7.(1)).

Except where exempted by NBC Article 3.1.8.9., a smoke damper or a combination smoke/fire damper is to be installed in ducts or air-transfer openings that penetrate an assembly required to be a fire separation (rated or non-rated), where the fire separation separates a public corridor, or serves a (future) assembly portion of the building (NBC Sentence 3.1.8.7.(2)).

Refer to Section 5 for further discussion regarding smoke dampers.

The requirement for fire dampers is permitted to be waived for (NBC Sentence 3.1.8.8.(1):

- Continuous noncombustible ducts having a melting point above 760°C that penetrate a vertical fire separation between suites of assembly,
- Ducts or air-transfer openings that penetrate a vertical fire separation not required to have a fire-resistance rating, or
- Noncombustible ducts or air-transfer openings that penetrate a vertical fire separation not required to have a fire-resistance rating, or
- Noncombustible ducts or air-transfer openings that penetrate a horizontal fire separation not required to have a fire-resistance rating.

The requirement for fire dampers is permitted to be waived for noncombustible branch ducts having a melting point above 760°C that penetrate a fire separation (NBC Sentence 3.1.8.8.(2)):

- Provided the ducts
  - Have a cross-sectional area not more than 0.013 m^2 and serve only air-conditioning units or combined air-conditioning and heating units discharging air not more than 1.2 m above the floor, or

- Extend not less than 500 mm inside exhaust duct risers that are under negative pressure and in which the airflow is upward as required by NBC Article 3.6.3.4., or

- Where the fire separation separates a vertical service space from the remainder of the building, provided each individual duct exhausts directly to the outdoors at the top of the vertical service space.

The requirement for smoke dampers or combination smoke/fire dampers is permitted to be waived for ducts (NBC Sentence 3.1.8.9.(1)):

- In which all inlet and outlet openings serve not more than one fire compartment, or

- That penetrate a vertical fire separation referred to in NBC Clause 3.3.1.7.(1)(b), provided
  - The movement of air is continuous, and
  - The configuration of the air-handling system prevents the recirculation of exhaust or return air under fire emergency conditions.

The requirement for smoke dampers and combination smoke/fire dampers is permitted to be waived for noncombustible branch ducts having a melting point above 760°C that penetrate a fire separation (NBC Sentence 3.1.8.9.(2)):

- Provided the ducts
  - Have a cross-sectional area not more than 0.013 m^2 and serve only air-conditioning units or combined air-conditioning and heating units discharging air not more than 1.2 m above the floor,
  - Extend not less than 500 mm inside exhaust duct risers that are under negative pressure and in which the airflow is upward as required by NBC Article 3.6.3.4., or
  - Are required to function as part of a smoke control system, or

- Where the fire separation separates a vertical service space from the remainder of the building, provided each individual duct exhausts directly to the outdoors at the top of the vertical service space.

Fire dampers are to be installed in the plane of the fire separation so as to stay in place should the duct become dislodged during a fire (NBC Sentence 3.1.8.10.(1)).

Fire dampers are to be arranged so that they automatically close upon the operation of a fusible link conforming to ULC-S505 or other heat-actuated or smoke-actuated device (NBC Sentence 3.1.8.10.(2)).

A heat-actuated device noted in the above requirement is to (NBC Sentence 3.1.8.10.(3)):

- Be located where it is readily affected by an abnormal rise in temperature in the duct, and
- Have a temperature rating approximately 30°C above the maximum temperature that would exist in the system, whether it is in operation or shut down.

Fire dampers, smoke dampers and combination smoke/fire dampers tested in the vertical or horizontal position are to be installed in the position in which it was tested (NBC Sentences 3.1.8.10.(4) and 3.1.8.11.(4)).

A tightly fitted access door is to be installed for each fire damper, smoke damper and combination smoke/fire damper to provide access for the inspection of the damper and the resetting of the release device (NBC Sentences 3.1.8.10.(5) and 3.1.8.11.(5)).

Where smoke dampers are used as a closure in an air-transfer opening, they are to be installed in the plane of the fire separation (NBC Sentence 3.1.8.11.(1)).

Where combination smoke/fire dampers are used as a closure in a duct, they are to be installed within 610 mm of the plane of the fire separation, provided there is no inlet or outlet opening between the fire separation and the damper (NBC Sentence 3.1.8.11.(2)).

Smoke dampers and combination smoke/fire dampers are to be configured so as to close automatically upon signal from an adjacent smoke detector located as described in CAN/ULC-S524, within 1.5 m horizontally of the duct or air-transfer opening in the fire separation (NBC Sentence 3.1.8.11.(3)):

- On both sides of the air-transfer opening, or
- In the duct downstream of the smoke damper or combination smoke/fire damper.

Doors in a required fire separation are to be equipped with listed self-closing and positive-latching mechanisms (NBC Articles 3.1.8.13 and 3.1.8.15).

A hold-open device is permitted to be used on a closure in a required fire separation, other than on an exit stair door in a building more than three storeys in building height and on a door for a vestibule required by NBC Article 3.3.5.7., provided the device is designed to release the closure in conformance with this Article (NBC Sentence 3.1.8.14.(1)).

Where the building is provided with a fire alarm system, a hold-open device is to release upon any alert signal from the fire alarm system or upon actuation of any adjacent smoke detectors (NBC Sentence 3.1.8.14.(2)).

Where the building is provided with a fire alarm system, a hold-open device is to release upon a signal from a smoke detector connected to the fire alarm system and located as described in CAN/ULC-S524, where the hold-open device is used on (NBC Sentence 3.1.8.14.(3)):

- A door opening into a public corridor,
- A closure serving an assembly occupancy, or
- A door in a fire separation referred to in NBC Clause 3.3.1.7.(1)(b).

4.3.3 Fire Blocks and Fire Stops

The continuity of a fire separation having a fire-resistance rating that abuts another fire separation, a floor, a ceiling, or a roof is to be maintained by a fire stop that conforms with the below requirement (NBC Sentence 3.1.8.3.(2)).

The fire stop required above is to have an FT rating not less than the fire-resistance rating of the abutting fire separation when subjected to the fire test method in CAN/ULC-S115 (NBC Sentence 3.1.8.3.(3)).

Except as noted in the requirement below, joints located in a horizontal plane between a floor and an exterior wall are to be sealed by a fire stop that, when subjected to the fire test method in ASTM E2307, has an F rating not less than the fire-resistance rating of the horizontal fire separation (NBC Sentence 3.1.8.3.(4)).

Joints between ceilings and walls, between floors and walls, and between walls at corners need not comply with NBC Sentences 3.1.8.3.(2) and (4) where such joints consist of gypsum board that is attached to framing members and arranged so as to restrict the passage of flame and smoke through the joints (NBC Sentence 3.1.8.3.(5)).

Penetrations through fire separations or a membrane forming part of an assembly required to have a fire-resistance rating are to be sealed with listed fire stop systems in conformance with NBC Subsection 3.1.9.

Concealed spaces are to be protected by fire blocks in conformance with NBC Subsection 3.1.11.

Unless specifically designed with a fire stop, fire dampers are permitted to penetrate a fire separation or a membrane forming part of an assembly required to have a fire-resistance rating without having to meet the fire stop requirements of NBC Sentences 3.1.9.1.(1) to 3.1.9.1.(3) provided the fire damper is installed in conformance with NFPA 80 (NBC Sentence 3.1.9.1.(5)).

Except as provided in NBC Sentence 3.1.9.3.(3) noted below, outlet boxes are permitted to penetrate the membrane of an assembly required to have a fire-resistance rating, provided they are sealed at the penetration by a fire stop that has an FT rating not less than the fire-resistance rating of the fire separation when subjected to the fire test method in CAN/ULC-S115 (NBC Sentence 3.1.9.3.(1)).

Combustible outlet boxes are permitted to penetrate the membrane of an assembly required to have a fire-resistance rating, provided they are sealed at the penetration by a fire stop that, when subjected to the fire test method in CAN/ULC-S115, has an FT rating not less than the fire-resistance rating for the fire separation (NBC Sentence 3.1.9.3.(2)).

Noncombustible outlet boxes that penetrate a vertical fire separation or a membrane forming part of an assembly required to have a fire-resistance rating need not conform to NBC Sentence 3.1.9.3.(1) above, provided (NBC Sentence 3.1.9.3.(3):

- They do not exceed:
  - 0.016 m^2 in area, and
  - An aggregate area of 0.065 m^2 in any 9.3 m^2 of surface area, and

- The annular space between the membrane and the noncombustible electrical outlet boxes does not exceed 3 mm.

Outlet boxes on opposite sides of a vertical fire separation having a fire-resistance rating are to be separated by (NBC Sentence 3.1.9.3.(4)):

- A horizontal distance of not less than 600 mm,

- A fire block conforming to NBC Article 3.1.11.7., or

- A fire stop installed on each outlet box that has an FT rating not less than the fire-resistance rating of the fire separation when subjected to the fire test method in CAN/ULC-S115.

Combustible drain, waste and vent piping is permitted to penetrate a fire separation required to have a fire-resistance rating or a membrane that forms part of an assembly required to have a fire-resistance rating, provided (NBC Sentence 3.1.9.4.(4)):

- The piping is sealed at the penetration by a fire stop that has an F rating not less than the fire-resistance rating required for the fire separation when subjected to the fire test method in CAN/ULC-S115,

- In buildings more than three storeys in building height, the piping is sealed at the penetration by a fire stop that has an F rating not less than the fire-resistance rating required for the fire separation when subjected to the fire test method in CAN/ULC-S115 with a pressure differential of 50 Pa between the exposed and unexposed sides, with the higher pressure on the exposed side, and

- The piping is not located in a vertical service space.

4.3.4 Flame-Spread Rating

The flame-spread rating and smoke development classification of a material, assembly, or structural member are to be determined on the basis of not less than three tests conducted in conformance with CAN/ULC-S102 (NBC Sentence 3.1.12.1.(1)).

The flame-spread rating and smoke developed classification of a material or assembly are to be determined on the basis of not less than three tests conducted in conformance with CAN/ULC-S102.2 if the material or assembly (NBC Sentence 3.1.12.1.(2)):

- Is designed for use in a relatively horizontal position with only its top surface exposed to air,

- Cannot be tested per CAN/ULC-S102 without the use of supporting material that is not representative of the intended installation, or

- Is thermoplastic.

A material, assembly, or structural member is also permitted to be assigned a flame-spread rating and smoke developed classification based on NBC Appendix D (NBC Sentence 3.1.12.1.(3)).

Combustible interior wall and ceiling finishes, which consist of surfacing of fabric, paint, plastic, veneer or wallpaper, which are not more than 1 mm thick are permitted in a building required to be of noncombustible construction (NBC Sentence 3.1.5.12.(1)).

Combustible interior wall finishes, other than foamed plastics, which are not more than 25 mm thick are permitted in a building required to be of noncombustible construction, provided they have a flame-spread rating not more than 150 on any exposed surface, or any surface that would be exposed by cutting through the material in any direction (NBC Sentence 3.1.5.12.(2)).

Expect as provided in the below requirement, combustible interior ceiling finishes, other than foamed plastics, that are not more than 25 mm thick are permitted in a building required to be of noncombustible construction, provided they have a flame-spread rating not more than 25 on any exposed surface, or any surface that would be exposed by cutting through the material in any direction, except that not more than 10% of the ceiling area within each fire compartment is permitted to have a flame-spread rating not more than 150 (NBC Sentence 3.1.5.12.(3)).

Combustible interior ceiling finishes made of fire-retardant-treated wood are permitted in a building required to be of noncombustible construction, provided the flame-spread rating on the surface is not more than 25 (NBC Sentence 3.1.5.12.(4)).

4.4 Egress and Exiting

4.4.1 Occupant Load

An occupant load analysis has been completed using the factors representative of the use of space as follows (NFPA 101 Table 7.3.1.2) and is summarized in Table 4:

- Research/computer labs (4.6 m^2/person),
- Collaboration rooms < 42 m^2 in area (2.8 m^2/person), and
- Business use for offices (14 m^2/person).

Table 4: Occupant Load Summary

Floor	Room	Approximate Area (m^2)	Occupant Load Factor (m^2/Person)	Calculated Occupant Load (Persons)	Functional Occupant Load (Persons)
Fifth	Workspace	238	4.6	52	90
	Meeting Room	20	2.8	8	
	Project Director Office	11	14	1	
	Lab	50	4.6	11	
Total Fifth Floor (Suite 5109) Occupant Load				***72***	***90***

It is acknowledged that the original occupant loading assumed in the base building egress models had accounted for 800 across the three L5 pavilions; the current implications across the recent/future A/B/C fit-ups is being evaluated concurrently by RJBE.

4.4.2 Exit Capacity

An exit capacity analysis has been completed using the factors indicated in NFPA 101, Table 7.3.3.1.as summarized in Table 5.

Table 5: Exit Capacity Summary

Floor	Exit	Approximate Width (mm)	Exit Capacity Factor (mm/Person)	Exit Capacity (Persons)
Fifth	Stair 3	1,630	7.6[(a)]	214
	Stair 4	1,630	7.6[(a)]	214
Total 5C Exit Capacity				***428[(b)]***

(a) NFPA Section 7.3.3.2 modified equation.
(b) If necessary to accommodate future shelled space uses, additional capacity is available via adjacent Pavilion B/C.

4.4.3 General Exit and Egress Requirements

NFPA 101 Sub-Subparagraph 7.2.1.2.3.2 requires door openings in means of egress to not be less than 810 mm in clear width.

A minimum of two means of egress is to be provided from the 5C Pavilion (NFPA 101 Paragraph 13.2.4.2).

The travel distance to an exit is not to exceed 76 m (NFPA 101 Paragraph 13.2.6.2).

The common path of travel is permitted for the first 6.1 m from any point where the common path serves any number of occupants, and for the first 23 m from any point where the common path serves not more than 50 occupants (NFPA 101 Paragraph 13.2.5.2).

Dead-end corridors are not to exceed 6.1 m (NFPA Paragraph 13.2.5.3).

Every door opening and every principal entrance that is required to serve as an exit is to be designed and constructed so that the path of egress travel is obvious and direct. Windows that, because of their physical configuration or design and the materials used in their construction, have the potential to be mistaken for door openings are to be made inaccessible to the occupants by barriers or railings (NFPA 101 Subparagraph 7.2.1.1.2).

NFPA 101 Subparagraph 7.2.1.2.3 requires door openings in means of egress to not be less than 810 mm in clear width.

All exit doors, and egress doors from a room that is intended for an occupant load of more than 50 persons are to swing in the direction of travel to an exit and on a vertical axis (NFPA 101 Sub-subparagraph 7.2.1.4.2.1).

Only approved fire exit hardware is to be used on fire protection-rated door assemblies. New panic hardware and new fire exit hardware are to comply with ANSI/UL 305, *Standard for Safety Panic Hardware,* and ANSI/BHMA A156.3, *Exit Devices* (NFPA 101 Subparagraph 7.2.1.7.2).

Notwithstanding dimensional requirements arising from occupant load or the alternative solution, the minimum required width of exit components serving the building as per NFPA 101 is outlined below in Table 6. The minimum height of risers is of 100 mm and the minimum tread depth is 280 mm (NFPA 101 Sub-subparagraph 7.2.2.2.1.1 and 7.2.2.2.1.2).

Table 6: Minimum Clear Widths

Description	Minimum Clear Opening Width (mm)
Doorways	810
Corridors	1,120
Exit Stairs	1,120

Exits are to be located, and exit access is to be arranged, so that exits are readily accessible at all times (NFPA 101 Paragraph 7.5.1.1).

Where exits are not immediately accessible from an open floor area, continuous passageways, aisles, or corridors leading directly to every exit are to be maintained and arranged to provide access for each occupant to not less than two exits by separate ways of travel (NFPA 101 Subparagraph 7.5.1.1.1).

Where more than one exit, exit access, or exit discharge is required from a building or portion thereof, such exits, exit accesses, or exit discharges are to be remotely located from each other and be arranged to minimize the possibility that more than one has the potential to be blocked by any one fire or other emergency condition (NFPA 101 Section 7.5.1.3.1).

Exit access and exit doors are to be designed and arranged to be clearly recognizable (NFPA 101 Paragraph 7.5.2.2).

4.4.4 Exit Signs

Access to exits is to be marked by approved, readily visible signs in all cases where the exit or way to reach the exit is not readily apparent to the occupants (NFPA 101 Subparagraph 7.10.1.5.1.).

A sign complying with 7.10.3, with a directional indicator showing the direction of travel, is to be placed in every location where the direction of travel to reach the nearest exit is not apparent (NFPA 101 Paragraph 7.10.2.1).

Signs are to read as follows in plainly legible letters, or other appropriate wording is to be used: EXIT. Where approved by the AHJ, pictograms in compliance with NFPA 170 are permitted (NFPA 101 Subsection 7.10.3).

Each exit sign is to consist of a green pictogram and a white or lightly tinted graphical symbol meeting the color specifications referred to in ISO 3864-1, "*Graphical symbols – Safety colors and safety signs – Part 1: Design principles for safety signs in workplaces and public areas*," and conform to the dimensions indicated in ISO 7010, "*Graphical symbols – Safety colors and safety signs – Safety signs in workplaces and public areas"* for the directional symbols (NBC Article 3.4.5.1.).

4.5 Interconnected Floor Space

The CFS includes two central atrium spaces, which effectively create three distinct pavilions. Per the NBC acceptable solutions requirements, these interconnected floor spaces require the following measures of additional protection (NBC Subsection 3.2.8.):

- Exit stairs which open into the interconnected floor space are required to have non-rated vestibules that have doorways not less than 1.8 m apart. The vestibules are to be designed to limit the passage of smoke so that the exit shaft does not contain more than 1% by volume of contaminated air from the fire floor.

- Elevator hoistways opening into an interconnected floor space and into storeys above the interconnected floor space are to be protected by vestibules as above.

- Exits serving the interconnected floor space are required to be cumulative unless:
  - Not less than 0.3 m^2 of area of treads and landings is provided for each occupant of the interconnected floor space, or
  - Not less than 0.5 m^2 of protected floor space is provided for each occupant of the interconnected floor space.

- Draft stops having a depth of not less than 500 mm are required to be provided around the perimeter of atrium floor openings on each level.

- A manually activated mechanical exhaust system is required to remove air from the interconnected floor space at a rate of four air changes per hour.

- Combustible contents, excluding interior finishes, in the interconnected floor space in areas where the ceiling is more than 8 m above floor level is required to be limited to 16 g of combustible material for each cubic meter of interconnected floor space volume.

A performance-based alternative solution has been developed to facilitate a greater degree of interconnection for the upper atrium levels. This alternative is not impacted by the previous introduction of the 5A fit-up or the current 5C suite fit-up, however implications on certain fire safety features need to be incorporated into this design and are explicitly identified in the relevant report sections (e.g., enhanced fire separations in certain locations, sprinkler head specifications, maintained exit stair widths).

4.6 Active Fire Protection

4.6.1 Fire Suppression Systems

As the building is provided with a sprinkler and standpipe systems, any alterations to the existing systems are to comply with the requirements of NFPA 13 and NFPA 14. The sprinkler system also considered the sequencing requirements of the atrium smoke control system as per the RJBE alternative solution.

In keeping with the previously accepted alternative solution, the automatic sprinkler systems serving all floor areas are to be equipped with fast-response type sprinkler heads with an activation temperature of 57°C. Some exceptions apply such as service rooms, at the ceiling level of the atrium space, and other areas where high ambient temperatures are expected.

Where fire protection and life safety systems and systems with fire protection and life safety functions are integrated with each other, they are to be tested as a whole in accordance with CAN/ULC-S1001 to verify that they have been properly integrated (NBC Article 3.2.9.1.).

Portable fire extinguishers are to be provided and installed in accordance with provincial or territorial regulations or municipal By-Laws, or in the absence of regulations or By-Laws, the National Fire Code of Canada (NBC Article 3.2.5.16.). Portable fire extinguisher coverage is to be maintained in accordance with NFPA 10, particularly if it is intended to eliminate placement of extinguishers from the fit-up proper.

4.6.2 Fire Alarm and Detection System

Any alterations to the existing fire alarm system are to be in accordance with CAN/ULC-S524.

The CSF is served by a two-stage fire alarm system as permitted by NBC Articles 3.2.4.1. and 3.2.4.3.

The fire alarm system is required to provide notification to the local fire department in conformance with CAN/ULC-S561 upon activation of a water-flow indicating device or initiation of an alarm/alert signal (NBC Article 3.2.4.7.). It has been the practice for all Campus buildings to provide monitoring via Campus Security. The acceptability of such a continued approach for this project is at the discretion of the Building Owner, Emergency Responders, and the AHJ.

A voice communication system will be provided throughout the building and is to consist of (NBC Sentences 3.2.4.22.(4) and (5)):

- A two-way means of communication with the central alarm and control facility and to the mechanical control centre from each floor area, and
- Loudspeakers operated from the central alarm and control facility that are designed and located so that transmitted messages are audible and intelligible in all parts of the building, except in elevator cars.

The fire alarm system is required to be zoned such that separate indication are provided for the following (NBC Article 3.2.4.8.):

- Each shaft required to be equipped with a smoke detector.
- Each ventilation system required to be equipped with a smoke detector.
- Each level or area as specified by NFPA 13.

The sprinkler system and fire alarm zoning are required to be consistent based on the most stringent requirements. As part of the enhanced measures to facilitate the atrium alternative solution, the main fire alarm panel will be located in the CACF at the east atrium main entrance, with an additional annunciator at the secondary response point located at the west atrium main entrance.

The automatic sprinkler system is required to be electrically supervised to indicate a supervisory signal on the building fire alarm system annunciator for each of the following. Indication of a supervisory signal is to be transmitted to the fire department in conformance with CAN/ULC-S561 (NBC Sentences 3.2.4.9.(3) and 3.2.4.10.(5)) for the following:

- Movement of a valve handle that controls the supply of water to sprinklers,
- Loss of excess water pressure required to prevent false alarms in a wet pipe system,
- Loss of air pressure in a dry pipe system,
- Loss of air pressure in a pressure tank, and
- A temperature approaching the freezing point in any dry pipe valve enclosure or water storage container used for firefighting purposes.

Detection is to be provided by the following devices:

- Smoke detectors installed at the top of each exit stair, in the vicinity of draft stops, in elevator machine rooms, near the entrance of walkways to adjacent buildings and as required by the atria alternative solution (NBC Article 3.2.4.11.),
- Duct-type smoke detectors in an air-handling system where it serves more than one storey (NBC Article 3.2.4.12.),
- Manual pull stations installed near every exit and principal entrances (NBC Sentence 3.2.4.16.(1)), and
- Sprinkler system waterflow detecting devices (NBC Article 3.2.4.15.).

Audible signal devices are to be installed throughout the building and be (NBC Article 3.2.4.18.):

- Clearly audible throughout the floor area,
- In conformance with the temporal pattern identified in Clause 4.2 of ISO 8201,
- At a noise level not greater than 110 dBA in a normally occupied area,
- At a noise level not less than 65 dBA, and
- Not less than 10 dBA above the ambient noise level.

Visual signal devices are required to be installed throughout the following areas (NBC Article 3.2.4.19.):

- Areas that are primarily intended for use by persons with a hearing impairments,
- Areas where ambient noise levels exceed 87 dBA, and
- Areas in which occupants use ear protection devices, are located in an audiometric booth, or are located in a sound-insulating enclosure.

Visual signaling devices are also required to be installed in conformance with the Newfoundland and Labrador Buildings Accessibility Regulations.

Fire protection and life safety systems and components are to be tested as a whole in accordance with CAN/ULC-S1001 (NBC Article 3.2.9.1.).

4.7 Window Sprinkler Systems

The use of window sprinkler systems in lieu of fire-rated construction has been previously accepted by the AHJ in the context of an alternative solution to the prescriptive requirements for fire separations in this building. The Design Team is proposing that the west wall of the 5C 5109 suite, adjacent to the atrium, is protected with listed window sprinklers. The west facing windows of suite 5C 5109 will be fitted with aluminum frames, consistent with the window framing used throughout the Atrium.

The Underwriters Laboratory of Canada (ULC) has developed and published a Test Standard that outlines requirements for providing sprinkler-protected window assemblies in lieu of traditional fire-resistive assemblies and closures. This Standard, ULC/ORD C263.1-99, "*Sprinkler-Protected Window Systems*", requires that physical testing be performed to assess the performance, under controlled fire exposure conditions, of a sprinkler-protected window system. The fire exposure used in the test is such that the temperature measured in the test room, under nonsprinklered conditions, follows the standard time temperature curve defined in CAN/ULC-S101, "*Fire Endurance Tests of Building Construction and Materials*". The term "listed" window sprinkler is intended to refer to a product tested in accordance with ULC/ORD C263.1.

General guidelines to be considered when specifying such a system are as follows and shall be incorporated as the design progresses:

- The sprinkler system shall be installed and tested in accordance with NFPA 13 as a wet pipe system and maintained in accordance with the NFC.

- Listed window sprinklers (i.e., Tyco model WS or similar), installed in accordance with the manufacturer's requirements developed based on ULC/ORD C263.1 full scale fire testing based on *"Glazing in Fire Resistant Wall Assemblies",* published by the National Research Council of Canada.

- The interior glazing shall consist of fixed non-operable tempered or heat strengthened glass installed in a hollow metal steel and/or aluminum frame per the sprinkler manufacturer's listing.

- This window sprinkler system may be used to protect non-operable window openings to a maximum of 2 h fire-resistance rating provided:
  - In an exposing building face or exterior spatial separation, the window sprinkler is installed on the interior side of the window, or
  - In an interior fire separation, the window sprinkler is installed on both sides of the window in the fire separation.

- Should the system be located in a loadbearing wall, all loadbearing components shall be protected independently of this window sprinkler assembly system.

- This window sprinkler system shall not be used in more than 50% of required exits.

This window sprinkler system shall be zoned separately from the building's floor area.

4.8 Fire Department Access

A fire department connection serving the sprinkler and standpipe systems is to be located near the primary fire department response point and not more than 45 m, unobstructed, from a fire hydrant (NBC Article 3.2.5.15.). As part of the enhanced measures to facilitate the atria alternative solution, multiple siamese connections have been provided and form a looped system (i.e., one at each of the two designated fire department response points).

Fire department access routes are required to be provided for each building face having a principal entrance. The access route is to be located such that the principal entrance is not less than 3 m and not more than 15 m from the closest portion of the fire department access route, measured horizontally from the face of the building
(NBC Sentence 3.2.5.5.(1)).

NBC Article 3.2.5.4. requires an access route for fire department vehicles to the principal entrance. Access route design requirements are as follows (NBC Article 3.2.5.6.):

- Located not less than 3 m, but no more than 15 m from the principal entrance to the building,

- A minimum width of 6 m and a centerline radius of not less than 12 m,
- Have a change of gradient no more than 1 in 12.5 over a minimum distance of 15 m,
- Surfaced with concrete, asphalt or other suitable material suitable to support firefighting equipment under all climatic conditions,
- Be accessible under all climatic conditions, and
- Have an overhead clearance not less than 5 m.

Where the slope of the roof of the CSF is less than 1 in 4, all main roof areas are required to provide direct access from the floor areas immediately below, either by a stairway or a hatch not less than 550 mm by 900 mm with a fixed ladder (NBC Article 3.2.5.3.).

4.9 Emergency Power and Lighting

Emergency lighting with an average level of illumination of 10 lx and a minimum value not less than 1 lx is required to be provided in (NBC Article 3.2.7.3.):

- Exits,
- Principal routes providing access to exits in open floor areas and service rooms,
- Laboratory units,
- Corridors serving lab spaces,
- Public washrooms that are equipped to serve more than one person at a time,
- Floor areas or parts thereof where the public may congregate in Group A, Division 2 occupancies having an occupant load of 60 or more, and
- Corridors used by the public.

The following systems are to be provided with an emergency power supply via a generator, batteries, or a combination of both:

- All emergency lighting and exit signs for a period of 90 min (NFPA Paragraph 7.9.2.1.), and

- The building's fire alarm and detection system for a period of 24 h of supervisory operation immediately followed by 90 min of operation under full load (NBC Article 3.2.7.8. and NFPA 101 Paragraph 7.9.2.1.).

It is noted that as part of the alternative solution, these systems are required to operate under full load for a period of 2 h.

An emergency electrical power supply system shall be installed in conformance with CSA C282 (NBC Sentence 3.2.7.5.). If a liquid or fuel-fired engine or turbine for emergency electric power supply is dependent on a fuel supply from outside the building, the fuel supply shall be provided with an appropriately identified separate shut-off valve outside the building (NBC Sentence 3.2.7.6.(1)).

If provided, an emergency electrical power supply system serving any fire safety system is to be installed in conformance with CSA C282 (NBC Article 3.2.7.5.).

Two elevators for use by firefighters have been provided in the building as part of the atria alternative solution and the emergency power generator is required to be capable of operating one of the firefighter's elevators plus one additional elevator simultaneously (NBC Sentence 3.2.7.9.(2)).

Emergency conductors serving firefighter elevators, smoke control equipment, and the fire alarm and detection systems are to conform to ULC-S139, *"Fire Test for Evaluation of Integrity of Electrical Cables",* including the hose stream application, to provide a circuit integrity of 1 h, or be located in a service space that is separated from the remainder of the building by a fire separation that has a fire-resistance rating not less than 1 h. The service space is not to contain any combustible materials other than the cables being protected (NBC Article 3.2.7.10.).

The circuitry serving lighting for exit signs is to serve no equipment other than emergency equipment (NBC Sentence 3.4.5.1.(5)).

4.10 Storage and Handling of Dangerous Goods

The proposed tenant fit-up will reportedly not include any areas where dangerous goods will be handled or stored. The associated requirements are thus not relevant to this tenant.

5 Discussion

1. Smoke dampers and combination smoke/fire dampers have been incorporated into the base building's mechanical and electrical designs for many locations. Except where subject to available waivers, it is noted that combination smoke/fire dampers would be required where ductwork penetrates public corridors and other fire separations serving this assembly occupancy on L5. It is recommended that coordination between architectural, mechanical, and electrical designers be made to ensure smoke damper requirements are considered during the design phase.

2. The additional occupants that will now be present as a result of the Pav 5C fit-up (and prior L5 fit-ups) have been input into egress models previously developed by RJBE as part of the original alternative solution, to quantify the impact on the required safe egress time (RSET) considered in the analysis. This iterative exercise has been reviewed and will follow under separate cover to validate the continued acceptability of the proposed occupant loading and distribution.

6 Reliance

This document was prepared for the party indicated herein. The material and information in the document reflects RJ Bartlett Engineering, A Division of CBCL Limited's opinion and best judgment based on the information available at the time of preparation. Any use of this document or reliance on its content by third parties is the responsibility of the third party. RJ Bartlett Engineering, A Division of CBCL Limited accepts no responsibility for any damages suffered as a result of third-party use of this document.

CERC FIT UP

LEVEL 5- PAVILION C

CORE SCIENCE BUILDING, MUN
St. John's, NL

FMA Proj. No.: 0230-55

Client Proj. No: CSF-103-23

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ISSUED FOR TENDER 25-07-07

PROJECT #: 0230-55

ARCHITECTURAL

SYMBOL LEGEND

1 HR FIRE SEPARATION

2 HR FIRE SEPARATION

DOOR TYPES (SEE A-11.1 FOR SCHEDULE)

WALL TYPES

ROOM NUMBER

CEILING HEIGHTS

DENOTES WALL FINISH (SEE FINISHES SCHEDULE)
DENOTES BASEBOARD FINISH (SEE FINISHES SCHEDULE)
DENOTES FLOOR FINISH (SEE FINISHES SCHEDULE)

REFERENCE INTERIOR ELEVATION

EXISTING WALL

EXISTING TO BE REMOVED

NEW PARTITION

EXISTING DOOR TO REMAIN

EXISTING DOOR TO BE REMOVED

NEW DOOR

ARCHITECURAL DRAWING LIST

A-0.0	COVER
A-0.1	LIST OF DRAWINGS, LEGENDS, AND NOTES
A-0.2	5TH FLOOR KEY PLAN
A-1.1	DEMOLITION FLOOR PLAN
A-2.1	NEW FLOOR PLAN
A-2.2	FURNITURE PLAN
A-3.1	REFLECTED CEILING PLAN
A-6.1	WALL SECTIONS
A-6.2	WALL SECTIONS
A-8.1	DETAILS
A-8.2	WALL SECTION DETAILS
A-10.1	INTERIOR ELEVATIONS
A-11.1	DOOR SCHEDULE
A-11.2	FINISHES

ABBREVIATIONS

@ = AT
DIA = DIAMETER
ADJ = ADJUSTABLE
A.F.F. = ABOVE FINISHED FLOOR
B = BASE
BLDG, = BUILDING
C = CONCRETE
CEIL = CEILING
CF = CLEAR FINISH
CH = COAT HOOK
CHT = CHANGE TABLE
CM = CABINET MIRROR
COR = CORRIDOR
C.O.J. = CHECK ON JOB
CPT = CARPET
C.T. = CERAMIC TILE
C/W = COMPLETE WITH
DN = DOWN
DP = DOOR PULL
EC = EXPOSED CONCRETE
ELEC. = ELECTRICAL
EP = EPOXY PAINT
E = EXISTING
EX = EXISTING
F = FRIDGE (NIC)
FFE = FURNITURE, FIXTURES & EQUIPMEMT
FIN = FINISHED
FDN = FOUNDATION
FLR = FLOOR
F.R.R. = FIRE RESISTANCE RATING
GAL = GALVANIZED
GB = GRAB BAR
GB1 = GRAB BAR 1 (SEE SPEC)
GB2 = GRAB BAR 2 (SEE SPEC)
GBD = GYPSUM BOARD
H/C = HANDICAP
HM = HOLLOW METAL
JAN = JANITOR
JS = JANITORS SINK
LAT = LAY IN TILE
LSD = LIQUID SOAP DISPENSER
M = MIRROR
MC = MEDICINE CABINET
mm = MILLIMETER
MBH = MOP & BROOM HOLDER
MECH. = MECHANICAL
MEL = MELAMINE
MIN = MINIMUM
MR = MACHINE ROOM
NIC = NOT IN CONTRACT
NTS = NOT TO SCALE
O.C. = ON CENTER
P = PAINT
PF = PRE-FINISH
P.LAM = PLASTIC LAMINATE
P.T. = PORCELAIN TILE
PREP = PREPARATION
PS = PRESSED STEEL
PTD = PAPER TOWEL DISPENSER
R = RANGE (NIC)
RB = RUBBER
RF = RESILIENT FLOORING
RH = ROBE HOOK
RSO = ROUGH STUD OPENING
S/CF = STAIN CLEAR FINISH
SCH = SCHEDULE
SCW = SOLID CORE WOOD
SG = SAFETY GLASS
SND = SANITARY NAPKIN DISPOSAL
SNV = SANITARY NAPKIN VENDER
SPEC. = SPECIFICATION
STD = STANDARD
STRUCT = STRUCTURAL
SV = SHEET VINYL
TB = TOWEL BAR
T.B.D. = TO BE DETERMINED
TS = TRANSITION STRIP
TTH = TOILET TISSUE HOLDER
TYP = TYPICAL
UF = UNFINISHED
U/S = UNDERSIDE
VAR. = VARIES
VCT = VINYL COMPOSITE TILE
VEST = VESTIBULE
VT = VINYL TILE
W = WOOD
WC = WALL COVERING
W/C = WATER CLOSET
WD = WOOD
WG = WIRED GLASS
WR = WASTE RECEPTACLE
WS = WORK STATION (NIC)
WSS = WINDOW SHADE SYSTEM
WWM = WELDED WIRE MESH

*ABBREVIATIONS LISTED ABOVE ARE NOT NECESSARILY USED IN THIS PACKAGE.

NOTES:

A. GENERAL NOTES:

1. PROVIDE SYSTEMS INDICATED ON THE CONSTRUCTION DOCUMENTS. COMPLY WITH REQUIREMENTS INDICATED ON THE CONSTRUCTION DOCUMENTS.
2. WORK WITHIN THE BOUNDARIES INDICATED ACROSS ALL CONSTRUCTION DOCUMENTS.
3. ENSURE WORK DOES NOT CAUSE INTURRUPTION TO OCCUPANCY OF ADJACENT SPACES. COORDINATE TIMING OF WORK REQUIRED OUTSIDE THE SCOPE OF WORK BOUNDARIES INDICATED ON A-0.2 WITH THE CLIENT PRIOR TO THE START OF ANY WORK.
4. VERIFY ON SITE CONDITIONS AND COORDINATE WITH THE CONSTRUCTION DOCUMENTS PRIOR TO PROCEEDING WITH WORK. NOTIFY THE MUN PROJECT MANAGER OF ANY DIFFERENCES FOUND ON SITE AND WAIT FOR WRITTEN INSTRUCTIONS PRIOR TO PROCEEDING WITH WORK.
5. WHERE DRAWINGS INDICATE TO MATCH EXISTING, NO ADDITIONAL COST FOR MINIMUM QUANTITIES OR SPECIAL SHIPPING COSTS WILL BE CONSIDERED AFTER TENDER ACCEPTANCE.
6. APPROVAL FROM THE OWNER AS WELL AS WRITTEN APPROVAL BY THE OWNERS REPRESENTATIVE MUST BE RECEIVED BEFORE ANY CHANGES TO WORK COMMENCE, OR ANY MATERIALS RELATED TO A CHANGE ARE ORDERED.
7. PROVIDE CERTIFICATE OF GUARANTEE OF WORKMANSHIP AND MATERIAL FOR A PERIOD OF ONE YEAR FROM THE DATE OF ACCEPTANCE BY OWNER.
8. SUBMIT A HAZARD ASSESSMENT TO BE REVIEWED AND APPROVED BY MUN EHS (APPLIES TO GC AND SUBCONTRACTORS). OBTAIN SAFETY CLEARANCE PRIOR TO COMMENCING WORK ON SITE.
9. SUPPLY A DUMPSTER BIN FOR MATERIAL REMOVAL. DUMPSTER BINS ARE NOT PERMITTED IN THE LOADING BAY AREA. CONFIRM DUMPSTER BIN LOCATION ON SITE WITH PROJECT COORDINATOR BEFORE USE.
10. KEEP GRASS, SIDEWALKS, AND PAVED AREAS AROUND DUMPSTER CLEAR OF DEBRIS AND MATERIALS. KEEP DUMPSTER COVERED. EMPTY DUMPSTER WHEN FULL.
11. OBTAIN PARKING PERMITS FROM CAMPUS ENFORCEMENT PATROL (CEP) FOR THE DURATION OF PROJECT. DO NOT PARK IN LOADING ZONES OR MATERIAL DROP OFF AREAS.
12. PAY PARKING TICKETS ISSUED BY CEP. CONTESTED OR DISPUTED TICKETS SHALL BE BETWEEN THE CONTRACTOR AND CEP.
13. INSTALL PROTECTIVE COVERING OVER EXISTING FLOORING IN HOARDING AREAS, AND ACCESS ROUTES. MAINTAIN COVERINGS UNTIL PROJECT COMPLETION, OR UNTIL A TIME AGREED UPON BY THE CONTRACTOR AND OWNER.
14. DO NOT USE INTERIOR SPACE AS STORAGE OR LAY DOWN AREAS EXCEPT FOR INTERIOR SPACE WITHIN SCOPE OF WORK.
15. PROVIDE HOARDING TO PROTECT WORK AREA AND ADJACENT SPACES FROM DAMAGE. REPAIR ANY AREAS THAT INCUR DAMAGE DURING PROJECT.
16. SEAL AFFECTED DUCT SYSTEMS FOR DUST CONTROL WITHIN WORK AREA AND ADJACENT SPACES. SEE MECHANICAL.
17. MAINTAIN FIRE RATINGS BETWEEN FLOOR AND WALL ASSEMBLIES. FIRE SEAL PENETRATIONS TO MAINTAIN FIRE RATINGS. SUBMIT RELATED PRODUCT DATA SHEETS FOR REVIEW AND APPROVAL.
18. COMPLETE THE ONLINE TRAINING MODULE FOR MEMORIAL UNIVERSITY'S ZERO ENERGY ISOLATION PROGRAM (ZEIP) BEFORE MOBILIZING ON SITE. ACCESS TRAINING VIA OOC.CITL.MUN.CA.
    A. CREATE AN ACCOUNT (IF YOU ARE A FIRST TIME USER)
    B. A CONFIRMATION EMAIL WILL BE SENT TO THE EMAIL YOU USED WHEN CREATING AN ACCOUNT. OPEN THE CONFIRMATION EMAIL AND CLICK THE LINK CONTAINED WITHIN.
    C. CLICK "ZERO ENERGY ISOLATION PROGRAM FOR CONTRACTORS"
    D. TO ENROLL, ENTER THE ENROLLMENT KEY: 7653. CLICK "ENROLL ME"
    E. COMPLETE THE TRAINING AS INSTRUCTED BY THE COURSE.
    F. SUCCESSFUL COMPLETION CERTIFICATES SHALL BE AVAILABLE DURING AUDITING BY ENVIRONMENTAL HEALTH AND SAFETY.

C. DEFINITIONS:

1. "TYPICAL" OR "TYP" INDICATES THE IDENTICAL COMPLETE SYSTEM SHALL BE PROVIDED FOR EACH OCCURRENCE OF THE CONDITION NOTED.
2. "SIMILAR" INDICATES COMPLETE SYSTEM AND COMPONENTS SHALL BE PROVIDED COMPARABLE TO THE CHARACTERISTICS FOR THE CONDITION NOTED.
3. "AS REQUIRED" INDICATES THE COMPONENTS REQUIRED TO COMPLETE THE NOTED SYSTEM, AS INDICATED IN THE PROJECT DOCUMENTS, SHALL BE PROVIDED.
4. "ALIGN" INDICATES ACCURATELY PROVIDE FINISH FACES OF MATERIALS IN STRAIGHT, TRUE, AND PLUMB RELATION TO ADJACENT MATERIALS.

D. DRAWING SET ORGANIZATION:

1. EACH DRAWING SET SHEET IS IDENTIFIED BY THE SHEET NUMBER IN THE LOWER RIGHT HAND CORNER OF THE DRAWING TITLE BLOCK. THE SHEET TITLE PROVIDES A GENERAL DESCRIPTION OF THE CONTENTS OF THE SHEET.
   SHEET NUMBER EXAMPLE: A-6.1
   "A" INDICATES THE DISCIPLINE THAT CREATED THE DRAWING
   "6" INDICATES THE DRAWING CATEGORY CONTAINED ON THE SHEET
   ".1" INDICATES THE SHEET NUMBER
2. DRAWING CATEGORY INDICATED. REFER TO THE DRAWING SET INDEX FOR DISCIPLINES, CATEGORIES AND SHEET NUMBERS CONTAINED IN THIS DRAWING SET.

1:2 0mm 20 40 60 80 100
1:5 0mm 50 100 150 200 250
1:10 0mm 100 200 300 400 500
1:20 0mm 0.2 0.4 0.6 0.8 1.0
1:25 0mm 0.25 0.5 0.75 1.0 1.25
1:50 0mm 0.5 1.0 1.5 2.0 2.5
1:75 0mm 1.0 2.0 3.0 3.75
1:100 0mm 1.0 2.0 3.0 4.0 5.0
1:125 0mm 1.25 2.5 3.75 5.0 6.25
1:200 0mm 2.0 4.0 6.0 8.0 10.0

Architect Prime Consultant
FOUGERE MENCHENTON ARCHITECTURE

Discipline: ARCHITECTURAL

Sub-Consultant: Mechanical/ Electrical
JEWER BAILEY CONSULTANTS
STRUCTURAL - MECHANICAL - ELECTRICAL

Sub-Consultant:

Sub-Consultant:

Sub-Consultant:

Client:
Memorial University of Newfoundland

Drawn:	Checked:
AH	MG
Designed:	**Approved:**
RF	MG

Consultants Project No.
0230-55

Professional Stamp & Permit
NEWFOUNDLAND AND LABRADOR - M.E.M.B.E.R - Ron Fougere NLAA - Expires Dec. 31, 2025 - Date: 07-07-2025 - LICENSED TO PRACTISE - ASSOCIATION OF ARCHITECTS -

Notes:
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4. CONTRACTOR SHALL DO ALL WORK IN ACCORDANCE WITH THE APPLICABLE STANDARDS AND CODES INCLUDING, BUT NOT LIMITED TO, THE NATIONAL BUILDING CODE OF CANADA.

No.	Revisions	MM/DD/YY
1	Issued for Tender	07-07-25

Drawing Nomenclature
Detail/Section No. 3 / A-1 — Dwg. No. where detailed

PROJECT TITLE
CERC FIT UP
LEVEL 5- PAVILION C

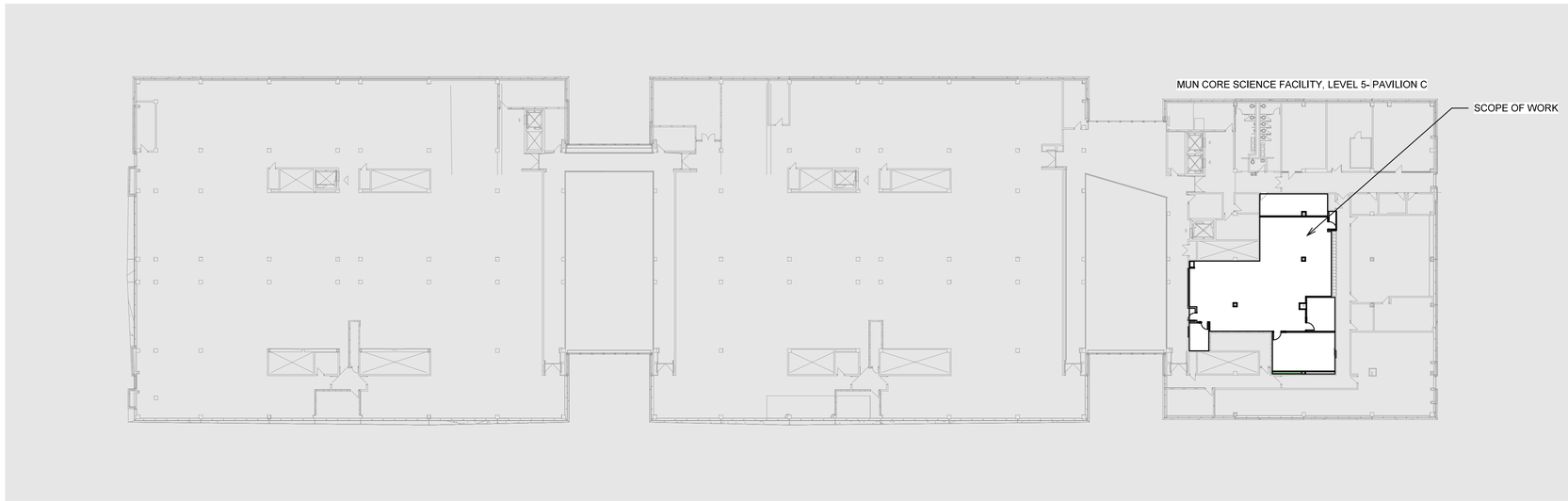
Client's Project No.: CFS-103-23

DRAWING TITLE
LIST OF DRAWINGS, LEGENDS, AND NOTES

SCALE	DRAWING NO.
As indicated	A-0.1
DATE: 07-07-25	
REVISION NO.: 1	7/7/2025 3:58:59 PM

GENERAL NOTES- KEY PLAN

1. MECHANICAL AND ELECTRICAL SCOPE OF WORK MAY EXTEND OUTSIDE OF BOUNDARIES SHOWN. REFER TO MECHANICAL AND ELECTRICAL.



1 / A-0.2 5TH FLOOR KEY PLAN

1 : 400

1:2 0mm 20 40 60 80 100
1:5 0mm 50 100 150 200 250
1:10 0mm 100 200 300 400 500
1:20 0mm 0.2 0.4 0.6 0.8 1.0
1:25 0mm 0.25 0.5 0.75 1.0 1.25
1:50 0mm 0.5 1.0 1.5 2.0 2.5
1:75 0mm 1.0 2.0 3.0 3.75
1:100 0mm 1.0 2.0 3.0 4.0 5.0
1:125 0mm 1.25 2.5 3.75 5.0 6.25
1:200 0mm 2.0 4.0 6.0 8.0 10.0

Autodesk Docs://0230-55 MUN CSF 5TH FLR/0230-55 MUN CORE 5TH FLR.rvt

Architect Prime Consultant

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Sub-Consultant:

Sub-Consultant:

Sub-Consultant:

Client:

Memorial University of Newfoundland

Drawn: AH	Checked: MG
Designed: RF	Approved: MG

Consultants Project No.

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Drawing Nomenclature

Detail/Section No. 3 / A-1 Dwg. No. where detailed

PROJECT TITLE

CERC FIT UP
LEVEL 5- PAVILION C

Client's Project No.: CFS-103-23

DRAWING TITLE

5TH FLOOR KEY PLAN

SCALE As indicated	DRAWING NO. A-0.2
DATE 07-07-25	
REVISION NO. 1	7/7/2025 3:59:00 PM

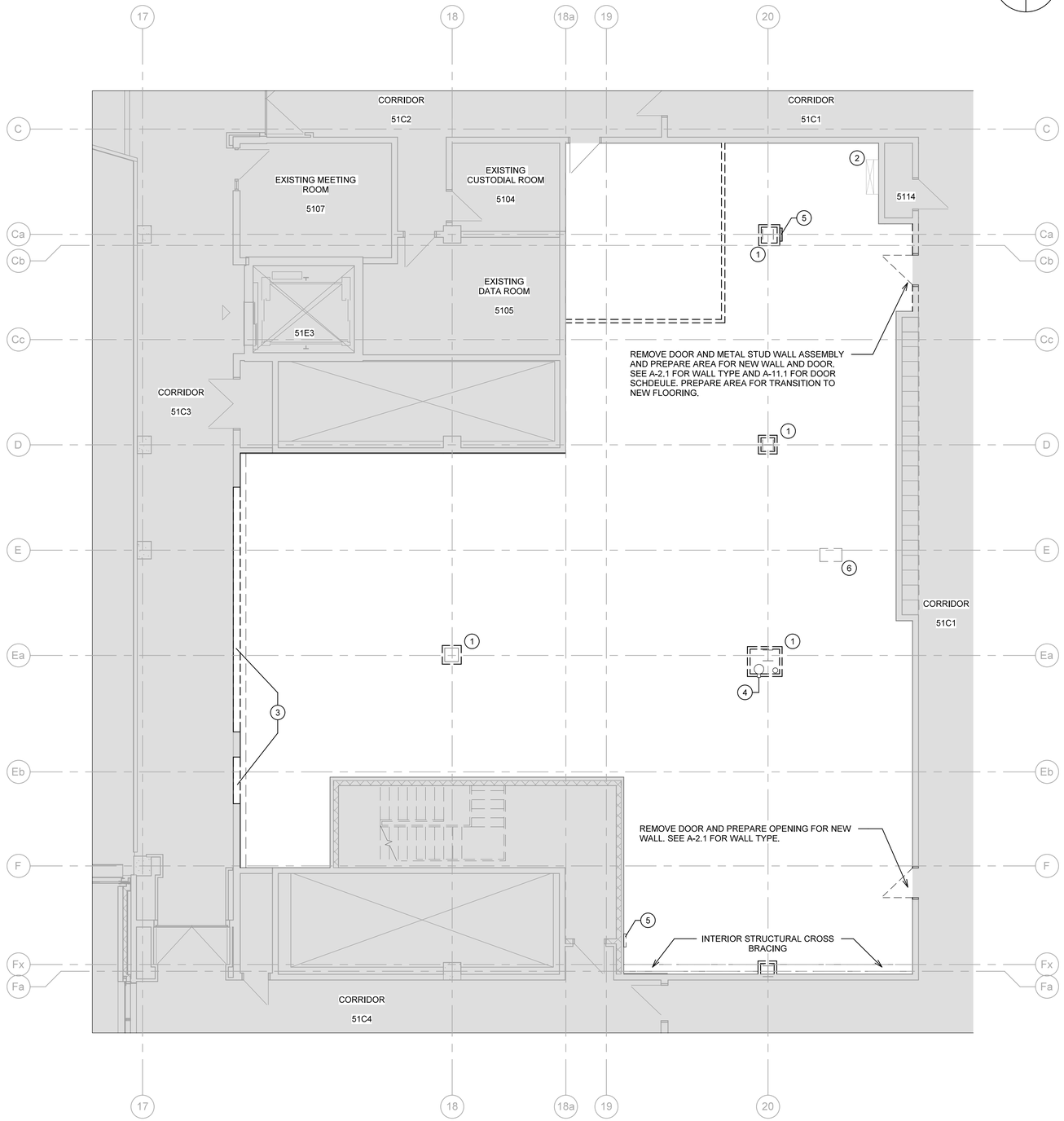
GENERAL NOTES- DEMO PLAN

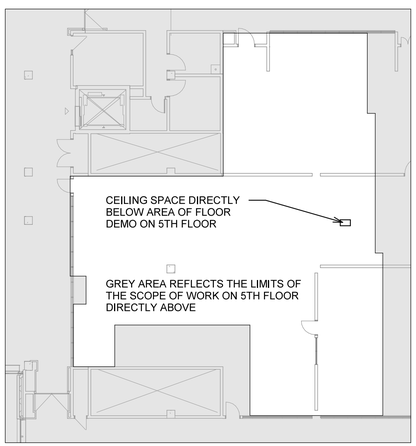
1. CLEAN, GRIND SMOOTH, AND PREPARE CONCRETE SUBFLOOR SURFACE TO RECEIVE FLOOR FINISH. FILL IN VOIDS AND CRACKS TO BE LEVEL WITH TOP OF CONCRETE FLOOR.
2. REMOVE LIGHT FIXTURES IN AREA OF WORK. RETURN TO OWNER OR STORE IN LOCATION AS DIRECTED BY OWNER.
3. SEAL OFF INTERIOR SPACES WHICH ARE DIRECTLY EXPOSED TO DEMOLITION WORK UNTIL WORK IS COMPLETE TO MINIMIZE THE SPREAD OF DUST, DEBRIS, AND OTHER CONTAMINANTS.
4. REMOVE FURNITURE AND RETURN TO OWNER OR STORE IN LOCATION AS DIRECTED BY OWNER.
5. PERFORM DEMOLITION WORK SHOWN. DO NOT ASSUME ARCHITECTURAL DEMOLITION DRAWINGS SHOW FULL EXTENT OF DEMOLITION WORK.
6. REVIEW ARCHITECTURAL DEMOLITION PLAN IN CONJUNCTION WITH OTHER DISCIPLINES PLANS AND DETAILS.
7. RETURN DOORS, LOCKSETS, CLOSURES, AND OPERATING SYSTEMS REMOVED DURING DEMOLITION OR CONSTRUCTION TO OWNER.
8. REMOVE ANY EXISTING SIGNAGE FROM AREA OF WORK. RETURN TO OWNER OR STORE IN LOCATION AS DIRECTED BY OWNER.
9. REMOVE ANY MISC. WALL MOUNTED ITEMS SUCH AS CLOCKS, WHITEBOARDS, COAT HOOKS, ETC., AND RETURN TO OWNER OR STORE IN LOCATION AS DIRECTED BY OWNER.
10. MAINTAIN SAFE WORKSITE CONDITIONS.

KEYNOTES- DEMO PLAN	
KEYNOTE	NOTE
1	REMOVE GYPSUM AROUND STEEL STUD FRAMIMG.
2	HVAC EQUIPMENT RUNNING UP WALL. LEAVE AS IS.
3	DEMO IN PREPARATION OF GLAZING UNITS AND ENTRANCE. SEE A-10.1 AND A-2.1 FOR SIZE AND LOCATION OF OPENINGS. PREPARE AREA FOR TRANSITION TO NEW FLOORING.
4	REMOVE PIPE CONNECTION PROTRUDING FROM HATCH OPENING AND RELOCATE CONNECTION ABOVE CEILING FINISH. REFER TO MECH. DEMO HATCH COVER HERE.
5	REMOVE AND RELOCATE EXISTING SEMI- RECESSED FIRE EXTINGUISHER. REFER TO MECH.
6	CORE HOLE THROUGH LEVEL 5 CONCRETE FLOOR DOWN THROUGH TO LEVEL 4 CEILING SPACE TO PREPARE FOR FLOOR BOX INSTALLATION IN THIS AREA.

LEGEND- DEMO PLAN

- EXISTING WALL TO REMAIN
- EXISTING WALL TO BE DEMO'D
- EXISTING DOOR TO REMAIN
- DOOR TO BE DEMO'D





2 A-1.1 KEY PLAN- 4TH FLOOR DEMO
1 : 200

1 A-1.1 DEMOLITION FLOOR PLAN
1 : 75

1:2 0mm 20 40 60 80 100 | 1:5 0mm 50 100 150 200 250 | 1:10 0mm 100 200 300 400 500 | 1:20 0mm 0.2 0.4 0.6 0.8 1.0 | 1:25 0mm 0.25 0.5 0.75 1.0 1.25 | 1:50 0mm 0.5 1.0 1.5 2.0 2.5 | 1:75 0mm 1.0 2.0 3.0 3.75 | 1:100 0mm 1.0 2.0 3.0 4.0 5.0 | 1:125 0mm 1.25 2.5 3.75 5.0 6.25 | 1:200 0mm 2.0 4.0 6.0 8.0 10.0

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JEWER BAILEY CONSULTANTS

Sub-Consultant:

Sub-Consultant:

Sub-Consultant:

Client:
Memorial University of Newfoundland

Drawn: AH	Checked: MG
Designed: RF	Approved: MG

Consultants Project No.
0230-55

Professional Stamp & Permit
NEWFOUNDLAND AND LABRADOR ASSOCIATION OF ARCHITECTS - MEMBER - LICENSED TO PRACTISE
Ron Fougere NLAA
Expires Dec. 31, 2025
Date: 07-07-2025

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Drawing Nomenclature
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PROJECT TITLE
CERC FIT UP
LEVEL 5- PAVILION C

Client's Project No.: CFS-103-23

DRAWING TITLE
DEMOLITION FLOOR PLAN

SCALE	DRAWING NO.
As indicated	A-1.1
DATE: 07-07-25	
REVISION NO.: 1	7/7/2025 3:59:03 PM

PARTITION TYPES:					
TYPE	STC	FIRE	DESCRIPTION	GRAPHIC	NOTES
P1	55	1H	- 2 LAYERS, 16mm TYPE X GYPSUM BOARD - 92mm METAL STUD FRAMING @400 o.c. EXTENDING TO U/S OF DECK - MINERAL WOOL INSULATION TO FILL CAVITY - 2 LAYERS 16mm TYPE X GYPSUM BOARD		- INSTALL F.R.R. WALL AS PER ULC DES. W424 - NOT ALL P1 WALLS WITHIN AREA OF SCOPE ARE REQUIRED TO BE RATED. REFER TO FLOOR PLAN A-2.1 TO SEE LOCATIONS OF RATED WALLS.
P2	N/A	N/A	- 13mm GYPSUM BOARD - 92mm METAL STUD FRAMING @400 o.c. EXTENDING TO U/S OF CEILING - 13mm GYPSUM BOARD		
P3	MATCH EXISTING (51)	MATCH EXISTING (1HR)	- 16mm TYPE X GYPSUM BOARD - 152mm METAL STUD FRAMING @600 o.c. EXTENDING TO U/S OF DECK - MINERAL WOOL INSULATION TO FILL CAVITY - 16mm TYPE X GYPSUM BOARD		- INSTALL F.R.R. WALL AS PER ULC DES. W453
P4	MATCH EXISTING (55)	MATCH EXISTING (2HR)	- 2 LAYERS, 16mm TYPE X GYPSUM BOARD - 152mm METAL STUD FRAMING @400 o.c. EXTENDING TO U/S OF DECK - ACOUSTIC MINERAL WOOL INSULATION TO FILL CAVITY - 2 LAYERS, 16mm TYPE X GYPSUM BOARD - 6mm ACOUSTIC SEALANT AT BASE		- INSTALL F.R.R. WALL AS PER ULC DES. W424
P5	N/A	N/A	- 13mm GYPSUM BOARD - 92mm METAL STUD FRAMING @400 o.c. EXTENDING TO U/S OF CEILING		

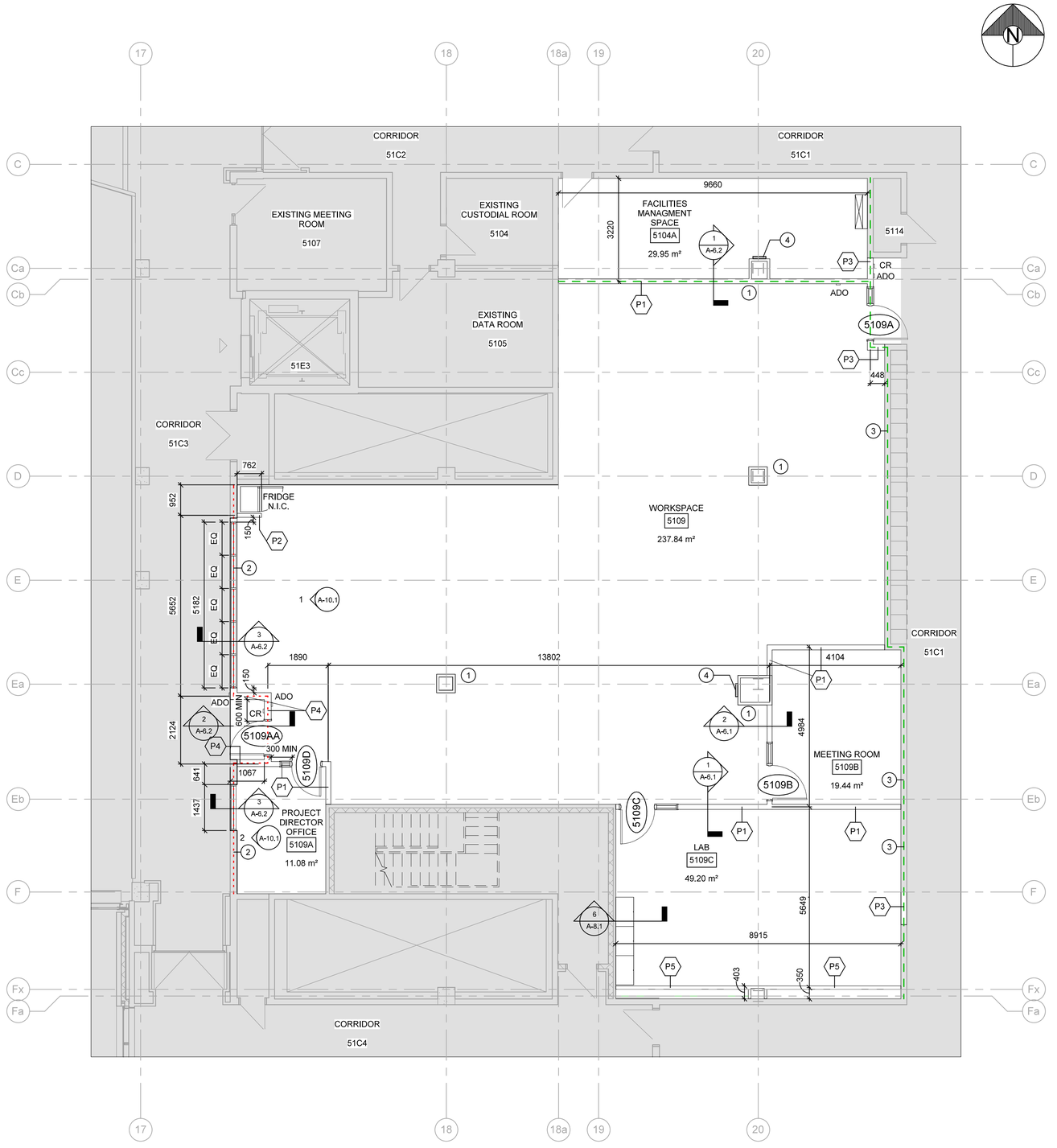
LEGEND- FLOOR PLAN

- EXISTING WALL
- NEW WALL
- EXISTING DOOR
- NEW DOOR AND FRAME
- ADO- AUTOMATIC DOOR OPENER
- CR- CARD READER
- 1 HR FIRE RATING REQUIRED
- 2 HR FIRE RATING REQUIRED

GENERAL NOTES: FLOOR PLAN

1. DIMENSIONS ARE TAKEN FROM THE INSIDE FACE OF PERIMETER WALLS TO THE MIDPOINT OF PARTITIONS UNLESS OTHERWISE NOTED.
2. PROVIDE AND COORDINATE SOLID CORE BLOCKING FOR WALL AND CEILING MOUNTED ITEMS. FIRE TREAT CONCEALED BLOCKING.
3. PROVIDE AND INSTALL SIGNAGE TYPE A.04 AT DOORS 5109A, 5109AA, 5109B, 5109C, AND 5109C. SEE SPEC.
4. PROVIDE AND INSTALL SIGNAGE TYPE A.13 AT FIRE EXTINGUISHER LOCATIONS. SEE SPEC.

KEYNOTES- FLOOR PLAN	
KEYNOTE	NOTE
1	WRAP STEEL STUD COLUMN FRAMING WITH 2 LAYERS, 16mm TYPE X GYPSUM.
2	MAINTAIN 2HR FIRE RATING ACROSS THIS WALL.
3	MAINTAIN 1HR FIRE RATING ACROSS THIS WALL.
4	FIRE EXTINGUISHER



1 / A-2.1 FLOOR PLAN
1 : 75

1:2 0mm 20 40 60 80 100 | 1:5 0mm 50 100 150 200 250 | 1:10 0mm 100 200 300 400 500 | 1:20 0mm 0.2 0.4 0.6 0.8 1.0 | 1:25 0mm 0.25 0.5 0.75 1.0 1.25 | 1:50 0mm 0.5 1.0 1.5 2.0 2.5 | 1:75 0mm 1.0 2.0 3.0 3.75 | 1:100 0mm 1.0 2.0 3.0 4.0 5.0 | 1:125 0mm 1.25 2.5 3.75 5.0 6.25 | 1:200 0mm 2.0 4.0 6.0 8.0 10.0

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Architect Prime Consultant
FOUGERE MENCHENTON ARCHITECTURE

Discipline: ARCHITECTURAL

Sub-Consultant: Mechanical/ Electrical
JEWER BAILEY CONSULTANTS
STRUCTURAL · MECHANICAL · ELECTRICAL

Sub-Consultant:

Sub-Consultant:

Sub-Consultant:

Client:
Memorial University of Newfoundland

Drawn: AH	Checked: MG
Designed: RF	Approved: MG

Consultants Project No.
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1	Issued for Tender	07-07-25

Drawing Nomenclature
Detail/Section No. 3 / A-1 — Dwg. No. where detailed

PROJECT TITLE
CERC FIT UP
LEVEL 5- PAVILION C

Client's Project No.: CFS-103-23

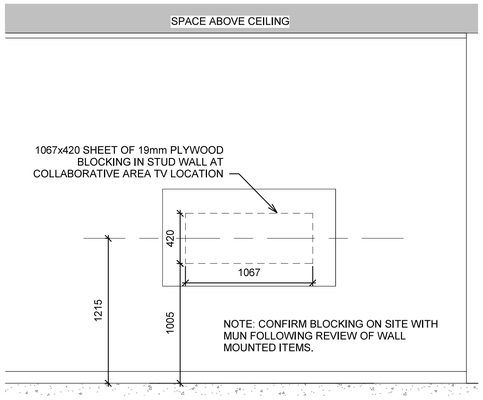
DRAWING TITLE
NEW FLOOR PLAN

SCALE	DRAWING NO.
As indicated	A-2.1
DATE: 07-07-25	
REVISION NO.: 1	7/7/2025 3:59:04 PM

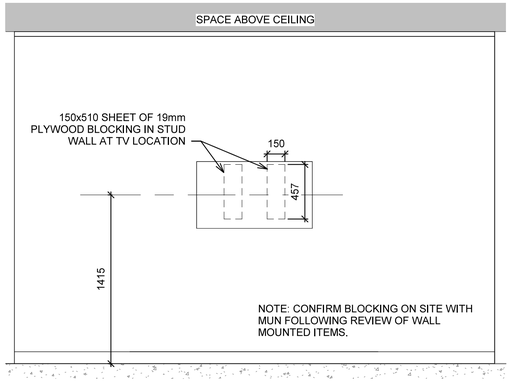
GENERAL NOTES- FURNITURE PLAN

1. FURNITURE AND OFFICE EQUIPMENT IS SHOWN FOR REFERENCE AND COORDINATION PURPOSES ONLY. FURNITURE AND EQUIPMENT ARE OUTSIDE OF SCOPE. CONFIRM PRODUCTS AND DIMENSIONS WITH OWNER.

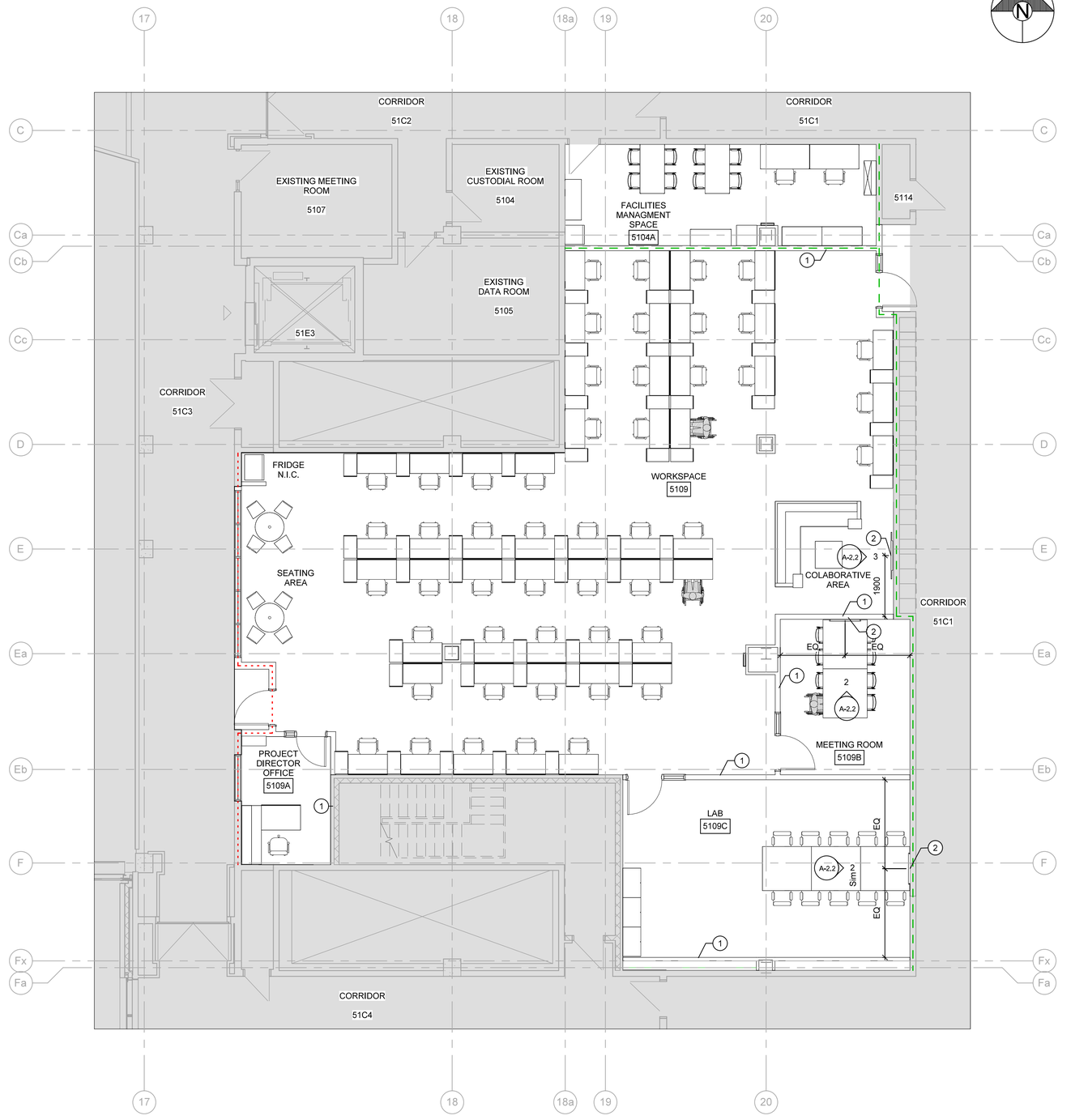
KEYNOTES- FURNITURE PLAN	
KEYNOTE	NOTE
1	PROVIDE BLOCKING AT THIS LOCATION FOR WHITEBOARD.
2	PROVIDE BLOCKING AT THIS LOCATION FOR WALL MOUNT TV.



3 A-2.2 MEDIA ELEVATION TYPE 2
1 : 25



2 A-2.2 MEDIA ELEVATION TYPE 1
1 : 25



1 A-2.2 FURNITURE PLAN
1 : 75

1:2 0mm 20 40 60 80 100
1:5 0mm 50 100 150 200 250
1:10 0mm 100 200 300 400 500
1:20 0mm 0.2 0.4 0.6 0.8 1.0
1:25 0mm 0.25 0.5 0.75 1.0 1.25
1:50 0mm 0.5 1.0 1.5 2.0 2.5
1:75 0mm 1.0 2.0 3.0 3.75
1:100 0mm 1.0 2.0 3.0 4.0 5.0
1:125 0mm 1.25 2.5 3.75 5.0 6.25
1:200 0mm 2.0 4.0 6.0 8.0 10.0

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AH	MG
Designed:	Approved:
RF	MG

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PROJECT TITLE
CERC FIT UP
LEVEL 5- PAVILION C

Client's Project No.: CFS-103-23

DRAWING TITLE
FURNITURE PLAN

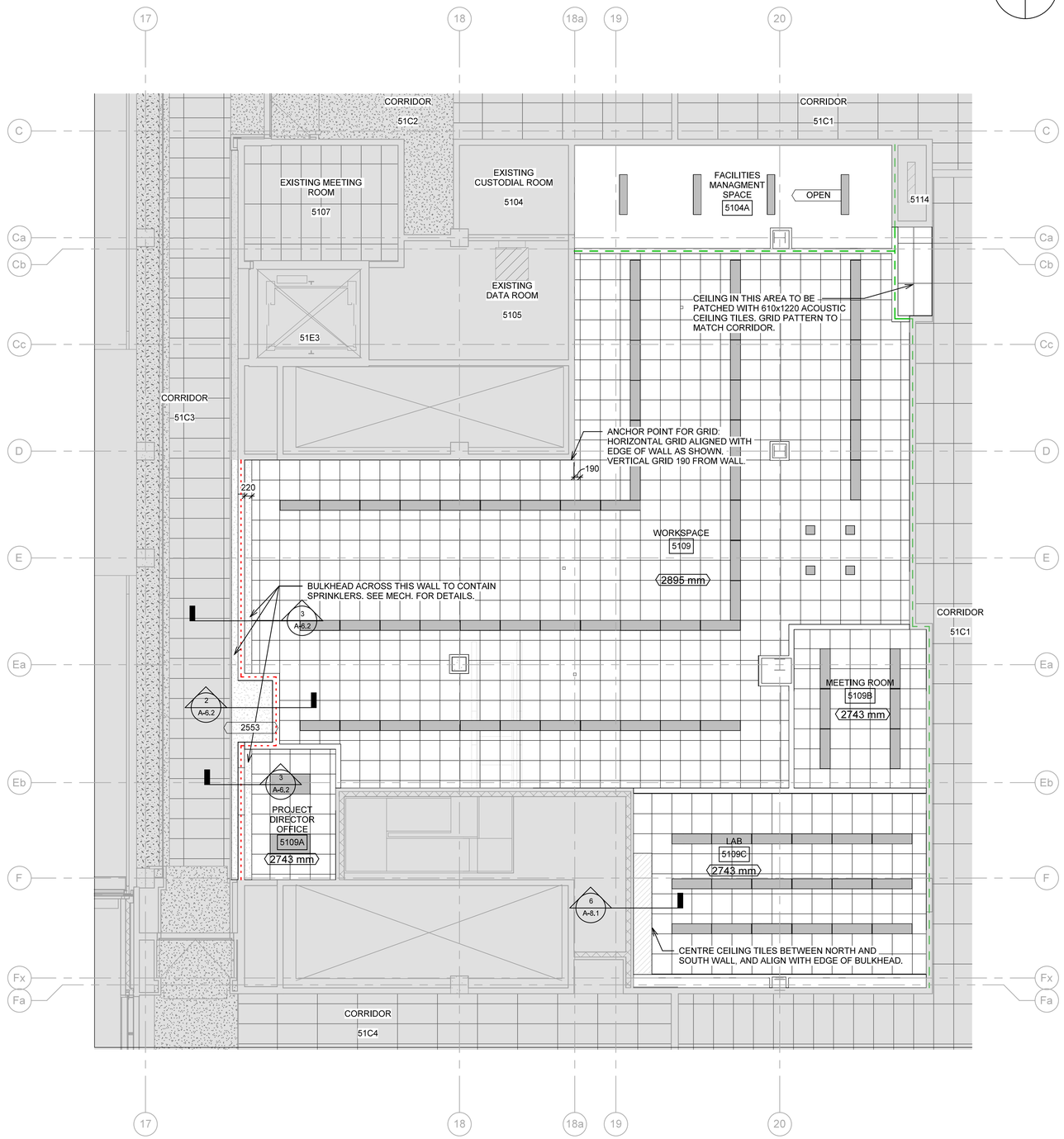
SCALE	DRAWING NO.
As indicated	A-2.2
DATE: 07-07-25	
REVISION NO.: 1	7/7/2025 3:59:05 PM

LEGEND- REFLECTED CEILING PLAN

- EXISTING CEILING TO REMAIN AS IS
- CEILING GYPSUM BOARD
- 610x610 T-BAR CEILING (AP-1)
- 610x1220 T-BAR CEILING (AP-2)
- XXXX — HEIGHT A.F.F.
- LIGHT FIXTURES, SEE ELECTRICAL

GENERAL NOTES- REFLECTED CEILING PLAN

1. CEILING HEIGHTS ARE MEASURED FROM FINISHED FLOOR LEVEL UNLESS OTHERWISE NOTED.
2. CENTER CEILING TILES WITHIN ROOMS UNLESS OTHERWISE NOTED.
3. MECHANICAL AND ELECTRICAL ITEMS ARE NOT NECCESSARILY INDICATED N THE ARCHITECTURAL REFLECTED CEILING PLAN. REFER TO MECHANICAL AND ELECTRICAL DRAWINGS FOR ALL MECH AND ELEC CEILING MOUNTED FIXTURES, TYPES, LOCATIONS, AND QUANTITIES. REFER TO MECHANICAL AND ELECTRICAL DRAWINGS FOR ADDITIONAL SERVICES WITHIN CEILINGS.
4. REFER TO ELECTRICAL LIGHTING SPECIFICATIONS FOR ALL LIGHT FIXTURES.



1 / A-3.1 REFLECTED CEILING PLAN
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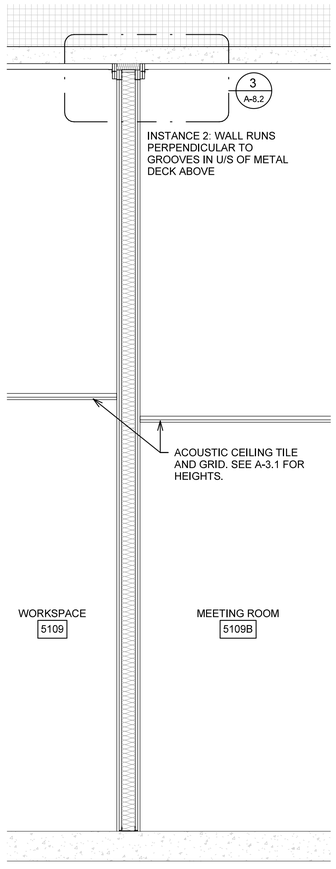
CERC FIT UP
LEVEL 5- PAVILION C

Client's Project No.: CFS-103-23

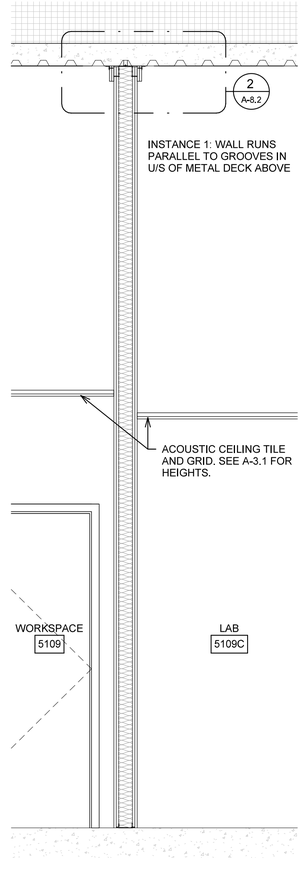
DRAWING TITLE
REFLECTED CEILING PLAN

SCALE	DRAWING NO.
As indicated	A-3.1
DATE: 07-07-25	
REVISION NO.: 1	7/7/2025 3:59:06 PM



2 A-6.1 SECTION THROUGH NON RATED WALL- INSTANCE 2

1 : 20



1 A-6.1 SECTION THROUGH NON RATED WALL- INSTANCE 1

1 : 20

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1:5 0mm 50 100 150 200 250
1:10 0mm 100 200 300 400 500
1:20 0mm 0.2 0.4 0.6 0.8 1.0
1:25 0mm 0.25 0.5 0.75 1.0 1.25
1:50 0mm 0.5 1.0 1.5 2.0 2.5
1:75 0mm 1.0 2.0 3.0 3.75
1:100 0mm 1.0 2.0 3.0 4.0 5.0
1:125 0mm 1.25 2.5 3.75 5.0 6.25
1:200 0mm 2.0 4.0 6.0 8.0 10.0

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STRUCTURAL · MECHANICAL · ELECTRICAL

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Sub-Consultant:

Sub-Consultant:

Client:

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Detail/Section No. 3 / A-1 Dwg. No. where detailed

PROJECT TITLE

CERC FIT UP
LEVEL 5- PAVILION C

Client's Project No.: CFS-103-23

DRAWING TITLE

WALL SECTIONS

SCALE	DRAWING NO.
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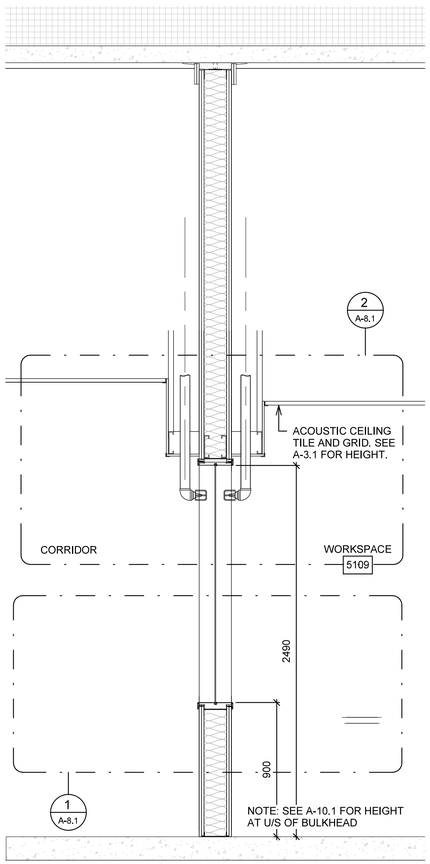
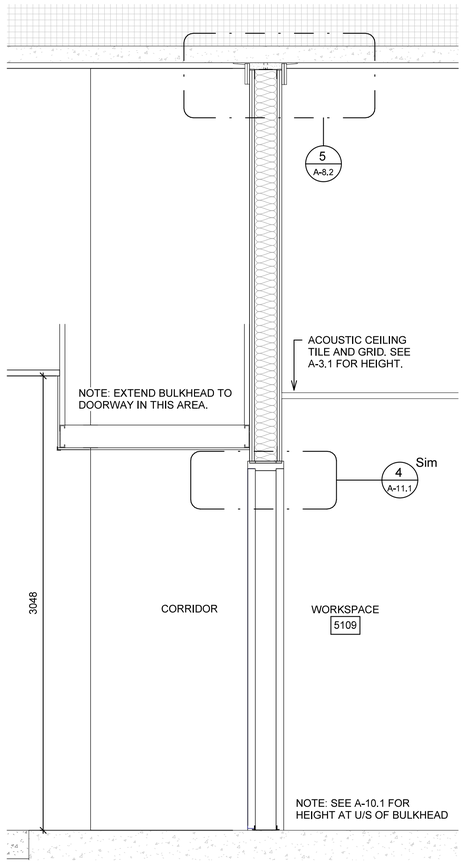
DATE: 07-07-25	
REVISION NO.: 1	7/7/2025 3:59:07 PM



3 A-6.2 SECTION THROUGH RATED WALL INSTANCE 3

1 : 20



2 A-6.2 SECTION THROUGH RATED WALL- INSTANCE 2

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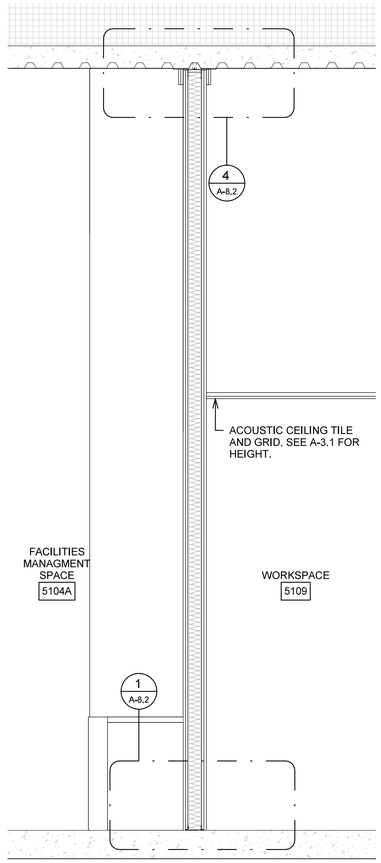

1 A-6.2 SECTION THROUGH RATED WALL- INSTANCE 1

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Sub-Consultant:

Sub-Consultant:

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PROJECT TITLE

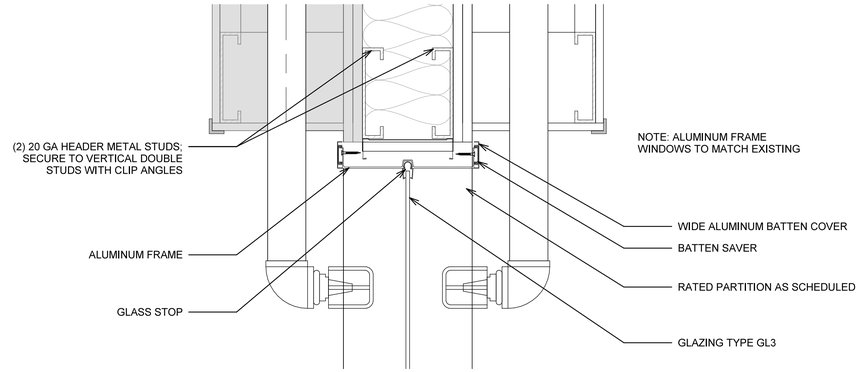
CERC FIT UP
LEVEL 5- PAVILION C

Client's Project No.: CFS-103-23

DRAWING TITLE

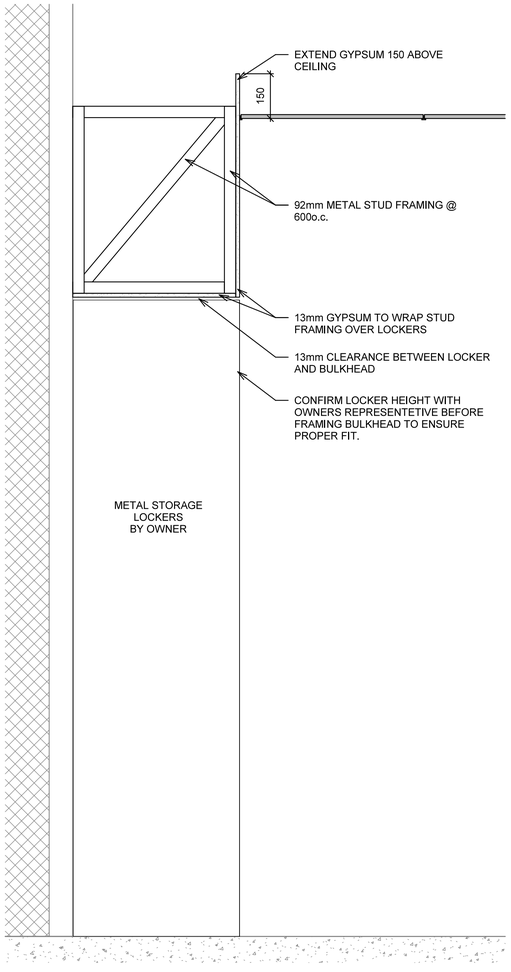
WALL SECTIONS

SCALE	DRAWING NO.
1 : 20	A-6.2
DATE: 07-07-25	
REVISION NO.: 1	7/7/2025 3:59:07 PM



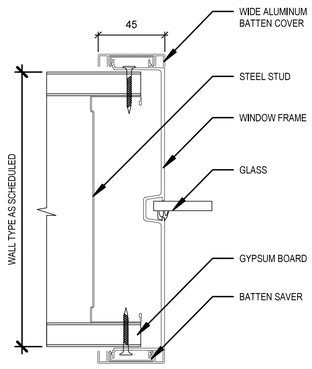
3 A-8.1 GLAZING HEAD FULL DETAIL

1 : 5



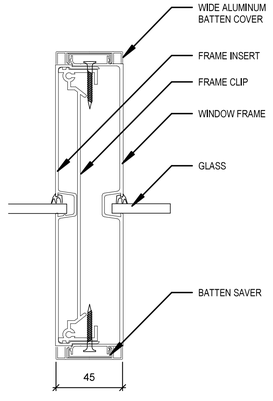
6 A-8.1 FRAMING OVER LOCKERS

1 : 10



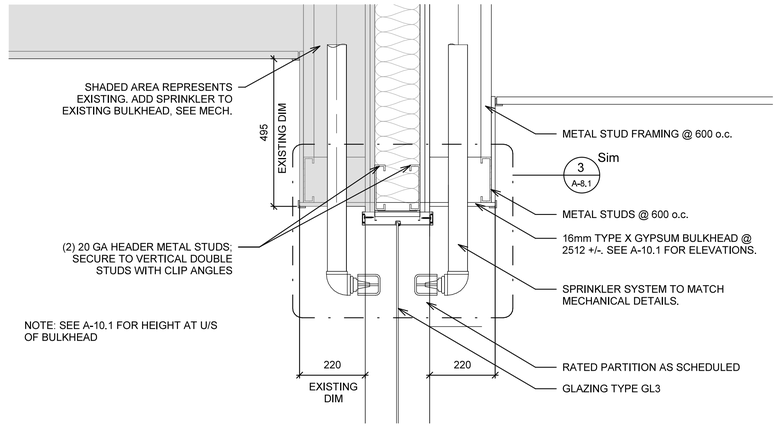
5 A-8.1 GLAZING JAMB

1 : 2



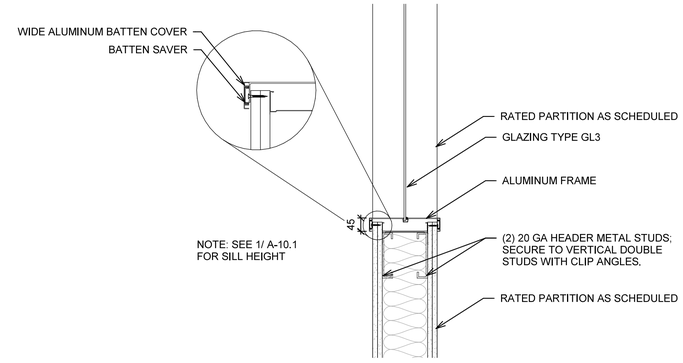
4 A-8.1 VERTICAL MULLION

1 : 2



2 A-8.1 SPRINKLER OVER GLAZING

1 : 10



1 A-8.1 GLAZING SILL AT RATED WALL

1 : 10

0mm 20 40 60 80 100 — 1:2
0mm 50 100 150 200 250 — 1:5
0mm 100 200 300 400 500 — 1:10
0mm 0.2 0.4 0.6 0.8 1.0 — 1:20
0mm 0.25 0.5 0.75 1.0 1.25 — 1:25
0mm 0.5 1.0 1.5 2.0 2.5 — 1:50
0mm 1.0 2.0 3.0 3.75 — 1:75
0mm 1.0 2.0 3.0 4.0 5.0 — 1:100
0mm 1.25 2.5 3.75 5.0 6.25 — 1:125
0mm 2.0 4.0 6.0 8.0 10.0 — 1:200

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Sub-Consultant:

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Consultants Project No.

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NEWFOUNDLAND AND LABRADOR ASSOCIATION OF ARCHITECTS
MEMBER
Ron Fougere NLAA
Expires Dec. 31, 2025
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PROJECT TITLE

CERC FIT UP
LEVEL 5- PAVILION C

Client's Project No.: CFS-103-23

DRAWING TITLE

DETAILS

SCALE: As indicated

DATE: 07-07-25

REVISION NO.: 1

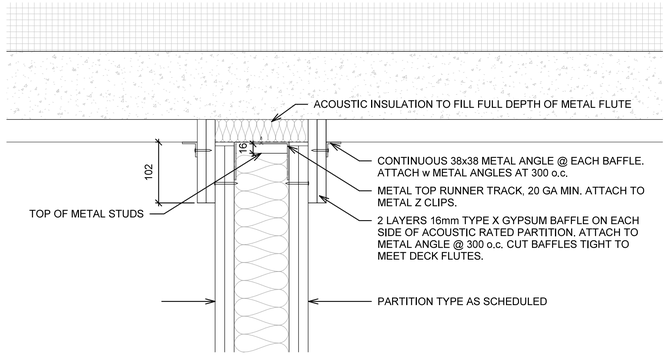
DRAWING NO.

A-8.1

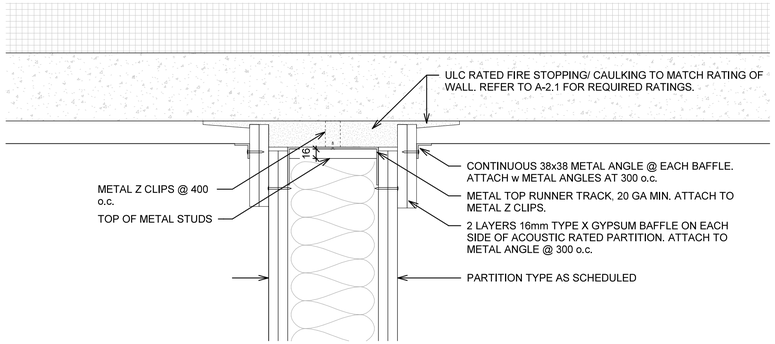
7/7/2025 3:59:09 PM

GENERAL NOTES- WALL SECTION DETAILS

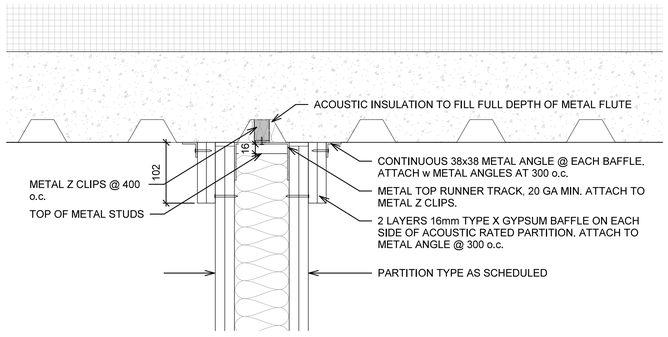
1. INSTANCE 1- WALL RUNS PARALEL TO THE GROOVES IN THE DECK.
2. INSTANCE 2- WALL RUNS PERPENDICULAR TO THE GROOVES IN THE DECK.



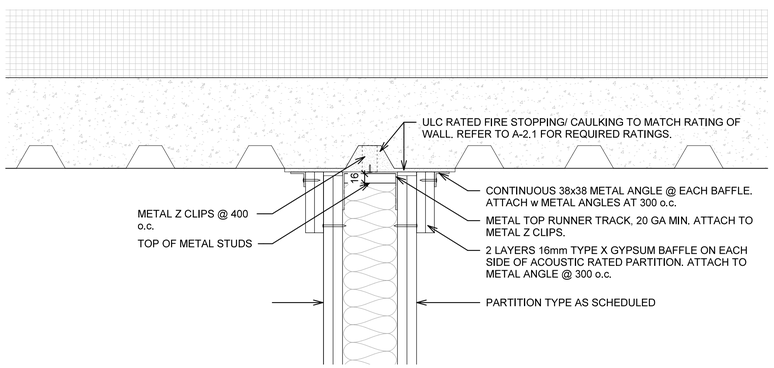
3 A-8.2 NON RATED WALL TO U/S OF DECK CONNECTION- INSTANCE 2
1 : 5



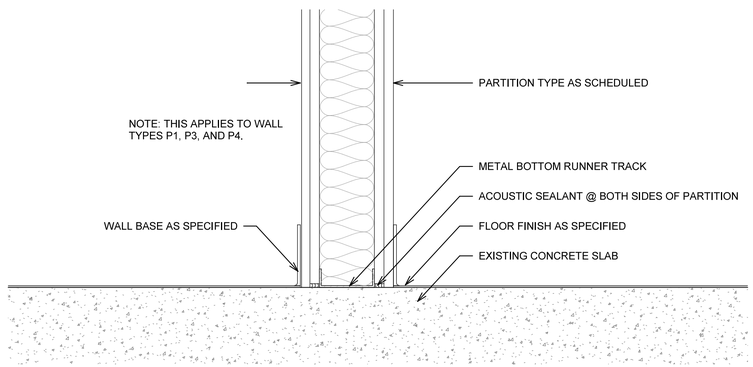
5 A-8.2 RATED WALL TO U/S OF DECK CONNECTION- INSTANCE 2
1 : 5



2 A-8.2 NON RATED WALL TO U/S OF DECK CONNECTION- INSTANCE 1
1 : 5



4 A-8.2 RATED WALL TO U/S OF DECK CONNECTION- INSTANCE 1
1 : 5



1 A-8.2 RATED WALL TO FLOOR CONNECTION
1 : 5

0mm 20 40 60 80 100
1:2
0mm 50 100 150 200 250
1:5
0mm 100 200 300 400 500
1:10
0mm 0.2 0.4 0.6 0.8 1.0
1:20
0mm 0.25 0.5 0.75 1.0 1.25
1:25
0mm 0.5 1.0 1.5 2.0 2.5
1:50
0mm 1.0 2.0 3.0 3.75
1:75
0mm 1.0 2.0 3.0 4.0 5.0
1:100
0mm 1.25 2.5 3.75 5.0 6.25
1:125
0mm 2.0 4.0 6.0 8.0 10.0
1:200

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Architect Prime Consultant

FOUGERE MENCHENTON ARCHITECTURE

Discipline ARCHITECTURAL

Sub-Consultant: Mechanical/ Electrical

JEWER BAILEY CONSULTANTS

Sub-Consultant:

Sub-Consultant:

Sub-Consultant:

Client:

Memorial University of Newfoundland

Drawn: AH	Checked: MG
Designed: RF	Approved: MG

Consultants Project No.

0230-55

Professional Stamp & Permit

NEWFOUNDLAND AND LABRADOR MEMBER Ron Fougere NLAA Expires Dec. 31, 2025 Date: 07-07-2025 LICENSED TO PRACTISE - ASSOCIATION OF ARCHITECTS -

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No.	Revisions	MM/DD/YY
1	Issued for Tender	07-07-25

Drawing Nomenclature

Detail/Section No. 3 / A-1 ← Dwg. No. where detailed

PROJECT TITLE

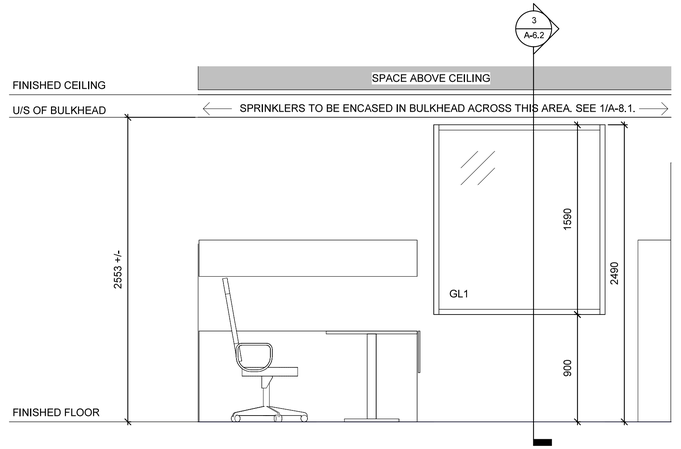
CERC FIT UP
LEVEL 5- PAVILION C

Client's Project No.: CFS-103-23

DRAWING TITLE

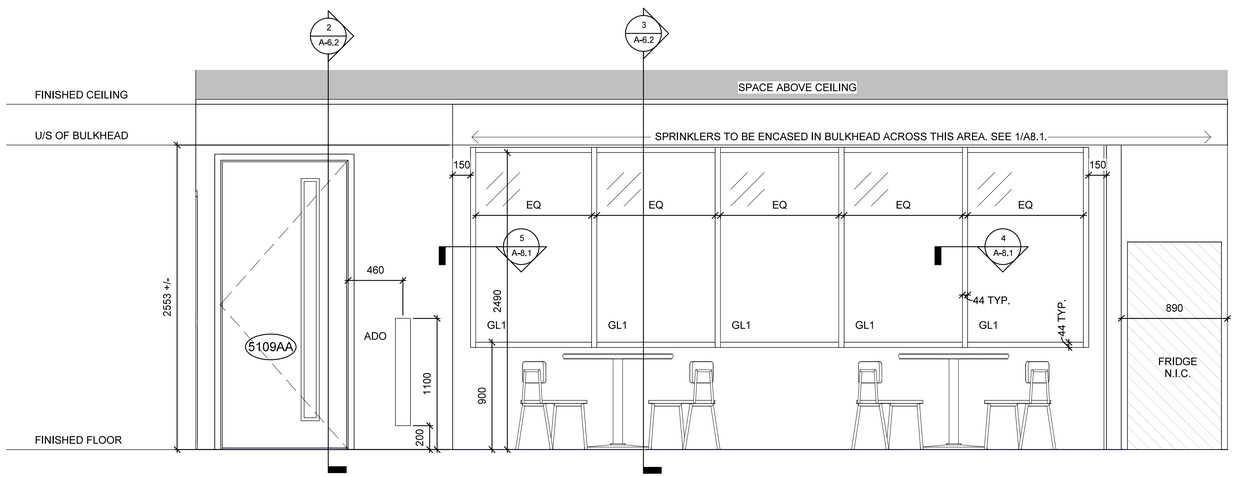
WALL SECTION DETAILS

SCALE 1 : 5	DRAWING NO. A-8.2
DATE 07-07-25	
REVISION NO. 1	7/7/2025 3:59:12 PM



2 A-10.1 ELEVATION OF GLAZING 2

1 : 25



1 A-10.1 ELEVATION OF GLAZING 1

1 : 25

0mm 20 40 60 80 100
1:2
0mm 50 100 150 200 250
1:5
0mm 100 200 300 400 500
1:10
0mm 0.2 0.4 0.6 0.8 1.0
1:20
0mm 0.25 0.5 0.75 1.0 1.25
1:25
0mm 0.5 1.0 1.5 2.0 2.5
1:50
0mm 1.0 2.0 3.0 3.75
1:75
0mm 1.0 2.0 3.0 4.0 5.0
1:100
0mm 1.25 2.5 3.75 5.0 6.25
1:125
0mm 2.0 4.0 6.0 8.0 10.0
1:200

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FOUGERE MENCHENTON ARCHITECTURE

Discipline
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Sub-Consultant: Mechanical/ Electrical

JEWER BAILEY CONSULTANTS
STRUCTURAL - MECHANICAL - ELECTRICAL

Sub-Consultant:

Sub-Consultant:

Sub-Consultant:

Client:
Memorial University of Newfoundland

Drawn: AH	Checked: MG
Designed: RF	Approved: MG

Consultants Project No.
0230-55

Professional Stamp & Permit
NEWFOUNDLAND AND LABRADOR
ASSOCIATION OF ARCHITECTS
MEMBER
Ron Fougere NLAA
Expires Dec. 31, 2025
Date: 07-07-2025
LICENSED TO PRACTISE

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Drawing Nomenclature

Detail/Section No. → 3 / A-1 ← Dwg. No. where detailed

PROJECT TITLE

CERC FIT UP
LEVEL 5- PAVILION C

Client's Project No.: CFS-103-23

DRAWING TITLE

INTERIOR ELEVATIONS

SCALE	DRAWING NO.
1 : 25	A-10.1
DATE 07-07-25	
REVISION NO. 1	7/7/2025 3:59:13 PM

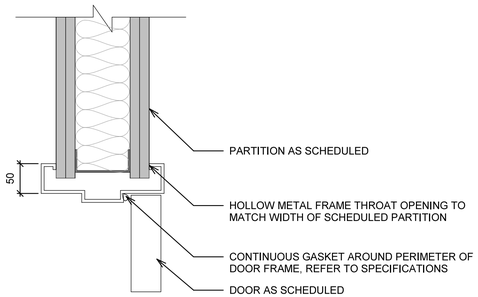
DOOR SCHEDULE

Door No.	Height	Width	Fire Rating	Door Elevation	Door Material	Door Finish	Frame Elevation	Frame Material	Frame Finish	Glass	Sidelight Width	Jamb Type	Threshold	Door Hardware	Remarks
5109A	2134	1067	45m	A	MCW	PT	FR2	HM	PT	GL-1	460	1	N/A	SEE SPEC.	EQUIP DOOR WITH POWER DOOR OPERATOR C/W PUSH BUTTON ACTUATORS ON BOTH SIDES OF DOOR AND CARD READERS ON CORRIDOR SIDE.
5109AA	2438	1067	1.5h	A	MCW	PT	FR1	HM	PT	GL-2		1	N/A	SEE SPEC.	EQUIP DOOR WITH POWER DOOR OPERATOR C/W PUSH BUTTON ACTUATORS ON BOTH SIDES OF DOOR AND CARD READERS ON CORRIDOR SIDE.
5109B	2134	1067	N/A	B	SCW	PT	FR2	HM	PT	GL-3	610	1	N/A	SEE SPEC.	
5109C	2134	1067	N/A	B	SCW	PT	FR2	HM	PT	GL-3	610	1	N/A	SEE SPEC.	
5109D	2134	914	N/A	B	SCW	PT	FR2	HM	PT	GL-3	254	1	N/A	SEE SPEC.	

DOOR SCHEDULE ABBREVIATIONS	
AL	ALUMINUM
SCW	SOLID CORE WOOD
MCW	MINERAL CORE WOOD
HM	HOLLOW METAL
PT	PAINTED
GL1	45m RATED
GL2	1.5hr RATED
GL3	6mm TEMPERED GLASS

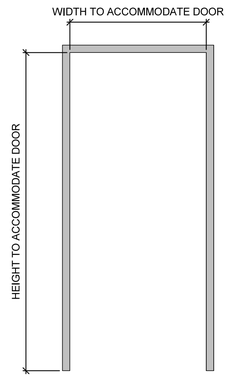
GENERAL NOTES- DOOR SCHEDULE

1. FIT SCHEDULED DOORS WITH GASKETS (HEAD, JAMB, AND SILL) TO REDUCE SOUND TRANSMISSION BEWEEN SPACES.
2. DOOR AND FRAME ASSEMBLIES SHALL COMPLY WITH ALL SCHEDULED REQUIREMENTS, GENERAL NOTES & LEGENDS, DOOR AND FRAME DETAILS, AND PROJECT SPECIFICATIONS.
3. REFER TO SPEC FOR DOOR HARDWARE.

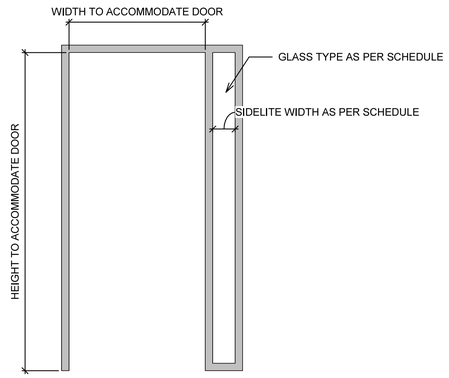


4 A-11.1 DOOR HEAD DETAIL

1 : 5



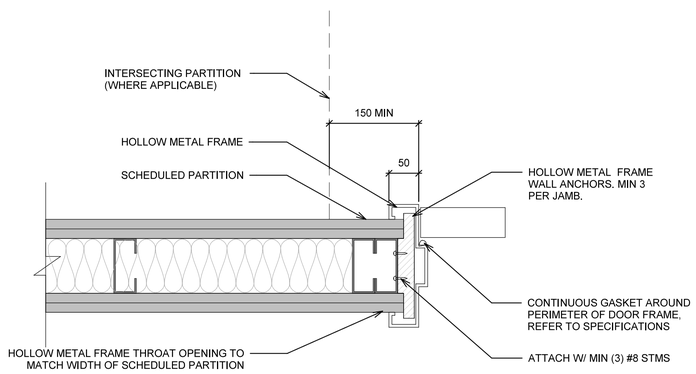
TYPE FR1



TYPE FR2

2 A-11.1 FRAME ELEVATIONS

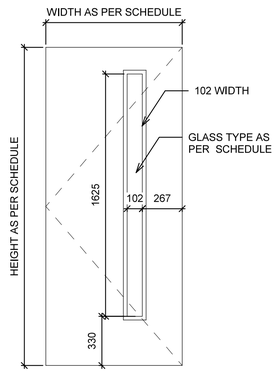
1 : 20



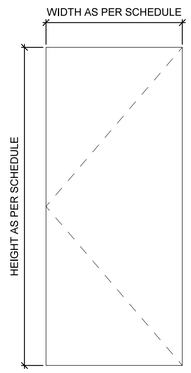
JAMB TYPE 1

3 A-11.1 JAMB DETAIL

1 : 5



ELEVATION A



ELEVATION B

1 A-11.1 DOOR ELEVATIONS

1 : 20

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0mm 50 100 150 200 250 — 1:5
0mm 100 200 300 400 500 — 1:10
0mm 0.2 0.4 0.6 0.8 1.0 — 1:20
0mm 0.25 0.5 0.75 1.0 1.25 — 1:25
0mm 0.5 1.0 1.5 2.0 2.5 — 1:50
0mm 1.0 2.0 3.0 3.75 — 1:75
0mm 1.0 2.0 3.0 4.0 5.0 — 1:100
0mm 1.25 2.5 3.75 5.0 6.25 — 1:125
0mm 2.0 4.0 6.0 8.0 10.0 — 1:200

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Architect Prime Consultant

FOUGERE MENCHENTON ARCHITECTURE

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Sub-Consultant: Mechanical/ Electrical

JEWER BAILEY CONSULTANTS

Sub-Consultant:

Sub-Consultant:

Sub-Consultant:

Client:

Memorial University of Newfoundland

Drawn: AH	Checked: MG
Designed: RF	Approved: MG

Consultants Project No.

0230-55

Professional Stamp & Permit

NEWFOUNDLAND AND LABRADOR - M.E.M.B.E.R - Ron Fougere NLAA Expires Dec. 31, 2025 Date: 07-07-2025 - LICENSED TO PRACTISE - ASSOCIATION OF ARCHITECTS -

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Drawing Nomenclature

Detail/Section No. 3 / A-1 — Dwg. No. where detailed

PROJECT TITLE

CERC FIT UP
LEVEL 5- PAVILION C

Client's Project No.: CFS-103-23

DRAWING TITLE

DOOR SCHEDULE

SCALE	DRAWING NO.
As indicated	A-11.1
DATE: 07-07-25	
REVISION NO.: 1	7/7/2025 3:59:14 PM

LEGEND- FINISHES PLAN

XX-XX ← DENOTES WALL FINISH
XX-XX ← DENOTES BASEBOARD FINISH
XX-XX ← DENOTES FLOOR FINISH

PT-XX DENOTES ACCENT WALL FINISH

PT-01 TO BE SW 7566, WEST HIGHLAND WHITE. USE SEMI-GLOSS FINISH (G5) FOR WALLS AND MATTE FINISH (G1) FOR BULKHEADS

PT-02 TO BE SW 0055, LIGHT FRENCH GREY. USE SEMI-GLOSS FINISH (G5) FOR WALLS.

PT-03 TO BE SW 7067, CITYSCAPE. USE SEMI-GLOSS FINISH (G5) FOR WALLS, DOORS, AND FRAMES.

RB-01 TO BE RUBBER BASE, NORA LIGHT GREY, 6232.

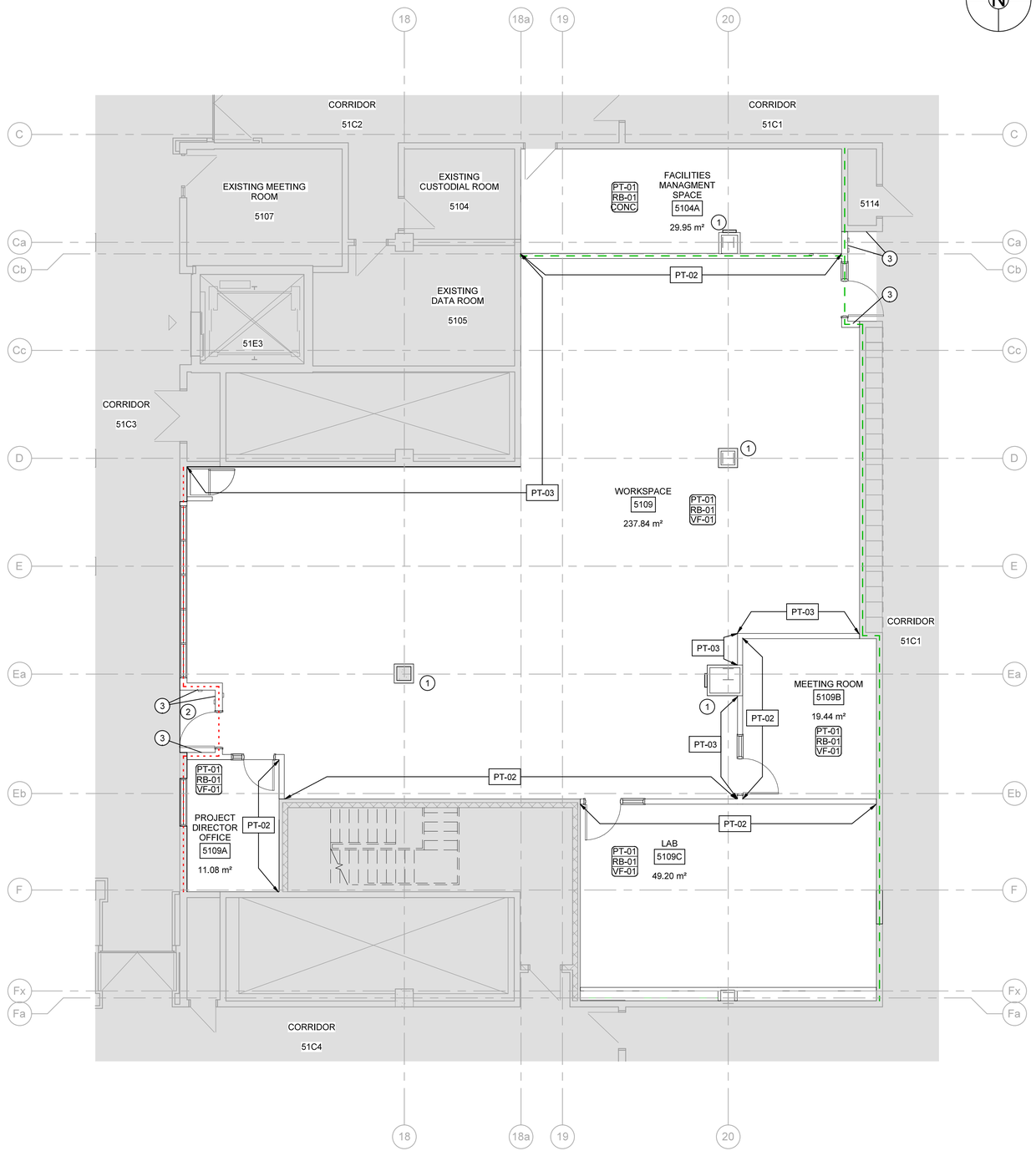
VF-01 TO BE GERFLOR, MIPOLAM SYMBIOZ 6010 MIST.

CONC. - EXISTING CONCRETE FLOOR FINISH TO REMAIN

GENERAL NOTES- FINISHES PLAN

1. PAINT WALLS PT-01 UNLESS OTHERWISE NOTED.
2. PAINT DOORS AND FRAMES PT-03 UNLESS OTHERWISE NOTED.
3. BASE IS RB-01 UNLESS NOTED OTHERWISE.
4. FLOOR FINISH IS VF-01 UNLESS NOTED OTHERWISE.
5. SEE SPECIFICATIONS FOR MORE INFORMATION ON FINISHES AND APPROVED EQUALS.
6. LOCATE INTERSECTIONS OF FLOOR FINISH MATERIALS DIRECTLY UNDER CENTRE OF DOORS UNLESS OTHERWISE NOTED.
7. PREPARE FLOOR TO RECEIVE SPECIFIED FINISH AS PER MANUFACTURERS RECCOMMENDATION. REPAIR CRACKS, HOLES, AND IMPERFECTIONS IN FLOOR SURFACE PRIOR TO INSTALLATION OF FLOOR FINISH.
8. PREPARE WALLS TO RECEIVE SPECIFIED FINISH AS PER MANUFACTURER'S SPECIFICATIONS. TAPE AND SAND GYPSUM BOARD PARTITIONS SMOOTH SO THERE ARE NO VISIBLE JOINTS OR LINES. PATCH ALL SCREWS OR OTHER ATTACHMENT DEVICES SO THEY ARE NOT VISIBLE. ALIGN AND SAND SMOOTH SURFACES ALONG THE WALLS.
9. PAINT EXPOSED SPRINKLER PIPING TO MATCH ADJACENT BULKHEAD.
10. PAINT GYPSUM BOARD CEILINGS PT-01 UNLESS OTHERWISE NOTED.
11. ADD CLEAR PLASTIC CORNER GUARDS AT OUTSIDE CORNERS. SEE SPEC.
12. COVER ALL FURNITURE, FIXTURES, AND EQUIPMENT DURING PAINTING.
13. EXAMINE FINISHED SURFACES AFTER COMPLETION OF WORK AND PROCEED WITH TOUCH UPS AS REQUIRED.

KEYNOTES- FINISHES PLAN	
KEYNOTE	NOTE
1	PAINT EXPOSED SIDES OF COLUMN PT-01.
2	PAINT BULKHEAD IN CORRIDOR TO MATCH EXISTING. REFER TO A-3.1 FOR EXTENT OF CORRIDOR BULKHEAD WITHIN SCOPE. REVIEW IN CONJUNCTION WITH OTHER DISCIPLINES PLANS TO CONFIRM EXTEND OF BULKHEAD REQUIRED TO BE REPAINTED.
3	PAINT WALL TO MATCH ADJACENT CORRIDOR WALLS



1 / A-11.2 FINISHES PLAN
1 : 75

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0mm 50 100 150 200 250 — 1:5
0mm 100 200 300 400 500 — 1:10
0mm 0.2 0.4 0.6 0.8 1.0 — 1:20
0mm 0.25 0.5 0.75 1.0 1.25 — 1:25
0mm 0.5 1.0 1.5 2.0 2.5 — 1:50
0mm 1.0 2.0 3.0 3.75 — 1:75
0mm 1.0 2.0 3.0 4.0 5.0 — 1:100
0mm 1.25 2.5 3.75 5.0 6.25 — 1:125
0mm 2.0 4.0 6.0 8.0 10.0 — 1:200

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Sub-Consultant:

Sub-Consultant:

Sub-Consultant:

Client:
Memorial University of Newfoundland

Drawn: AH	Checked: MG
Designed: RF	Approved: MG

Consultants Project No.
0230-55

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Ron Fougere NLAA
Expires Dec. 31, 2025
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Drawing Nomenclature
Detail/Section No. → 3 / A-1 ← Dwg. No. where detailed

PROJECT TITLE
CERC FIT UP
LEVEL 5- PAVILION C

Client's Project No.: CFS-103-23

DRAWING TITLE
FINISHES

SCALE	DRAWING NO.
As indicated	A-11.2
DATE: 07-07-25	
REVISION NO.: 1	7/7/2025 3:59:14 PM

PROJECT TITLE: CERC FIT UP

REVISION: Issued for Tender

FMA PROJECT NUMBER: 0230-55

CLIENT PROJECT NUMBER: CSF-103-23

CLIENT: Memorial University of Newfoundland

CONSULTANTS:

JEWER BAILEY CONSULTANTS
STRUCTURAL · MECHANICAL · ELECTRICAL

FOUGERE MENCHENTON ARCHITECTURE

MECHANICAL DRAWING LIST	
DRAWING #	DRAWING NAME
M000	COVER SHEET
M001	MECHANICAL LEGEND
M105	COMPOSITE PLAN
M205	DEMOLITION LEVEL 5 PLAN
M605	FIRE PROTECTION LEVEL 5 PLAN
M641	FIRE SUPPRESSION DETAILS
M642	FIRE SUPPRESSION DETAILS
M705	VENTILATION LEVEL 5 PLAN
M705A	MOTORIZED SMOKE AND FIRE DAMPER LEVEL 5 PLAN
M706	HVAC PIPING LEVEL 5 PLAN
M741	HVAC DETAILS
M742	HVAC DETAILS
M743	HVAC DETAILS
M801	MECHANICAL SCHEDULES
M802	MECHANICAL SCHEDULES
M905	CONTROLS LEVEL 5 ZONE AND PRESSURIZATION PLAN
M940	CONTROLS ARCHITECTURE
M950	HVAC ZONE CONTROLS - TYPE 4 CONTROL SEQUENCE
M951	HVAC ZONE CONTROLS - TYPE 5 CONTROL SEQUENCE
M952	HVAC ZONE CONTROLS

MECHANICAL

DETAIL NUMBERING

XXX — DETAIL NUMBER.
XXXX — LOCATION DRAWING No.

DRAWING NUMBERING

M-XXXX
- SUBSYSTEM IDENTIFIER
- SEQUENTIAL NUMBER
- SHEET TYPE
- SYSTEM NUMBER
- MECHANICAL PLANT/AREA/FACILITY/ BUILDING NUMBER

SYSTEM NUMBER

0XX LEGEND
1XX SITE/COMPOSITE/ROOF
2XX DEMOLITION
3XX PLUMBING
4XX MISCELLANEOUS SYSTEM -FUEL OIL -MEDICAL GAS -REFRIGERATION -PROPANE -COMPRESSED AIR, ETC.
5XX HYDRONICS
6XX FIRE PROTECTION
7XX VENTILATION
80X SCHEDULES
8XX SECTIONS
9XX CONTROLS

SHEET TYPE (UNLESS OTHERWISE NOTED)

X0X PLAN
X1X PART PLANS
X2X PERSPECTIVES
X3X DETAILS
X4X SCHEMATICS

EQUIPMENT/FIXTURE TAGS/ABBREVIATIONS

EQUIPMENT NUMBER
EQUIPMENT ABBREVIATION
FACILITY IDENTIFIER (CSF)
GRAPHICAL DISPLAY OF BOX NOT SIGNIFICANT.

FLOOR DRAIN	##-FD-#
ROOF DRAIN	##-RD-#
TRAP SEAL PRIMER	##-TSP-#
FAN	##-F-#
HUMIDIFIER	##-H-#
AIR CONDITIONING UNIT	##-AC-#
ENERGY RECOVERY VENTILATOR UNIT	##-ERV-#
HEAT RECOVERY VENTILATOR UNIT	##-HRV-#
AIR HANDLING UNIT	##-AHU-#
CONDENSING UNIT	##-CU-#
EVAPORATOR UNIT	##-EV-#
EXPANSION TANK	##- ET-#
HEAT PUMP UNIT	##-HP-#
ELECTRIC HOT WATER GENERATION	##-EHWG-#
LOUVRE	##-LV-#
GLYCOL MAKE-UP TANK	##-GT-#
BUFFER TANK	##-BT-#
HEAT EXCHANGER	##-HX-#
SILENCER	##-SL-#
VARIABLE OR CONSTANT VOLUME BOX	##-B-#
PUMP	##-P-#
AIR SEPARATOR	##-AS#
HEAT RECOVERY COIL	##-HRC-#
REHEAT COIL	##-RC-#
HEATING COIL	##-HC-#
UNIT HEATER	##-UH-#
FAN COIL UNIT	##-FC-#
FORCE FLOW HEATER	##-F-#
WALL FIN CONVECTOR TAG	##-A
LAVATORY	##-L-#
SINK	##-S-#
MOP SINK	##-MS-#
WATER CLOSET	##-WC-#
SHOWER	##-SH-#
URINAL	##-UR-#
DRINKING FOUNTAIN	##-DF-#
PIPE SUPPORT	##-PS-#

PIPING SIZE DESIGNATION

DN= 6	NPS= 1/8
DN= 8	NPS= 1/4
DN= 10	NPS= 3/8
DN= 15	NPS= 1/2
DN= 20	NPS= 3/4
DN= 25	NPS= 1
DN= 32	NPS= 1-1/4
DN= 40	NPS= 1-1/2
DN= 50	NPS= 2
DN= 65	NPS= 2-1/2
DN= 80	NPS= 3
DN= 100	NPS= 4
DN= 150	NPS= 6
DN= 200	NPS= 8
DN= 250	NPS= 10
DN= 300	NPS= 12

RADIANT INFLOOR HEATING TAGS

MANIFOLD TAG
- FACILITY IDENTIFIER (IF USED)
- MANIFOLD (MH)
- ##-MH-## — MANIFOLD PANEL DESIGNATION

LOOP TAG
MH-#
- LOOP NUMBER
- MANIFOLD DESIGNATION

UNIT NOMENCLATURE

MB	MIXING BOX
EE	ECONOMIZER
FF	FILTER
SF	SUPPLY FILTER
RF	RETURN FAN
XA	ACCESS SECTION
CC	COOLING COIL
HC	HEATING COIL

WATER HAMMER ARRESTOR TAGS

##-WHA-X
- MODEL OR SCHEDULE TAG
- WATER HAMMER ARRESTOR (WHA)
- FACILITY IDENTIFIER (IF USED)

WIRING

- TWISTED PAIR
- SHIELDED TWISTED PAIR
- TWISTED TRIPLET
- SHIELDED TWISTED TRIPLET
- INDIVIDUAL CONDUCTORS
- PNEUMATIC PIPE
- WHEN NO SYMBOL IS INDICATED WIRING TYPE SHALL BE DETERMINED

TERMINAL UNIT TAGS

VARIABLE VOLUME SUPPLY AIR TERMINAL BOX **
- SCHEDULE TAG
- VV-1 (###) — SEQUENTIAL NUMBER
- 50/40 — MAX/MIN OCCUPIED L/s
- 40 — MIN UNOCCUPIED L/s

VARIABLE VOLUME EXHAUST AIR TERMINAL BOX **
- SCHEDULE TAG
- VVE-1 (###) — SEQUENTIAL NUMBER
- 50/× — MAX L/s
- 40 — MIN L/s

** NOTE: CONSTANT VOLUME BOX INDICATED WHEN MAX AND MIN L/s ARE EQUAL

PIPE SYSTEMS

50ø SPD	FIRE PROTECTION DRAIN
SP-D	DRY SPRINKLER
F	FIRE PROTECTION PIPING
S-PA	PRE-ACTION SPRINKLER
S	WET SPRINKLER
CWR	CHILLED WATER RETURN
CWS	CHILLED WATER SUPPLY
GCWR	GLYCOL CHILLED WATER RETURN
GCWS	GLYCOL CHILLED WATER SUPPLY
CR	CONDENSER WATER RETURN
CS	CONDENSER WATER SUPPLY
FOF	FUEL OIL FILL
FOR	FUEL OIL RETURN
FOS	FUEL OIL SUPPLY
FOV	FUEL OIL VENT
GLR	GROUND LOOP RETURN
GLS	GROUND LOOP SUPPLY
HWR	HEATING WATER RETURN
HWS	HEATING WATER SUPPLY
GHWR	GLYCOL HEATING WATER RETURN
GHWS	GLYCOL HEATING WATER SUPPLY
HT-HWR	HIGH TEMP HEATING WATER RETURN
HT-HWS	HIGH TEMP HEATING WATER SUPPLY
RD	REFRIGERANT SUCTION
RHG	REFRIGERANT SUCTION
RL	REFRIGERANT LIQUID
RS	REFRIGERANT SUCTION
HPS	HIGH PRESSURE STEAM
LPS	LOW PRESSURE STEAM
HPC	HIGH PRESSURE CONDENSATE
LPC	LOW PRESSURE CONDENSATE
CA	COMPRESSED AIR
DCW	DOMESTIC COLD WATER
DHW	DOMESTIC HOT WATER
NPW	NON POTABLE WATER
DHWR	DOMESTIC HOT WATER RECIRCULATION
TW	TEMPERED WATER
TWR	TEMPERED WATER
G	NATURAL GAS
GV	NATURAL GAS VENT
PG	PROPANE GAS
SAN	SANITARY DRAINAGE
ED	EQUIPMENT DRAIN
V	SANITARY VENT
SAN (B)	SANITARY DRAINAGE BELOW GRADE
CRD	CORRISON RESISTANT DRAINAGE
SD	STORM DRAINAGE
SD (B)	STORM DRAINAGE BELOW GRADE
AGSS	GAS SCAVENGING
A	ACID RESISTANT DRAINAGE
AV	ACID RESISTANT VENT
CHL	CHLORINE
CHLV	CHLORINE VENT
DA	DENTAL AIR
DV	DENTAL VACUUM
AG	ARGON
CO2	CARBON DIOXIDE
HE	HELIUM
N2	NITROGEN
LN2	LIQUID NITROGEN
NO2	NITROUS OXIDE
O2	OXYGEN
LO2	OXYGEN LIQUID
IA	INSTRUMENT AIR
LA	LAB AIR
LV	LAB VACUUM
MA	MEDICAL AIR
MV	MEDICAL VACUUM
DI	DEIONIZED WATER
DW	DISTILLED WATER
RO	REVERSE OSMOSIS
ROR	REVERSE OSMOSIS

PIPING SPECIALTIES

- BALL VALVE (BV)
- BUTTERFLY VALVE (BFV)
- CHECK VALVE (CV)
- GATE VALVE (GV) OUTSIDE STEM AND YOKE (OS&Y)
- GATE VALVE (GV) NON RISING STEM
- GLOBE VALVE (GLBV)
- PRESSURE CONTROL VALVE
- CONTROL (SOLENOID) VALVE
- DRAIN VALVE
- SAFETY VALVE
- RELIEF VALVE
- ANTI SYPHON VALVE
- FLOW BALANCING VALVE
- THREE WAY VALVE
- AIR VENT
- VACUUM BREAKER
- AUTOMATIC AIR VENT
- MANUAL AIR VENT
- WATER HAMMER ARRESTOR
- STRAINER (STR)
- SUCTION DIFFUSER
- TRIPLE DUTY
- ADAPTOR
- FLANGE/UNION/COUPLING
- QUICK CONNECTION - FEMALE
- QUICK CONNECTION - MALE
- PRESSURE TEMPERATURE PORT
- HOSE REIL
- ACCESS BOX
- FLEXIBLE CONNECTION
- PLUMBING FIXTURE CARRIERS
- INTERCEPTOR
- TRAP PRIMER CABINET
- WALL HYDRANT
- BACKFLOW PREVENTOR C/W DETECTOR ASSEMBLY
- REDUCED PRESSURE BACKFLOW PREVENTOR
- PUMP
- PIPING OUTLET
- PIPING CONTINUES
- PRESSURE GAUGES
- THERMOMETER
- CLEANOUT
- FLOOR DRAIN
- P TRAP
- PIPE SUPPORT
- PIPE CAP

DIFFUSER/GRILLE TAGS

- DIFFUSER, GRILLE, REGISTER LETTER DESIGNATOR (SEE SCHEDULE)
- DESIGN L/s
- A(200) / (200) — ALTERNATE L/s LOCATION

ROOM TAG SYSTEM

- RM: XXXX — ROOM NAME
- RM #: XXXX — ROOM NUMBER
- ZONE ID: XXXX — ZONE IDENTIFICATION NUMBER
- CONT: XXXX — CONTROL TYPE
- DIFF: XXXX — SPACE AIRFLOW DIFFERENTIAL

RADIANT PANEL TAGS

VV-1	IDENTIFIER/TAG/DESIGNATION
900 m	LENGTH
90 W	CAPACITY
0.01 L/s	FLOW
100 Pa	PRESSURE DROP

FIRE PROTECTION

- ANGLE FIRE HOSE VALVE
- STRAIGHT FIRE HOSE VALVE
- "AGS" TEST AND DRAIN VALVE
- FIRE DEPARTMENT CONNECTION
- FIRE PUMP TEST HEADER
- BACKFLOW PREVENTOR TEST HEADER
- ALARM GONG
- PENDANT SPRINKLER HEAD (SUBSCRIPT "g" INDICATES PROVIDE GUARD)
- DRY PENDANT SPRINKLER HEAD
- UPRIGHT SPRINKLER HEAD (SUBSCRIPT "g" INDICATES PROVIDE GUARD)
- SIDEWALL SPRINKLER HEAD
- ZONE CONTROL ASSEMBLY
- LIGHT HAZARD
- ORDINARY HAZARD GROUP 1 CLASSIFICATION
- ORDINARY HAZARD GROUP 2 CLASSIFICATION
- ORDINARY HAZARD GROUP 3 CLASSIFICATION
- EXTRA HAZARD GROUP 1
- EXTRA HAZARD GROUP 2
- FIRE EXTINGUISHER CABINET
- FIRE HOSE CABINET
- FIRE DEPARTMENT VALVE (STRAIGHT)
- FIRE EXTINGUISHER
- FIRE DEPARTMENT VALVE (ANGLED)

COMPRESSED AIR SPECIALTIES

- PIPE ADAPTOR-NPT TO MODULAR BLOCKS
- MODULAR FILTER
- MODULAR REGULATOR C/W PRESSURE GAUGE
- MODULAR LUBRICATOR
- RUNAWAY VALVE
- THERMAL PRESSURE RELIEF VALVE
- QUICK COUPLING PLUG (MALE)
- QUICK COUPLING COUPLER (FEMALE)

VENTILATION

- ROUND DUCT
- RECTANGULAR DUCT
- FRESH AIR (FA) OR INTAKE RISE OR DROP
- EXHAUST AIR (EA) RISE OR DROP
- RETURN AIR RISE OR DROP
- SUPPLY AIR RISE OR DROP
- EXHAUST AIR GRILLES AND DIFFUSERS - SEE SCHEDULES
- STRAIGHT SOUND ATTENUATOR ROUND CONNECTIONS
- STRAIGHT SOUND ATTENUATOR RECTANGULAR AND ROUND CONNECTIONS
- STRAIGHT SOUND ATTENUATOR RECTANGULAR CONNECTIONS
- ELBOW SOUND ATTENUATOR RECTANGULAR CONNECTIONS
- ELBOW R/W = 1.5 UNLESS OTHERWISE NOTED
- MITERED ELBOW W/AIRFOIL TURNING VANES
- RETURN AIR GRILLES AND DIFFUSERS - SEE SCHEDULES
- F.C. DUCT FLEXIBLE CONNECTION
- SQUARE TO ROUND TRANSITION
- COILS
- MD MOTORIZED DAMPER
- ABD AUTOMATIC BACKDRAFT DAMPER
- BDD BACKDRAFT DAMPER
- BD BALANCING DAMPER
- FD (###) TAG / SEQUENTIAL NUMBER — FIRE DAMPER
- SFD MOTORIZED SMOKE AND FIRE DAMPER
- WALL CAP
- T.O.D (TYP) / B.O.D (TYP)
- SUPPLY/FRESH AIR GRILLES AND DIFFUSERS - SEE SCHEDULES

- AFS AIRFLOW STATION
- EXHAUST AIR LOUVER
- SUPPLY/FRESH AIR LOUVER
- FAN
- AIR HANDLING UNIT (AHU)
- AIR FILTER
- DAMPER - OPPOSED
- DAMPER - PARALLEL
- HUMIDIFIER
- WATER HTG/CLG COIL
- HEATING COIL.
- COOLING COIL.
- ELEC. HEATING COIL

CONTROLS & INSTRUMENTATION

- DUCT INSERTION PROBE
- DUCT AVERAGING
- REMOTE BULB
- OUTSIDE AIR
- FIRE STAT
- DUCT STATIC PRESSURE
- DIFF. PRESSURE
- AIR AVERAGING STATION
- HOT WIRE SENSOR
- PITOT TUBE
- PRESSURE TAP
- PIPE WELL INSERTION
- PIPE SURFACE MTD.
- VENTURI FLOW METER
- ORIFICE PLATE
- TURBINE PROBE
- ANNUBAR
- PADDLE SWITCH/FLOW SWITCH
- DISCONNECT FUSED
- DISCONNECT NON-FUSED
- MAGNETIC STARTER
- MANUAL STARTER
- MAG STARTER C/W DISCONNECT
- TEMPERATURE
- HUMIDITY
- ENTHALPY
- DIFF. PRESSURE
- ABSOLUTE PRESSURE
- VELOCITY
- VOLTAGE
- CURRENT
- ELECTRICAL POWER
- LEVEL
- LIGHT
- ROTATION
- SMOKE
- TIMER
- VIBRATION
- CARBON MONOXIDE
- CARBON DIOXIDE
- REFRIGERANT GAS
- VOLTAGE SOURCE
- RESISTANCE SOURCE
- DRY CONTACT SOURCE
- POTENTIOMETER
- DIGITAL INPUT POINT
- DIGITAL OUTPUT POINT
- ANALOG INPUT POINT
- ANALOG OUTPUT POINT
- TOTALIZER INPUT POINT

- PB PUSH BUTTON
- C CONDUCTIVITY
- DDC DDC CONTROLLER
- DP DIFFERENTIAL PRESSURE CONTROLLER
- DPT DIFFERENTIAL PRESSURE TRANSDUCER
- DPS DIFFERENTIAL PRESSURE SWITCH
- DM DAMPER MOTOR
- CR CONTROL RELAY
- E ETHERNET DROP
- FS FLOW SWITCH
- HL HUMIDITY HIGH LIMIT DUCT MOUNT
- H HUMIDITY SENSOR
- F FLOW METER
- LR LEVEL RELAY
- LS LEVEL SENSOR
- LP LOW PRESSURE SWITCH
- PS PRESSURE SWITCH
- PT PRESSURE TRANSDUCER
- RMC ROOM MONITOR CONTROLLER
- RPS ROOM PRESSURE SENSOR
- R RELAY
- TS TEMPERATURE SENSOR (DUCT MOUNT)
- TS TEMPERATURE SENSOR
- TS F TEMPERATURE SENSOR FLAT PLATE
- TS LV TEMPERATURE SENSOR LOW VOLTAGE
- T H/C TEMPERATURE SENSOR HEATCOOL
- TR TRANSFORMER
- VFD VARIABLE FREQUENCY DRIVE
- VSD VARIABLE SPEED DRIVE
- CO2 CARBON DIOXIDE SENSOR
- CO CARBON MONOXIDE SENSOR
- NO2 NITROUS DIOXIDE SENSOR
- NO NITROUS OXIDE SENSOR
- O OXYGEN SENSOR
- FUSE
- XXXX EMCS POINT

Architect Prime Consultant

FOUGERE MENCHENTON ARCHITECTURE

Discipline: MECHANICAL

Sub-Consultant: Mechanical/ Electrical

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Memorial University of Newfoundland

Drawn:	Checked:
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Designed: J. COLOMBE	Approved: K. JEWER

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4. CONTRACTOR SHALL DO ALL WORK IN ACCORDANCE WITH THE APPLICABLE STANDARDS AND CODES INCLUDING, BUT NOT LIMITED TO, THE NATIONAL BUILDING CODE OF CANADA.

No.	Revisions	MM/DD/YY
0	Issued for Tender	2025-07-03
D	Issued for 90% Review	2025-05-06
C	Issued for 66% Review	2025-03-31
B	Issued for 33% Review	2025-02-14
A	Issued for Client Review	2025-01-17

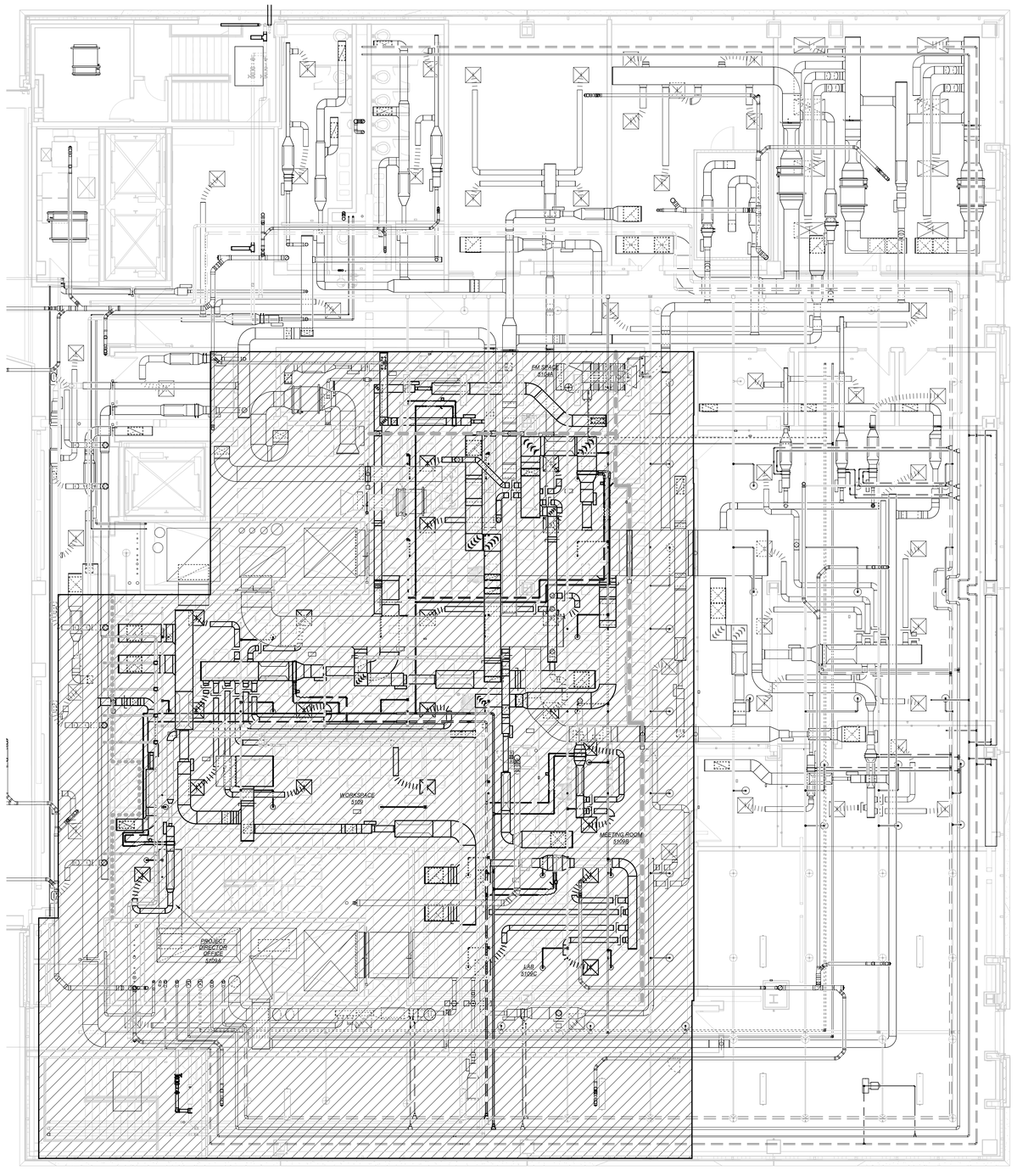
Drawing Nomenclature
Detail/Section No. 3 / A-1 — Dwg. No. where detailed

PROJECT TITLE
CERC FIT UP

Client's Project No.: CFS-103-23

DRAWING TITLE
MECHANICAL LEGEND

SCALE	DRAWING NO.
AS INDICATED	M001
DATE: 2025-07-03	
REVISION NO.: 0	



1 / M105 COMPOSITE LEVEL 5 PLAN
1 : 100

1:2 0mm 20 40 60 80 100
1:5 0mm 50 100 150 200 250
1:10 0mm 100 200 300 400 500
1:20 0mm 0.2 0.4 0.6 0.8 1.0
1:25 0mm 0.25 0.5 0.75 1.0 1.25
1:50 0mm 0.5 1.0 1.5 2.0 2.5
1:75 0mm 1.0 2.0 3.0 3.75
1:100 0mm 1.0 2.0 3.0 4.0 5.0
1:125 0mm 1.25 2.5 3.75 5.0 6.25
1:200 0mm 2.0 4.0 6.0 8.0 10.0

GENERAL NOTES:

1. THESE PLANS INDICATE SCOPE BETWEEN THEIR RESPECTIVE LEVEL AND THE LEVEL ABOVE. THIS MEANS THE SANITARY PIPING INDICATED SERVES THE FIXTURES ON THE LEVEL ABOVE OR EXISTS IN A CHASE ABOVE THE FLOOR. CONTRACTOR SHALL INTERPRET ALL CONTRACT DOCUMENTS TO DETERMINE EXACT ROUTING.
2. COMPOSITE PLANS INDICATE ALL MAJOR EXISTING BUILDING SERVICES WITH APPROXIMATE QUANTITIES AND LOCATIONS TO CONVEY THE GENERAL LAYOUT WITH RESPECT TO NEW WORK. HANGERS, CONDUITS, THREADED RODS, MISCELLANEOUS SMALL BORE PIPING, JUNCTION BOXES AND OTHER BUILDING APPURTANCES ARE NOT INDICATED.
3. CONTRACTOR SHALL INTERPRET ALL CONTRACT DOCUMENTS TO DETERMINE COORDINATION REQUIREMENTS AND EVALUATE CONSTRUCTION TOLERANCES.
4. REPAIR/PATCH ALL OPENINGS IN EXISTING WALL, CEILING AND FLOOR ASSEMBLIES TO NEW CONDITION MATCHING EXISTING CONSTRUCTION.
5. SEAL ALL OPENINGS IN FLOORS, WALLS AND ALL RATED ASSEMBLIES WITH ULC LISTED FIRE STOPPING SYSTEMS.

Architect Prime Consultant

FOUGERE MENCHENTON ARCHITECTURE

Discipline: MECHANICAL

Sub-Consultant: Mechanical/ Electrical

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Designed:	J. COLOMBE	Approved:	K. JEWER

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A	Issued for Client Review	2025-01-17

Drawing Nomenclature

Detail/Section No. 3 / A-1 — Dwg. No. where detailed

PROJECT TITLE

CERC FIT UP

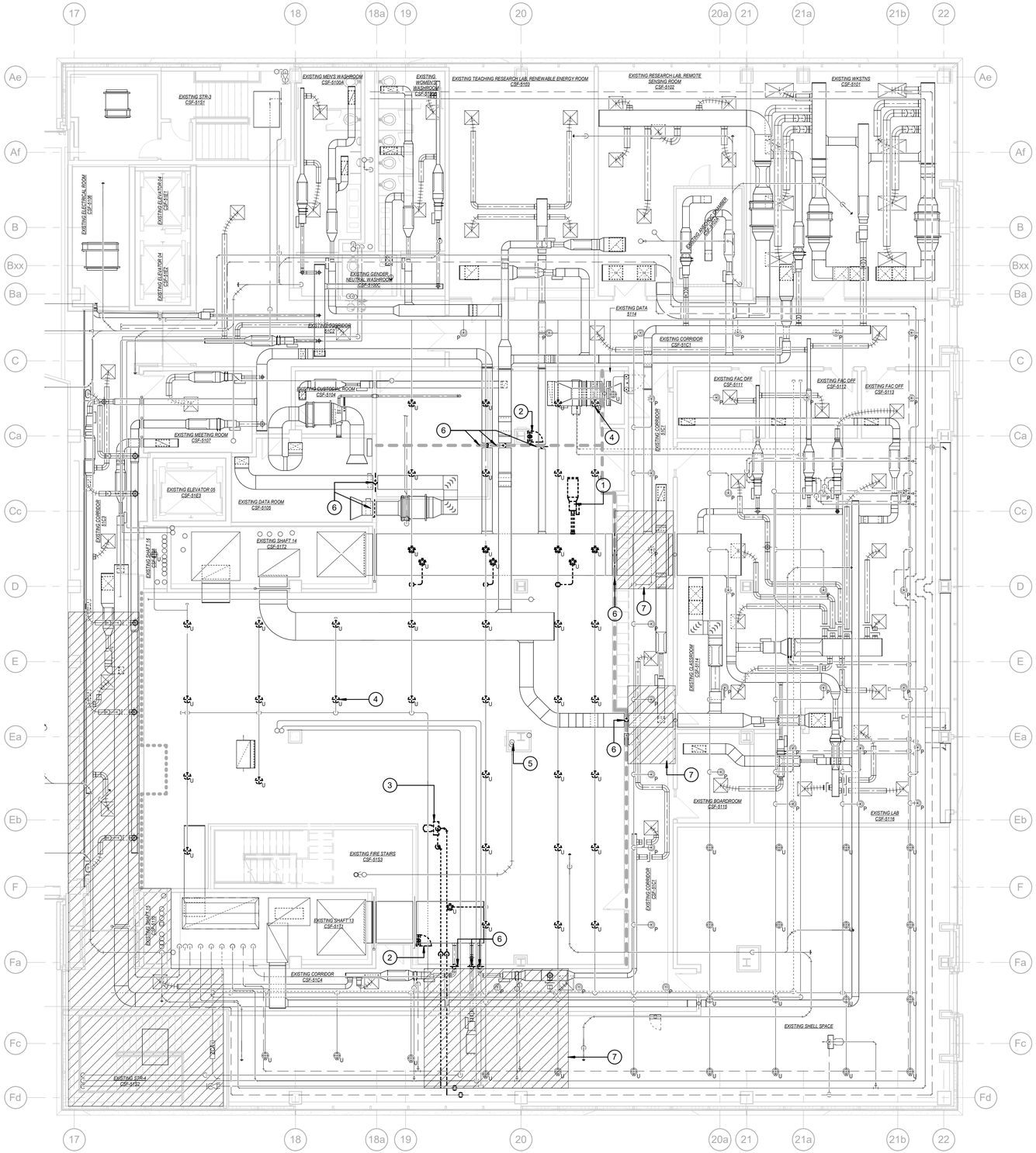
Client's Project No.: CFS-103-23

DRAWING TITLE

COMPOSITE PLAN

SCALE	DRAWING NO.
AS INDICATED	M105
DATE: 2025-07-03	
REVISION NO.: 0	

NOTE #	DRAWING NOTES
1	REMOVE EXISTING DIFFUSERS/GRILLES, EQUIPMENT AND ASSOCIATED DUCTWORK AS INDICATED. CAP DISCONNECTED DUCTWORK. (TYPICAL)
2	RELOCATE EXISTING FIRE EXTINGUISHER CABINET AS INDICATED ON NEW PLANS.
3	REMOVE EXISTING UNIT HEATER, VALVES, ACCESSORIES AND OTHER APPURTANCES. TURN OVER TO OWNER. (TYPICAL)
4	REMOVE EXISTING SPRINKLER AND BRANCH PIPING AS REQUIRED. CAP PIPING AS REQUIRED. (TYPICAL)
5	REMOVE EXISTING VICTAULIC MECHANICAL TEE, ELBOW AND CAP. INSTALL NEW PIPING AND A NEW BARRETT CLEANOUT C/W CAP ABOVE FINISHED CEILING.
6	REMOVE EXISTING FIRE DAMPER AND ASSOCIATED DUCTWORK AS REQUIRED TO FACILITATE THE INSTALLATION OF NEW MOTORIZED SMOKE AND FIRE DAMPERS.
7	ANY WORK WITHIN THIS AREA IS OUTSIDE THE CONSTRUCTION ZONE AND SHALL BE COMPLETED AFTER HOURS. HOARDING AND SCHEDULING SHALL BE COORDINATED WITH THE OWNER'S REPRESENTATIVE, GENERAL CONTRACTOR, AND ALL CONTRACT DOCUMENTS. (TYPICAL)



1 / M205 DEMOLITION LEVEL 5 COMPOSITE PLAN
1 : 100

1:2 0mm 20 40 60 80 100
1:5 0mm 50 100 150 200 250
1:10 0mm 100 200 300 400 500
1:20 0mm 0.2 0.4 0.6 0.8 1.0
1:25 0mm 0.25 0.5 0.75 1.0 1.25
1:50 0mm 0.5 1.0 1.5 2.0 2.5
1:75 0mm 1.0 2.0 3.0 3.75
1:100 0mm 1.0 2.0 3.0 4.0 5.0
1:125 0mm 1.25 2.5 3.75 5.0 6.25
1:200 0mm 2.0 4.0 6.0 8.0 10.0

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Designed:	**Approved:**
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A	Issued for Client Review	2025-01-17

Drawing Nomenclature

Detail/Section No. 3 / A-1 — Dwg. No. where detailed

PROJECT TITLE

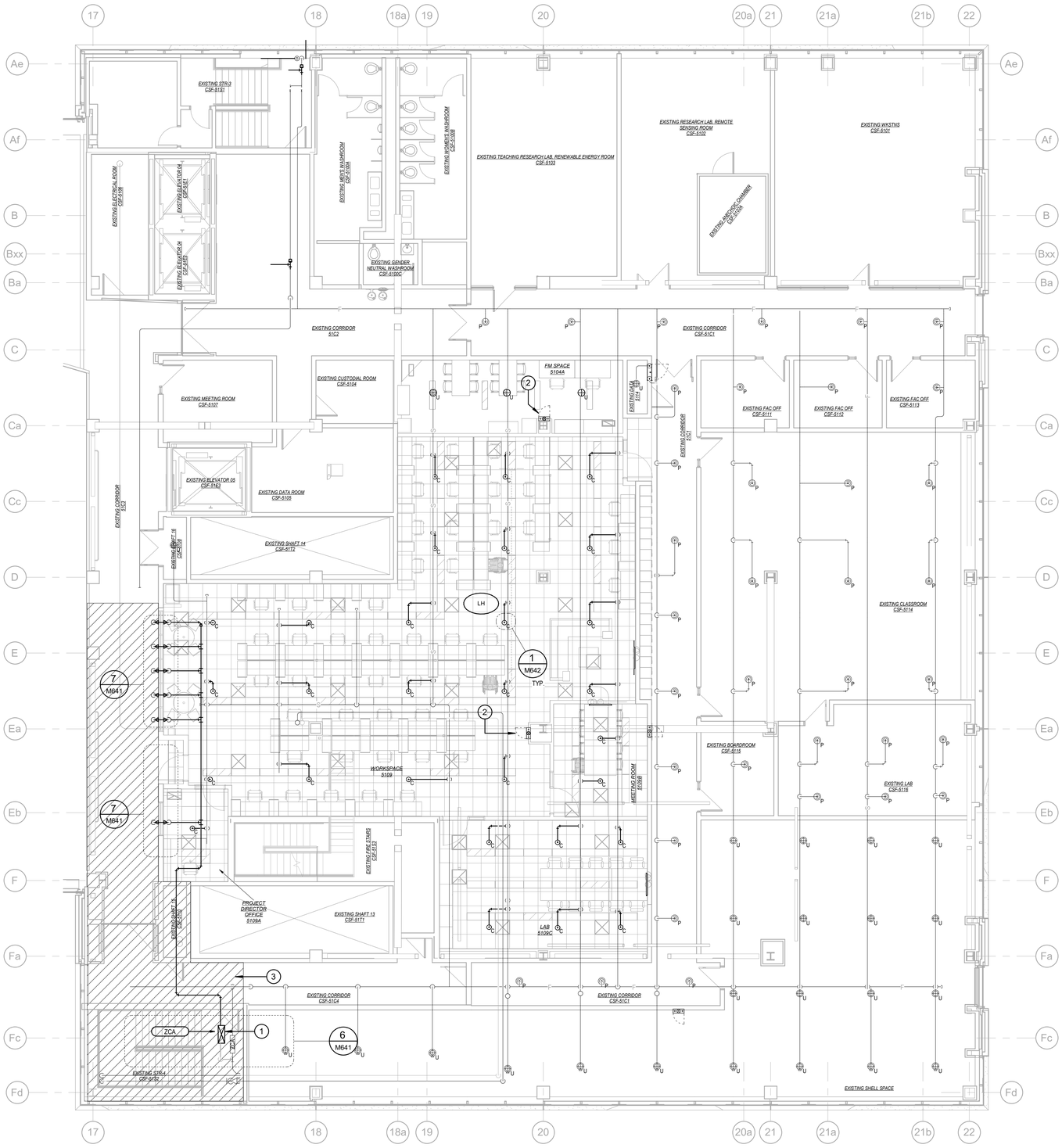
CERC FIT UP

Client's Project No.: CFS-103-23

DRAWING TITLE

DEMOLITION LEVEL 5 PLAN

SCALE	DRAWING NO.
AS INDICATED	M205
DATE: 2025-07-03	
REVISION NO.: 0	



1 / M605 FIRE PROTECTION LEVEL 5 COMPOSITE PLAN

1 : 100

1:2 0mm 20 40 60 80 100
1:5 0mm 50 100 150 200 250
1:10 0mm 100 200 300 400 500
1:20 0mm 0.2 0.4 0.6 0.8 1.0
1:25 0mm 0.25 0.5 0.75 1.0 1.25
1:50 0mm 0.5 1.0 1.5 2.0 2.5
1:75 0mm 1.0 2.0 3.0 3.75
1:100 0mm 1.0 2.0 3.0 4.0 5.0
1:125 0mm 1.25 2.5 3.75 5.0 6.25
1:200 0mm 2.0 4.0 6.0 8.0 10.0

NOTE #	DRAWING NOTES
1	INSTALL NEW ZONE CONTROL ASSEMBLY FOR WINDOW SPRINKLERS. CONNECT TO EXISTING SYSTEM. COORDINATE EXISTING SYSTEM SHUTDOWN WITH OWNER'S REPRESENTATIVE AND PROVIDE 24 HOUR FIRE WATCH FOR SHUT DOWN PERIOD.
2	INSTALL RELOCATED FIRE EXTINGUUISHER CABINET C/W TYPE B EXTINGUISHER IN THIS APPROXIMATE LOCATION.
3	ANY WORK WITHIN THIS AREA IS OUTSIDE THE CONSTRUCTION ZONE AND SHALL BE COMPLETED AFTER HOURS. HOARDING AND SCHEDULING SHALL BE COORDINATED WITH THE OWNER'S REPRESENTATIVE, GENERAL CONTRACTOR, AND ALL CONTRACT DOCUMENTS. (TYPICAL)

GENERAL NOTES:

1. THESE PLANS INDICATE SCOPE BETWEEN THEIR RESPECTIVE LEVEL AND THE LEVEL ABOVE. THIS MEANS THE SANITARY PIPING INDICATED SERVES THE FIXTURES ON THE LEVEL ABOVE OR EXISTS IN A CHASE ABOVE THE FLOOR. CONTRACTOR SHALL INTERPRET ALL CONTRACT DOCUMENTS TO DETERMINE EXACT ROUTING.
2. THIS PLAN HIGHLIGHTS THE FIRE PROTECTION PIPING TO PROVIDE CLARITY AND ONLY SHOWS PERTINENT EXISTING BUILDING SERVICES.
3. CONTRACTOR SHALL INTERPRET ALL CONTRACT DOCUMENTS TO DETERMINE COORDINATION REQUIREMENTS AND EVALUATE CONSTRUCTION TOLERANCES.
4. FIRE PROTECTION PIPING SHALL BE COORDINATED WITH ALL OTHER MECHANICAL SERVICES. TYPICALLY FIRE PROTECTION PIPING SHOULD BE INSTALLED ABOVE OTHER SERVICES WITH PIPING FROM THE FIRE PROTECTION MAINS TO THE SPRINKLERS ROUTED AROUND OTHER MECHANICAL SERVICES.
5. REPAIR/PATCH ALL OPENINGS IN EXISTING WALL, CEILING AND FLOOR ASSEMBLIES TO NEW CONDITION MATCHING EXISTING CONSTRUCTION.
6. SEAL ALL OPENINGS IN FLOORS, WALLS AND ALL RATED ASSEMBLIES WITH ULC LISTED FIRE STOPPING SYSTEMS.
7. COORDINATE ALL FIRE PROTECTION SHUT DOWNS AND TIE-INS TO EXISTING SYSTEM WITH OWNER. PROVIDE TWENTY-FOUR HOUR FIRE WATCH FOR 48 HOURS.

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A	Issued for Client Review	2025-01-17

Drawing Nomenclature

Detail/Section No. 3 / A-1 Dwg. No. where detailed

PROJECT TITLE

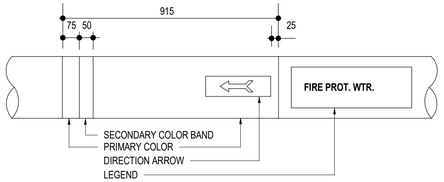
CERC FIT UP

Client's Project No.: CFS-103-23

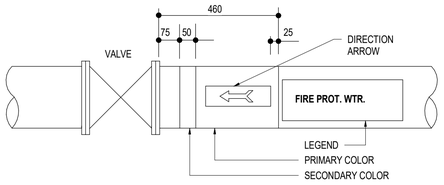
DRAWING TITLE

FIRE PROTECTION LEVEL 5 PLAN

SCALE	DRAWING NO.
AS INDICATED	M605
DATE: 2025-07-03	
REVISION NO.: 0	

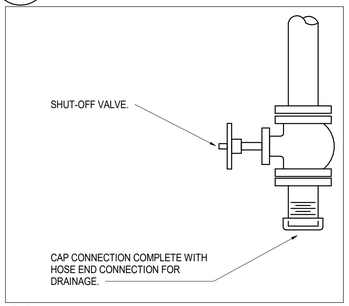


PIPING IDENTIFICATION ARRANGEMENT FOR STRAIGHT RUNS

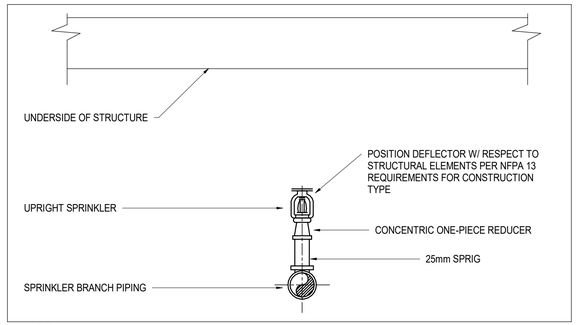


PIPING IDENTIFICATION ARRANGEMENTS AT VALVES AND FITTINGS

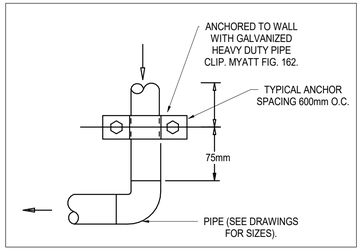
1 / M641 — FIRE PROTECTION PIPING IDENTIFICATION DETAILS
NTS



2 / M641 — DRAIN FOR LOW POINTS
NTS

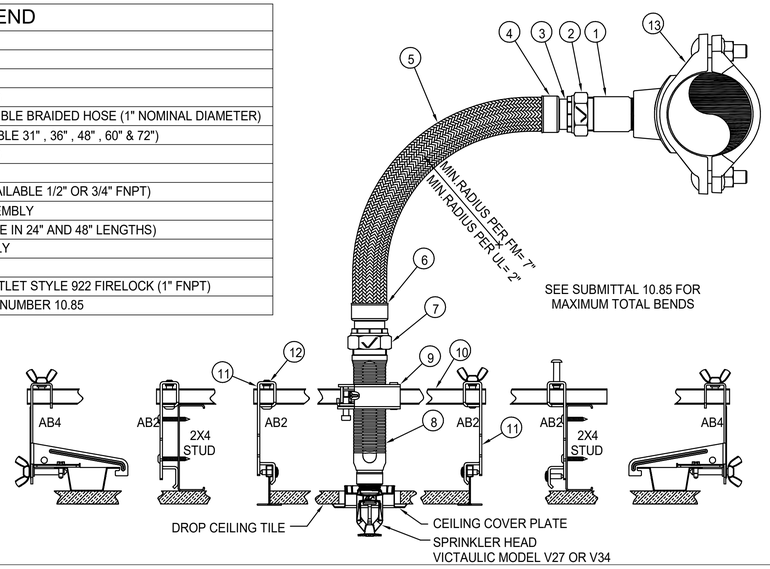


4 / M641 — SPRINKLER UPRIGHT
NTS



5 / M641 — HEAVY DUTY PIPE CLIP
1 : 1

PRODUCT LEGEND	
1	INLET NIPPLE (1" MPT)
2	NUT
3	ISOLATION RING
4	COLLAR / WELD FITTING
5	STAINLESS STEEL FLEXIBLE BRAIDED HOSE (1" NOMINAL DIAMETER)
	(LENGTHS AVAILABLE 31" , 36" , 48" , 60" & 72")
6	COLLAR / WELD FITTING
7	NUT
8	REDUCING OUTLET (AVAILABLE 1/2" OR 3/4" FNPT)
9	CENTER BRACKET ASSEMBLY
10	SQUARE BAR (AVAILABLE IN 24" AND 48" LENGTHS)
11	END BRACKET ASSEMBLY
12	SHEET METAL SCREW
13	VIC MECHANICAL - T OUTLET STYLE 922 FIRELOCK (1" FNPT)
SEE VICTAULIC SUBMITTAL NUMBER 10.85	



SEE SUBMITTAL 10.85 FOR MAXIMUM TOTAL BENDS

BRAIDED VICFLEX FLEXIBLE HOSE SPRINKLER ASSEMBLIES FOR STANDARD PENDENT SPRINKLERS

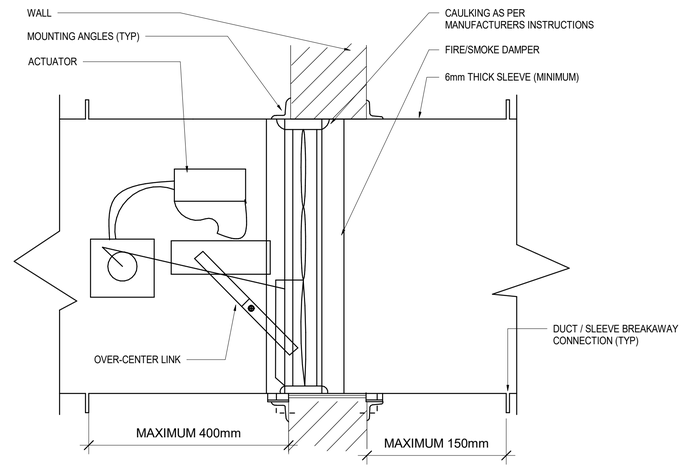
c UL us LISTED FM

NOTES:
1. REFER TO VICTAULIC SUBMITTAL 10.85 FOR ADDITIONAL DETAILS.

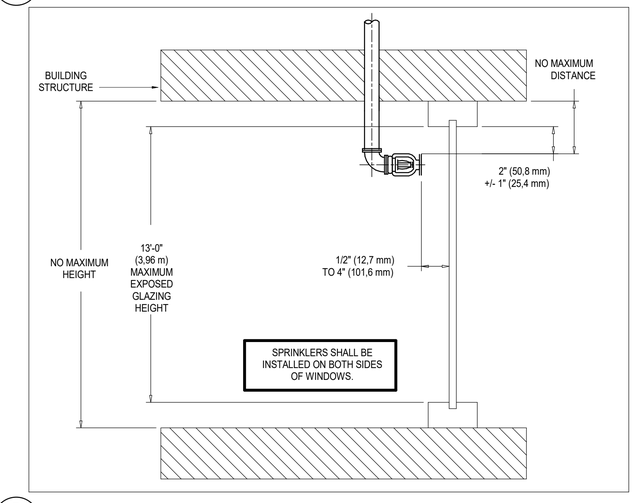
3 / M641 — FLEXIBLE SPRINKLER
1 : 32

GENERAL NOTES:

1. DETAIL INDICATED IS SPECIFIC TO MODEL INDICATED. RECTANGULAR DUCT BASED ON RUSKIN MODEL FSD60.
2. REFER TO INSTALLATION MANUAL FOR PROVIDED PRODUCT TO ENSURE INSTALLATION MEETS THE U.L.C LISTING REQUIREMENTS.
3. TRANSITION FROM ROUND TO RECTANGULAR DUCTWORK AS REQUIRED. WHERE DUCTWORK IS SMALLER THAN SMALLEST AVAILABLE DAMPER SIZE; TRANSITON TO DAMPER SIZE AS REQUIRED.



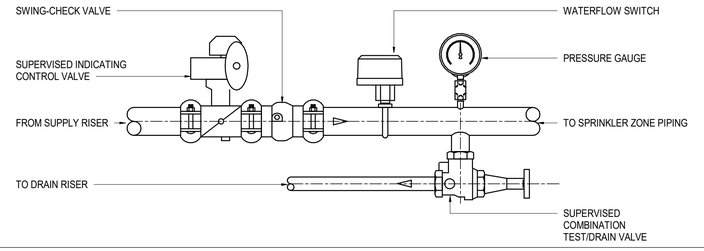
8 / M641 — FIRE PROTECTION - COMBINATION SMOKE FIRE DAMPER
1 : 1



7 / M641 — WINDOW SPRINKLER DETAIL TYPE 4
1 : 1

GENERAL NOTES

1. COORDINATE SYSTEM SHUT DOWN WITH OWNER AND OWNER'S REPRESENTATIVE.
2. ALLOW 48 HOURS FOR SHUT DOWN. SHUT DOWN TO BE COMPLETED AFTER HOURS.
3. ALLOW FOR 24 HOUR FIRE WATCH DURING ANY SHUT DOWN PERIODS.



6 / M641 — ZONE CONTROL ASSEMBLY
1 : 1

Architect Prime Consultant

FOUGERE MENCHENTON ARCHITECTURE

Discipline: MECHANICAL

Sub-Consultant: Mechanical/ Electrical

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Sub-Consultant:

Client:

Memorial University of Newfoundland

Drawn:	J. COLOMBE	Checked:	K. JEWER
Designed:	J. COLOMBE	Approved:	K. JEWER

Consultants Project No.

JBC-24-C-156

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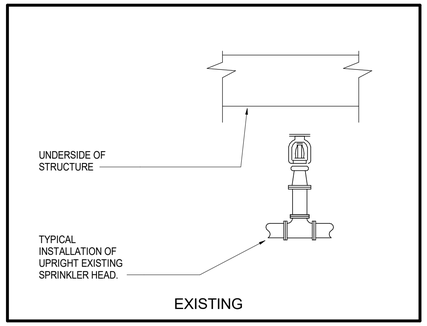
CERC FIT UP

Client's Project No.: CFS-103-23

DRAWING TITLE

FIRE SUPPRESSION DETAILS

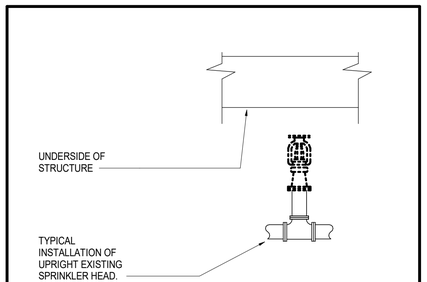
SCALE: AS INDICATED
DATE: 2025-07-03
REVISION NO.: 0
DRAWING NO.: M641



EXISTING

GENERAL NOTES :

1. DETAIL INDICATES ACCEPTABLE DESIGN INTENT BUT DOES NOT INDICATE ALL ACCEPTABLE METHODS. CONRACTOR SHALL SUBMIT INSTALLATION DETAILS WITHIN SHOP DRAWING PACKAGE.
2. FLEXIBLE SPRINKLER DROPS ARE NOT INDICATED. SEE SPECIFICATIONS AND OTHER DETAILS TO DETERMINE IF FLEXIBLE SPRINKLER DROPS MAY BE USED.



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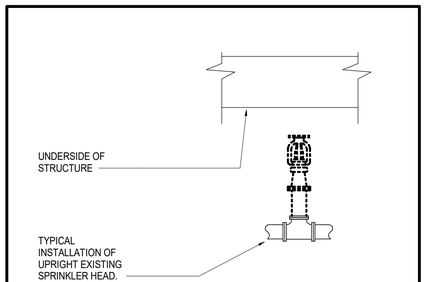

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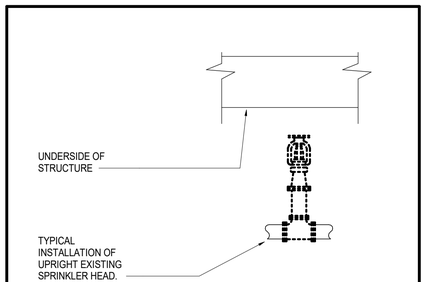

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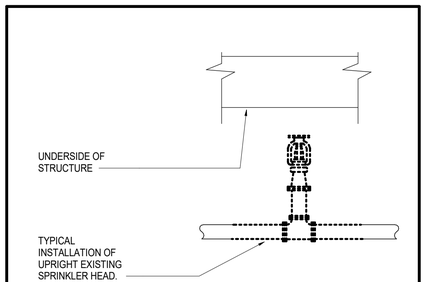

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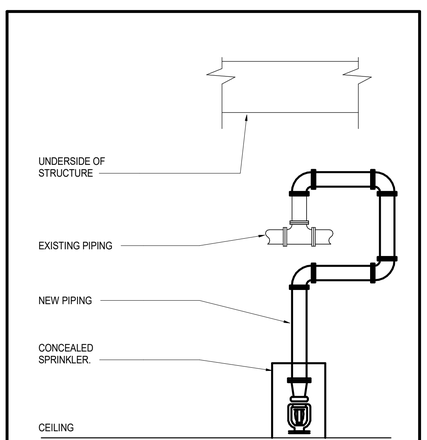
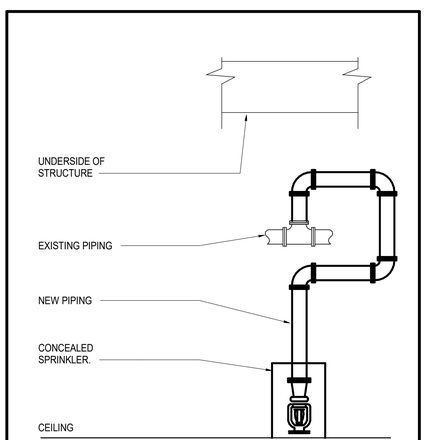


REVISED OPTION 1



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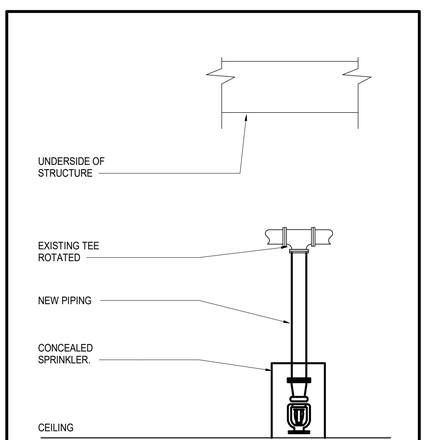
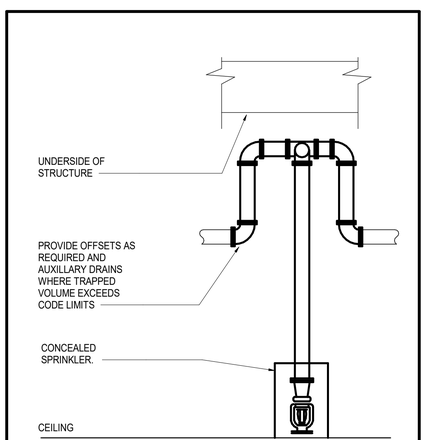


DEMOLITION OPTION 3



DEMOLITION OPTION 4

1 / M642 SPRINKLER CONNECTION TO EXISTING
1 : 1

1:2 0mm 20 40 60 80 100
1:5 0mm 50 100 150 200 250
1:10 0mm 100 200 300 400 500
1:20 0mm 0.2 0.4 0.6 0.8 1.0
1:25 0mm 0.25 0.5 0.75 1.0 1.25
1:50 0mm 0.5 1.0 1.5 2.0 2.5
1:75 0mm 1.0 2.0 3.0 3.75
1:100 0mm 1.0 2.0 3.0 4.0 5.0
1:125 0mm 1.25 2.5 3.75 5.0 6.25
1:200 0mm 2.0 4.0 6.0 8.0 10.0

Architect Prime Consultant

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Discipline
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Designed:	J. COLOMBE	Approved:	K. JEWER

Consultants Project No.
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K.H.G JEWER
SIGNATURE
2025-07-03
DATE

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Drawing Nomenclature

Detail/Section No. 3 / A-1 — Dwg. No. where detailed

PROJECT TITLE

CERC FIT UP

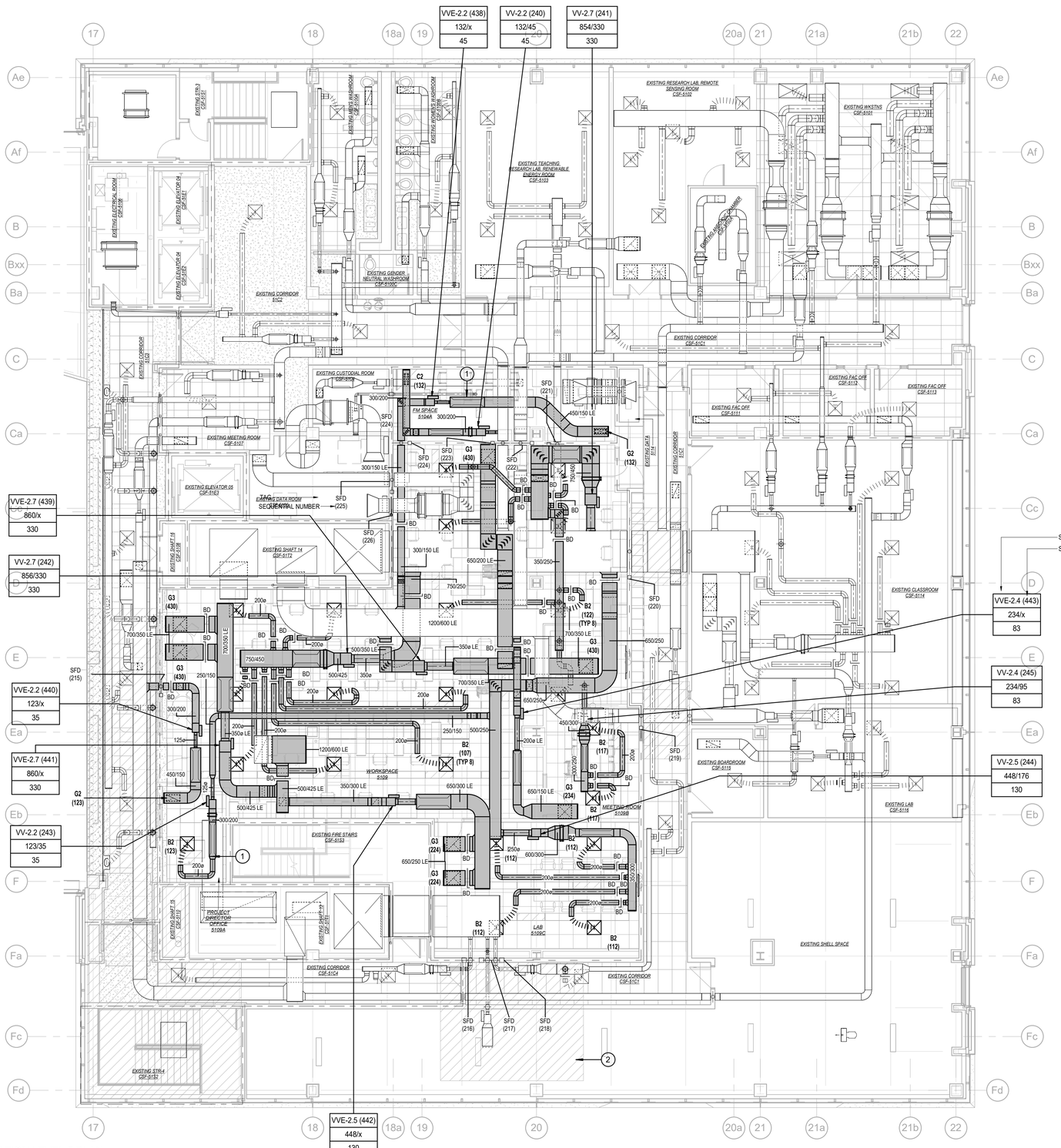
Client's Project No.: CFS-103-23

DRAWING TITLE

FIRE SUPPRESSION DETAILS

SCALE	DRAWING NO.
AS INDICATED	M642
DATE: 2025-07-03	
REVISION NO.: 0	

NOTE #	DRAWING NOTES
1	SEE TERMINAL UNIT SOUND ATTENUATOR SCHEDULE.
2	ANY WORK WITHIN THIS AREA IS OUTSIDE THE CONSTRUCTION ZONE AND SHALL BE COMPLETED AFTER HOURS. HOARDING AND SCHEDULING SHALL BE COORDINATED WITH THE OWNER'S REPRESENTATIVE, GENERAL CONTRACTOR, AND ALL CONTRACT DOCUMENTS. (TYPICAL)



1 / M705 VENTILATION LEVEL 5 PLAN
1 : 100

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0mm 50 100 150 200 250 — 1:5
0mm 100 200 300 400 500 — 1:10
0mm 0.2 0.4 0.6 0.8 1.0 — 1:20
0mm 0.25 0.5 0.75 1.0 1.25 — 1:25
0mm 0.5 1.0 1.5 2.0 2.5 — 1:50
0mm 1.0 2.0 3.0 3.75 — 1:75
0mm 1.0 2.0 3.0 4.0 5.0 — 1:100
0mm 1.25 2.5 3.75 5.0 6.25 — 1:125
0mm 2.0 4.0 6.0 8.0 10.0 — 1:200

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FOUGERE MENCHENTON ARCHITECTURE

Discipline: MECHANICAL

Sub-Consultant: Mechanical/ Electrical

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Drawn:	Checked:
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Designed:	**Approved:**
J. COLOMBE	K. JEWER

Consultants Project No.

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2025-07-03
DATE

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PROJECT TITLE

CERC FIT UP

Client's Project No.: CFS-103-23

DRAWING TITLE

VENTILATION LEVEL 5 PLAN

SCALE	DRAWING NO.
AS INDICATED	M705
DATE: 2025-07-03	
REVISION NO.: 0	

NOTE #	DRAWING NOTES
1	INSTALL NEW MOTORIZED SMOKE AND FIRE DAMPER IN EXISTING DUCTWORK. CONFIRM DUCT SIZE PRIOR TO SUBMITTING SHOP DRAWING. (TYPICAL)
2	INSTALL NEW MOTORIZED SMOKE AND FIRE DAMPER IN NEW DUCTWORK.
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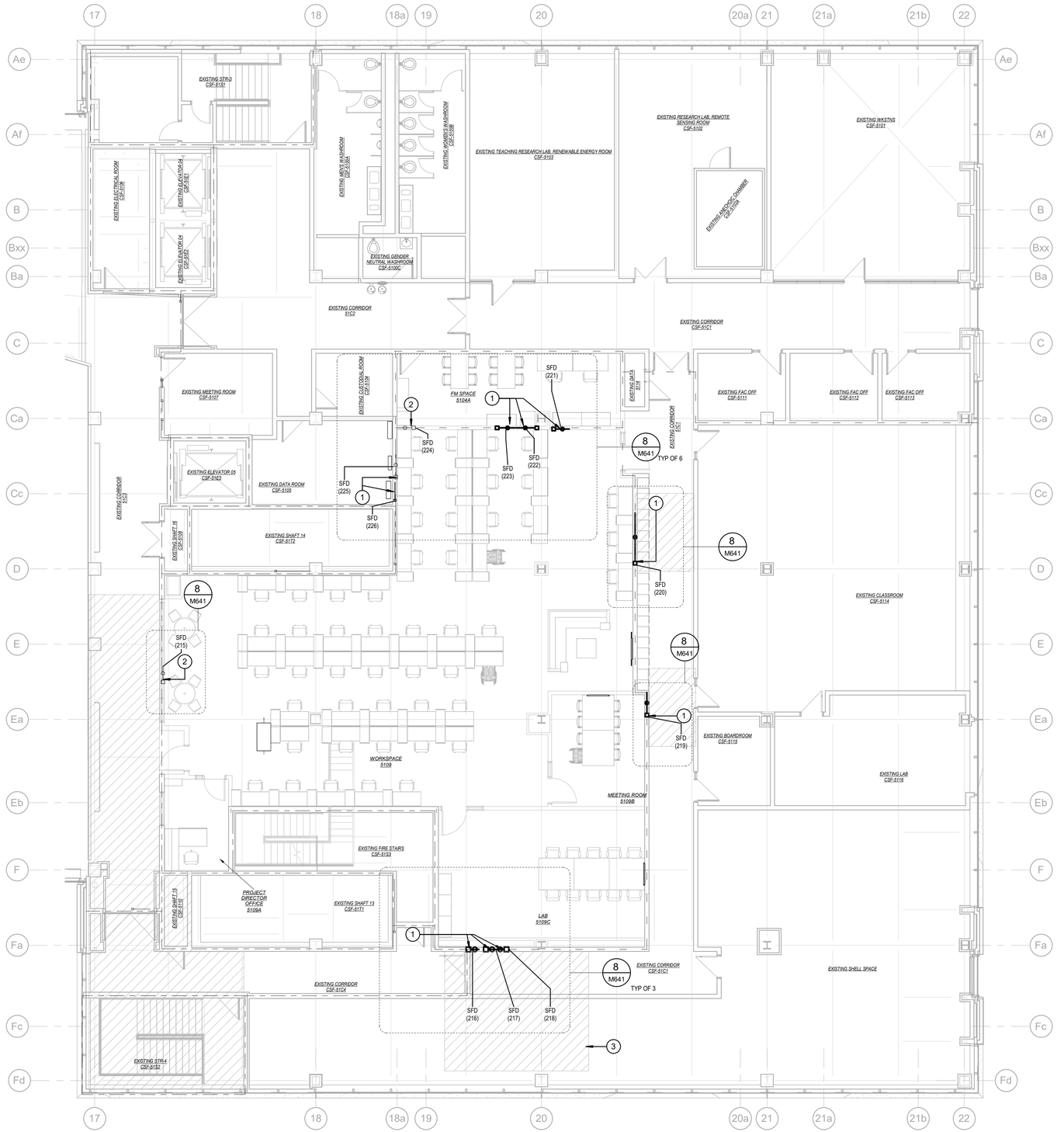

0mm 20 40 60 80 100 — 1:2
0mm 50 100 150 200 250 — 1:5
0mm 100 200 300 400 500 — 1:10
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0mm 0.25 0.5 0.75 1.0 1.25 — 1:25
0mm 0.5 1.0 1.5 2.0 2.5 — 1:50
0mm 1.0 2.0 3.0 3.75 — 1:75
0mm 1.0 2.0 3.0 4.0 5.0 — 1:100
0mm 1.25 2.5 3.75 5.0 6.25 — 1:125
0mm 2.0 4.0 6.0 8.0 10.0 — 1:200

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Sub-Consultant: Mechanical/ Electrical

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Drawing Nomenclature

Detail/Section No. → 3 / A-1 ← Dwg. No. where detailed

PROJECT TITLE

CERC FIT UP

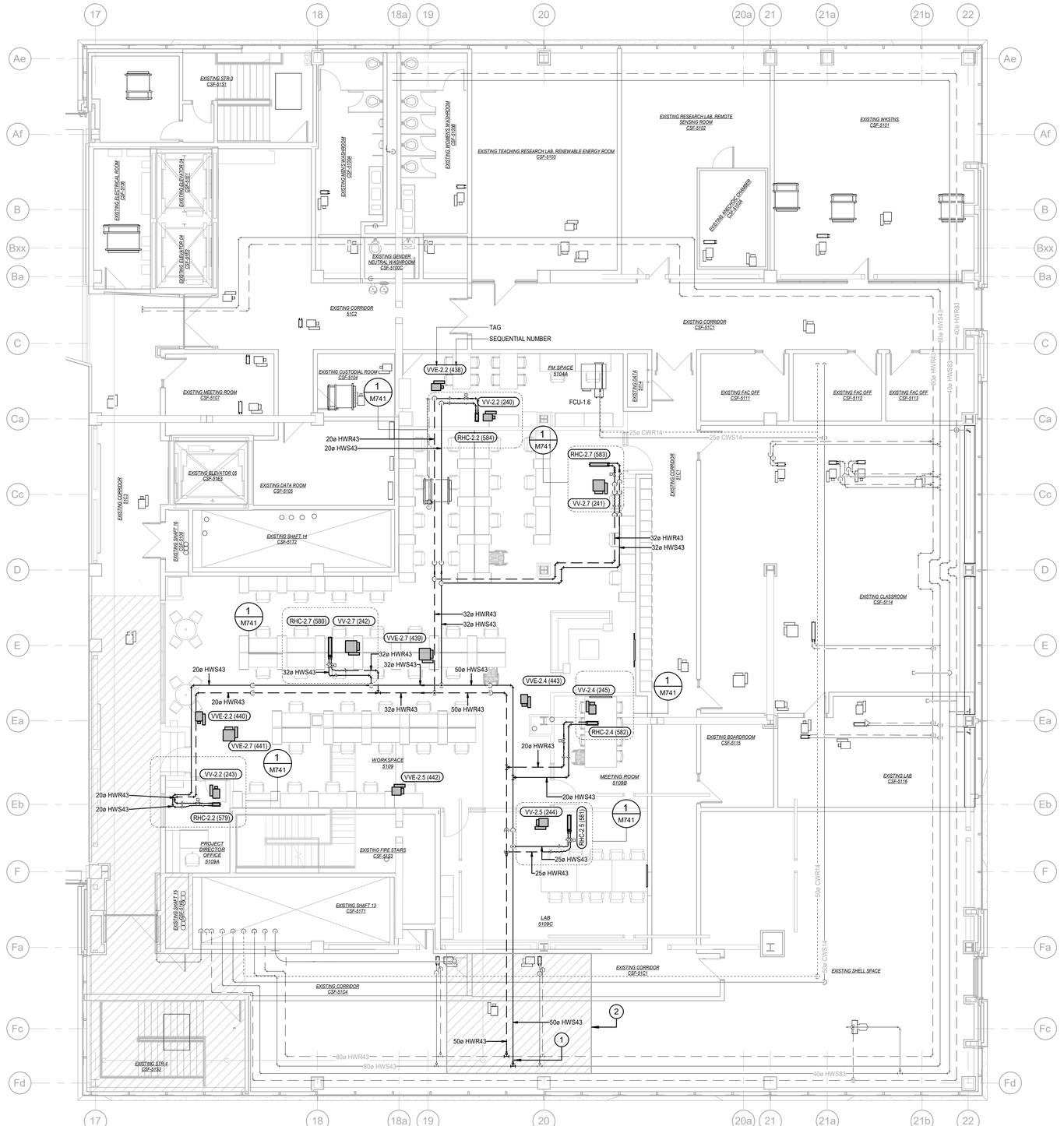
Client's Project No.: CFS-103-23

DRAWING TITLE

MOTORIZED SMOKE AND FIRE DAMPER LEVEL 5 PLAN

SCALE	DRAWING NO.
AS INDICATED	M705A
DATE: 2025-07-03	
REVISION NO.: 0	

NOTE #	DRAWING NOTES
1	CONNECT TO EXISTING PIPING IN THIS APPROXIMATE LOCATION.
2	ANY WORK WITHIN THIS AREA IS OUTSIDE THE CONSTRUCTION ZONE AND SHALL BE COMPLETED AFTER HOURS. HOARDING AND SCHEDULING SHALL BE COORDINATED WITH THE OWNER'S REPRESENTATIVE, GENERAL CONTRACTOR, AND ALL CONTRACT DOCUMENTS. (TYPICAL)



1 M706 HVAC PIPING LEVEL 5 PLAN
1 : 100

0mm 20 40 60 80 100 1:2
0mm 50 100 150 200 250 1:5
0mm 100 200 300 400 500 1:10
0mm 0.2 0.4 0.6 0.8 1.0 1:20
0mm 0.25 0.5 0.75 1.0 1.25 1:25
0mm 0.5 1.0 1.5 2.0 2.5 1:50
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0mm 1.25 2.5 3.75 5.0 6.25 1:125
0mm 2.0 4.0 6.0 8.0 10.0 1:200

Architect Prime Consultant

FOUGERE MENCHENTON ARCHITECTURE

Discipline
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Sub-Consultant: Mechanical/ Electrical

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SIGNATURE
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Drawing Nomenclature

Detail/Section No. 3 / A-1 — Dwg. No. where detailed

PROJECT TITLE

CERC FIT UP

Client's Project No.: CFS-103-23

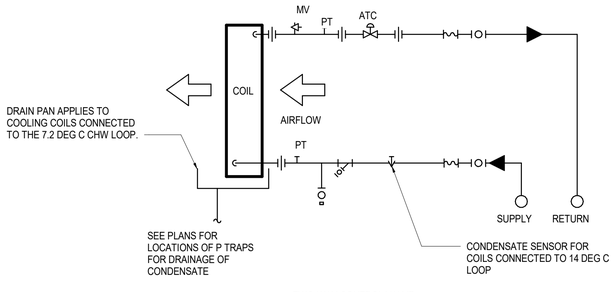
DRAWING TITLE

HVAC PIPING LEVEL 5 PLAN

SCALE	DRAWING NO.
AS INDICATED	M706
DATE: 2025-07-03	
REVISION NO.: 0	

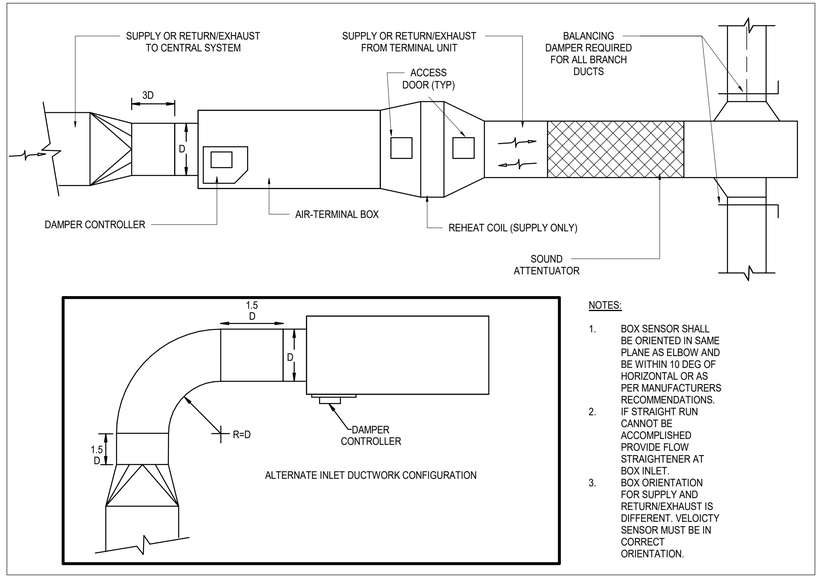
NOTES:

1. DETAIL APPLIES TO SINGLE DUCT MOUNTED OR VAV BOX COILS, TERMINAL HEATING AND COOLING UNIT COILS INCLUDING FAN COIL UNITS, CABINET HEATERS, UNIT HEATERS, RADIANT HEATERS, PANELS, ETC.
2. PIPING FOR MULTIPLE ROW COILS SHALL BE CONNECTED IN COUNTERFLOW ARRANGEMENT.
3. RELOCATE MANUAL AIR VENT TO COIL IF CONNECTION IS PROVIDED BY THE COIL MANUFACTURER.
4. SUBSTITUTE BUTTERFLY VALVES FOR BALL VALVES IF PIPING IS 2-1/2" NPS OR LARGER.
5. RELOCATE DRAIN OFF VALVE TO COIL IF CONNECTION IS PROVIDED BY THE COIL MANUFACTURER.
6. PROVIDE DRAIN OFF VALVES AND VENTS IN PIPING SYSTEM AS SPECIFIED.
7. REMOVE STRAINER BASKETS AFTER INITIAL STARTUP AND SYSTEM FLUSH IS COMPLETE.
8. WHERE COIL CONNECTIONS ARE IN SAME VERTICAL PLANE, PROVIDE COIL VENT AND DRAIN OFF CONNECTIONS.
9. WHERE COIL CONNECTIONS ARE NOT IN SAME VERTICAL PLANE, SUPPLY SHALL BE THROUGH THE BOTTOM CONNECTION.
10. WHERE WATER COIL IS INSTALLED IN A FAN COIL UNIT, ALL VALVES SHALL FIT WITHIN THE FAN COIL UNIT ENCLOSURE. COOLING COIL PIPING AND VALVES NOT LOCATED OVER AN EXTENDED COIL DRAIN PAN SHALL BE INSULATED, INCLUDING WITHIN THE TERMINAL UNIT CABINET.
11. WHERE FAN COIL UNITS ARE CONNECTED TO THE 14 DEG C CHW LOOP, CAP OR PLUG DRAIN PAN CONNECTION AND PROVIDE A MOISTURE SENSOR ON THE SURFACE OF THE CHILLED WATER SUPPLY TO THE FAN COIL VALVE TO SHUT DOWN THE UNIT UPON SENSING CONDENSATE FORMATION ON PIPE SURFACE.



TWO-WAY CONTROL VALVE

1 / M741 — TERMINAL WATER COIL PIPING — 1 : 1



ALTERNATE INLET DUCTWORK CONFIGURATION

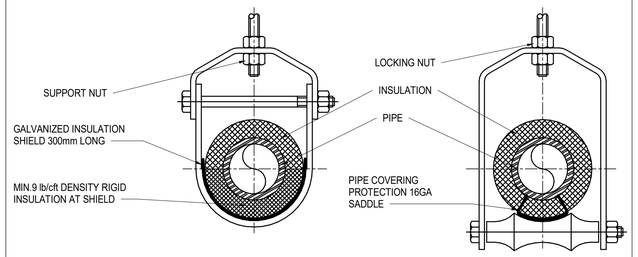
NOTES:

1. BOX SENSOR SHALL BE ORIENTED IN SAME PLANE AS ELBOW AND BE WITHIN 10 DEG OF HORIZONTAL OR AS PER MANUFACTURERS RECOMMENDATIONS.
2. IF STRAIGHT RUN CANNOT BE ACCOMPLISHED PROVIDE FLOW STRAIGHTENER AT BOX INLET.
3. BOX ORIENTATION FOR SUPPLY AND RETURN/EXHAUST IS DIFFERENT. VELOICTY SENSOR MUST BE IN CORRECT ORIENTATION.

3 / M741 — AIR TERMINAL BOX CONNECTION — 1 : 1

NOTES:

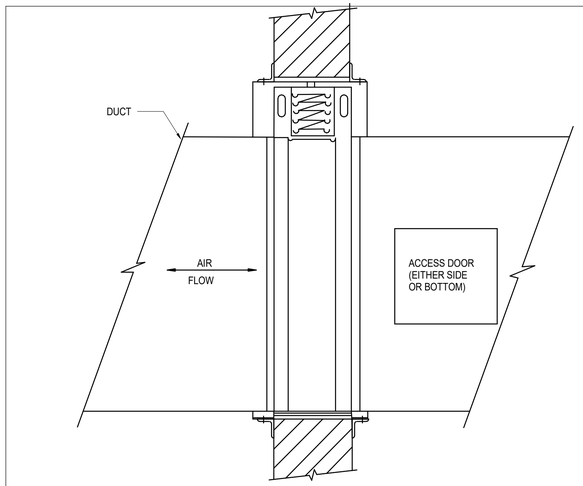
1. SEE SPECIFICATION FOR HANGER SIZES.
2. PIPE 8" AND LARGER SHALL HAVE ROLLER SUPPORTED WITH DUAL RODS.
3. FOR CHW SERVICE OVER 3" REPLACE SADDLE WITH 300 mm LONG 14 GA SHIELD WITH RIGID INSULATION BETWEEN PIPE AND SHIELD.



HEAVY DUTY CLEVIS HANGER
(FOR DN15 TO DN80 PIPE)

ADJUSTABLE HANGER
(FOR DN100 TO DN150 PIPE)

4 / M741 — PIPE HANGER SUPPORT — 1 : 1



FIRE-RATED WALL OR PARTITION
(TYPE AND SIZE VARIES).

NOTES :

1. CURTAIN TYPE FIRE DAMPER ASSEMBLY SHALL BE CASE 50 mm or 75 mm WITH BLADES OUT OF AIRSTREAM TYPE "B OR C' (SEE SMACNA FIRE, SMOKE AND RADIATION DAMPER INSTALLATION GUIDE FOR HVAC SYSTEMS - 5TH EDITION PAGES 5.8,5.11 AND 7.2 OR NEWER VERSION IF APPLICABLE) WHEN DUCT DIMENSIONS REQUIRE MULTIPLE DAMPER SECTIONS, PROVIDE OPPOSED BLADE TYPE FIRE DAMPER.
2. PROVIDE SPRING LOADED CLOSURE FOR ALL FIRE DAMPERS.
3. WHEN DUCTWORK IS INSULATED OR LINED, PROVIDE INSULATED ACCESS DOOR.
4. ACCESS DOOR SHALL BE 300 mm X 300 mm OR LARGER IF REQUIRED FOR FUSIBLE LINK REPLACEMENT.
5. CASE 1, TYPE A FIRE DAMPERS (BLADES IN AIR STREAM) MAY ONLY BE SUBSTITUTED FOR BLADES IN AIR STREAM TYPE WHERE VELOCITIES ARE UNDER 500 FPM IN LOW PRESSURE DUCT SYSTEMS ONLY.
6. INSTALLATION SHOWN AS AN EXAMPLE. SPECIFIC INSTALLATION SHALL CONFORM WITH MANUFACTURER'S, UL APPROVED INSTRUCTIONS.

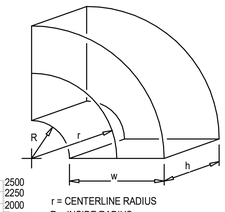
2 / M741 — FIRE PROTECTION - FIRE DAMPER PENETRATION — 1 : 1

RADIUS ELBOW AND SPLITTER VANE REQUIREMENTS

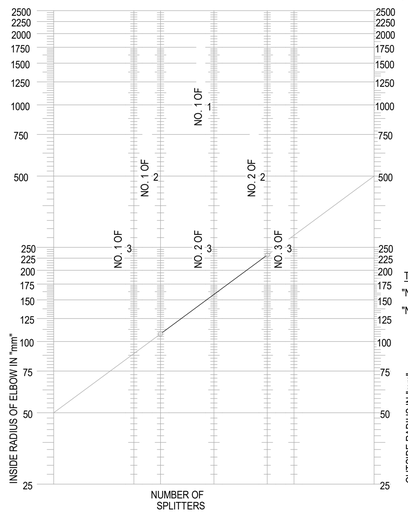
r/w RATIO:	NO. OF VANES FOR 1 ELBOW	NO. OF VANES WHEN 2 ELBOWS ARE WITHIN 2 EQUIV. DIA.:
r/w >=1.50	0	1
1.5 > r/w >=0.70	1	2
0.7 > r/w >=0.60	2	3
0.6 > r/w >=0.55	3	3

EQUIVALENT DIAMETER =(w+h)/2

NOTE: r/w = 0.5 IS A SQUARE THROAT ELBOW. HOWEVER, MINIMUM INSIDE RADIUS R SHOULD BE 2".



r = CENTERLINE RADIUS
R = INSIDE RADIUS
w = DUCT WIDTH
h = DUCT HEIGHT

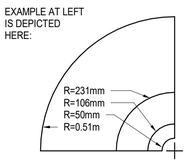


TERMINOLOGY:

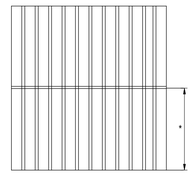
"NO. 1 OF 3" = NO. 1 VANE OF A TOTAL OF 3 VANES

"NO. 2 OF 3" = NO. 2 VANE OF A TOTAL OF 3 VANES

EXAMPLE AT LEFT IS DEPICTED HERE:



5 / M741 — SHORT RADIUS ELBOW SPLITTER VANE QUANTITY AND SPACING — 1 : 1



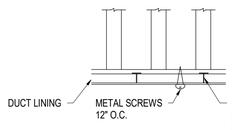
*MAXIMUM UNSUPPORTED VANE LENGTH

SMALL SINGLE VANE 36"
LARGE SINGLE VANE 36"
SMALL DOUBLE VANE 60"
LARGE DOUBLE VANE 72"

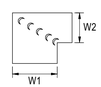
INSTALL VANES IN SECTIONS OR USE TIE RODS TO LIMIT THE UNBRACED VANE LENGTH

VANES SHALL BE SECURELY FASTENED TO RUNNERS.

ALL VANES SHALL BE SECURE AND STABLE IN INSTALLED OPERATING POSITION.



TO PREVENT LINER DAMAGE CARE MUST BE EXERCISED WHEN INSTALLING VANES IN LINED OR FIBROUS GLASS DUCT,



IF W2 DOES NOT EQUAL W1 SPECIAL PROVISIONS MUST BE MADE IN VANE SHAPE OR ANGLE OF ENTRY AND EXIT. APPLIES TO ALL TYPES OF VANES. CONSTRUCT VANE EDGES TO PROJECT TANGENTS PARALLEL TO DUCT SIDES.

6 / M741 — VANE SUPPORT IN ELBOW DETAILS — N.T.S.

Architect Prime Consultant

FOUGERE MENCHENTON ARCHITECTURE

Discipline: MECHANICAL

Sub-Consultant: Mechanical/ Electrical

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Sub-Consultant:

Client:

Memorial University of Newfoundland

Drawn:	Checked:
J. COLOMBE	K. JEWER
Designed: J. COLOMBE	Approved: K. JEWER

Consultants Project No.

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CERC FIT UP

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DRAWING TITLE

HVAC DETAILS

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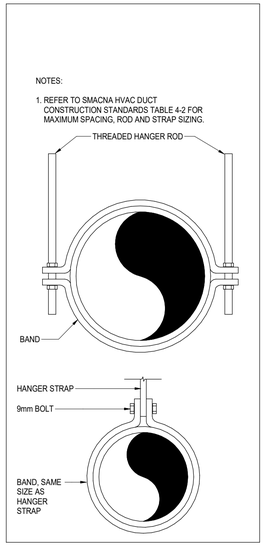
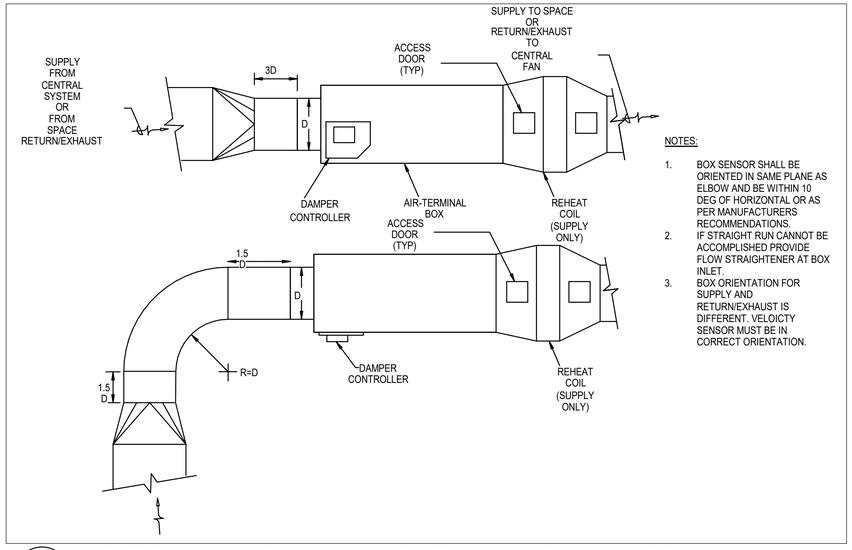


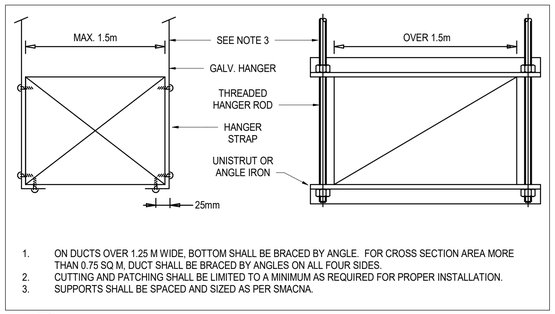
1 / M742 ROUND DUCT HANGER

1 : 1



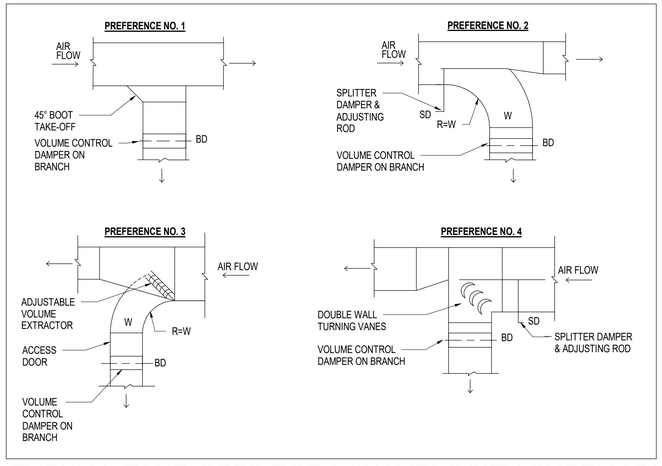
4 / M742 AIR TERMINAL BOX CONNECTION (HARD DUCTED)

1 : 1



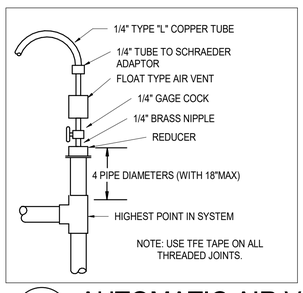
7 / M742 DUCT HANGER SUPPORT

1 : 1



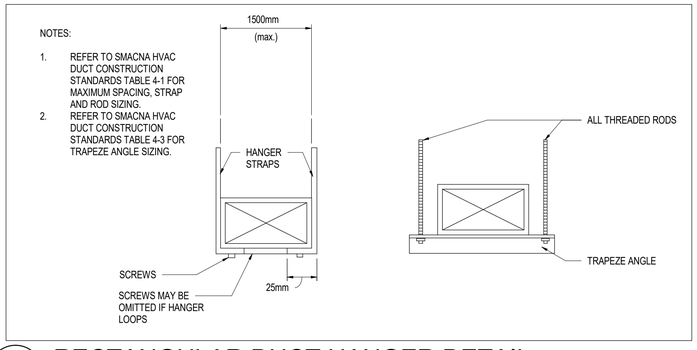
2 / M742 TYPICAL TAKE-OFFS FOR LOW VELOCITY SUPPLY DUCTS

1 : 1



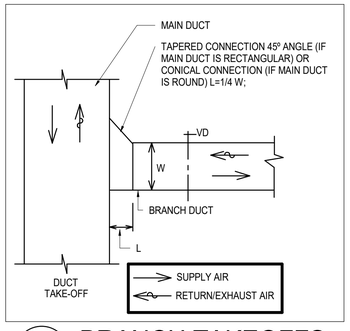
5 / M742 AUTOMATIC AIR VENT ASSEMBLY

1 : 1



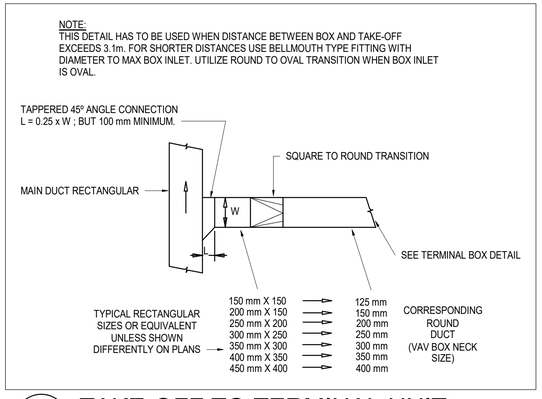
3 / M742 RECTANGULAR DUCT HANGER DETAIL

N.T.S.



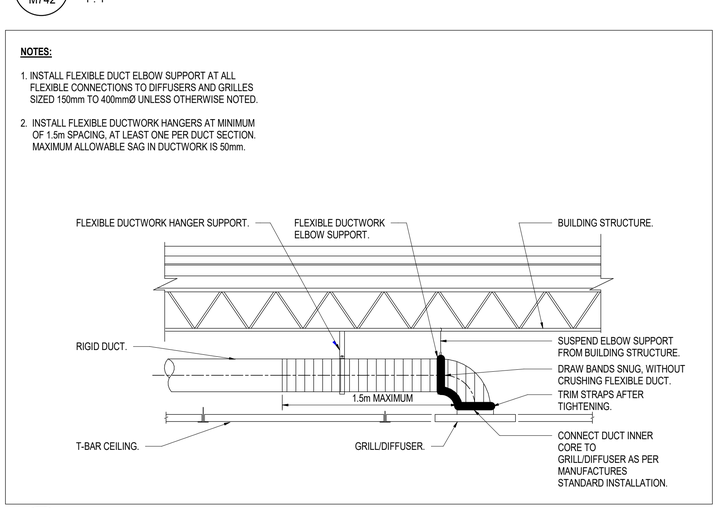
6 / M742 BRANCH TAKEOFFS

1 : 1



9 / M742 TAKE-OFF TO TERMINAL UNIT

1 : 1



8 / M742 FLEXIBLE DUCTWORK HANGER & ELBOW SUPPORT DETAIL

N.T.S.

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FOUGERE MENCHENTON ARCHITECTURE

Discipline

MECHANICAL

Sub-Consultant: Mechanical/ Electrical

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Designed:	**Approved:**
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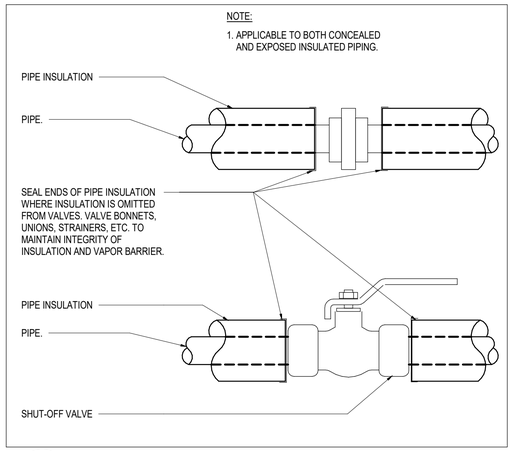
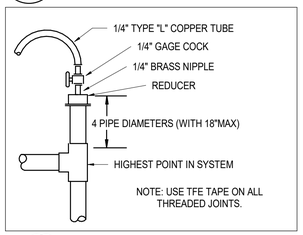


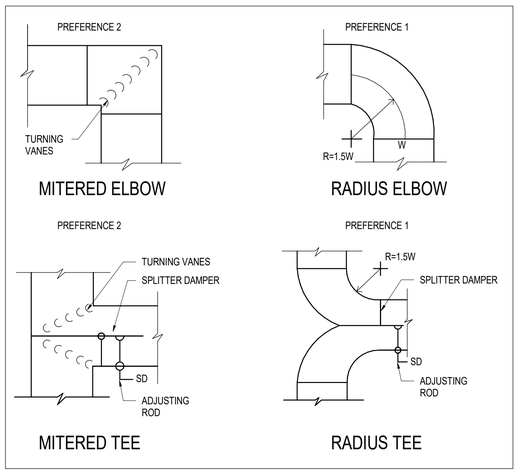
1 / M743 INSULATION AROUND VALVES & UNIONS

N.T.S.



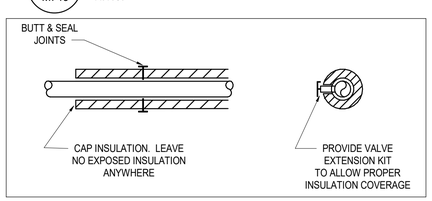
2 / M743 MANUAL AIR VENT ASSEMBLY

1 : 1



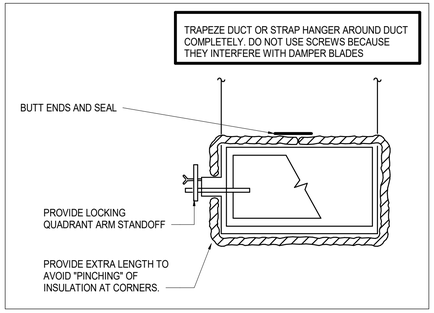
3 / M743 STANDARD DUCT FITTINGS

N.T.S.



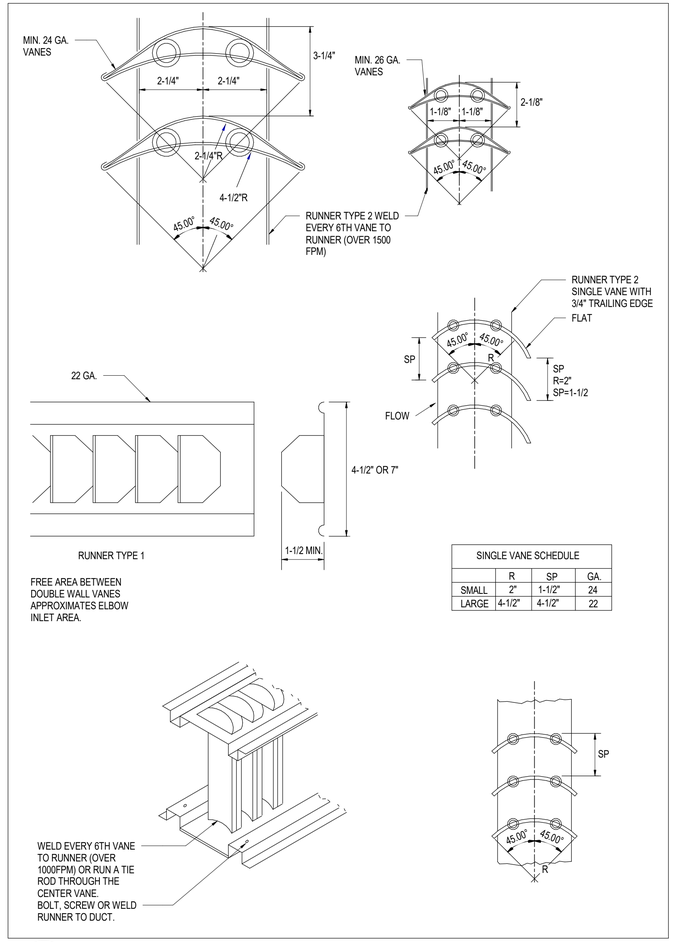
4 / M743 TYPICAL PIPE INSULATION AND VALVE HANDLE EXTENSION

1 : 1



5 / M743 INSULATION NEAR ACCESSORIES

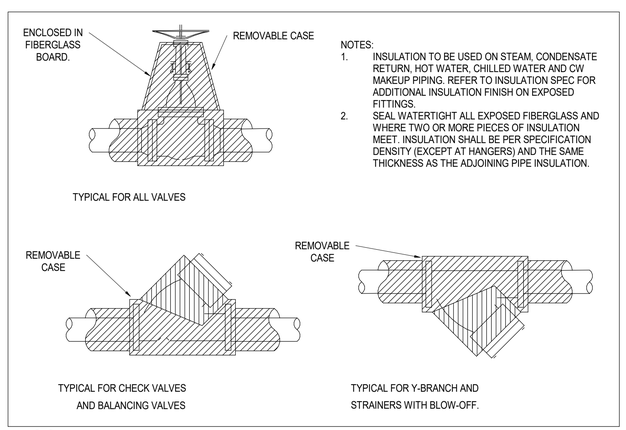
1 : 1



SINGLE VANE SCHEDULE			
	R	SP	GA.
SMALL	2"	1-1/2"	24
LARGE	4-1/2"	4-1/2"	22

6 / M743 VANES AND RUNNERS DETAIL

N.T.S.



NOTES:
1. INSULATION TO BE USED ON STEAM, CONDENSATE RETURN, HOT WATER, CHILLED WATER AND OW MAKEUP PIPING. REFER TO INSULATION SPEC FOR ADDITIONAL INSULATION FINISH ON EXPOSED FITTINGS.
2. SEAL WATERTIGHT ALL EXPOSED FIBERGLASS AND WHERE TWO OR MORE PIECES OF INSULATION MEET. INSULATION SHALL BE PER SPECIFICATION DENSITY (EXCEPT AT HANGERS) AND THE SAME THICKNESS AS THE ADJOINING PIPE INSULATION.

7 / M743 VALVE AND STRAINER INSULATION

1 : 1

Architect Prime Consultant

FOUGERE MENCHENTON ARCHITECTURE

Discipline: MECHANICAL

Sub-Consultant: Mechanical/ Electrical

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DATE: 2025-07-03	
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TYPE 2 EXHAUST AIR TERMINAL BOX (OFFICE) SCHEDULE

UNIT NO.	SELECTION RANGE	MINIMUM CONTROL SETPOINT (L/s)	VALVE QUANTITY	VALVE INLET DIAMETER (mm)	MANUFACTURER MODEL NUMBER (AS STANDARD)	MAX S.P. DROP (Pa)	SOUND POWER LEVEL @ 125 Pa (BASIC ASSEMBLY) OCTAVE BAND / REFERENCE	2	3	4	5	6	7		REMARKS
VVE-2.2	93-144	33	1	125 Ø	PRICE SDV	79	RADIATED	62	47	39	32	24	19	SATT-VVE2.2	-
							DISCHARGE	69	58	52	47	42	38		
VVE-2.4	209-370	83	1	200 Ø	PRICE SDV	68	RADIATED	60	50	39	32	27	19	SATT-VVE2.4	-
							DISCHARGE	69	62	51	48	42	38		
VVE-2.5	371-578	130	1	250 Ø	PRICE SDV	66	RADIATED	56	46	39	33	29	26	SATT-VVE2.5	-
							DISCHARGE	68	59	53	52	47	43		
VVE-2.7	834-1135	252	1	350 Ø	PRICE SDV	66	RADIATED	62	51	49	40	36	28	SATT-VVE2.7	-
							DISCHARGE	68	60	58	52	50	46		

TYPE 2 SUPPLY AIR TERMINAL BOX (OFFICE) SCHEDULE

UNIT NO.	SELECTION RANGE	MINIMUM CONTROL SETPOINT (L/s)	VALVE QUANTITY	VALVE INLET DIAMETER (mm)	MANUFACTURER MODEL NUMBER (AS STANDARD)	MAX S.P. DROP (Pa)	SOUND POWER LEVEL @ 125 Pa (BASIC ASSEMBLY) OCTAVE BAND / REFERENCE	2	3	4	5	6	7	REHEAT COIL (SEE SCHEDULE)	OUTLET SOUND ATTENUATOR (SEE SCHEDULE)	REMARKS
VV-2.2	93-144	33	1	125 Ø	PRICE SDV	79	RADIATED	62	47	39	32	24	19	RHC-2.2	SATT-VV2.2	-
							DISCHARGE	69	58	52	47	42	38			
VV-2.4	209-370	83	1	200 Ø	PRICE SDV	68	RADIATED	60	50	39	32	27	19	RHC-2.4	SATT-VV2.4	-
							DISCHARGE	69	62	51	48	42	38			
VV-2.5	371-578	130	1	250 Ø	PRICE SDV	66	RADIATED	56	46	39	33	29	26	RHC-2.5	SATT-VV2.5	-
							DISCHARGE	68	59	53	52	47	43			
VV-2.7	834-1135	252	1	350 Ø	PRICE SDV	66	RADIATED	62	51	49	40	36	28	RHC-2.7	SATT-VV2.7	-
							DISCHARGE	68	60	58	52	50	46			

AIR TERMINAL BOX SOUND ATTENUATOR SCHEDULE

UNIT NO.	SERVICE	LOCATION	AIRFLOW (L/s)	FACE VELOCITY (m/s)	AIR FLOW FORWARD REVERSE	OVERALL SIZE (mm) (WXHXL)	P.D. (Pa)	DYNAMIC INSERTION LOSS (dB) 63 HZ	125 HZ	250 HZ	500 HZ	1000 HZ	2000 HZ	4000 HZ	8000 HZ	MANUFACTURER MODEL NUMBER (AS STANDARD)	REMARK
SATT-VV2.2	SUPPLY	OFFICE SUPPLY TERMINAL BOX	144	2.47	FORWARD	300 x 200 x 1500	20	11	16	21	30	34	37	21	14	PRICE RLT59/6E	GALVANIZED 18ga CASING, 22ga PERFORATED LINER, POLYMER FILM BAGGED AND MASTIC FILLED SEAMS
SATT-VV2.4	SUPPLY	OFFICE SUPPLY TERMINAL BOX	370	2.65	FORWARD	300 x 250 x 1200	82	10	14	19	29	33	36	20	13	PRICE RLT59/6E	GALVANIZED 18ga CASING, 22ga PERFORATED LINER, POLYMER FILM BAGGED AND MASTIC FILLED SEAMS
SATT-VV2.5	SUPPLY	OFFICE SUPPLY TERMINAL BOX	578	3.11	FORWARD	350 x 300 x 1500	65	10	13	17	24	25	25	18	12	PRICE RLT59/8D	GALVANIZED 18ga CASING, 22ga PERFORATED LINER, POLYMER FILM BAGGED AND MASTIC FILLED SEAMS
SATT-VV2.7	SUPPLY	OFFICE SUPPLY TERMINAL BOX	1,135	3.26	FORWARD	750 x 450 x 1200	72	12	15	18	25	27	27	18	12	PRICE RLT59/UE	GALVANIZED 18ga CASING, 22ga PERFORATED LINER, POLYMER FILM BAGGED AND MASTIC FILLED SEAMS
SATT-VVE2.2	EXHAUST	OFFICE EXHAUST TERMINAL BOX	144	3.6	REVERSE	450 x 150 x 1500	32	14	18	25	37	46	52	33	17	PRICE RLT59/3F	GALVANIZED 18ga CASING, 22ga PERFORATED LINER, POLYMER FILM BAGGED AND MASTIC FILLED SEAMS
SATT-VVE2.4	EXHAUST	OFFICE EXHAUST TERMINAL BOX	370	5.92	REVERSE	350 x 250 x 1500	57	14	17	22	30	33	32	19	12	PRICE RLT59/8E	GALVANIZED 18ga CASING, 22ga PERFORATED LINER, POLYMER FILM BAGGED AND MASTIC FILLED SEAMS
SATT-VVE2.5	EXHAUST	OFFICE EXHAUST TERMINAL BOX	578	6.42	REVERSE	650 x 300 x 1500	30	14	17	22	30	34	34	20	13	PRICE RLT59/7E	GALVANIZED 18ga CASING, 22ga PERFORATED LINER, POLYMER FILM BAGGED AND MASTIC FILLED SEAMS
SATT-VVE2.7	EXHAUST	OFFICE EXHAUST TERMINAL BOX	1,135	5.60	REVERSE	700 x 350 x 1500	72	12	15	18	25	27	27	18	12	PRICE RLT59/UE	GALVANIZED 18ga CASING, 22ga PERFORATED LINER, POLYMER FILM BAGGED AND MASTIC FILLED SEAMS

NOTES:

1. ROUND CONNECTIONS TO SILENCERS ARE TO BE FACTORY INSTALLED WHERE POSSIBLE. SEE PLANS.
2. DIMENSIONS ARE SOFT CONVERSIONS.

CONTROL VALVE SCHEDULE

UNIT NO.	SERVICE/LOCATION	NOMINAL VALVE SIZE (NPS)	CHW / HW L/min RANGE	MAX ΔP (kPa)	MAX Cv	CLOSE OFF PRESS. (kPa)	MANUFACTURER MODEL NUMBER (BASIS OF DESIGN)	CHW / WH BODY DESIGN	REMARKS
V-1	SEE DWG'S, SCHEDULES, DETAILS AND SPECIFICATION	1/2	0-8	5	0.5	SEE SPEC.	VICTAULIC TA SERIES TMP	PRESSURE INDEPENDENT	-
V-2	SEE DWG'S, SCHEDULES, DETAILS AND SPECIFICATION	3/4	8-16.2	5	2.5	SEE SPEC.	VICTAULIC TA SERIES TMP	PRESSURE INDEPENDENT	-
V-3	SEE DWG'S, SCHEDULES, DETAILS AND SPECIFICATION	1	16.2-29.2	5	3.7	SEE SPEC.	VICTAULIC TA SERIES TMP	PRESSURE INDEPENDENT	-
V-4	SEE DWG'S, SCHEDULES, DETAILS AND SPECIFICATION	1-1/4	29.2-59.8	5	6.4	SEE SPEC.	VICTAULIC TA SERIES TMP	PRESSURE INDEPENDENT	-

GENERAL NOTES

1. THESE SCHEDULES DO NOT REFLECT EXACT QUANTITIES. REFER TO PLANS, DETAILS, SPECIFICATIONS, AND ALL CONTRACT DOCUMENTS FOR QUANTITIES.
2. FACILITY IDENTIFIER "CSF" SHALL BE ADDED TO THE FRONT OF ALL PHYSICAL EQUIPMENT TAGS

Architect Prime Consultant

FOUGERE MENCHENTON ARCHITECTURE

Discipline: MECHANICAL

Sub-Consultant: Mechanical/ Electrical

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J. COLOMBE	K. JEWER
Designed: J. COLOMBE	Approved: K. JEWER

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Drawing Nomenclature

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PROJECT TITLE

CERC FIT UP

Client's Project No.: CFS-103-23

DRAWING TITLE

MECHANICAL SCHEDULES

SCALE	DRAWING NO.
AS INDICATED	M801
DATE: 2025-07-03	
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AIR TERMINAL BOX HOT WATER REHEAT COIL SCHEDULE

UNIT NO.	SERVICE	LOCATION	L/s	OUTPUT (kW)	SIZE WXH (mm)	FACE VELOCITY (m/s)	ROWS	AIR DATA			WATER						MANUFACTURER MODEL NUMBER (AS STANDARD)	REMARKS
								EAT (°C)	LAT (°C)	P.D. (Pa)	L/s	EWT (°C)	LWT (°C)	P.D. (kPa)	PIPE CONNECTION SIZE (NPS)	CONTROL VALVE (SEE SCHEDULE)		
RHC-2.2	SUPPLY AIR	VV-2.2 OUTLET	144	2.40	300 x 200	2.48	2	12.8	26.7	65	0.13	43.3	38.7	4.2	1/2	V-1	HWP-12.0AW-7.5 X 12.0-2--11	-
RHC-2.4	SUPPLY AIR	VV-2.4 OUTLET	370	6.21	450 x 300	2.66	2	12.8	26.7	72	0.27	43.3	37.8	33.2	1/2	V-2	HWP-10.0AW-10.5 X 18.0-2-11	-
RHC-2.5	SUPPLY AIR	VV-2.5 OUTLET	578	9.70	600 x 300	3.11	2	12.8	26.7	95	0.42	43.3	37.8	17.3	2	V-3	HW-10.0AW-12.0 X 24.0-2-0.25	-
RHC-2.7	SUPPLY AIR	VV-2.7 OUTLET	1135	19.05	750 x 450	3.26	2	12.8	26.7	102	0.83	43.3	37.8	32.6	2	V-4	HW-14.0AW-18.0 X 32.0-2-0.25	-

GENERAL NOTES

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DIFFUSERS, GRILLES AND REGISTER SCHEDULE

TAG	NECK SIZE	FACE SIZE	SELECTION RANGE (L/s)	SERVICE	MOUNTING	MANUFACTURER	MODEL	NC AT MAX FLOW	HORIZONTAL THROW MAX	VERTICAL THROW MAX
B2	200	600/600	0-130	SUPPLY	CEILING	TITUS	TMS-08-24x24-3-26	19	-	-
C2	450/150	500/200	0-178	SUPPLY	DUCT	TITUS	272FL	19	-	-
G2	550/250	600/300	0-194	EXHAUST/RETURN	CEILING/SURFACE	TITUS	3FL	20	-	-
G3	550/550	600/600	194-354	EXHAUST/RETURN	CEILING	TITUS	3FL	15	-	-

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Drawing Nomenclature

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MECHANICAL SCHEDULES

SCALE	DRAWING NO.
AS INDICATED	M802
DATE: 2025-07-03	
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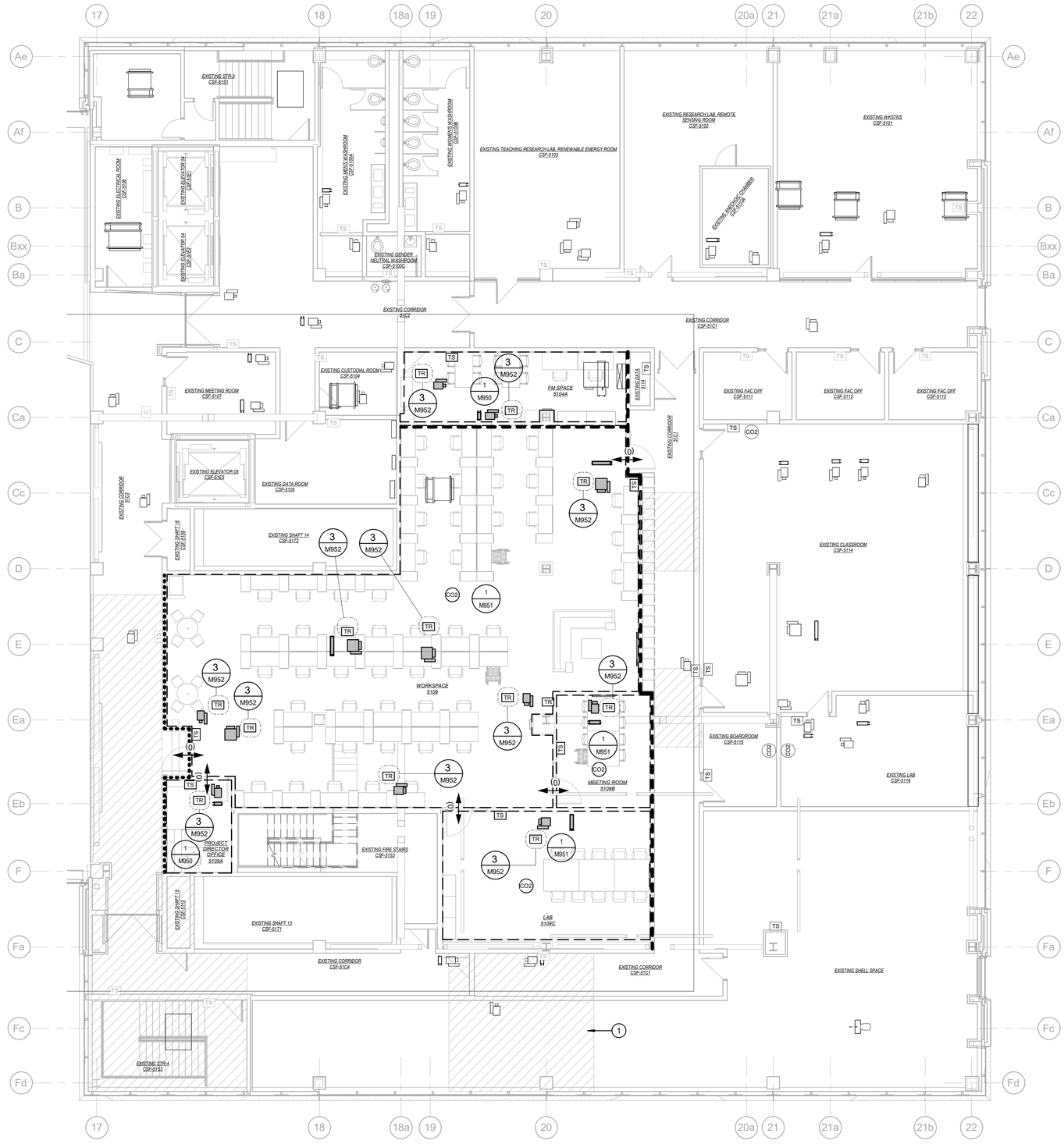
NOTE #	DRAWING NOTES
1	ANY WORK WITHIN THIS AREA IS OUTSIDE THE CONSTRUCTION ZONE AND SHALL BE COMPLETED AFTER HOURS. HOARDING AND SCHEDULING SHALL BE COORDINATED WITH THE OWNER'S REPRESENTATIVE, GENERAL CONTRACTOR, AND ALL CONTRACT DOCUMENTS. (TYPICAL)



1 M905 CONTROLS LEVEL 5 ZONE AND PRESSURIZATION PLAN
1 : 100

1:2 1:5 1:10 1:20 1:25 1:50 1:75 1:100 1:125 1:200

REFER TO ELECTRICAL DRAWINGS FOR BAS INTERFACE OF LIGHTING CONTROL

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DRAWING TITLE

CONTROLS LEVEL 5 ZONE AND PRESSURIZATION PLAN

SCALE	DRAWING NO.
AS INDICATED	M905
DATE: 2025-07-03	
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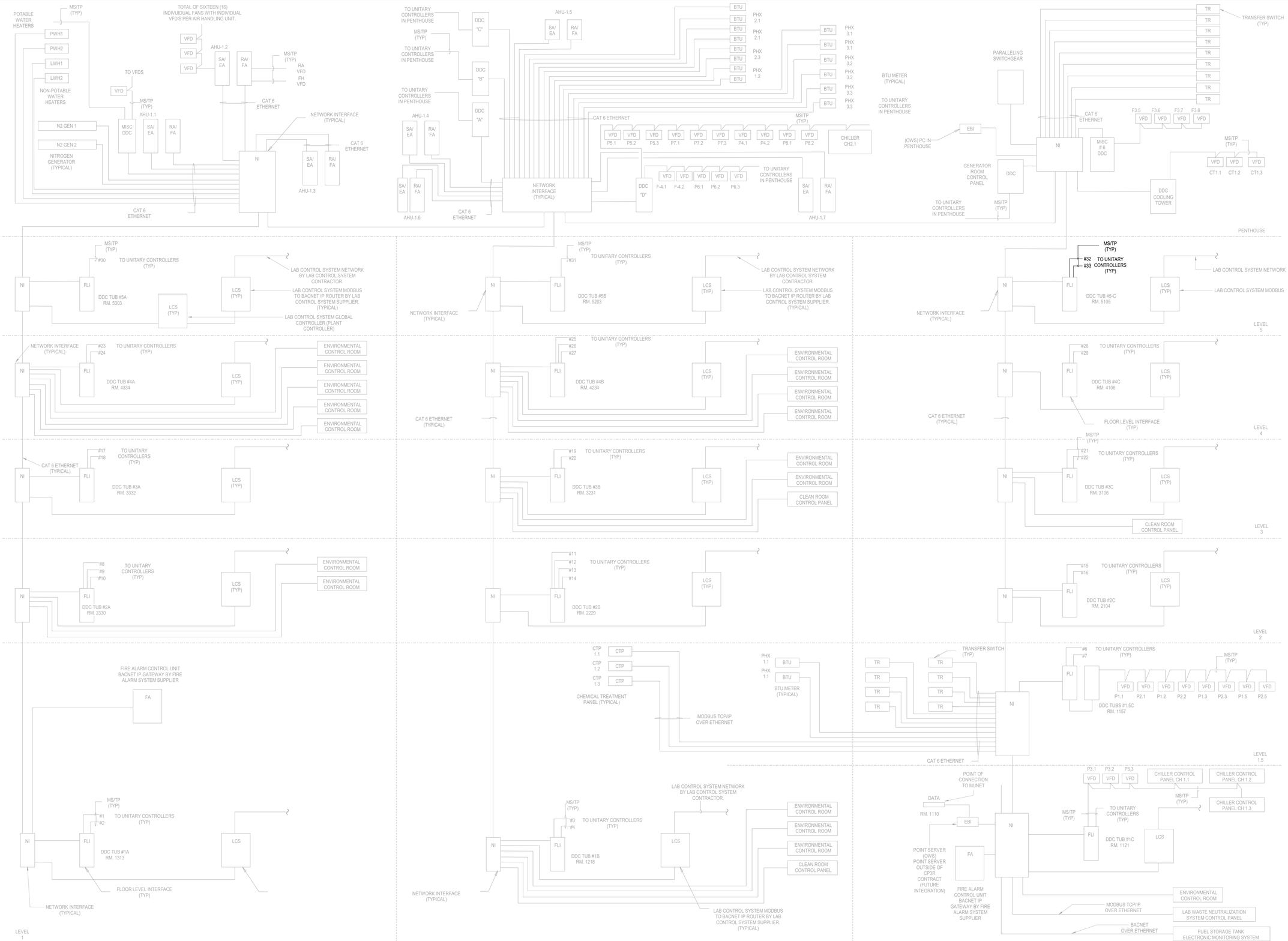

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CONTROLS ARCHITECTURE

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GENERAL

1. REQUIREMENTS OF "SEQUENCE OF CONTROLS - GENERAL", "SEQUENCE OF CONTROLS - STANDBY POWER" AND "CONTROL SYSTEM NOTES" ON DRAWING M-801 APPLY TO ALL SEQUENCES.
2. SV AND RV BOX SYSTEMS SHALL BE OPERATIONAL 24 HOURS PER DAY, 7 DAYS PER WEEK.
3. THIS SEQUENCE OF OPERATION APPLIES TO NON-LABORATORY ZONES SUPPLIED BY SINGLE OR MULTIPLE SV BOXES, NO SUPPLEMENTAL COOLING, A MINIMUM OF ONE RV BOX FOR RETURN.
4. REFER TO TYPICAL SV AND RV BOX CONTROL DETAILS FOR POINTS ASSOCIATED WITH EACH TERMINAL BOX. ALL POINTS SHOWN ON THE TYPICAL DETAILS ARE REQUIRED BY THIS SEQUENCE.

ALARMS

1. ALARM POINTS SHOWN ON THE TYPICAL SV AND RV BOX DETAILS ARE REQUIRED BY THIS SEQUENCE.

SAFETIES

1. THE FIRE ALARM SYSTEM SHALL PROVIDE SIGNALING TO THE BAS INDICATING CLOSURE OF SUPPLY RISER FIRE-SMOKE DAMPERS. UPON FIRE ALARM DETECTION OF SMOKE AND THE CLOSURE OF THE FIRE-SMOKE DAMPER SUPPLY, RETURN AND GENERAL ROOM EXHAUST BOXES ON THE AFFECTED FLOOR SHALL BE COMMANDED TO FULLY CLOSED POSITION.

OCCUPIED / UNOCCUPIED MODES

1. THE BAS SHALL DETERMINE WHETHER THE ZONE IS OCCUPIED OR UNOCCUPIED BASED ON THE TIME OF DAY AND BY THE OCCUPANCY SENSORS (YS-XX01). IF ONE SENSOR INDICATES SPACE IS OCCUPIED THEN THE SPACE IS OCCUPIED. ALL SENSORS HAVE TO INDICATE UNOCCUPIED AND THE TIME CLOCK FUNCTION MUST BE IN THE UNOCCUPIED MODE FOR ZONE TO BE IN UNOCCUPIED MODE.
2. PROVIDE MULTIPLE SENSORS PER ZONE FOR FULL COVERAGE OF THE ZONE.

SUPPLY AIR FLOW CONTROL

1. SUPPLY AIR VOLUME CONTROL BOX SHALL BE PRESSURE INDEPENDENT AND SHALL CONTROL THE SUPPLY AIR FLOW RATE TO THE ZONE TO MAINTAIN OCCUPIED AND UNOCCUPIED VENTILATION RATES AS INDICATED ON THE PLANS. WHERE UNOCCUPIED VENTILATION RATES ARE INDICATED AS ZERO (0 CFM) BOXES SHALL COMPLETELY CLOSE. WHEN MULTIPLE SV BOXES FEED A SINGLE ROOM OR ZONE, THE BAS SHALL MODULATE THE SV BOXES IN PARALLEL TO MAINTAIN THE TOTAL VENTILATION RATE.\
2. WHN THE SPACE TEMPERATURE AT TT-XX01 RISES ABOVE SETPOINT, THE SUPPLY BOX SHALL MODULATE TOWARDS MAXIMUM CFM SHOWN ON THE PLANS. AS THE SPACE TEMPERATURE DROPS, THE AIRFLOW SHALL MODULATE TOWARDS MINIMUM FLOW RATE SHOWN ON THE PLANS. UPON CONTINUED DROP IN TEMPERATURE, THE TEMPERATURE CONTROL SEQUENCE BELOW SHALL BE INITIATED.
3. DURING UNOCCUPIED MODE, SUPPLY AIR FLOW SHALL BE SET TO MINIMUM FLOW SHOWN ON THE PLANS. OCCUPANCY MODE SHALL BE BASED ON ZONE OCCUPANCY SENSOR YS-XX01. WHERE A ZONE CONSISTS OF MULTIPLE OFFICES, THE OCCUPANCY SENSORS SHALL BE WIRED IN PARALLEL TO ALLOW SWITCH TO OCCUPIED MODE FROM ANY SINGLE SENSOR. WHERE OCCUPANCY SENSORS ARE PROVIDED UNDER DIVISION 26 FOR LIGHTING CONTROL, CONNECT TO AUXILIARY CONTACTS IN LIGHTING SENSOR.
4. THE SV BOX FLOW TRANSMITTERS (FT-XX01) SHALL PROVIDE SIGNALING TO THE BAS IDENTIFYING THE SUPPLY FLOW RATE THROUGH EACH BOX.
5. UNOCCUPIED FLOW SHALL BE OVERRIDDEN IF THE SPACE TEMPERATURE RISES ABOVE SETPOINT. A SPECIFIC ALARM SHALL BE GENERATED AT THE BAS IF THE SPACE TEMPERATURE OVERRIDES THE UNOCCUPIED SETPOINT.

RETURN AIR FLOW CONTROL

1. ROOM RETURN BOX SHALL BE VARIABLE AIR VOLUME TYPE. SETPOINT SHALL BE EQUAL TO THE TOTAL SUPPLY AIR TO THE ZONE PLUS/MINUS THE DESIGN FLOW DIFFERENTIAL IDENTIFIED ON THE PLANS. THE BAS SHALL MONITOR ALL FLOWS AND VARY THE ROOM RETURN TO MAINTAIN FLOW DIFFERENTIAL SHOWN ON THE PLANS. SEE PRESSURIZATION PLANS FOR DESIGN FLOW DIFFERENTIAL.
2. THE RV BOX FLOW TRANSMITTERS SHALL PROVIDE SIGNALING TO THE BAS IDENTIFYING THE RETURN FLOW RATE THROUGH EACH BOX.
3. UNOCCUPIED FLOW SHALL BE OVERRIDDEN IF SUPPLY BOX MODE IS OVERRIDDEN BY SPACE TEMPERATURE AS NOTED ABOVE. A SPECIFIC ALARM SHALL BE GENERATED AT THE BAS IF THE NORMAL FLOW SETPOINT IS OVERRIDDEN.

TEMPERATURE CONTROL

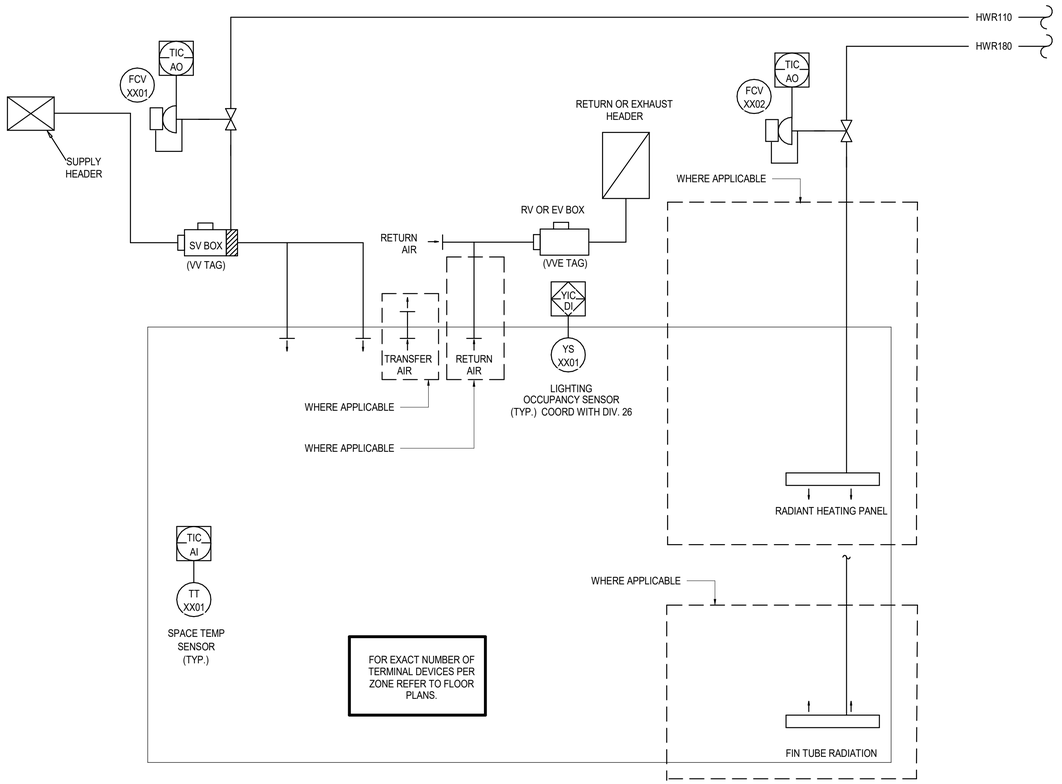
1. TEMPERATURE TRANSMITTERS (TT-XX01) SHALL PROVIDE SIGNALING TO THE BAS IDENTIFYING THE SPACE TEMPERATURE.
2. WHEN THE SPACE TEMPERATURE IS ABOVE MAXIMUM COOLING SETPOINT THE SV BOX REHEAT COIL VALVE SHALL BE FULLY CLOSED. AS THE SPACE TEMPERATURE DROPS, AFTER THE SUPPLY BOX REACHES MINIMUM SETPOINT, THE REHEAT COIL HEATING VALVE SHALL MODULATE OPEN TO MAINTAIN SETPOINT. UPON A RISE IN TEMPERATURE THE REVERSE SHALL OCCUR.
3. BAS SHALL MONITOR ALL SPACES WITHIN A RADIANT PANEL OR FINTUBE ZONE IDENTIFIED ON THE PRESSURIZATION DRAWINGS. WHERE APPLICABLE IF ALL SPACES OR A SINGLE SPACE IN THE ZONE IS CALLING FOR HEATING AND THE OUTSIDE AIR TEMPERATURE IS BELOW 50 DEG F THE RADIANT PANEL OR FINTUBE VALVE SHALL FULLY OPEN. WHEN OUTSIDE AIR TEMPERATURE IS ABOVE 50 DEG F AND/OR NO SPACES ARE CALLING FOR HEATING THE FINTUBE OR RADIANT PANEL ZONE VALVE SHALL BE FULLY CLOSED. CONTROL OF RADIANT PANEL OR FINTUBE IS APPLICABLE DURING BOTH OCCUPIED AND UNOCCUPIED PERIODS.

STANDBY (GENERATOR) POWER MODE

1. ALL BAS COMPONENTS SHALL BE OPERATIONAL ON STANDBY POWER WITH A UPS BACK-UP BY CONTROLS VENDOR.
2. UPON LOSS OF NORMAL POWER AND STANDBY POWER BECOMES AVAILABLE, BOTH THE SUPPLY AND RETURN VOLUME CONTROL BOX OR BOXES SHALL FULLY CLOSE.
3. UPON RETURN TO NORMAL POWER, AND ESTABLISHMENT OF FULL AIR FLOW FROM THE AIR HANDLING UNITS AND EXHAUST FANS, ALL SYSTEMS SHALL RESTART AND CONTROL ACCORDING TO THE SEQUENCE ABOVE.

HISTORIES/TRENDING & REPORTS

1. THE BAS SOFTWARE SHALL BE CAPABLE OF RECORDING AND PRODUCING REPORTS TO DOCUMENT ALL READINGS ASSOCIATED WITH EACH ZONE AND DEVICE SHOWN. INCLUDE GRAPHING CAPABILITY IN REPORT GENERATING SOFTWARE. DATA RECORDING SHALL BE CAPABLE OF STORING HOURLY READINGS, DAILY AVERAGE READING, WEEKLY AVERAGE READING AND MONTHLY AVERAGE READINGS. SOFTWARE SHALL ALSO BE CAPABLE OF REPORTING DAILY AND MONTHLY HIGH/LOW PEAK READINGS.



TYPE 4 CONTROL SEQUENCE

Architect Prime Consultant

FOUGERE MENCHENTON ARCHITECTURE

Discipline
MECHANICAL

Sub-Consultant: Mechanical/ Electrical

JEWER BAILEY CONSULTANTS
STRUCTURAL · MECHANICAL · ELECTRICAL

Permit to Practice

PROVINCE OF NEWFOUNDLAND AND LABRADOR
pegnl PROFESSIONAL ENGINEERS & GEOSCIENTISTS NEWFOUNDLAND & LABRADOR
PERMIT HOLDER
This Permit Allows
JEWER BAILEY CONSULTANTS ULC
MIRC:
To practice Professional Engineering in Newfoundland and Labrador.
Permit No. as issued by PEG N0540
which is valid for the year 2025.

Sub-Consultant:

Client:

Memorial University of Newfoundland

Drawn:	J. COLOMBE	Checked:	K. JEWER
Designed:	J. COLOMBE	Approved:	K. JEWER

Consultants Project No.
JBC-24-C-156

Professional Stamp

REGISTERED PROFESSIONAL ENGINEER
PEG
K.M.G JEWER
SIGNATURE
2025-07-03
DATE
NEWFOUNDLAND & LABRADOR

Notes:

1. DO NOT SCALE FROM THIS DRAWING.
2. UNLESS OTHERWISE NOTED, ALL DIMENSIONS ARE IN MILLIMETRES.
3. CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS ON SITE PRIOR TO PROCEEDING WITH ANY PORTION OF THIS WORK.
4. CONTRACTOR SHALL DO ALL WORK IN ACCORDANCE WITH THE APPLICABLE STANDARDS AND CODES INCLUDING, BUT NOT LIMITED TO, THE NATIONAL BUILDING CODE OF CANADA.

No.	Revisions	MM/DD/YY
0	Issued for Tender	2025-07-03
D	Issued for 90% Review	2025-05-06
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B	Issued for 33% Review	2025-02-14
A	Issued for Client Review	2025-01-17

Drawing Nomenclature

Detail/Section No. 3 / A-1 Dwg. No. where detailed

PROJECT TITLE

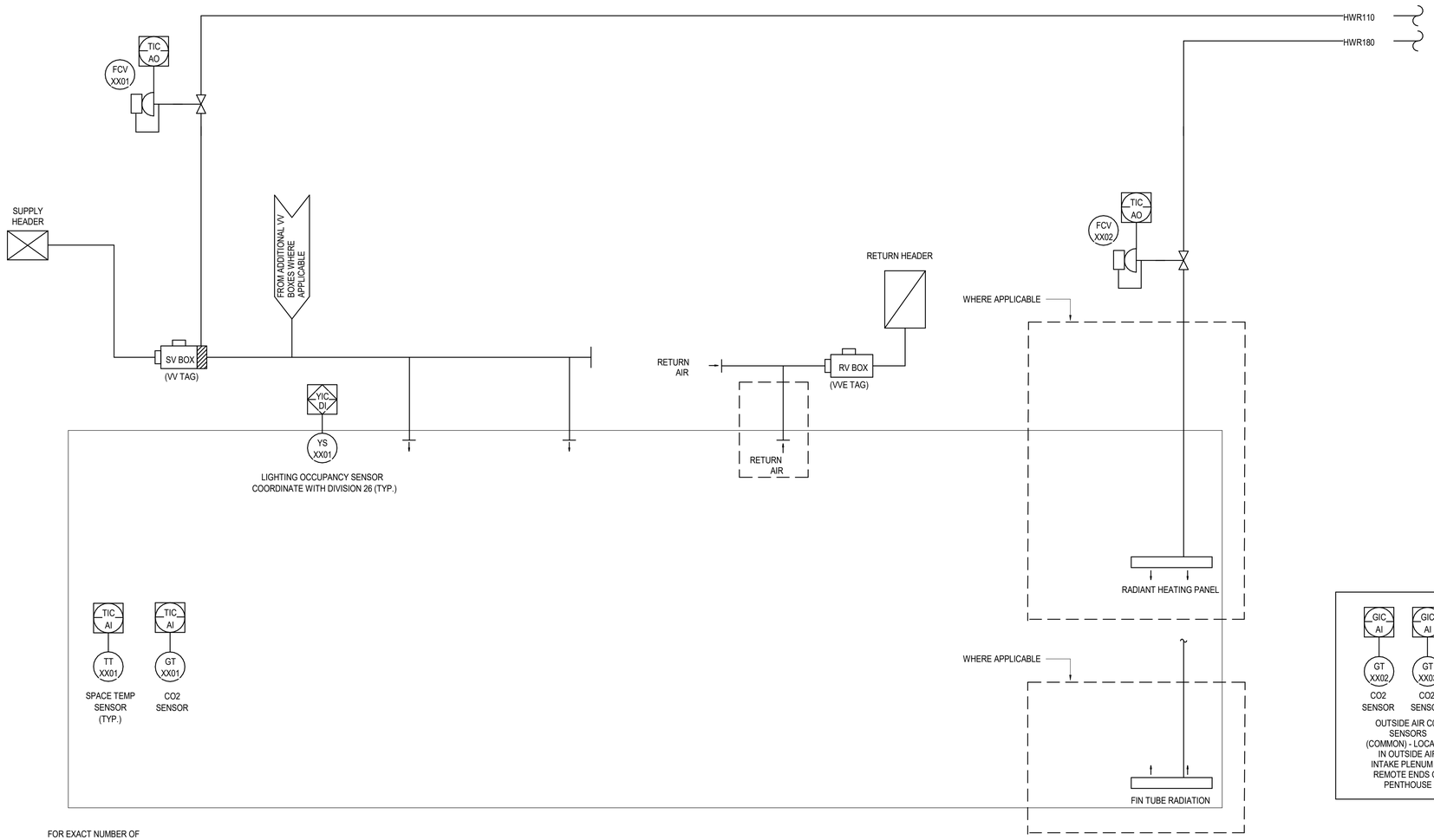
CERC FIT UP

Client's Project No.: CFS-103-23

DRAWING TITLE

HVAC ZONE CONTROLS - TYPE 4 CONTROL SEQUENCE

SCALE	DRAWING NO.
AS INDICATED	M950
DATE: 2025-07-03	
REVISION NO.: 0	



GENERAL

1. REQUIREMENTS OF "SEQUENCE OF CONTROLS - GENERAL", "SEQUENCE OF CONTROLS - STANDBY POWER" AND "CONTROL SYSTEM NOTES" ON DRAWING M-801 APPLY TO ALL SEQUENCES.
2. SV AND RV BOX SYSTEMS SHALL BE OPERATIONAL 24 HOURS PER DAY, 7 DAYS PER WEEK.
3. THIS SEQUENCE OF OPERATION APPLIES TO AUDITORIUMS, CLASSROOMS, CONFERENCE ROOMS AND SIMILAR HIGH OCCUPANCY SPACES SUPPLIED BY SINGLE OR MULTIPLE SV BOXES, NO SUPPLEMENTAL COOLING, A MINIMUM OF ONE RV BOX FOR RETURN.
4. REFER TO TYPICAL SV AND RV BOX CONTROL DETAILS FOR POINTS ASSOCIATED WITH EACH TERMINAL BOX. ALL POINTS SHOWN ON THE TYPICAL DETAILS ARE REQUIRED BY THIS SEQUENCE.

ALARMS

1. ALARM POINTS SHOWN ON THE TYPICAL SV AND RV BOX DETAILS ARE REQUIRED BY THIS SEQUENCE.

SAFETIES

1. THE FIRE ALARM SYSTEM SHALL PROVIDE SIGNALING TO THE BAS INDICATING CLOSURE OF SUPPLY RISER FIRE-SMOKE DAMPERS. UPON FIRE ALARM DETECTION OF SMOKE AND THE CLOSURE OF THE FIRE-SMOKE DAMPER SUPPLY, RETURN AND GENERAL ROOM EXHAUST BOXES ON THE AFFECTED FLOOR SHALL BE COMMANDED TO FULLY CLOSED POSITION.

OCCUPIED / UNOCCUPIED MODES

1. THE BAS SHALL DETERMINE WHETHER THE ZONE IS OCCUPIED OR UNOCCUPIED BASED ON THE TIME OF DAY AND BY THE OCCUPANCY SENSORS (YS-XX01). IF ONE SENSOR INDICATES SPACE IS OCCUPIED THEN THE SPACE IS OCCUPIED. ALL SENSORS HAVE TO INDICATE UNOCCUPIED AND THE TIME CLOCK FUNCTION MUST BE IN THE UNOCCUPIED MODE FOR ZONE TO BE IN UNOCCUPIED MODE.

SUPPLY AIR FLOW CONTROL

1. SUPPLY AIR VOLUME CONTROL BOX SHALL BE PRESSURE INDEPENDENT AND SHALL CONTROL THE SUPPLY AIR FLOW RATE TO THE ZONE TO MAINTAIN OCCUPIED AND UNOCCUPIED VENTILATION RATES AS INDICATED ON THE PLANS. WHERE UNOCCUPIED VENTILATION RATES ARE INDICATED AS ZERO (0 CFM) BOXES SHALL COMPLETELY CLOSE. WHEN MULTIPLE SV BOXES FEED A SINGLE ROOM OR ZONE, THE BAS SHALL MODULATE THE SV BOXES IN PARALLEL TO MAINTAIN THE TOTAL VENTILATION RATE.
2. WHEN THE SPACE TEMPERATURE AT TT-XX01 OR THE CO2 LEVEL AT GAS SENSOR GT-XX01 RISES ABOVE SETPOINT, THE SUPPLY BOX SHALL MODULATE TOWARDS MAXIMUM CFM SHOWN ON THE PLANS. AS THE SPACE TEMPERATURE OR CO2 LEVEL DROPS, THE AIRFLOW SHALL MODULATE TOWARDS MINIMUM FLOW RATE SHOWN ON THE PLANS. UPON CONTINUED DROP IN TEMPERATURE, THE TEMPERATURE CONTROL SEQUENCE BELOW SHALL BE INITIATED.
3. DURING UNOCCUPIED MODE, SUPPLY AIR FLOW SHALL BE SET TO MINIMUM FLOW SHOWN ON THE PLANS. OCCUPANCY MODE SHALL BE BASED ON ZONE OCCUPANCY SENSOR YS-XX01. WHERE A ZONE CONSISTS OF MULTIPLE OFFICES, THE OCCUPANCY SENSORS SHALL BE WIRED IN PARALLEL TO ALLOW SWITCH TO OCCUPIED MODE FROM ANY SINGLE SENSOR. WHERE OCCUPANCY SENSORS ARE PROVIDED UNDER DIVISION 26 FOR LIGHTING CONTROL, CONNECT TO AUXILIARY CONTACTS IN LIGHTING SENSOR.
4. THE SV BOX FLOW TRANSMITTERS (FT-XX01) SHALL PROVIDE SIGNALING TO THE BAS IDENTIFYING THE SUPPLY FLOW RATE THROUGH EACH BOX.
5. UNOCCUPIED FLOW SHALL BE OVERRIDDEN IF THE SPACE TEMPERATURE RISES ABOVE SETPOINT. A SPECIFIC ALARM SHALL BE GENERATED AT THE BAS IF THE SPACE TEMPERATURE OVERRIDES THE UNOCCUPIED SETPOINT.

RETURN AIR FLOW CONTROL

1. ROOM RETURN BOX SHALL BE VARIABLE AIR VOLUME TYPE. SETPOINT SHALL BE EQUAL TO THE TOTAL SUPPLY AIR TO THE ZONE PLUS/MINUS THE DESIGN FLOW DIFFERENTIAL IDENTIFIED ON THE PLANS. THE BAS SHALL MONITOR ALL FLOWS AND VARY THE ROOM RETURN TO MAINTAIN FLOW DIFFERENTIAL SHOWN ON THE PLANS. SEE PRESSURIZATION PLANS FOR DESIGN FLOW DIFFERENTIAL.
2. THE RV BOX FLOW TRANSMITTERS SHALL PROVIDE SIGNALING TO THE BAS IDENTIFYING THE RETURN FLOW RATE THROUGH EACH BOX.
3. UNOCCUPIED FLOW SHALL BE OVERRIDDEN IF SUPPLY BOX MODE IS OVERRIDDEN BY SPACE TEMPERATURE AS NOTED ABOVE. A SPECIFIC ALARM SHALL BE GENERATED AT THE BAS IF THE NORMAL FLOW SETPOINT IS OVERRIDDEN.

TEMPERATURE CONTROL/CO2 VENTILATION CONTROL

1. TEMPERATURE TRANSMITTER (TT-XX01) SHALL PROVIDE SIGNALING TO THE BAS IDENTIFYING THE SPACE TEMPERATURE. C02 CONTROL GAS SENSOR GT-XX01 SHALL PROVIDE CO2 LEVEL READINGS WITHIN THE SPACE TO THE BAS. C02 CONTROL GAS SENSORS GT-XX02 & GT-XX03 SHALL PROVIDE CO2 LEVEL READINGS FOR OUTDOORS TO THE BAS. GT-XX02 & GT-XX03 SHALL BE MONITORED IN PARALLEL AND BAS SHALL ALARM IF ONE OF THE SENSORS READS 50 PPM GREATER OR LESS THAN THE OTHER SENSOR FOR 10 CONSECUTIVE MINUTES. ALARM SHALL INDICATE "CHECK OUTDOOR CO2 SENSOR CALIBRATION" AND ZONE SUPPLY AND RETURN BOXES SHALL GO TO MAXIMUM AIRFLOW SETPOINT TO ENSURE CODE REQUIRED VENTILATION IS PROVIDED AT ALL TIMES.
2. WHEN THE SPACE TEMPERATURE RISES ABOVE SETPOINT OR CO2 LEVEL IN THE SPACE INCREASES ABOVE OUTDOOR C02 LEVEL BY 300 PPM (ADJUSTABLE) OR MORE, SUPPLY AIR SHALL BE MODULATED TOWARD MAXIMUM AIRFLOW INDICATED ON THE PLANS. AS SPACE TEMPERATURE DROPS AND CO2 LEVEL IN THE SPACE DROPS TO LESS THAN 300 PPM (ADJUSTABLE) BELOW THE OUTSIDE AIR CO2 LEVEL, THE SUPPLY AIRFLOW SHALL MODULATE TOWARDS THE MINIMUM OCCUPIED AIRFLOW SHOWN ON THE PLANS.
3. WHEN THE SPACE TEMPERATURE IS ABOVE MAXIMUM COOLING SETPOINT THE SV BOX REHEAT COIL VALVE SHALL BE FULLY CLOSED AS THE SPACE TEMPERATURE DROPS, AFTER THE SUPPLY COIL REACHES MINIMUM SETPOINT, THE REHEAT COIL HEATING VALVE SHALL MODULATE OPEN TO MAINTAIN SETPOINT. UPON A RISE IN TEMPERATURE THE REVERSE SHALL OCCUR
4. BAS SHALL MONITOR ALL SPACES WITHIN A RADIANT PANEL OR FINTUBE ZONE IDENTIFIED ON THE PRESSURIZATION DRAWINGS. WHERE APPLICABLE IF ALL SPACES OR A SINGLE SPACE IN THE ZONE IS CALLING FOR HEATING AND THE OUTSIDE AIR TEMPERATURE IS BELOW 50 DEG F THE RADIANT PANEL OR FINTUBE VALVE SHALL FULLY OPEN. WHEN OUTSIDE AIR TEMPERATURE IS ABOVE 50 DEG F AND/OR NO SPACES ARE CALLING FOR HEATING THE FINTUBE OR RADIANT PANEL ZONE VALVE SHALL BE FULLY CLOSED. CONTROL OF RADIANT PANEL OR FINTUBE IS APPLICABLE DURING BOTH OCCUPIED AND UNOCCUPIED PERIODS.

STANDBY (GENERATOR) POWER MODE

1. ALL BAS COMPONENTS SHALL BE OPERATIONAL ON STANDBY POWER WITH A UPS BACK-UP BY CONTROLS VENDOR.
2. UPON LOSS OF NORMAL POWER AND STANDBY POWER BECOMES AVAILABLE, BOTH THE SUPPLY AND RETURN VOLUME CONTROL BOX OR BOXES SHALL FULLY CLOSE.
3. UPON RETURN TO NORMAL POWER, AND ESTABLISHMENT OF FULL AIR FLOW FROM THE AIR HANDLING UNITS AND EXHAUST FANS, ALL SYSTEMS SHALL RESTART AND CONTROL ACCORDING TO THE SEQUENCE ABOVE.

HISTORIES/TRENDING & REPORTS

1. THE BAS SOFTWARE SHALL BE CAPABLE OF RECORDING AND PRODUCING REPORTS TO DOCUMENT ALL READINGS ASSOCIATED WITH EACH ZONE AND DEVICE SHOWN. INCLUDE GRAPHING CAPABILITY IN REPORT GENERATING SOFTWARE. DATA RECORDING SHALL BE CAPABLE OF STORING HOURLY READINGS, DAILY AVERAGE READING, WEEKLY AVERAGE READING AND MONTHLY AVERAGE READINGS. SOFTWARE SHALL ALSO BE CAPABLE OF REPORTING DAILY AND MONTHLY HIGH/LOW PEAK READINGS.

Architect Prime Consultant

FOUGERE MENCHENTON ARCHITECTURE

Discipline: MECHANICAL

Sub-Consultant: Mechanical/ Electrical

JEWER BAILEY CONSULTANTS
STRUCTURAL · MECHANICAL · ELECTRICAL

Permit to Practice

PROVINCE OF NEWFOUNDLAND AND LABRADOR
PERMIT HOLDER
This Permit Allows
JEWER BAILEY CONSULTANTS ULC
MIRC:
To practice Professional Engineering in Newfoundland and Labrador.
Permit No. as issued by PEG N0540 which is valid for the year 2025.

Sub-Consultant:

Client:

Memorial University of Newfoundland

Drawn: J. COLOMBE	Checked: K. JEWER
Designed: J. COLOMBE	Approved: K. JEWER

Consultants Project No.

JBC-24-C-156

Professional Stamp

REGISTERED PROFESSIONAL ENGINEER
PEG
K.H.G. JEWER
SIGNATURE
2025-07-03
DATE
NEWFOUNDLAND & LABRADOR

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No.	Revisions	MM/DD/YY
0	Issued for Tender	2025-07-03
D	Issued for 90% Review	2025-05-06
C	Issued for 66% Review	2025-03-31
B	Issued for 33% Review	2025-02-14
A	Issued for Client Review	2025-01-17

Drawing Nomenclature

Detail/Section No. → 3 / A-1 ← Dwg. No. where detailed

PROJECT TITLE

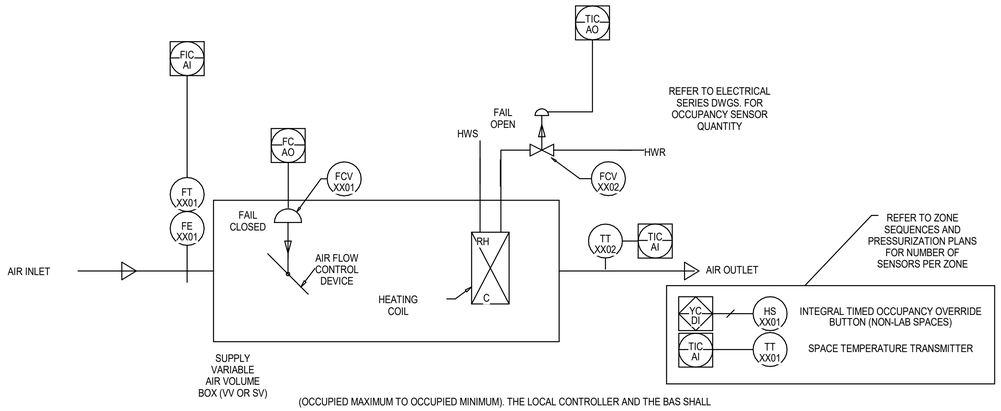
CERC FIT UP

Client's Project No.: CFS-103-23

DRAWING TITLE

HVAC ZONE CONTROLS - TYPE 5 CONTROL SEQUENCE

SCALE	DRAWING NO.
AS INDICATED	M951
DATE: 2025-07-03	
REVISION NO.: 0	



(OCCUPIED MAXIMUM TO OCCUPIED MINIMUM). THE LOCAL CONTROLLER AND THE BAS SHALL

GENERAL

1. REQUIREMENTS OF "SEQUENCE OF CONTROLS - GENERAL", "SEQUENCE OF CONTROLS - STANDBY POWER" AND "CONTROL SYSTEM NOTES" APPLY TO ALL SEQUENCES.
2. VARIABLE AIR VOLUME BOX (SV/VV) SHALL BE CONTROLLED BY A LOCAL (BOX MOUNTED) DIRECT DIGITAL CONTROLLER COMMUNICATING WITH THE BAS. ALL BOXES SHALL BE CAPABLE OF VARIABLE, TWO POSITION AND CONSTANT AIR VOLUME OPERATION. PROVIDE INPUT/OUTPUT EXPANSION MODULES TO PERFORM SEQUENCES OUTLINED. SEE TYPICAL SPACE SEQUENCES FOR OPERATING REQUIREMENTS.
3. SETPOINTS AND OCCUPANCY SCHEDULING SHALL BE ADJUSTABLE FROM THE BAS. THE BAS SHALL BE CAPABLE OF ADJUSTING SETPOINTS AND STATUS GLOBALLY AS WELL AS ON AN INDIVIDUAL BOX BASIS.
4. NON-LABORATORY SERVICE (OFFICES): LOCAL SPACE TEMPERATURE TRANSMITTER (TT-XX01) SHALL BE CAPABLE OF SETPOINT ADJUSTMENT WITHIN A BAS DEFINED ADJUSTABLE RANGE. THE LOCAL TRANSMITTER SHALL ALSO BE CAPABLE OF OVERRIDING THE BAS UNOCCUPIED SCHEDULE (VIA PUSH BUTTON OPERATION INTEGRAL TO THE SPACE TEMPERATURE TRANSMITTER) TO ALLOW THE SV OR VV BOX TO OPERATE TEMPORARILY IN THE OCCUPIED MODE FOR A BAS DEFINED ADJUSTABLE TIME PERIOD (0.5 TO 12 HOURS).
5. LABORATORY SERVICE: LOCAL SPACE TEMPERATURE TRANSMITTER (TT-XX01) SHALL BE CAPABLE OF SETPOINT ADJUSTMENT WITHIN A BAS DEFINED ADJUSTABLE RANGE. EVERY LABORATORY ROOM SHALL BE EQUIPPED WITH AN OCCUPANCY SENSOR FOR THE PURPOSE OF OVERRIDING THE BAS UNOCCUPIED SCHEDULE TO ALLOW THE SV OR VV BOX TO OPERATE TEMPORARIIY IN THE OCCUPIED MODE FOR A BAS DEFINED ADJUSTABLE TIME PERIOD (0.5 TO 12 HOURS).
6. ALL LAB SUPPLY BOXES SHALL BE FAIL CLOSED UNLESS NOTED OTHERWISE. (SPRING RETURN)
7. ALL NON-LAB BOXES SHALL FAIL AT LAST POSITION OF DAMPER.
8. SV OR VV BOX AIR FLOW RATE SETPOINT AS MEASURED AT FT-XX01 (OR VIA POSITION FEEDBACK) SHALL BE MAINTAINED BY THE LOCAL CONTROLLER REGARDLESS OF UPSTREAM PRESSURE (PRESSURE INDEPENDENT OPERATION). THE BAS SHALL MONITOR AND DISPLAY (UPON REQUEST) THE FLOW RATE OF ANY SV OR VV BOX.
9. VALVE ACTUATORS SERVING VALVES IN HYDRAULIC HEATING APPLICATIONS SHALL BE FAIL OPEN VALVES UNLESS OTHERWISE NOTED.
10. HYDRAULIC HEATING VALVE ACTUATORS SERVING AQUATICS SHALL FAIL CLOSED TO AVOID HEAT STRESSING THE FISH.

ALARMS

1. THE FOLLOWING SHALL INITIATE A SPECIFIC ALARM NOTICE AT THE BAS:
   A. SPACE TEMPERATURE 5 DEGREES F ABOVE SETPOINT - TIME DELAY 10 MINUTES.
   B. SPACE TEMPERATURE 5 DEGREES F BELOW SETPOINT - TIME DELAY 10 MINUTES.
   C. AIRFLOW RATE 10% ABOVE SETPOINT FOR 5 CONSECUTIVE MINUTES.
   D. AIRFLOW RATE 10% BELOW SETPOINT FOR 5 CONSECUTIVE MINUTES.

OCCUPIED MODE

1. SV OR VV BOX SHALL OPERATE BETWEEN PRESET FLOW RATES (CFM) SHOWN ON THE PLANS (OCCUPIED MAXIMUM TO OCCUPIED MINIMUM). THE LOCAL CONTROLLER AND THE BAS SHALL MONITOR ROOM TEMPERATURE AT TT-XX01 AND AIR FLOW RATE AT FT-XX01 (OR VIA POSITION FEEDBACK). THE LOCAL CONTROLLER SHALL MODULATE AIR FLOW RATE VIA FCV-XX01 AND HOT WATER FLOW VIA FCV-XX02.
2. FOR OFFICE SPACES, WHEN THE SPACE TEMPERATURE IS ABOVE OCCUPIED SETPOINT AT TT-XX01, THE HOT WATER VALVE FCV-XX02 SHALL BE FULLY CLOSED AND THE AIRFLOW CONTROL DAMPER FCV-XX01 SHALL BE MODULATED AS REQUIRED TO MAINTAIN MAXIMUM OCCUPIED AIR FLOW SETPOINT AT FT-XX01. AS THE TEMPERATURE AT TT-XX01 DROPS, THE AIRFLOW CONTROL DAMPER SHALL BE MODULATED TOWARD CLOSED POSITION TO REDUCE FLOW TO MAINTAIN SETPOINT AT TT-XX01. ONCE AIR FLOW HAS BEEN REDUCED TO MINIMUM OCCUPIED FLOW SETPOINT AT FT-XX01 AND IF ROOM TEMPERATURE CONTINUES TO DROP, HOT WATER VALVE FCV-XX02 SHALL MODULATE OPEN TO MAINTAIN SETPOINT AT TT-XX01. UPON A RISE IN TEMPERATURE AT TT-XX01, THE REVERSE SHALL OCCUR.

UNOCCUPIED MODE

1. SV OR VV BOX SHALL OPERATE WITHIN PRESET AIRFLOW RANGE (CFM) SHOWN ON THE PLANS (UNOCCUPIED SETPOINT). THE LOCAL CONTROLLER AND THE BAS SHALL MONITOR ROOM TEMPERATURE AT TRANSMITTER TT-XX01 AND AIR FLOW RATE AT FT-XX01. THE LOCAL CONTROLLER SHALL MODULATE AIR FLOW RATE VIA FCV-XX01 AND HOT WATER FLOW VIA FCV-XX02.
2. FOR OFFICE SPACES, WHEN THE SPACE TEMPERATURE IS AT OR ABOVE THE UNOCCUPIED SETPOINT AT TT-XX01, HOT WATER VALVE FCV-XX02 SHALL BE FULLY CLOSED, AIRFLOW CONTROL DAMPER FCV-XX01 SHALL MODULATE TO MAINTAIN UNOCCUPIED FLOW SETPOINT AT FT-XX01. AS THE SPACE TEMPERATURE DROPS, HOT WATER VALVE FCV-XX02 SHALL BE MODULATED OPEN IN ORDER TO MAINTAIN UNOCCUPIED SETPOINT AT TT-XX01. UPON A RISE IN TEMPERATURE AT TT-XX01, FCV-XX02 SHALL MODULATE CLOSED.
3. UNOCCUPIED FLOW SHALL BE OVERRIDDEN IF THE SPACE TEMPERATURE RISES ABOVE SETPOINT. A SPECIFIC ALARM SHALL BE GENERATED AT THE BAS IF THE SPACE TEMPERATURE OVERRIDES THE UNOCCUPIED SETPOINT.

EMERGENCY MODE OPERATION

1. IN ADDITION TO OTHER SAFETIES, ON A SYSTEM LEVEL FAILURE, THE BAS SHALL PROVIDE A SIGNAL FOR SUPPLY BOXES TO GO TO MINIMUM POSITIONS BASED ON THE TEMPORARY LACK OF CAPACITY. BOXES SHALL MODULATE TO MINIMUM POSITION BASED ON THIS GLOBAL SIGNAL

HISTORIES/TRENDING & REPORTS

THE BAS SOFTWARE SHALL BE CAPABLE OF RECORDING AND PRODUCING REPORTS TO DOCUMENT ALL READINGS ASSOCIATED WITH EACH SUPPLY SV OR VV BOX. REFER TO TYPICAL ZONE SEQUENCES FOR ADDITIONAL REQUIREMENTS

1 M952 CONTROL DETAIL - TYPICAL SUPPLY VARIABLE VOLUME BOX

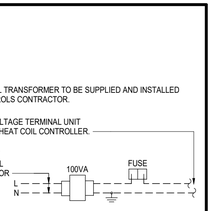
1 : 1

NOTES:

1. CONTROL TRANSFORMER TO BE SUPPLIED AND INSTALLED BY CONTROLS CONTRACTOR.

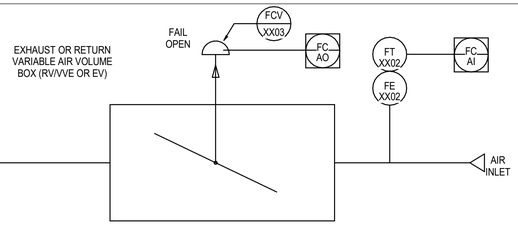
TO LOW VOLTAGE TERMINAL UNIT AND/OR REHEAT COIL CONTROLLER.

120/1/60 BY ELECTRICAL CONTRACTOR



3 M952 CONTROL TRANSFORMER DETAIL

1 : 1



GENERAL

1. REQUIREMENTS OF "SEQUENCE OF CONTROLS - GENERAL", "SEQUENCE OF CONTROLS -STANDBY POWER" AND "CONTROL SYSTEM NOTES" ON DRAWING M-801 APPLY TO ALL SEQUENCES.
2. VARIABLE AIR VOLUME EXHAUST/RETURN BOX (EV/RV/VVE) SHALL BE CONTROLLED BY A LOCAL (BOX MOUNTED) DIRECT DIGITAL CONTROLLER COMMUNICATING WITH THE BAS. ALL BOXES SHALL BE CAPABLE OF VARIABLE, TWO POSITION AND CONSTANT AIR VOLUME OPERATION. SEE TYPICAL SPACE SEQUENCES FOR OPERATING REQUIREMENTS.
3. AIRFLOW SETPOINT AND OCCUPANCY SCHEDULING SHALL BE ADJUSTABLE FROM THE BAS. THE BAS SHALL BE CAPABLE OF ADJUSTING SETPOINTS AND STATUS GLOBALLY AS WELL AS ON AN INDIVIDUAL BOX BASIS.
4. THE EV/RV/VVE BOX SHALL BE SOFTWARE INTERLOCKED WITH SUPPLY SV/VV BOX OR BOXES FEEDING THE APPLICABLE SPACE TO ALLOW FOR TEMPORARY OVERRIDE OF UNOCCUPIED SCHEDULE FOR A BAS DEFINED ADJUSTABLE TIME PERIOD (0.5 TO 12 HOURS).
5. ALL EXHAUST BOXES EV/RV/VVE SHALL BE FAIL OPEN UNLESS NOTED OTHERWISE. (SPRING RETURN)
6. EV/RV/VVE BOX AIR FLOW RATE SETPOINT AS MEASURED AT FT-XX02 SHALL BE MAINTAINED BY THE LOCAL CONTROLLER REGARDLESS OF UPSTREAM PRESSURE (PRESSURE INDEPENDENT OPERATION). THE BAS SHALL MONITOR AND DISPLAY (UPON REQUEST) THE FLOW RATE OF ANY EV/RV/VVE BOX.
7. VALVE ACTUATORS SERVING VALVES IN HYDRAULIC HEATING APPLICATIONS SHALL BE FAIL OPEN VALVES UNLESS OTHERWISE NOTED.
8. HYDRAULIC HEATING VALVE ACTUATORS SERVING AQUATICS SHALL FAIL CLOSED TO AVOID HEAT STRESSING THE FISH.

ALARMS

1. THE FOLLOWING SHALL INITIATE A SPECIFIC ALARM NOTICE AT THE BAS:
   A. AIRFLOW RATE 10% ABOVE SETPOINT FOR 5 CONSECUTIVE MINUTES.
   B. AIRFLOW RATE 10% BELOW SETPOINT FOR 5 CONSECUTIVE MINUTES.

OCCUPIED MODE

1. EV/RV/VVE BOX SHALL BE VARIABLE VOLUME TYPE. SETPOINT SHALL BE EQUAL TO THE TOTAL SUPPLY TO THE ZONE PLUS/MINUS THE DESIGN DIFFERENTIAL IDENTIFIED ON THE PLANS LESS THE FUME HOOD EV EXHAUST AIRFLOW SETPOINT (WHERE APPLICABLE), LESS THE SNORKEL EV EXHAUST AIRFLOW SETPOINT (WHERE APPLICABLE). THE BAS SHALL MONITOR ALL FLOWS AND VARY THE ROOM EXHAUST TO MAINTAIN THE FLOW DIFFERENTIAL SHOWN ON THE PLANS. SEE ZONE CONTROL PLANS FOR DESIGN FLOW DIFFERENT
2. EXHAUST BOXES SERVING FUME HOODS, BIOSAFETY CABINETS, SNORKELS AND ELEPHANT TRUCKS EXHAUST SHALL BE INDEPENDENT OF ROOM EXHAUST AND S HALL OPERATE AT CONSTANT, TWO POSITION OR VARIABLE VOLUME AS INDICATED IN ROOM SEQUENCES. THE LOCAL CONTROLLER SHALL MODULATE FCV-XX03 TO MAINTAIN THE VARIABLE SETPOINT FLOW RATE AT FT-XX02.

UNOCCUPIED MODE

1. IN THE UNOCCUPIED MODE, EV/RV/VVE BOX SHALL MODULATE AIRFLOW AS INDIC ATED IN THE ZONE SEQUENCES. THE LOCAL CONTROLLER AND THE BAS SHALL MONITOR AIRFLOW RATE AT FT-XX02. THE LOCAL CONTROLLER SHALL MODULATE AIR FLOW RATE VIA FCV-XX03.
2. UNOCCUPIED FLOW SHALL BE OVERRIDDEN IF SUPPLY BOX MODE IS OVERWRITT EN BY SPACE TEMPERATURE AS NOTED IN VV/SV CONTROL STRATEGY OR IF THE FUME HOOD SASH IS OPENED. A SPECIFIC ALARM SHALL BE GENERATED AT THE BAS IF THE N ORMAL FLOW SETPOINT IS OVERRIDDEN.

EMERGENCY MODE OPERATION

1. IN ADDITION TO OTHER SAFETIES, ON A SYSTEM LEVEL FAILURE, THE BAS SHALL PROVIDE A SIGNAL FOR EXHAUST BOXES TO GO TO MINIMUM POSITIONS BASED O N THE TEMPORARY LACK OF CAPACITY. BOXES SHALL MODULATE TO MINIMUM POSITIO N BASED ON THIS GLOBAL SIGNAL. FUME HOOD EXHAUST VALVES ARE EXEMPT FRO M THIS REQUIREMENT AND SHALL REMAIN AT CURRENT POSITION.

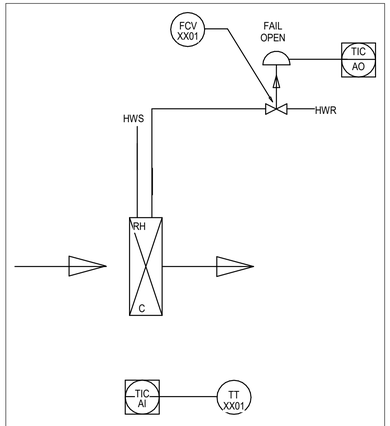
HISTORIES/TRENDING & REPORTS

1. THE BAS SOFTWARE SHALL BE CAPABLE OF RECORDING AND PRODUCING REPOR TS TO DOCUMENT ALL READINGS ASSOCIATED WITH EACH EV/RV/VVE BOX. REFER TO T YPICAL ZONE SEQUENCES FOR ADDITIONAL REQUIREMENTS

2 M952 CONTROL DETAIL - TYPICAL RETURN/EXHAUST VARIABLE AIR VOLUME BOX

1 : 1

"CONDUIT AND FIELD WIRING FOR CONTROLS IS THE RESPONSIBILITY OF THE ELECTRICAL CONTRACTOR. MECHANICAL AND CONTROLS CONTRACTORS ARE RESPONSIBLE TO COORDINATE WITH THE ELECTRICAL CONTRACTOR FOR ALL CONTROLS REQUIREMENTS."



GENERAL

1. REQUIREMENTS OF "SEQUENCE OF CONTROLS - GENER AL", "SEQUENCE OF CONTROLS - STANDBY POWER" AND "CONTROL SYSTEM NOTES" APPLY TO ALL SEQUENCES.

TEMPERATURE CONTROL

1. TEMPERATURE TRANSMITTER (TT-XX01) SHALL SIGNAL THE BAS REGARDING THE SPACE T EMPERATURE.
2. IF THE TEMPERATURE FALLS BELOW SETPOINT THE VAL VE SHALL BE MODULATED OPEN. ON RISE IN TEMPERATURE THE REVERSE SHALL OCCUR

4 M952 DUCT MOUNTED REHEAT COIL

1 : 1

Architect Prime Consultant

FOUGERE MENCHENTON ARCHITECTURE

Discipline: MECHANICAL

Sub-Consultant: Mechanical/ Electrical

JEWER BAILEY CONSULTANTS
STRUCTURAL · MECHANICAL · ELECTRICAL

Permit to Practice

PROVINCE OF NEWFOUNDLAND AND LABRADOR
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PERMIT HOLDER
This Permit Allows
JEWER BAILEY CONSULTANTS ULC
MIRC:
To practice Professional Engineering in Newfoundland and Labrador.
Permit No. as issued by PEG N0540
which is valid for the year 2025.

Sub-Consultant:

Client:

Memorial University of Newfoundland

Drawn: J. COLOMBE	Checked: K. JEWER
Designed: J. COLOMBE	Approved: K. JEWER

Consultants Project No.

JBC-24-C-156

Professional Stamp

REGISTERED PROFESSIONAL ENGINEER
PEGNL
K.M.G. JEWER
SIGNATURE
2025-07-03
DATE
NEWFOUNDLAND & LABRADOR

Notes:

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No.	Revisions	MM/DD/YY
0	Issued for Tender	2025-07-03
D	Issued for 90% Review	2025-05-06
C	Issued for 66% Review	2025-03-31
B	Issued for 33% Review	2025-02-14
A	Issued for Client Review	2025-01-17

Drawing Nomenclature

Detail/Section No. 3 A-1 — Dwg. No. where detailed

PROJECT TITLE

CERC FIT UP

Client's Project No.: CFS-103-23

DRAWING TITLE

HVAC ZONE CONTROLS

SCALE: AS INDICATED

DATE: 2025-07-03

REVISION NO.: 0

DRAWING NO.

M952

PROJECT TITLE: CERC FIT UP

REVISION: ISSUED FOR TENDER

FMA PROJECT NUMBER: 0230-55

CLIENT PROJECT NUMBER: CSF-103-23

CLIENT: MEMORIAL UNIVERSITY OF NEWFOUNDLAND

CONSULTANTS:

ELECTRICAL DRAWING LIST	
E000	COVER SHEET
E001	ELECTRICAL LEGEND AND LIST OF DRAWINGS
E101	DEMOLITION LIGHTING AND FIRE ALARM DEVICES FLOOR PLAN - LEVEL 5, PAV-C
E102	DEMOLITION POWER FLOOR PLAN - LEVEL 5, PAV-C
E301	REVISED LIGHTING AND FIRE ALARM SYSTEMS FLOOR PLAN - LEVEL 5, PAV-C
E401	REVISED POWER SYSTEMS FLOOR PLAN - LEVEL 5 PAV-C
E411	POWER & MISC. SYSTEMS ELEVATIONS
E501	ELECTRICAL DETAILS
E502	ELECTRICAL DETAILS
E503	ELECTRICAL DETAILS
E511	FIRE ALARM DEMOLITION/REVISED ZONES, GRAPHIC DISPLAY
E601	ELECTRICAL SCHEDULES AND DETAILS
E602	ELECTRICAL SCHEDULES AND DETAILS

TECHNOLOGY INFRASTRUCTURE DRAWING LIST	
T001	TECHNOLOGY INFRASTRUCTURE LEGEND
T401	REVISED DATA FLOOR PLAN - LEVEL 5, PAV-A
T701	TECHNOLOGY INFRASTRUCTURE DETAILS

ELECTRICAL

POWER & MISCELLANEOUS SYSTEMS

- 20A, 120V HEAVY DUTY DUPLEX RECEPTACLE (CSA TYPE 5-20R) - MOUNTED 400mm A.F.F. RECEPTACLE COLOUR TO BE WHITE C/W STAINLESS STEEL COVER PLATE.
- 20A, 120V HEAVY DUTY DUPLEX RECEPTACLE (CSA TYPE 5-20R) MOUNTED ABOVE COUNTER - 175mm ABOVE BACKSPLASH OR 1150mm A.F.F. RECEPTACLE COLOUR TO BE WHITE C/W STAINLESS STEEL COVER PLATE.
- 20A, 120V HEAVY DUTY DOUBLE DUPLEX RECEPTACLE (CSA TYPE 5-20R) - MOUNTED 400mm A.F.F. RECEPTACLE COLOUR TO BE WHITE C/W STAINLESS STEEL COVER PLATE.
- 20A, 120V HEAVY DUTY DOUBLE DUPLEX RECEPTACLE (CSA TYPE 5-15R) MOUNTED ABOVE COUNTER - 175mm ABOVE BACKSPLASH OR 1150mm A.F.F. RECEPTACLE COLOUR TO BE WHITE C/W STAINLESS STEEL COVER PLATE.
- IG 20A, 120V HEAVY DUTY DUPLEX RECEPTACLE (CSA TYPE 5-20R), C/W ISOLATED GROUND - MOUNTED 400mm A.F.F. RECEPTACLE COLOUR TO BE WHITE C/W STAINLESS STEEL COVER PLATE.
- IG 20A, 120V HEAVY DUTY DOUBLE DUPLEX RECEPTACLE (CSA TYPE 5-20R), C/W ISOLATED GROUND - MOUNTED 400mm A.F.F. RECEPTACLE COLOUR TO BE WHITE C/W STAINLESS STEEL COVER PLATE.
- IG 20A, 120V HEAVY DUTY DUPLEX RECEPTACLE (CSA TYPE 5-20R), C/W ISOLATED GROUND MOUNTED ABOVE COUNTER - 175mm ABOVE BACKSPLASH OR 1150mm A.F.F. RECEPTACLE COLOUR TO BE WHITE C/W STAINLESS STEEL COVER PLATE.
- 20A, 120V HEAVY DUTY DUPLEX RECEPTACLE, C/W ONE USB-A AND ONE USB-C OUTLET - MOUNTED 400mm A.F.F. RECEPTACLE COLOUR TO BE WHITE C/W STAINLESS STEEL COVER PLATE.
- 20A, 120V, HEAVY DUTY DUPLEX RECEPTACLE (CSA TYPE 5-20R) - MOUNTED IN CEILING SPACE
- 20A, 120V DUPLEX RECEPTACLE (CSA TYPE 5-20R) MOUNTED IN SYSTEMS FURNITURE, WIRED BY ELECTRICAL
- RECESSED MOUNTED PANELBOARD
- SURFACE MOUNTED PANELBOARD
- DO AUTOMATIC DOOR OPERATOR
- PB COLUMN PLATE PUSH BUTTON FOR AUTOMATIC DOOR OPERATOR - EXACT LOCATION AS PER ARCHITECTURAL. ELECTRICAL TO PROVIDE OUTLET BOXES AT PUSHBUTTON LOCATIONS AND PROVIDE CONDUIT FROM PUSHBUTTON TO DOOR OPERATOR. LOW VOLTAGE WIRING BY DOOR HARDWARE INSTALLER
- DIRECT CONNECTION TO MECHANICAL EQUIPMENT
- IG FB2 200mm FIRE RATED RECESSED ACCESS POKE THROUGH FLOOR BOX (FB2) - C/W 2 ISOLATED GROUND DUPLEX RECEPTACLES AND PROVISIONS FOR A/V OUTLET. POKE THROUGH ASSEMBLY TO CONSIST OF THE FOLLOWING: HUBBELL 1 - S1R8PTFIT1, 1 - S1R8JNC2, 1 - S1R8CVRALU, 2 - S1R8CSPI, 1 - S1R8PSPB, 2 - S1R8PSPU AND 2 - HBL5362W.
- POWER CABLE MANAGEMENT SERVICE POLE - SUPPLIED AND INSTALLED BY FURNITURE SUPPLIER. ELECTRICAL CONTRACTOR TO CONNECT WIRING IN FURNITURE SYSTEMS WHIP RISING OUT OF TOP OF SERVICE POLE TO WIRING IN JUNCTION BOX ABOVE CEILING (PROVIDED BY ELECTRICAL CONTRACTOR). MAKE FINAL CONNECTIONS.
- SFD SMOKE AND FIRE DAMPER

CONDUIT SIZE DESIGNATION

INCHES	METRIC DESIGNATOR
1/2	16mm
3/4	21mm
1	27mm
1 1/4	35mm
1 1/2	41mm
2	53mm
2 1/2	63mm
3	78mm
3 1/2	91mm
4	103mm
5	129mm
6	155mm
8	200mm

DETAIL NUMBERING SYSTEM

0 — DETAIL NUMBER.
EXXX — LOCATION DRAWING No.

DRAWING NUMBERING SYSTEM

EXXX
- SEQUENTIAL NUMBER
- SUBSYSTEM NUMBER
- ELECTRICAL PLANT/AREA/FACILITY/ BUILDING NUMBER

SUBSYSTEM NUMBER

0XX LEGEND
1XX DEMOLITION
2XX ELECTRICAL DISTRIBUTION PLANS
3XX LIGHTING SYSTEMS PLANS
4XX POWER SYSTEMS PLANS
5XX ELECTRICAL DETAILS
6XX ELECTRICAL SCHEDULES
7XX SINGLE LINE DIAGRAMS

CIRCUIT NUMBER TAGS

A-1
- CIRCUIT NUMBER
- PANEL NAME

LIGHTING SYSTEMS

- A A-1 LINEAR LUMINAIRE, TYPE AS SCHEDULED. - CONNECTED TO PANEL A, CIRCUIT No. 1.
- B A-1 2' x 4' LUMINAIRE, TYPE AS SCHEDULED. - CONNECTED TO PANEL A, CIRCUIT No. 1.
- LIGHTING FIXTURES WITH A DIAGONAL CROSS HATCHING INDICATES FIXTURE IS CONNECTED TO AN EMERGENCY CIRCUIT.
- C A-1 CEILING MOUNTED DOWNLIGHT LUMINAIRE, TYPE AS SCHEDULED. - CONNECTED TO PANEL A, CIRCUIT No. 1.
- CEILING MOUNTED EXIT LIGHTING LUMINAIRE - ARROW INDICATES DIRECTION OF EXIT. DOUBLE ARROW INDICATES DOUBLE-SIDED SIGNAGE. LED, RUNNING MAN STYLE. SELF-POWERED FOR 90 MINUTES.
- S3 DIGITAL LIGHT MANAGEMENT (DLM) CEILING TYPE SENSOR - LOW VOLTAGE, 360 DEGREE COVERAGE, PASSIVE INFRARED/ULTRASONIC (PIR/U) TECHNOLOGY, SELF ADJUSTING SENSITIVITY - LIGHT SENSOR: INTEGRAL 10-300FC, HVAC RELAY: INTEGRAL 30V, 1A, FORM C ISOLATION RELAY, MAJOR COVERAGE: 149 SM (1600 SF), MINOR COVERAGE: 92 SM (1000 SF). WATTSTOPPER #LMDC-100 OR EQUAL.
- LV2 DIGITAL LIGHT MANAGEMENT (DLM) - LOW VOLTAGE WALL SWITCH (DUAL ZONE) - DIMMING APPLICATION: WATTSTOPPER #LMSW-102 OR EQUAL.
- LV1 DIGITAL LIGHT MANAGEMENT (DLM) - LOW VOLTAGE WALL SWITCH - SWITCHING APPLICATION: WATTSTOPPER #LMSW-101 OR EQUAL.
- LV5 DIGITAL LIGHT MANAGEMENT (DLM) - LOW VOLTAGE, 5-BUTTON, ROOM CONTROL SWITCH - PRESET (SCENE) SWITCHED APPLICATION: WATTSTOPPER #LMSW-105 OR EQUAL.
- A LIGHTING CONTROL TYPE IDENTIFIER - LETTER INDICATES THE LIGHTING CONTROL SCHEME FOR THE ROOM, REFER TO DRAWINGS E502 AND E503 FOR CONTROL SCHEMATICS. NOTE THAT NOT ALL LIGHTING CONTROL DEVICES ARE SHOWN ON THE FLOOR PLANS. CONTRACTOR TO USE LIGHTING CONTROL TYPE AND CONTROL SCHEMATICS TO DETERMINE EXACT NUMBER OF ROOM CONTROLLERS, RELAYS, RELAYS PANELS, NETWORK BRIDGES AND OTHER CONTROL DEVICES REQUIRED.

FIRE ALARM SYSTEM

- SP FIRE ALARM SPEAKER - CEILING MOUNTED
- SH STROBE/SPEAKER FIRE ALARM SIGNAL - CEILING MOUNTED
- FS SPRINKLER FLOW SWITCH
- VM VALVE MONITOR
- C-SFD COMBINATION SMOKE FIRE DAMPER - INTERFACE MODULE CONNECTION TO FIRE ALARM SYSTEM
- SD ADDRESSABLE IN-DUCT SMOKE DETECTOR
- OCM ADDRESSABLE FIRE ALARM OUTPUT CONTROL MODULE
- OMM ADDRESSABLE FIRE ALARM OUTPUT MONITORING MODULE

DEMOLITION ELECTRICAL SYSTEMS

- EX ER RL EXISTING LINEAR LUMINAIRE, CEILING SUSPENDED MOUNTED - SUBSCRIPT INDICATES PHASE STATUS.
- WT EX WT ER WT RL EXISTING WALL TIMER SWITCH - LOW VOLTAGE - SUBSCRIPT INDICATES PHASE STATUS.
- X EX X ER X RL EXISTING CEILING MOUNTED EXIT LIGHTING LUMINAIRE - ARROW INDICATES DIRECTION OF EXIT, DOUBLE ARROW INDICATES DOUBLE-SIDED SIGNAGE. SUBSCRIPT INDICATES PHASE STATUS.
- EX ER RL EXISTING 20A, 120V DUPLEX RECEPTACLE - SUBSCRIPT INDICATES PHASE STATUS.
- EX ER RL EXISTING 20A, 120V GFCI DUPLEX RECEPTACLE (CSA TYPE 5-20R) - SUBSCRIPT INDICATES PHASE STATUS.
- EX ER RL EXISTING DIRECT CONNECTION TO MECHANICAL EQUIPMENT - SUBSCRIPT INDICATES PHASE STATUS.
- SH EX SH ER SH RL EXISTING CEILING MOUNTED STROBE/SPEAKER FIRE ALARM SIGNAL - SUBSCRIPT INDICATES PHASE STATUS.
- SP EX SP ER SP RL EXISTING CEILING MOUNTED FIRE ALARM SPEAKER SIGNAL - CEILING MOUNTED. SUBSCRIPT INDICATES PHASE STATUS.

LIST OF SUBSCRIPTS

a	INDICATES SWITCHING ARRANGEMENTS
ER	INDICATES EXISTING TO BE REMOVED
EX	INDICATES EXISTING TO REMAIN
NL	INDICATES EXISTING MOUNTED IN NEW LOCATION
RL	INDICATES EXISTING TO BE RELOCATED

NOTES:

1. ALL WIRING SHALL BE RUN IN CONDUIT AND CONCEALED UNLESS SPECIFIED OTHERWISE.
2. ALL EQUIPMENT SHALL BE INSTALLED IN A NEAT AND WORKMANLIKE MANNER, RECTILINEAR TO BUILDING STRUCTURE.
3. ALL COMPONENTS SHOWN ON THE RISER DIAGRAMS, BUT NOT ON THE PLAN OR VICE VERSA, SHALL BE INCLUDED AS IF SHOWN ON BOTH.
4. EXACT LOCATION OF MECHANICAL EQUIPMENT THAT REQUIRES ELECTRICAL CONNECTION IS SHOWN ON THE MECHANICAL DRAWINGS.
5. CONDUIT HOMERUNS SHOWN ON THE DRAWING WITH MORE THAN 3 CURRENT CARRYING CONDUCTORS ARE SHOWN DIAGRAMATICALLY. THIS CONTRACTOR SHALL NOT INSTALL MORE THAN 3 CURRENT CARRYING CONDUCTORS IN A RACEWAY UNLESS INSTALLATION COMPLIES WITH CANADIAN ELECTRIC CODE, NOTES TO AMPACITY TABLES REGARDING CONDUCTOR ADJUSTMENT FACTORS.
6. ALL FLUSH MOUNTED PANELS SHALL HAVE AN EMPTY 1-1/2" CONDUIT & (2) 3/4" CONDUIT STUBBED ABOVE ACCESSIBLE CEILING FOR FUTURE SPARE CIRCUITS.
7. CONTRACTOR SHALL REVIEW ALL TRADES' CONTRACT DOCUMENTS TO DETERMINE SPECIFIC MOUNTING LOCATIONS FOR ELECTRICAL EQUIPMENT. COORDINATE EXACT MOUNTING LOCATIONS WITH THE ARCHITECT.
8. ELEMENTS OF THE ELECTRICAL WORK SHALL BE INSTALLED SUCH THAT AT COMPLETION THE ELEMENT SHALL BE "FULLY AND REASONABLY ACCESSIBLE". ELEMENTS OF THE ELECTRICAL WORK INCLUDE, BUT ARE NOT LIMITED TO PANELS, SWITCHBOARDS, MOTOR CONTROLS, TRANSFORMER, DISCONNECTS, JUNCTION BOXES, AND ALL MAINTENANCE ACCESS POINTS INCLUDING CABLE PULL SPACE. "FULLY AND REASONABLE ACCESSIBLE" SHALL BE DEFINED AS; CAPABLE OF BEING ACCESSED FOR SERVICE, REPAIR OR REPLACEMENT BY AN AVERAGE SPEED INDIVIDUAL, ON A LADDER IF NECESSARY, AND CAPABLE OF BEING SERVICED OR REMOVED WITHOUT REMOVING, MODIFYING OR DISTORTING OTHER COMPONENTS OF THE WORK OF OTHER TRADES. CONFLICTS WITH MEETING THIS REQUIREMENT SHALL BE BROUGHT TO THE ATTENTION OF THE OWNERS REPRESENTATIVE IN A TIMELY MANNER.
9. ALL SURFACE MULTI-OUTLET RACEWAYS INSTALLED ADJACENT TO SINKS SHALL HAVE A MINIMUM OF 300mm CLEARANCE FROM EDGE OF SINK TO NEAREST ELECTRIC OUTLET.
10. EACH LIGHTING AND RECEPTACLE BRANCH CIRCUIT SHALL INCLUDE A SEPARATE NEUTRAL CONDUCTOR FOR EACH AND EVERY CIRCUIT, UNLESS SPECIFICALLY NOTED OTHERWISE.
11. FOR ISOLATED GROUND RECEPTACLES, PROVIDE (1) INSULATED ISOLATED GROUNDING CONDUCTOR. IN ADDITION TO EQUIPMENT GROUND, FROM RECEPTACLE TO ISOLATED GROUND BUS IN PANELBOARD.
12. THE ELECTRICAL CONTRACTORS SHALL VERIFY EXISTING CONDITIONS TO INSURE THAT THE NEW WORK WILL FIT TO THE EXISTING STRUCTURE IN THE MANNER INTENDED AND SHOWN ON THE DRAWINGS. THE CONTRACTOR SHALL NOTIFY THE ARCHITECT/OWNER REPRESENTATIVE PRIOR TO ANY ROUGH-INS, FABRICATION, OR PERFORMING ANY WORK IN THE AREA INVOLVING DIFFERENCES. NOTIFICATION SHALL BE IN THE FORM OF A DRAWING OR SKETCH INDICATING FIELD MEASUREMENTS AND NOTES RELATED TO THE AREA.
13. THE ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL WIRING AND CONDUIT WHERE CALLED FOR BY OTHER DISCIPLINES OF THESE CONTRACT DOCUMENTS. THE ELECTRICAL CONTRACTOR SHALL OBTAIN, REVIEW, AND INCLUDE IN THEIR PRICE, ALL WORK INDICATED AS THEIR SCOPE THROUGHOUT ALL DRAWINGS AND SPECIFICATIONS.
14. THE NAMES AND DESIGNATIONS OF ALL PANELS, SWTICHBOARDS, AND DISTRIBUTION EQUIPMENT, ARE FOR TENDER AND PRICING PURPOSES ONLY. ALL SUCH NAMES AND DESIGNATIONS WILL BE CHANGED TO MEMORIAL UNIVERSITY STANDARDS PRIOR TO THE DISTRIBUTION OF ISSUED FOR CONSTRUCTION DRAWINGS. ALL SHOP DRAWINGS, AS-BUILT DRAWINGS, AND FIELD-APPLIED LABELS AND TAGS SHALL USE THE MEMORIAL UNIVERSITY STANDARD NAMES AND DESIGNATIONS.
15. FOR ANY RECEPTACLE SHOWN ON THE FLOOR PLANS WITHOUT A CIRCUIT TAG, SUPPLY AND INSTALL WIRING AND CONDUIT FROM RECEPTACLE TO NEAREST APPROPRIATE PANELBOARD (PER BELOW), AND SUPPLY AND INSTALL CIRCUIT BREAKER IN PANELBOARD TO SUIT. MAXIMUM OF 4 RECEPTACLES PER CIRCUIT. FOR RECEPTACLES MARKED AS IG OR TV, RECEPTACLE TO BE SUPPLIED FROM DEDICATED CIRCUIT.

    FOR ANY JUNCTION BOX OR HARD-WIRED CONNECTION SHOWN ON THE FLOOR PLANS WITHOUT A CIRCUIT TAG, SUPPLY AND INSTALL WIRING AND CONDUIT FROM DEVICE TO NEAREST APPROPRIATE PANELBOARD, AND SUPPLY AND INSTALL CIRCUIT BREAKER IN PANELBOARD TO SUIT. EACH DEVICE TO HAVE AN INDEPENDENT CIRCUIT.
16. ALL BRANCH CIRCUITS SHALL BE INSTALLED IN CONDUIT OR WHERE REQUIRED OR PERMITTED BY THE SPECIFICATION, SHALL BE AN ARMOURED CABLE. REFER TO THE SPECIFICATION.
17. LIGHT FIXTURES WITHOUT A CIRCUIT ALLOCATED SHALL BE CONNECTED TO THE NEAREST AVAILABLE CIRCUIT.

Architect Prime Consultant

FOUGERE MENCHENTON ARCHITECTURE

Discipline: ELECTRICAL

Sub-Consultant: Mechanical/ Electrical

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Drawn: E.D.	Checked: D.C.
Designed: E.D.	Approved: D.C.

Consultants Project No.
JBC-24-C-156

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D	ISSUED FOR 90% REVIEW	2025.05.06
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A	ISSUED FOR CLIENT REVIEW	2025.01.17

Drawing Nomenclature

Detail/Section No. 3 / A-1 — Dwg. No. where detailed

PROJECT TITLE

CERC FIT UP

Client's Project No.: CFS-103-23

DRAWING TITLE

ELECTRICAL LEGEND AND LIST OF DRAWINGS

SCALE	DRAWING NO.
N.T.S.	E001
DATE: 2025.07.03	
REVISION NO.: 0	7/9/2025 9:12:23 AM

NOTES:

1. FOR ALL DEVICES AND FIXTURES BEING REMOVED, ELECTRICAL CONTRACTOR TO DISCONNECT CIRCUIT AND REMOVE ALL EXISTING WIRING AND CONDUIT BACK TO SOURCE, UNLESS INDICATED OTHERWISE.
2. EXISTING SUSPENDED LIGHT FIXTURES INSTALLED IN OPEN TENANT SPACE TO BE REMOVED AND TURNED OVER TO THE OWNER. ELECTRICAL CONTRACTOR TO DISCONNECT FIXTURE AND REMOVE EXISTING CONDUIT AND WIRING BACK TO THE NEAREST JUNCTION BOX IN CEILING.
3. TYPICAL: EXISTING FIRE ALARM STROBE/SPEAKER DEVICES AND SPEAKER ONLY DEVICES TO BE REMOVED AND STORED IN A SECURE LOCATION. REMOVE EXISTING CONDUIT AND WIRING BACK TO THE NEAREST JUNCTION BOX IN CEILING. (NOTE: THESE DEVICES WILL BE REINSTALLED IN NEW LOCATIONS IN THE REVISED LAYOUT. ANY DEVICES NOT REUSED IN THE NEW LAYOUT SHALL BE TURNED OVER TO THE OWNER.)
4. TYPICAL: EXISTING EXIT SIGN TO BE REMOVED AND STORED IN A SECURE LOCATION. REMOVE EXISTING CONDUIT AND WIRING BACK TO THE NEAREST JUNCTION BOX IN CEILING. (NOTE: THESE DEVICES WILL BE REINSTALLED IN NEW LOCATIONS IN THE REVISED LAYOUT.

DEMOLITION LIGHTING AND FIRE ALARM SYSTEMS FLOOR PLAN - LEVEL 5 PAV-C SHELLED SPACE

1 / E101 — 1 : 75

0mm 20 40 60 80 100 — 1:2
0mm 50 100 150 200 250 — 1:5
0mm 100 200 300 400 500 — 1:10
0mm 0.2 0.4 0.6 0.8 1.0 — 1:20
0mm 0.25 0.5 0.75 1.0 1.25 — 1:25
0mm 0.5 1.0 1.5 2.0 2.5 — 1:50
0mm 1.0 2.0 3.0 3.75 — 1:75
0mm 1.0 2.0 3.0 4.0 5.0 — 1:100
0mm 1.25 2.5 3.75 5.0 6.25 — 1:125
0mm 2.0 4.0 6.0 8.0 10.0 — 1:200

Autodesk Docs://0230-55 MUN CSF 5TH FLR/JBC-24-C-156 Elec Central_V24_2025.02.07.rvt

Architect Prime Consultant

FOUGERE MENCHENTON ARCHITECTURE

Discipline: ELECTRICAL

Sub-Consultant: Mechanical/ Electrical

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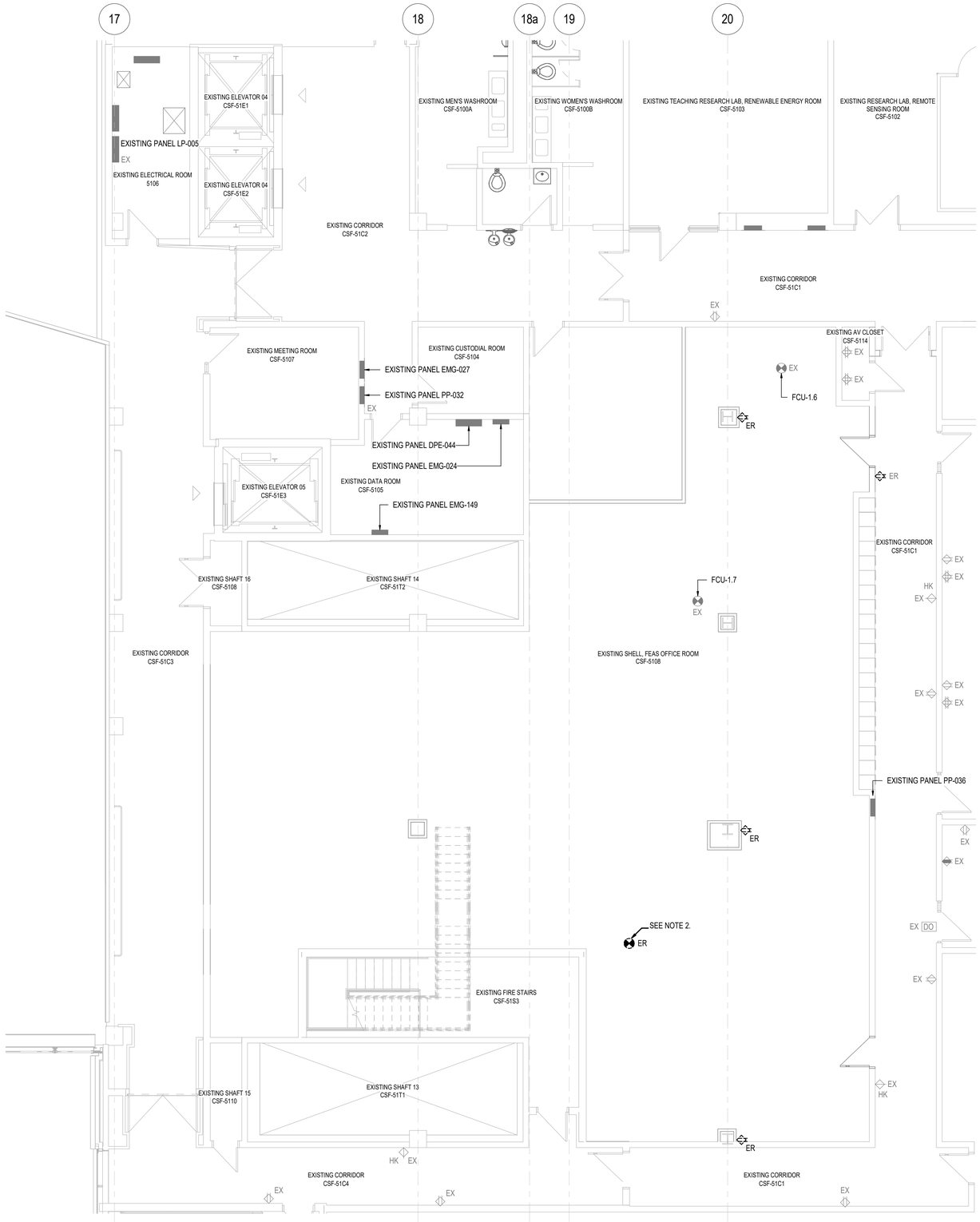
PROJECT TITLE
CERC FIT UP

Client's Project No.: CFS-103-23

DRAWING TITLE
DEMOLITION LIGHTING AND FIRE ALARM DEVICES FLOOR PLAN - LEVEL 5, PAV-C

SCALE 1 : 75	DRAWING NO. E101
DATE 2025.07.03	
REVISION NO. 0	7/9/2025 9:12:23 AM



NOTES:

1. FOR ALL DEVICES AND FIXTURES BEING REMOVED, ELECTRICAL CONTRACTOR TO DISCONNECT CIRCUIT AND REMOVE ALL EXISTING WIRING AND CONDUIT BACK TO SOURCE, UNLESS INDICATED OTHERWISE.
2. EXISTING UNIT HEATER IN CEILING SPACE TO BE REMOVED. ELECTRICAL CONTRACTOR TO DISCONNECT CIRCUIT AND REMOVE CONDUIT AND WIRING BACK TO SOURCE. EXISTING BRANCH BREAKER TO REMAIN AND IF NO OTHER LOADS ARE CONNECTED TO THE BREAKER IDENTIFY IT AS "SPARE".

DEMOLITION POWER AND MISC. SYSTEMS FLOOR PLAN - LEVEL 5 PAV-C SHELLED SPACE

1 / E102 — 1 : 75

0mm 20 40 60 80 100 — 1:2
0mm 50 100 150 200 250 — 1:5
0mm 100 200 300 400 500 — 1:10
0mm 0.2 0.4 0.6 0.8 1.0 — 1:20
0mm 0.25 0.5 0.75 1.0 1.25 — 1:25
0mm 0.5 1.0 1.5 2.0 2.5 — 1:50
0mm 1.0 2.0 3.0 3.75 — 1:75
0mm 1.0 2.0 3.0 4.0 5.0 — 1:100
0mm 1.25 2.5 3.75 5.0 6.25 — 1:125
0mm 2.0 4.0 6.0 8.0 10.0 — 1:200

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2025.07.03
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No.	Revisions	MM/DD/YY
0	ISSUED FOR TENDER	2025.07.03
D	ISSUED FOR 90% REVIEW	2025.05.06
C	ISSUED FOR 66% REVIEW	2025.03.31
B	ISSUED FOR 33% REVIEW	2025.02.14
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Drawing Nomenclature
Detail/Section No. 3 / A-1 — Dwg. No. where detailed

PROJECT TITLE
CERC FIT UP

Client's Project No.: CFS-103-23

DRAWING TITLE
DEMOLITION POWER FLOOR PLAN - LEVEL 5, PAV-C

SCALE 1 : 75	DRAWING NO. E102
DATE 2025.07.03	
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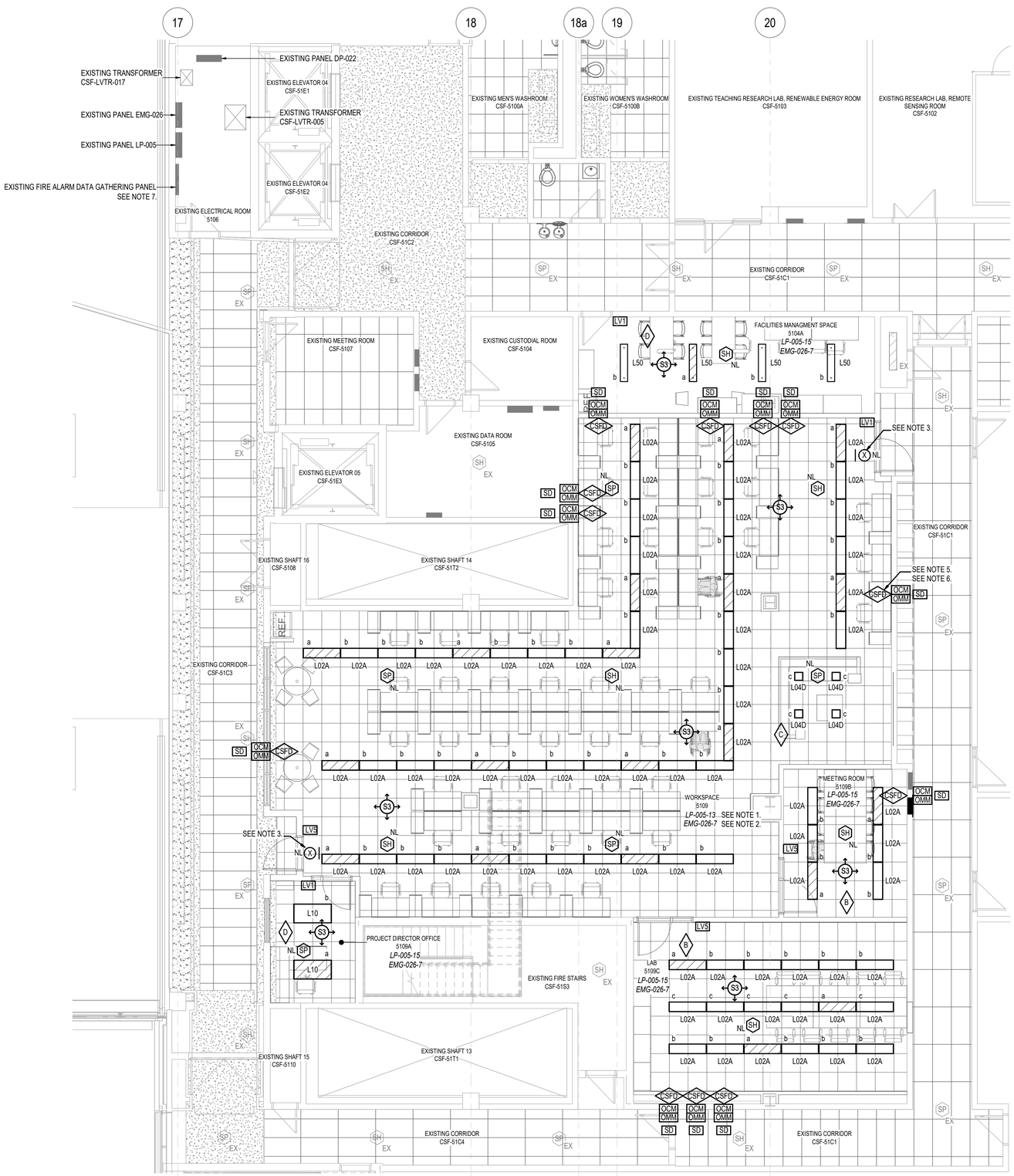
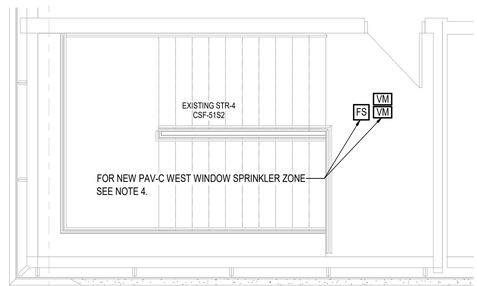


NOTES:

1. TYPICAL: WHERE ONLY ONE NORMAL POWER CIRCUIT IS IDENTIFIED IN A ROOM, CONNECT ALL LIGHT FIXTURES AND LIGHTING CONTROL DEVICES ON NORMAL POWER IN THIS ROOM TO THIS CIRCUIT UNLESS INDICATED OTHERWISE (SWITCHING ARRANGEMENTS 'b' AND 'c').
2. TYPICAL: WHERE ONLY ONE EMERGENCY POWER CIRCUIT IS IDENTIFIED IN A ROOM, CONNECT ALL LIGHT FIXTURES AND LIGHTING CONTROL DEVICES ON EMERGENCY POWER IN THIS ROOM TO THIS CIRCUIT UNLESS INDICATED OTHERWISE (SWITCHING ARRANGEMENT 'a').
3. EXISTING EXIT SIGNS TO BE REINSTALLED IN NEW CEILING IN LOCATIONS INDICATED. RECONNECT FIXTURES TO SAME POWER SOURCE. EXTENDING THE CIRCUIT TO NEW LOCATIONS OF EXIT SIGNS AS REQUIRED. ELECTRICAL CONTRACTOR TO PROVIDE CONDUIT AND WIRING AS NECESSARY AND MAKE FINAL CONNECTIONS.
4. TYPICAL: ANY WORK WITHIN THIS AREA IS OUTSIDE THE CONSTRUCTION ZONE AND SHALL BE COMPLETED AFTER HOURS. HOARDING AND SCHEDULING SHALL BE COORDINATED WITH THE OWNER'S REPRESENTATIVE, GENERAL CONTRACTOR, AND ALL CONTRACT DOCUMENTS.
5. TYPICAL: ALL COMBINATION FIRE/SMOKE DAMPERS (CSFD) SHALL HAVE A DEDICATED IN-DUCT STYLE SMOKE DETECTOR LOCATED IN THE DUCT WORK, WITHIN 1.5m DOWNSTREAM OF THE CSFD. ALL CSFD'S SHALL BE CONNECTED TO DEDICATED FIRE ALARM OUTPUT RELAYS SUCH THAT THE SMOKE DETECTOR WILL ACTIVATE THE FIRE/SMOKE DAMPER IT IS ADJACENT TO AND THE FIRE ALARM SYSTEM. ALL CSFD'S SHALL EACH BE CONNECTED TO AND CONTROLLED FROM THE FIRE ALARM PANEL FOR INDIVIDUAL STATUS MONITORING OF POSITION, VISUAL DISPLAY OF POSITION AND MANUAL OVERRIDE CAPABILITY OF EACH INDIVIDUAL DAMPER. THE FIRE ALARM SYSTEM MUST BE CAPABLE OF COMMUNICATING THE ABOVE INFORMATION TO AND FROM THE BUILDING MANAGEMENT SYSTEM, PROVIDE INTERCONNECTING WIRING AND PROGRAMMING AS REQUIRED. PROVIDE PROGRAMMING IN THE FIRE ALARM PANEL TO ALLOW THE BUILDING MANAGEMENT SYSTEM TO CONTROL THE POSITION OF ALL DAMPERS INDIVIDUALLY UPON SIGNALS FROM THE BUILDING MANAGEMENT SYSTEM.
6. TYPICAL: AT EACH IN-DUCT SMOKE DETECTOR LOCATION, CONTRACTOR SHALL PROVIDE AN ACCESS HATCH IN THE DUCT WORK, IN AN ACCESSIBLE LOCATION, SO THE SMOKE DETECTOR CAN BE ACCESS FOR SERVICE AND VERIFICATION.
7. ALL NEW FIRE ALARM DEVICES SHALL BE CONNECTED TO THE EXISTING PANEL IN THIS ROOM. SUPPLY AND INSTALL ALL REQUIRED TERMINAL BLOCKS, INTERCONNECTING WIRING AND HARDWARE TO COMPLETE THESE CONNECTIONS.



17

REVISED FIRE ALARM SYSTEMS PARTIAL FLOOR PLAN - STAIR 4 51S2

2 / E301 — 1 : 50

REVISED LIGHTING AND FIRE ALARM SYSTEMS FLOOR PLAN - LEVEL 5 PAV-C

1 / E301 — 1 : 75

1:2 0mm 20 40 60 80 100 | 1:5 0mm 50 100 150 200 250 | 1:10 0mm 100 200 300 400 500 | 1:20 0mm 0.2 0.4 0.6 0.8 1.0 | 1:25 0mm 0.25 0.5 0.75 1.0 1.25 | 1:50 0mm 0.5 1.0 1.5 2.0 2.5 | 1:75 0mm 1.0 2.0 3.0 3.75 | 1:100 0mm 1.0 2.0 3.0 4.0 5.0 | 1:125 0mm 1.25 2.5 3.75 5.0 6.25 | 1:200 0mm 2.0 4.0 6.0 8.0 10.0

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Architect Prime Consultant

FOUGERE MENCHENTON ARCHITECTURE

Discipline: ELECTRICAL

Sub-Consultant: Mechanical/ Electrical

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Client:
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Designed: E.D.	Approved: D.C.

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Drawing Nomenclature
Detail/Section No. 3 / A-1 ← Dwg. No. where detailed

PROJECT TITLE
CERC FIT UP

Client's Project No.: CFS-103-23

DRAWING TITLE
REVISED LIGHTING AND FIRE ALARM SYSTEMS FLOOR PLAN - LEVEL 5, PAV-C

SCALE	DRAWING NO.
As indicated	E301
DATE: 2025.07.03	
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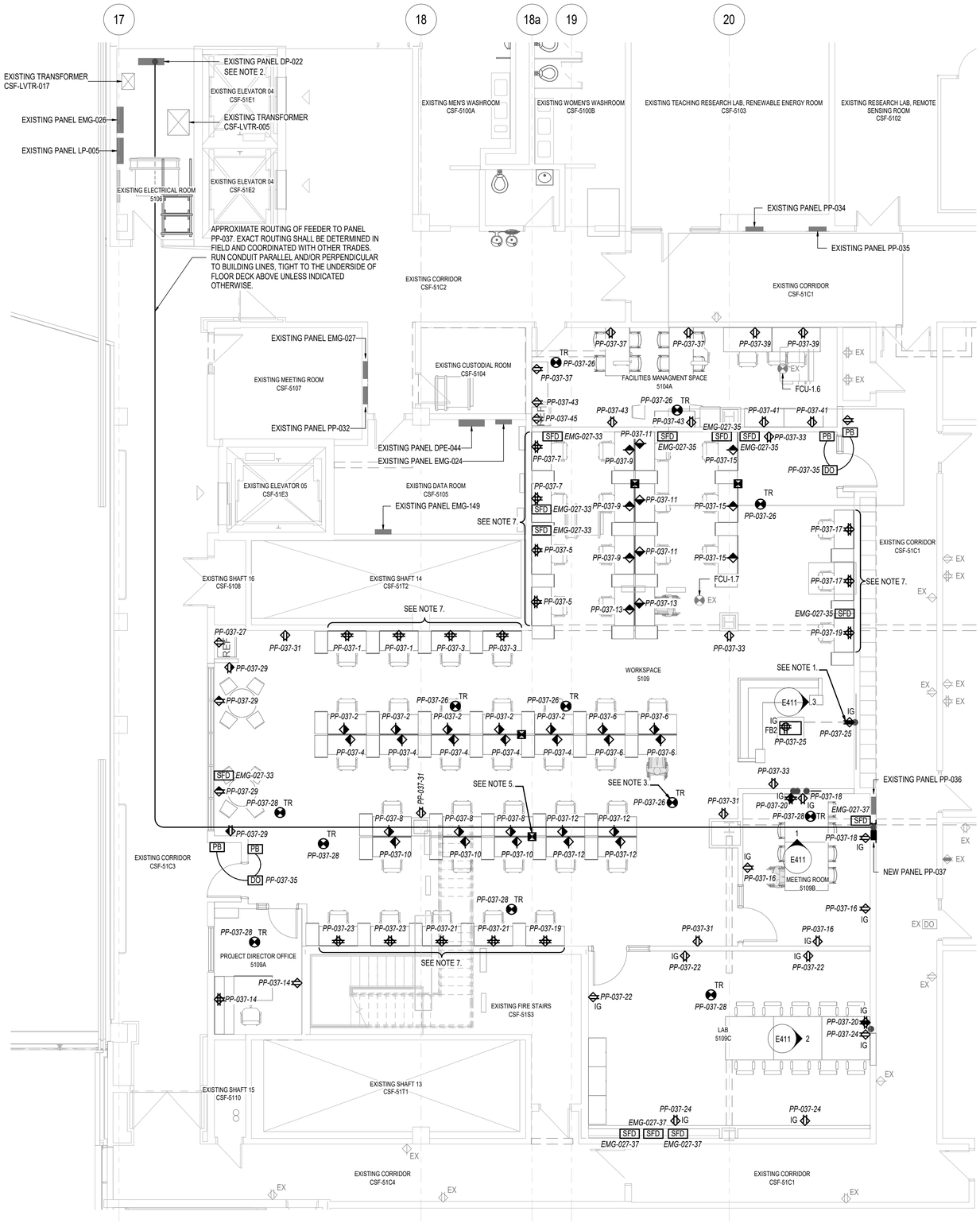
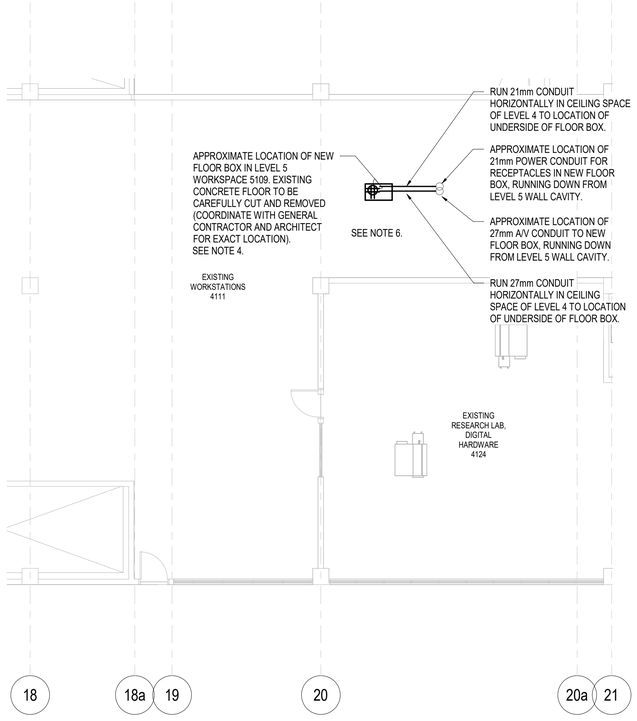


NOTES:

1. ELECTRICAL CONTRACTOR TO COORDINATE LOCATION AND MOUNTING HEIGHT OF RECEPTACLES ON SITE WITH GENERAL CONTRACTOR AND FURNITURE SUPPLIER PRIOR TO ROUGH IN. REFER TO ELEVATION FOR MORE DETAILED INSTRUCTIONS.
2. EXISTING PANEL DP-022 IS A SQUARE D I-LINE CIRCUIT BREAKER TYPE, 120.208V, 3Ø, 4W, C/W ISOLATED GROUND BUS, SURFACE MOUNTED. SUPPLY AND INSTALL A 125A, 3 POLE, FA TYPE BREAKER IN POSITIONS 19, 21, 23. BREAKER IC TO BE 25kA. SUPPLY AND INSTALL MOUNTING HARDWARE AS REQUIRED. RUN 4-#1 RW90 XLPE COPPER CONDUCTORS PLUS 1-#6 TW GROUND WIRE AND 1-#6 TW ISOLATED GROUND WIRE IN 53mm CONDUIT FROM EXISTING PANEL DP-022 TO NEW PANEL PP-037. MAKE FINAL CONNECTIONS.
3. TYPICAL: CONTROLS TRANSFORMER FOR AIR TERMINAL BOX (BY MECHANICAL CONTRACTOR). SUPPLY AND INSTALL WIRING AND CONDUIT AND MAKE FINAL CONNECTIONS. COORDINATE WITH MECHANICAL CONTRACTOR PRIOR TO INSTALLATION.
4. PRIOR TO CORING ANY FLOORS FOR FLOOR BOXES OR FLOOR PENETRATIONS THE CONTRACTOR SHALL X-RAY AT THE PROPOSED LOCATIONS TO CONFIRM THAT NO SERVICES OR STRUCTURAL ELEMENTS OF ANY KIND EXIST AT THESE LOCATIONS. IF ANY SERVICES OR STRUCTURAL ELEMENTS ARE FOUND, CONTRACTOR SHALL REPORT THEIR FINDINGS TO THE ENGINEER BEFORE PROCEEDING.
5. TYPICAL: ELECTRICAL CONTRACTOR TO SUPPLY AND INSTALL JUNCTION BOX IN CEILING SPACE IN EACH SERVICE POLE LOCATION FOR POWER WIRING. RUN POWER WIRING FOR RECEPTACLE CIRCUITS IN SYSTEM FURNITURE TO CEILING MOUNTED JUNCTION BOXES. AND CONNECT TO POWER WHIPS FROM SYSTEM FURNITURE WITHIN JUNCTION BOX. ELECTRICAL CONTRACTOR TO COORDINATE LOCATIONS OF ALL SERVICE POLES WITH FURNITURE SUPPLIER PRIOR TO INSTALLATION.
6. TYPICAL: ANY WORK WITHIN THIS AREA IS OUTSIDE THE CONSTRUCTION ZONE AND SHALL BE COMPLETED AFTER HOURS. HOARDING AND SCHEDULING SHALL BE COORDINATED WITH THE OWNER'S REPRESENTATIVE, GENERAL CONTRACTOR, AND ALL CONTRACT DOCUMENTS.
7. THE EXACT LOCATION OF RECEPTACLES AND DATA OUTLETS ON THESE WALLS MAY NEED TO ADJUST LOCATION AND/OR MOUNTING HEIGHT. CONTRACTOR SHALL COORDINATE WITH MUN REPRESENTATIVE ON-SITE PRIOR TO ROUGH-IN.



2 / E401 REVISED POWER PARTIAL FLOOR PLAN - LEVEL 4, PAV-C, EXISTING WORKSTATIONS 4111

1 : 100

1 / E401 REVISED POWER FLOOR PLAN - LEVEL 5, PAV-C

1 : 75

0mm 20 40 60 80 100 1:2 | 0mm 50 100 150 200 250 1:5 | 0mm 100 200 300 400 500 1:10 | 0mm 0.2 0.4 0.6 0.8 1.0 1:20 | 0mm 0.25 0.5 0.75 1.0 1.25 1:25 | 0mm 0.5 1.0 1.5 2.0 2.5 1:50 | 0mm 1.0 2.0 3.0 3.75 1:75 | 0mm 1.0 2.0 3.0 4.0 5.0 1:100 | 0mm 1.25 2.5 3.75 5.0 6.25 1:125 | 0mm 2.0 4.0 6.0 8.0 10.0 1:200

Architect Prime Consultant

FOUGERE MENCHENTON ARCHITECTURE

Discipline: ELECTRICAL

Sub-Consultant: Mechanical/ Electrical

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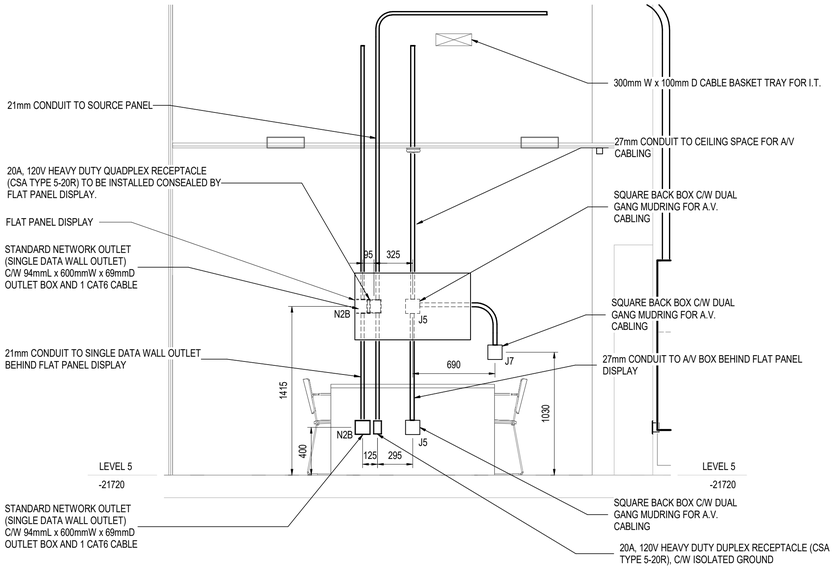
PROJECT TITLE
CERC FIT UP

Client's Project No.: CFS-103-23

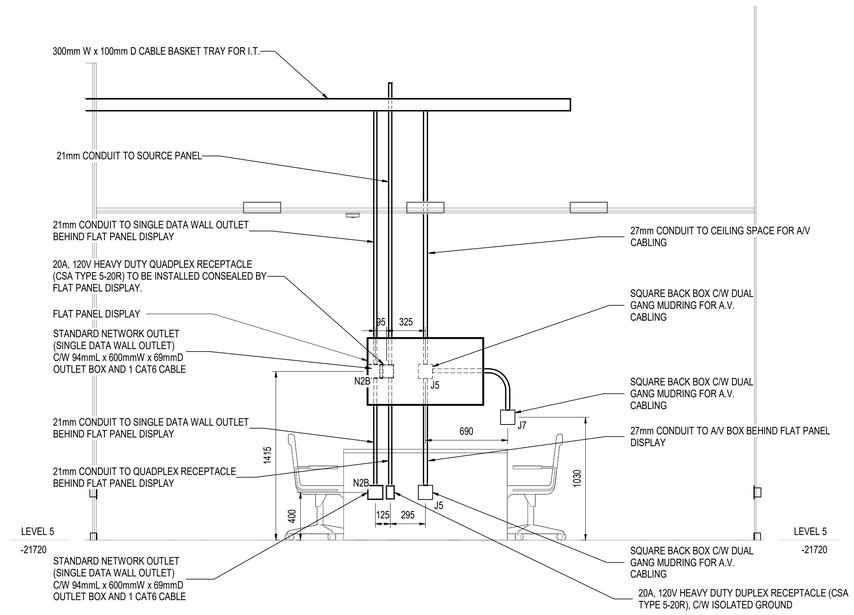
DRAWING TITLE
REVISED POWER SYSTEMS FLOOR PLAN - LEVEL 5 PAV-C

SCALE As indicated	DRAWING NO. E401
DATE 2025.07.03	
REVISION NO. 0	7/9/2025 9:12:26 AM



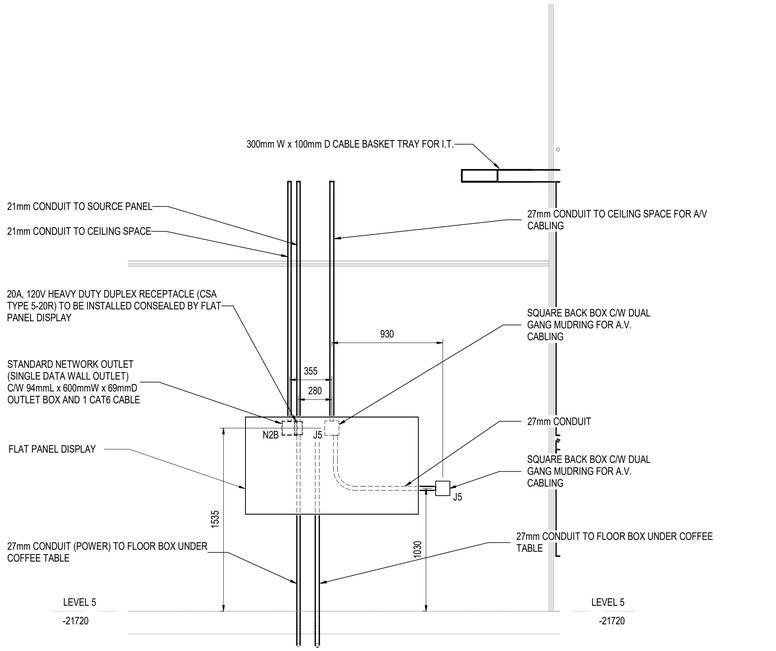
1 E411 POWER AND TECHNOLOGY INFRASTRUCTURE SYSTEMS ELEVATION - MEETING ROOM 5109B - NORTH WALL

1 : 25



2 E411 POWER AND TECHNOLOGY INFRASTRUCTURE SYSTEMS ELEVATION - LAB 5109C - EAST WALL

1 : 25



3 E411 POWER AND TECHNOLOGY INFRASTRUCTURE SYSTEMS ELEVATION - WORKSPACE 5109 COLABORATIVE AREA - EAST WALL

1 : 25

NOTES:

1. COODINATE EXACT LOCATIONS OF CONDUIT AND JUNCTION BOX LOCATIONS WITH BLOCKING LOCATIONS AT REAR OF FLAT PANEL DISPLAYS WITH ARCHITECT PRIOR TO INSTALLATION. SEE ARCHITECTURAL DRAWINGS.

Autodesk Docs://0230-55 MUN CSF 5TH FLR/JBC-24-C-156 Elec Central_V24_2025.02.07.rvt

Architect Prime Consultant

FOUGERE MENCHENTON ARCHITECTURE

Discipline: ELECTRICAL

Sub-Consultant: Mechanical/ Electrical

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PROJECT TITLE

CERC FIT UP

Client's Project No.: CFS-103-23

DRAWING TITLE

POWER & MISC. SYSTEMS ELEVATIONS

SCALE	DRAWING NO.
1 : 25	E411
DATE: 2025.07.03	
REVISION NO.: 0	7/9/2025 9:12:26 AM

NOTES:

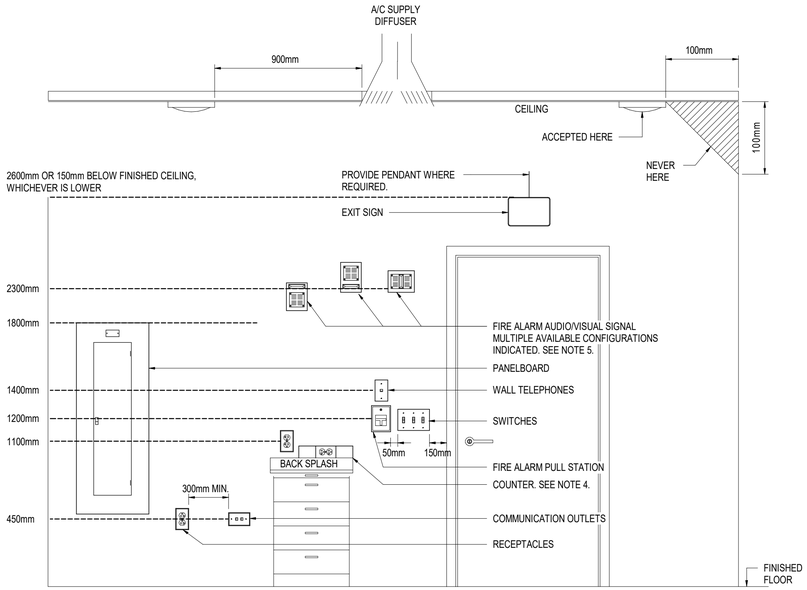
1. DEVICE LOCATIONS AND MOUNTING HEIGHTS SHALL BE CHECKED AGAINST THE ARCHITECTURAL PLANS AND ELEVATIONS PRIOR TO ROUGH-IN IN ORDER TO AVOID INTERFERENCE'S WITH CASEWORK, FURNITURE, WINDOWS, MIRRORS, EQUIPMENT, ETC.

2. LOCATIONS OF OUTLETS AND EQUIPMENT AS INDICATED ON THE DRAWINGS ARE APPROXIMATE. THE EXACT CENTER OF ALL OUTLETS SHALL BE PLACED IN COOPERATION WITH THE GENERAL CONTRACTOR AND ARCHITECT. CONTRACTOR SHALL EXAMINE ALL INTERIOR DETAILS OF THE CONSTRUCTION DRAWINGS FOR OUTLET LOCATIONS NOT CONFORMING TO THE DETAIL ABOVE. WHERE DETAILED TO SPECIFIC LOCATIONS, THE ARCHITECTURAL DRAWINGS SHALL TAKE PRECEDENCE. IF AN OUTLET IS INSTALLED IN SUCH A LOCATION AS TO BE OUT OF PROPER RELATION TO WALLS OR DETAILS OF THE BUILDING, ITS LOCATION SHALL BE CORRECTED BY AND AT THE EXPENSE OF THE CONTRACTOR UNDER THE DIRECTION OF THE ARCHITECT OR ENGINEER.

3. DEVICES SHALL BE CENTERED IN A COMMON VERTICAL PLANE. HEIGHT SHALL BE MEASURED FROM FINISHED FLOOR TO CENTERLINE OF DEVICE EXCEPT EXIT SIGNS, AND FIRE ALARM SIGNALS. COORDINATE LOCATION WITH MATERIALS SUCH AS MASONRY UNITS.

4. REFER TO THE ARCHITECT'S ELEVATION DETAILS FOR EXACT MOUNTING HEIGHT AND LENGTH OF SURFACE RACEWAYS. RECEPTACLE MOUNTING HEIGHT ABOVE COUNTERS SHALL BE COORDINATED WITH CASEWORK HEIGHTS.

5. THE ENTIRE LENS OF A FIRE ALARM A/V SIGNAL OR VISUAL ONLY SIGNAL SHALL BE LOCATED ABOVE 2300mm A.F.F. ELEVATION SHALL BE CONSISTENT THROUGHOUT PROJECT.

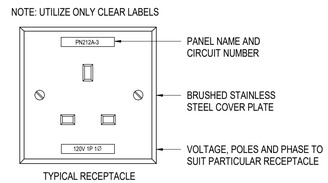


1 E501 TYPICAL DEVICE MOUNTING HEIGHTS DETAIL

N.T.S.

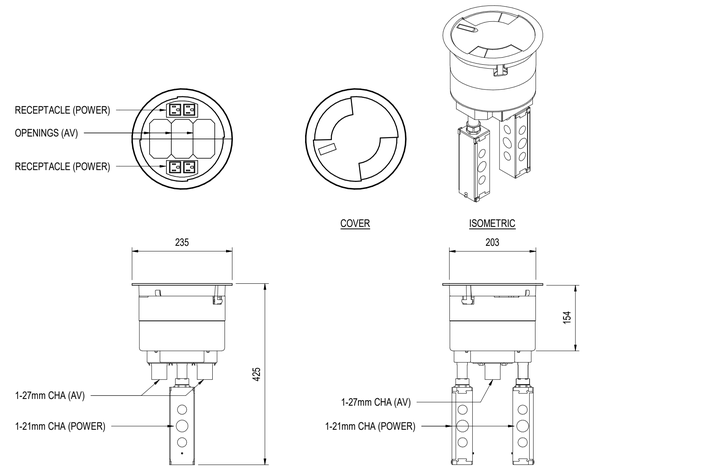
3 E501 ISOLATED GROUND DETAIL

N.T.S.



4 E501 TYPICAL DETAIL FOR LABELING SYSTEM ON DEVICE PLATES

N.T.S.



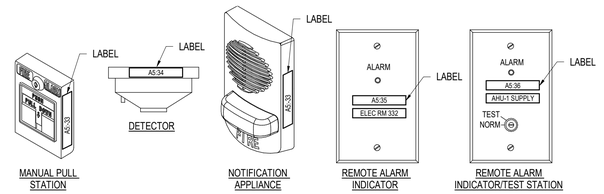
2 E501 POKE THROUGH FLOOR BOX DETAIL

N.T.S.

NOTES:

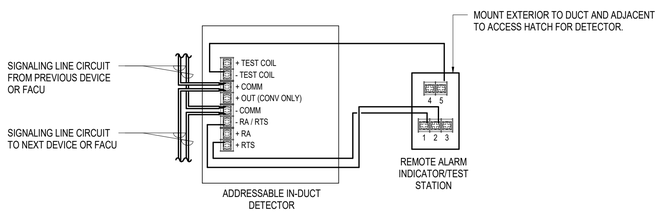
1. PROVIDE A LABEL ON ALL FIRE ALARM DEVICES. UTILIZE CLEAR USE SELF-ADHESIVE VINYL LABELS WITH LETTERING EASILY VISIBLE WITHOUT A LADDER.

2. LABEL ALL DEVICES WITH ADDRESS/ZONE INFORMATION AND WHERE APPLICABLE EQUIPMENT MONITORED (I.E. AHU-1 SUPPLY).



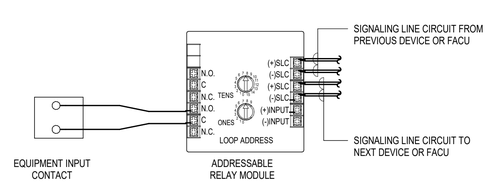
5 E501 FIRE ALARM DEVICE LABEL REQUIREMENTS

N.T.S.



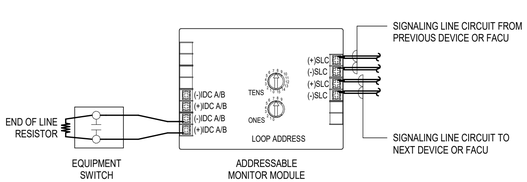
6 E501 TYPICAL SYSTEM IN-DUCT DETECTOR WIRING DETAIL

N.T.S.



7 E501 TYPICAL EQUIPMENT CONTROL INTERFACE DETAIL

N.T.S.



8 E501 TYPICAL EQUIPMENT MONITORING INTERFACE DETAIL

N.T.S.

Architect Prime Consultant

FOUGERE MENCHENTON ARCHITECTURE

Discipline: ELECTRICAL

Sub-Consultant: Mechanical/ Electrical

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PROJECT TITLE

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Client's Project No.: CFS-103-23

DRAWING TITLE

ELECTRICAL DETAILS

SCALE: As indicated	DRAWING NO. E501
DATE: 2025.07.03	
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GENERAL NOTES:

1. POWER PACKS FOR LIGHTING LOADS, CONTACTORS,NETWORK BRIDGES AND RELAYS ARE NOT INDICATED ON THE LAYOUTS. QUANTITIES AND LOCATIONS OF LIGHTING CONTROL POWER PACKS, CONTACTORS, NETWORK BRIDGES AND RELAYS TO BE DETERMINED BY CONTRACTOR AS REQUIRED TO ACHIEVE INDICATED SWITCHING ARRANGEMENT FOR THE QUANTITIES OF LIGHTING FIXTURES INDICATED ON THE LAYOUTS. RECORD LOCATIONS OF ALL DEVICES ON AS-BUILT DRAWINGS.

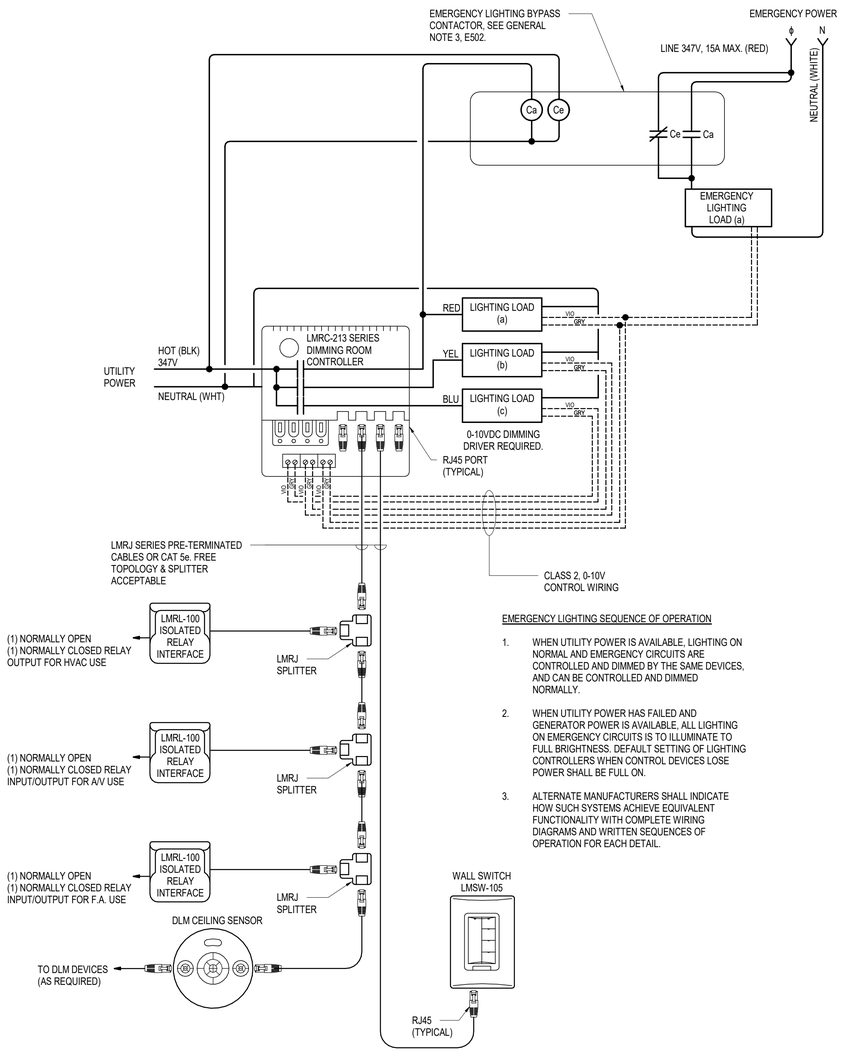
2. LIGHTING POWER PACKS: MINIMUM OF 1 PER ROOM, MORE AS REQUIRED TO ACHIEVE LIGHTING AND EMERGENCY LIGHTING LOADS AS REQUIRED.

3. EMERGENCY LIGHTING POWER AND CONTROL CONTACTORS SHALL BE CSA TYPE 1 ENCLOSURE, 347 VOLT CONTROL COIL, 347 VOLT CONTACTS AS SHOWN. MOUNT IN CEILING SPACE OF AREA CONTROLLED, LOCATION TO BE ACCESSIBLE AND MAXIMUM 300mm ABOVE CEILING. CONTACTS LABELLED 'Ce' SHALL BE LOCATED IN BARRIERED COMPARTMENT, SEPARATE FROM OTHER CONTACTS. CONTACTOR PANEL SHALL BE MANUFACTURED BY A CSA APPROVED SHOP AND SHALL BE SUITABLE FOR REGULAR, FREQUENT OPERATION FOR THE CONTROL OF LIGHTING FIXTURES. MANUFACTURED LIGHTING BYPASS RELAYS SHALL BE PERMITTED AS A SUBSTITUTE SO LONG AS THEY ARE CSA OR cUL APPROVED FOR 347V OPERATION, AND PROVIDE THE SAME FUNCTIONALITY SHOWN HERE. ALL EMERGENCY LIGHTING POWER AND CONTROL CONTACTORS OR RELAYS ARE TO BE COMPLETE WITH PUSH-TO-TEST BUTTONS AND LED PILOT LIGHTS INDICATING WHETHER POWER IS SUPPLIED FROM NORMAL, EMERGENCY, OR IN TEST MODE. LOCATIONS OF CONTACTORS AND RELAYS TO BE RECORDED ON AS-BUILT DRAWINGS.

4. QUANTITIES OF PHOTOCELLS, OCCUPANCY / VACANCY SENSORS, AND MANUAL LIGHTING CONTROL DEVICES ON THESE DETAILS IS NOT INDICATIVE OF ACTUAL NUMBER OF DEVICES CONNECTED TO EACH ROOM CONTROLLER. FOR EXACT QUANTITY OF SUCH DEVICES, REFER TO THE LIGHTING FLOOR PLANS.

5. LIGHTING CONTROL SYSTEMS WITH A/V OUTPUT RELAYS SHALL BE TIED IN TO COMMUNICATE WITH AND SHALL BE CAPABLE OF BEING CONTROLLED BY THE ASSOCIATED A/V PANELS IN SUCH ROOMS. CONTRACTOR TO COORDINATE WITH A/V CONTRACT DOCUMENTS FOR LOCATIONS OF ALL A/V PANELS.

6. PART NUMBERS AND CONFIGURATION DETAILS INDICATED REFER TO EQUIPMENT BY WATTSTOPPER.



EMERGENCY LIGHTING SEQUENCE OF OPERATION

1. WHEN UTILITY POWER IS AVAILABLE, LIGHTING ON NORMAL AND EMERGENCY CIRCUITS ARE CONTROLLED AND DIMMED BY THE SAME DEVICES, AND CAN BE CONTROLLED AND DIMMED NORMALLY.

2. WHEN UTILITY POWER HAS FAILED AND GENERATOR POWER IS AVAILABLE, ALL LIGHTING ON EMERGENCY CIRCUITS IS TO ILLUMINATE TO FULL BRIGHTNESS. DEFAULT SETTING OF LIGHTING CONTROLLERS WHEN CONTROL DEVICES LOSE POWER SHALL BE FULL ON.

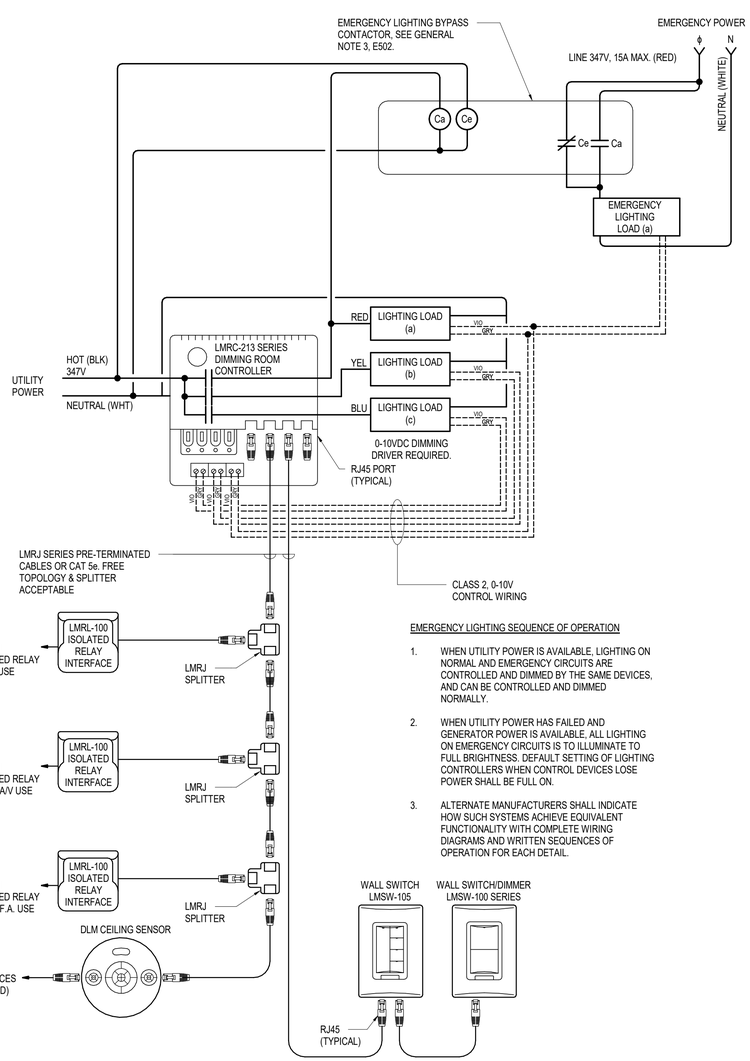
3. ALTERNATE MANUFACTURERS SHALL INDICATE HOW SUCH SYSTEMS ACHIEVE EQUIVALENT FUNCTIONALITY WITH COMPLETE WIRING DIAGRAMS AND WRITTEN SEQUENCES OF OPERATION FOR EACH DETAIL.

REGULAR SEQUENCE OF OPERATION:

SEQUENCE: OVERHEAD LIGHTS ARE MANUALLY TURNED ON BY SWITCH AND SHUT OFF WITH CEILING OCCUPANCY SENSOR.
ON: LIGHTS ARE TURNED ON MANUALLY.
ADJUST: LIGHTS ARE MANUALLY ADJUSTED BY PRESSING BUTTONS ON WALL SWITCH THAT HAVE DIMMING SETPOINTS (SCENE SELECTION) TO ESTABLISH PRESET LIGHT LEVELS FOR ROOM USE.
OFF: AFTER THE SPACE HAS BEEN VACANT FOR 30 MINUTES, THE LIGHTS WILL AUTOMATICALLY TURN OFF.

TYPE "B" DLM SYSTEM ROOM CONTROLLER, VACANCY SENSING AND DIMMING CONTROLS

1 / E502 N.T.S.



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OFF: AFTER THE SPACE HAS BEEN VACANT FOR 30 MINUTES, THE LIGHTS WILL AUTOMATICALLY TURN OFF.

TYPE "C" DLM SYSTEM ROOM CONTROLLER, VACANCY SENSING AND DIMMING CONTROLS

2 / E502 N.T.S.

Architect Prime Consultant

FOUGERE MENCHENTON ARCHITECTURE

Discipline: ELECTRICAL

Sub-Consultant: Mechanical/ Electrical

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Permit No. as issued by PEG N0540
which is valid for the year 2025.

Sub-Consultant:

Client: MEMORIAL UNIVERSITY OF NEWFOUNDLAND

Drawn: E.D.	Checked: D.C.
Designed: E.D.	Approved: D.C.

Consultants Project No.: JBC-24-C-156

Professional Stamp & Permit.

REGISTERED PROFESSIONAL ENGINEER
PEG
DUSTIN D. COLE
SIGNATURE
2025.07.03
DATE
NEWFOUNDLAND & LABRADOR

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No.	Revisions	MM/DD/YY
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D	ISSUED FOR 90% REVIEW	2025.05.06
C	ISSUED FOR 66% REVIEW	2025.03.31
B	ISSUED FOR 33% REVIEW	2025.02.14
A	ISSUED FOR CLIENT REVIEW	2025.01.17

Drawing Nomenclature

Detail/Section No. 3 / A-1 Dwg. No. where detailed

PROJECT TITLE

CERC FIT UP

Client's Project No.: CFS-103-23

DRAWING TITLE

ELECTRICAL DETAILS

SCALE N.T.S.	DRAWING NO. E502
DATE 2025.07.03	
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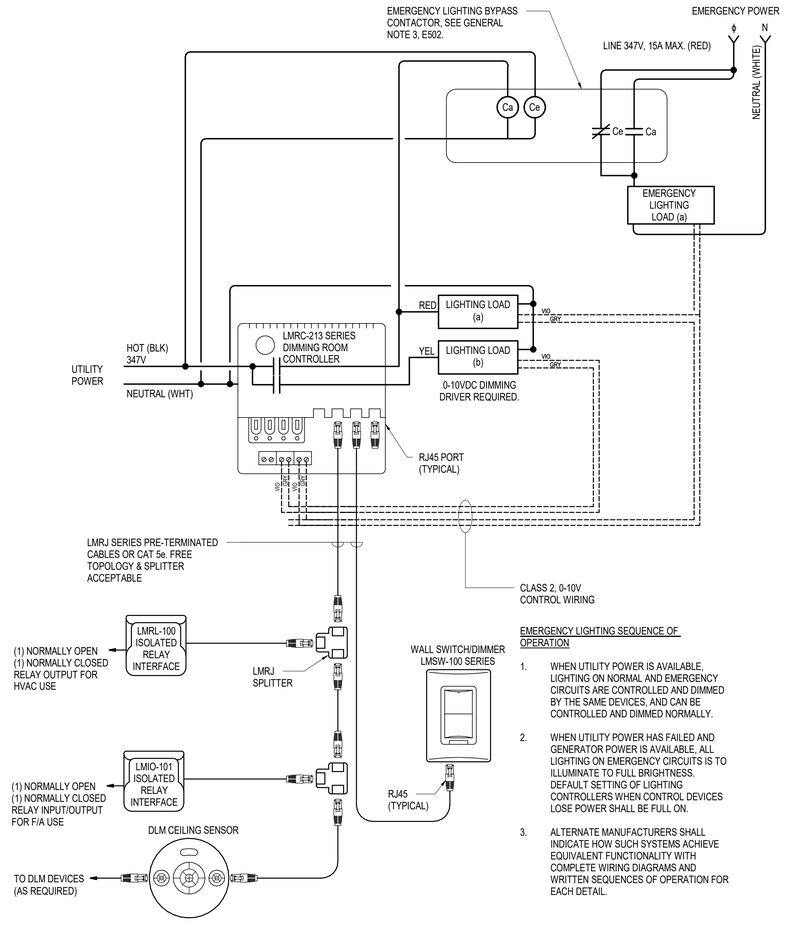

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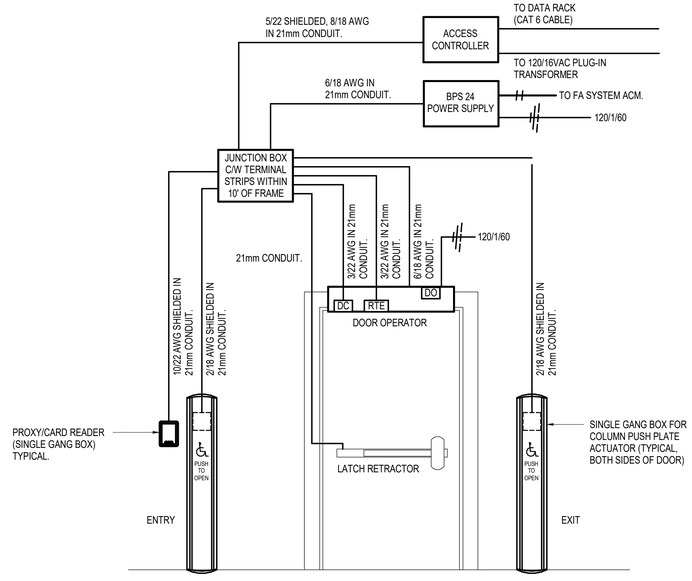
2 E503 TYPE "D" - DLM SYSTEM ROOM CONTROLLER, VACANCY SENSING, AND DIMMING CONTROLS

N.T.S.



1 E503 DOOR ACCESS/CARD ACCESS ROUGH-IN DETAIL

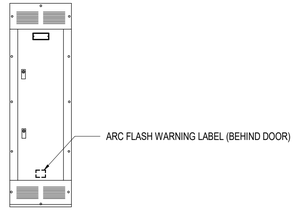
N.T.S.

NOTES:

1. ALL WIRING TO BE RUN IN CONDUIT.
2. ELECTRICAL CONTRACTOR IS RESPONSIBLE TO FIND CLOSEST EXISTING ACCESS POINT AND TO TIE INTO THE EXISTING DOOR HARDWARE/ACCESS SYSTEM IN THE BUILDING.
3. INSTALL AND WIRE ALL COMPONENTS AS PER MANUFACTURER'S INSTRUCTIONS.
4. ALL WIRING AND EQUIPMENT TO BE CONCEALED.
5. ELECTRICAL CONTRACTOR SHALL COORDINATE THE INSTALLATION FO DOOR HARDWARE/CARD ACCESS AS INDICATED ON THE FLOOR PLAN WITH DOOR HARDWARE SUPPLIER. LOCATIONS OF ALL DEVICES TO BE CONFIRMED PRIOR TO ROUGH-IN.
6. PROVIDE FIRE ALARM INTERLOCK CONNECTION SUCH THAT CARD ACCESS DOORS RELEASE ON FIRE ALARM.
7. ALL CONDUIT, 120VAC, LOW VOLTAGE ACCESS CONTROL WIRING AND FIRE ALARM INTERFACE IS BY ELECTRICAL CONTRACTOR UNLESS NOTED OTHERWISE.

LEGEND:

- RTE - REQUEST TO EXIT
- DC - DOOR CONTACT
- ES - ELECTRIC STRIKE
- DO - AUTOMATIC DOOR OPERATOR



NOTES:

1. PROVIDE NAMEPLATE TYPE 1 FOR EQUIPMENT AND NAMEPLATE TYPE 2 FOR COMPARTMENTS SERVING EQUIPMENT. FOR SPARE UNITS AND SPACES PROVIDE BLANK NAMEPLATES.

3 E503 PANEL ELECTRICAL IDENTIFICATION

N.T.S.

Architect Prime Consultant

FOUGERE MENCHENTON ARCHITECTURE

Discipline: ELECTRICAL

Sub-Consultant: Mechanical/ Electrical

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Drawn: E.D.	Checked: D.C.
Designed: E.D.	Approved: D.C.

Consultants Project No.: JBC-24-C-156

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Drawing Nomenclature

Detail/Section No. 3 / A-1 — Dwg. No. where detailed

PROJECT TITLE

CERC FIT UP

Client's Project No.: CFS-103-23

DRAWING TITLE

ELECTRICAL DETAILS

SCALE	DRAWING NO.
As indicated	E503
DATE: 2025.07.03	
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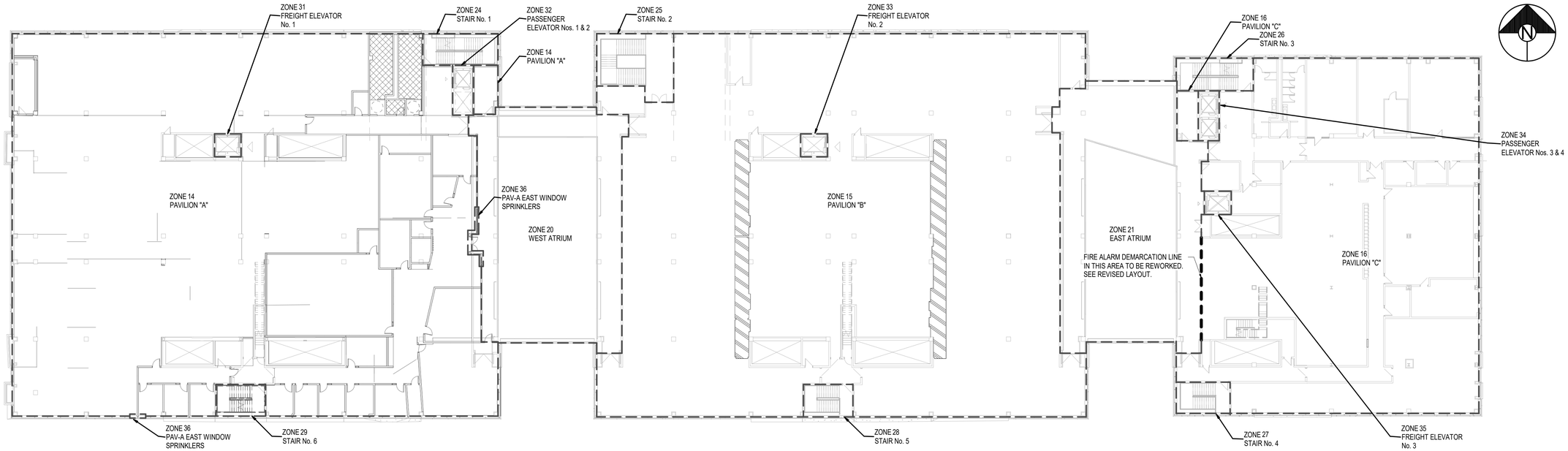

1 E511 FIRE ALARM DEMOLITION GRAPHIC DISPLAY - LEVEL 5

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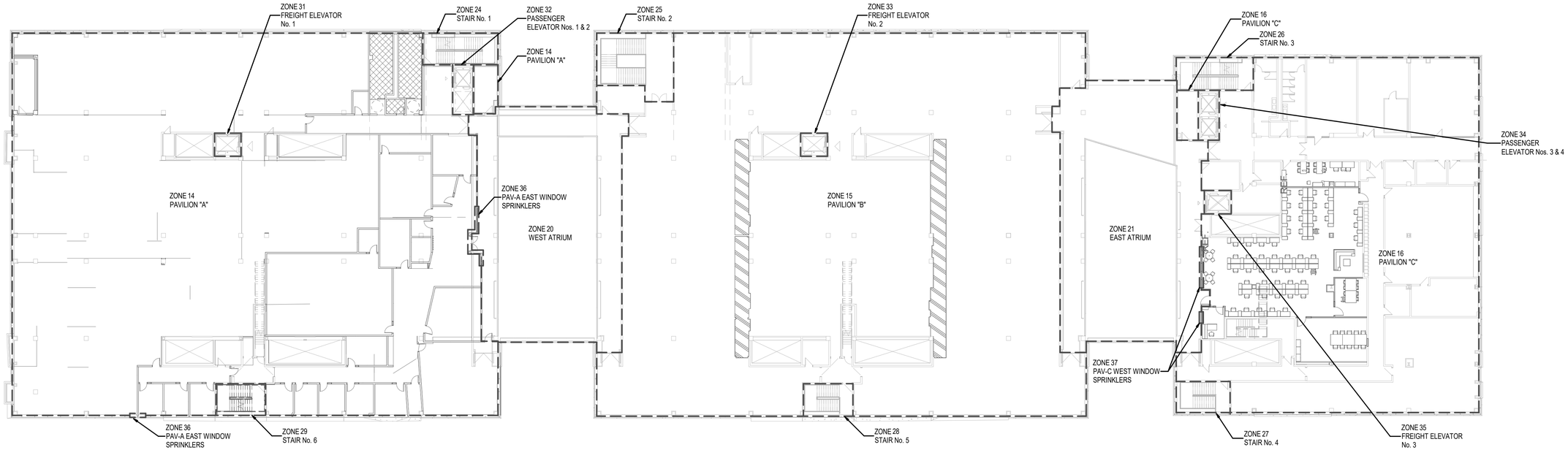

2 E511 FIRE ALARM REVISED GRAPHIC DISPLAY - LEVEL 5

N.T.S.

NOTES:

1. THERE ARE THREE(3) EXISTING PASSIVE DISPLAY GRAPHICS IN THE BUILDING. CONTRACTOR SHALL MODIFY THE EXISTING DISPLAYS BY ADDING THE NEW ZONE TO THEM, OR ALTERNATIVELY MAY REPLACE THEM IN FULL WITH NEW. IF NEW ARE BEING INSTALLED THEY SHALL MATCH THE EXISTING IN STYLE AND SIZE.
2. THE EXISTING FIRE ALARM SYSTEM SHALL BE RE-PROGRAMMED TO ACCOMMODATE THE ADDITION OF THE NEW ZONE.
3. UPON COMPLETION OF ALL FIRE ALARM SYSTEM WORK, PROVIDE SYSTEM VERIFICATION REPORT IN ACCORDANCE WITH CAN/ULC-S537.
4. CONTRACTOR TO COORDINATE WITH EXISTING FIRE ALARM GRAPHIC AND FIRE ALARM SYSTEM AND ASSIGN NEW ZONES TO NEXT AVAILABLE ZONE NUMBER.
5. THE ELECTRONIC FIREWORKS DISPLAY SHALL ALSO BE UPDATED TO MATCH ALL REVISIONS.

1:2 0mm 20 40 60 80 100
1:5 0mm 50 100 150 200 250
1:10 0mm 100 200 300 400 500
1:20 0mm 0.2 0.4 0.6 0.8 1.0
1:25 0mm 0.25 0.5 0.75 1.0 1.25
1:50 0mm 0.5 1.0 1.5 2.0 2.5
1:75 0mm 1.0 2.0 3.0 3.75
1:100 0mm 1.0 2.0 3.0 4.0 5.0
1:125 0mm 1.25 2.5 3.75 5.0 6.25
1:200 0mm 2.0 4.0 6.0 8.0 10.0

Architect Prime Consultant

FOUGERE MENCHENTON ARCHITECTURE

Discipline: ELECTRICAL

Sub-Consultant: Mechanical/ Electrical

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JBC-24-C-156

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PEGNL
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Drawing Nomenclature
Detail/Section No. 3 / A-1 Dwg. No. where detailed

PROJECT TITLE
CERC FIT UP

Client's Project No.: CFS-103-23

DRAWING TITLE
FIRE ALARM DEMOLITION/REVISED ZONES, GRAPHIC DISPLAY

SCALE N.T.S.	DRAWING NO. E511
DATE 2025.07.03	
REVISION NO. 0	7/9/2025 9:12:29 AM

LIGHTING FIXTURE SCHEDULE

TYPE	GENERAL DATA			LAMP DATA	LAMP DATA				MOUNTING DATA				ELECTRICAL CHARACTERISTICS			REMARKS
	FIXTURE	MANUFACTURER	CATALOG NO.	SHIELDING	NOMINAL LUMENS	COLOUR TEMPERATURE	LAMP WATTAGE	LAMP DESIGNATION	LOCATION	METHOD	MOUNTING HEIGHT	CEILING OR WALL FINISH	FIXTURE VOLTAGE	BALLAST/DRIVER TYPE	TOTAL FIXTURE WATTAGE	
L02A	1'x4' LINEAR RECESSED LUMINAIRE	LEDALITE - SIGNIFY	4214D1CRL93530Q13E	LIGHT GUIDE WITH MESOOPTICS	3000lm	3500K	27 W	LED	CEILING	RECESSED	SEE ARCH.	SEE ARCH.	347 V	0-10V DIMMING DRIVER	27 W	SEE NOTE 1.
L04D	4" SQUARE APERTURE LED DOWNLIGHT	SPECTRUM LIGHTING	SDFO4XT20L35KMDDS10-347-CB24-SD4FXT-SG-SOX	----	2000 lm	3500K	24 W	LED	CEILING	RECESSED	SEE ARCH.	SEE ARCH.	347 V	0-10V DIMMING DRIVER	24 W	SEE NOTE 2.
L10	2'x4' LED LAY-IN TROFFER	DAY-BRIGHT CFI - SIGNIFY	2AVEG49L835-4-ACR-347-DIM	FROSTED RIBBED ACRYLIC LENS	4900lm	3500K	44 W	LED	CEILING	RECESSED	SEE ARCH.	SEE ARCH.	347 V	0-10V DIMMING DRIVER	44 W	----
L50	4' GENERAL PURPOSE SUSPENDED STRIP LIGHT	SIGNIFY - DAY-BRIGHT CFI	FSS455L835-347-DIM	FROSTED ACRYLIC LENS	5500lm	3500K	41 W	LED	CEILING	SUSPENDED	3.0m A.F.F.	SEE ARCH.	347 V	0-10V DIMMING DRIVER	41 W	----

LIGHTING FIXTURE SCHEDULE NOTES:

1. LAMPING IN C.S. LED - 80+ CRI, 3500K, CONSTANT CURRENT DRIVER C/W 0-10V DIMMING. REMOTE 347 VOLT TRANSFORMER, INTEGRAL EMERGENCY DRIVER WITH BATTERY BACK-UP WHERE INDICATED. WHITE BODY/TRIM WITH WHITE PAINTED STEEL REFLECTOR, ACRYLIC LENS WITH MICRO OPTICS, SINGLE CIRCUIT. RECESS IN CEILING. COORDINATE CEILING TYPES WITH CONTRACT DOCUMENTS AND SHOP DRAWINGS. PROVIDE ALL REQUIRED MOUNTING BRACKETS, TRIM AND HARDWARE.
2. LED - 80+ CRI, 3500K, 114mm (4.5") SQUARE, CLEAR DIFFUSED CONE FINISH WITH WHITE FLANGED TRIM AND NON ADJUSTABLE, NEW CONSTRUCTION TYPE HOUSING, MEDIUM BEAM SPREAD WITH BEAM SOFTENING OPTICS, C/W 0-10 VOLT DIMMING DRIVER AND 347 VOLT TRANSFORMER (WHERE INDICATED). FIXTURE TO BE C/W INTEGRAL EMERGENCY BATTERY PACK WHERE INDICATED. MAXIMUM HEIGHT 115mm (4-1/2") HIGH HOUSING NORMAL POWER AND 160mm (6-5/16") FIXTURE WITH EM. BATTERY PACK.
3. FURNISH ALL LIGHTING FIXTURES COMPLETE WITH MOUNTING ACCESSORIES TO MEET JOB REQUIREMENTS. VERIFY FIXTURE MOUNTING AND LOCATION AGAINST ARCHITECTS PLANS, ELEVATIONS AND DETAIL DRAWINGS. EXACT LOCATION OF ALL FIXTURES SHALL BE CONFIRMED WITH THE ARCHITECT PRIOR TO ROUGHING IN. REFER TO ARCHITECT \ LIGHTING DESIGNER DRAWINGS AND/OR SPECIFICATIONS FOR ADDITIONAL FIXTURES OR REQUIREMENTS NOT SHOWN IN ELECTRICAL LIGHTING FIXTURE SCHEDULE.
4. FIXTURE SUBMITTAL PACKAGE SHALL BE IN ELECTRONIC SEARCHABLE FORMAT (NOT SCANNED) AND INCLUDE THE FOLLOWING INFORMATION:

   (A). SUMMARY SHEET LISTING ALL THE LIGHT FIXTURES TYPES, THE CATALOG NUMBER FOR EACH, THE QUANTITY OF EACH FIXTURE THE LAMP TYPE AND MANUFACTURER, THE DRIVER AND THE VOLTAGE.
   (B). EACH FIXTURE TYPE SHALL HAVE AN INDIVIDUAL SUMMARY SHEET THAT IDENTIFIES THE FOLLOWING: - FIXTURE TYPE - FIXTURE MANUFACTURER - FIXTURE CATALOG NUMBER - VOLTAGE - SYSTEM WATTAGE (LAMP AND DRIVER) - LAMP MANUFACTURER/CATALOG NUMBER - LAMP TYPE AND QUANTITY PER FIXTURE - DRIVER MANUFACTURER/CATALOG NUMBER - CONTRACTORS COMMENTS
   (C). EACH FIXTURE TYPE SHALL HAVE A FIXTURE SPEC SHEET THAT INCLUDES PHOTOMETRIC DATA, FOLLOWED BY A CUT SHEET OF THE LAMP WHICH IS FOLLOWED BY A CUT SHEET OF THE DRIVER.
   (D). PRODUCT DATA SHALL INCLUDE PHYSICAL DIMENSIONS, AND ANY SPECIAL MOUNTING DETAILS.
5. THE SPECIFIED FIXTURES HAVE BEEN SELECTED FOR PERFORMANCE AND/OR AESTHETIC REASONS. "ALTERNATE MANUFACTURER" AND "OR APPROVED EQUAL" MEANS EQUIVALENT OR SUPERIOR IN PERFORMANCE, MATERIALS, WORKMANSHIP AND APPEARANCE TO THE SPECIFIED EQUIPMENT. FIXTURE SUBSTITUTIONS SHALL ONLY BE CONSIDERED IF: (A) THE SUBMITTING AGENT MUST SUBMIT IN WRITING THE REASONS THAT THIS FIXTURE SHOULD BE CONSIDERED AN EQUAL, TO BE CONSIDERED. THE ACCEPTANCE OR REJECTION OF ANY FIXTURE SUBSTITUTION SHALL BE SOLE DETERMINATION OF THE DESIGN TEAM AND BASED ON, BUT NOT LIMITED TO: OPTICAL PERFORMANCE, CONSTRUCTION QUALITY, AESTHETICS, SHAPE, SIZE, LAMPING, FUNCTIONALITY, ACCESSORIES, LEAD TIMES, COSTS, AND FEATURES. (B) THE SUBSTITUTED FIXTURE SHALL BE ACCOMPANIED BY A CUT SHEET OF THE BASIS OF DESIGN FIXTURE FOR A SIDE BY SIDE COMPARISON. (C) IF REQUESTED BY THE DESIGN TEAM, A WORKING SAMPLE OF THE SUBSTITUTION FIXTURE MUST BE PROVIDED TO THE ARCHITECT. WITHIN 10 WORKING DAYS UPON REQUEST.
6. SERIES FIXTURES SHALL SATISFY LENGTHS AS SHOWN ON THE DRAWINGS. FIXTURE LETTERS SHOWN ONCE ON A CONTINUOUS ROW OF FIXTURES SHALL BE TYPICAL FOR THAT ROW UNLESS OTHERWISE NOTED.
7. ALL FIXTURES SHALL BE SUPPORTED FROM THE BUILDING STRUCTURE, INDEPENDENT OF HUNG CEILING WITH ROD OR JACK CHAIN SUPPORT. STEM LENGTHS, STEM FINISHES AND STEM LOCATIONS OF ALL PENDANT FIXTURES TO BE VERIFIED AND CONFIRMED BY OWNER, ARCHITECT AND ENGINEER PRIOR TO ORDERING STEMS.
8. ELECTRICAL CONTRACTOR SHALL PROVIDE AND INSTALL ALL TRANSFORMERS AND/OR DRIVERS REQUIRED TO OPERATE ALL LAMPS SPECIFIED, INCLUDING REMOTE DRIVERS AND/OR TRANSFORMERS AND THE ENCLOSURES FOR SAME. ELECTRICAL CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFICATION OF COMPATIBILITY BETWEEN LAMPS SPECIFIED, DRIVERS AND/OR TRANSFORMERS SPECIFIED, AND DIMMING AND OTHER CONTROL DEVICES SPECIFIED. NOTIFY ARCHITECT AND ENGINEER CONSULTANT OF ANY INCOMPATIBILITY PRIOR TO ORDERING EQUIPMENT.
9. ELECTRICAL SUBCONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE COORDINATION OF ALL LIGHTING EQUIPMENT AND CONTROL DEVICES WITH CEILING AND WALL TYPES SPECIFIED PRIOR TO ORDERING LIGHTING EQUIPMENT.
10. PRELIMINARY AIMING OF ALL ADJUSTABLE LIGHTING EQUIPMENT SHALL BE DONE DURING INSTALLATION BY THE ELECTRICAL CONTRACTOR AS INDICATED ON THE LIGHTING PLANS / AIMING DIAGRAM, WHERE SUCH A DIAGRAM IS INCLUDED IN CONTRACT DOCUMENTS OR AS AN ADDENDUM. FINAL AIMING OF ALL ADJUSTABLE LIGHTING EQUIPMENT SHALL BE DONE BY THE ELECTRICAL CONTRACTOR AS DIRECTED BY THE ARCHITECT.
11. INSTALL CONES IN WALL WASHERS WITH CUTOUT(S) IN INNER REFLECTOR FACING WALL(S)TO BE LIT.
12. UNLESS NOTED TO THE CONTRARY PROVIDE WHITE CEILING TRIMS FOR ALL RECESSED LUMINAIRES.
13. RELAYS USED FOR CONTROL OF LIGHTING (IF ANY) SHALL BE LOCATED AND THE LOCATION SOUNDPROOFED SO AS TO BE INAUDIBLE FROM NORMALLY OCCUPIED AREAS WHEN ACTIVATED.
14. TO ASSURE THE MINIMIZATION OF NOISE, FIXTURES MUST BE MOUNTED SECURELY TO THE SUPPORTING STRUCTURE, AND ALL LOOSE INTERNAL PARTS MUST BE SECURELY TIGHTENED BEFORE ACTIVATING CIRCUITS. WHERE TRANSFORMERS HAVE SELECTOR SWITCHES TO ALLOW USE OF VARIOUS WATTAGE LAMPS, THESE SWITCHES MUST BE SET TO THE WATTAGE OF THE SPECIFIED LAMP.

EXISTING PANEL LP-005

LOCATION: EXISTING ELECTRICAL... **MOUNTING:** SURFACE **MAINS TYPE:** MLO **MANUFACTUR...** SQUARE D
SUPPLY FROM: DP-004 **ENCLOSURE:** TYPE 1 **MAINS RATING:** 125 A **MODEL:** I-LINE (CIRCUIT BREAKER TYPE)
SERVICE: 347/600 Wye, 3Φ, 4W **A.I.C. RATING:** 50kA

LOAD DESCRIPTION	LOAD	WIRE	BREAKER	ACC	CCT	A	B	C	CCT	ACC	BREAKER	WIRE	LOAD	LOAD DESCRIPTION
EXISTING PANEL LP-028	0 W		60 A, 3P	EX	1	0 VA / 0 VA			2	--	15 A, 1P	--	--	EXISTING (LIGHTS SHELL RM LVL 5 PAV C)
					3		0 VA / 0 VA		4	--	15 A, 1P	--	--	EXISTING (LIGHTS-LVL 5 PAV C & EAST...
					5			0 VA / 0 VA	6	--	15 A, 1P	--	--	EXISTING (LIGHTS ELEC LAB LVL 5 PAV C)
EXISTING (LIGHTS MECH RMS LVL 6 PAV C)	--	--	15 A, 1P	--	7	0 VA / 0 VA			8	--	20 A, 1P	--	--	EXISTING SPARE
EXISTING (LIGHTS ELEC RM LVL 6 PAV C)	--	--	15 A, 1P	--	9		0 VA / 0 VA		10	--	20 A, 1P	--	--	EXISTING SPARE
EXISTING (LIGHTS GEN RM LVL 6 PAV C)	--	--	15 A, 1P	--	11			0 VA / 0 VA	12	--	20 A, 1P	--	--	EXISTING SPARE
LIGHTING-WORKSPACE 5109	910 W	12	15 A, 1P	NW	13	958 VA / 0 VA			14	--	20 A, 1P	--	--	EXISTING SPARE
LTG.-MEET. RM. 5109B,LAB 5109C, OFF. 5109A	646 W	12	15 A, 1P	NW	15		668 VA / 0 VA		16					
					17				18					
					19				20					
					21				22					
					23				24					
					25				26					
					27				28					
					29				30					
					31				32					
					33				34					
					35				36					
					37				38					
					39				40					
					41				42					
			TOTAL WATTS			958 VA	668 VA	0 VA						
			TOTAL AMPS			3 A	2 A	0 A						

COMMENTS: BREAKER ACCESSORIES (ACC):
* - INDICATES BREAKER C/W LOCK-ON DEVICE

ES - INDICATES EXISTING SPARE BREAKER
EX - INDICATES EXISTING CONNECTED LOAD AND BREAKER TO REMAIN
NW - INDICATES NEW BREAKER (CONNECTED TO NEW LOAD) TO BE INSTALLED IN PANEL. SUPPLY AND INSTALL NEW BRANCH CIRCUIT BREAKER AS INDICATED IN EXISTING PANELBOARD. TYPE AND IC RATING TO MATCH EXISTING, C/W MOUNTING HARDWARE. RUN CONDUIT AND WIRING AND MAKE FINAL CONNECTIONS.

CONNECTED LOAD	1625 VA
ESTIMATED DEMAND	1625 VA
TOTAL CONNECTED CURRENT	2 A
TOTAL ESTIMATED DEMAND CURRENT	2 A

EXISTING PANEL EMG-026

LOCATION: EXISTING ELECTRICAL... **MOUNTING:** SURFACE **MAINS TYPE:** MLO **MANUFACTUR...** SQUARE D
SUPPLY FROM: **ENCLOSURE:** TYPE 1 **MAINS RATING:** 125 A **MODEL:** I-LINE (CIRCUIT BREAKER TYPE)
SERVICE: 347/600 Wye, 3Φ, 4W **A.I.C. RATING:** **BREAKERS:**

LOAD DESCRIPTION	LOAD	WIRE	BREAKER	ACC	CCT	A	B	C	CCT	ACC	BREAKER	WIRE	LOAD	LOAD DESCRIPTION
EXISTING PANEL EMG-027 (VIA TRANSFORMER CSF-LVTR-017)	16500 W		15 A, 3P	EX	1	6000 VA / 0 VA			2					
					3		5000 VA / 0 VA		4					
					5			5500 VA / 0 VA	6					
LTG.-WKSP. 5109, OFFICE 5109A, LAB 5109C	**614 W**	**12**	**15 A, 1P**	**NW**	7	642 VA / 0 VA			8					
					9				10					
					11				12					
					13				14					
					15				16					
					17				18					
					19				20					
					21				22					
					23				24					
					25				26					
					27				28					
					29				30					
					31				32					
					33				34					
					35				36					
					37				38					
					39				40					
					41				42					
			TOTAL WATTS			6616 VA	5000 VA	5500 VA						
			TOTAL AMPS			19 A	14 A	16 A						

COMMENTS: BREAKER ACCESSORIES (ACC):
* - INDICATES BREAKER C/W LOCK-ON DEVICE

ES - INDICATES EXISTING SPARE BREAKER
EX - INDICATES EXISTING CONNECTED LOAD AND BREAKER TO REMAIN
NW - INDICATES NEW BREAKER (CONNECTED TO NEW LOAD) TO BE INSTALLED IN PANEL. SUPPLY AND INSTALL NEW BRANCH CIRCUIT BREAKER AS INDICATED IN EXISTING PANELBOARD. TYPE AND IC RATING TO MATCH EXISTING, C/W MOUNTING HARDWARE. RUN CONDUIT AND WIRING AND MAKE FINAL CONNECTIONS.

CONNECTED LOAD	17115 VA
ESTIMATED DEMAND	17115 VA
TOTAL CONNECTED CURRENT	16 A
TOTAL ESTIMATED DEMAND CURRENT	16 A

Autodesk Docs://0230-55 MUN CSF 5TH FL/JBC-24-C-156 Elec Central_V24_2025.02.07.rvt

Architect Prime Consultant

FOUGERE MENCHENTON ARCHITECTURE

Discipline: ELECTRICAL

Sub-Consultant: Mechanical/ Electrical

JEWER BAILEY CONSULTANTS
STRUCTURAL · MECHANICAL · ELECTRICAL

PROVINCE OF NEWFOUNDLAND AND LABRADOR
PERMIT HOLDER
This Permit Allows
JEWER BAILEY CONSULTANTS ULC
MIRC:
To practice Professional Engineering in Newfoundland and Labrador.
Permit No. as issued by PEG N0540
which is valid for the year 2025.

Sub-Consultant:

Client: MEMORIAL UNIVERSITY OF NEWFOUNDLAND

Drawn: E.D.	Checked: D.C.
Designed: E.D.	Approved: D.C.

Consultants Project No.: JBC-24-C-156

Professional Stamp & Permit.

REGISTERED PROFESSIONAL ENGINEER — PEG — DUSTIN O'COLE — SIGNATURE — 2025.07.03 — DATE — NEWFOUNDLAND & LABRADOR

Notes:

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No.	Revisions	MM/DD/YY
0	ISSUED FOR TENDER	2025.07.03
D	ISSUED FOR 90% REVIEW	2025.05.06
C	ISSUED FOR 66% REVIEW	2025.03.31
B	ISSUED FOR 33% REVIEW	2025.02.14
A	ISSUED FOR CLIENT REVIEW	2025.01.17

Drawing Nomenclature

Detail/Section No. 3 / A-1 — Dwg. No. where detailed

PROJECT TITLE

CERC FIT UP

Client's Project No.: CFS-103-23

DRAWING TITLE

ELECTRICAL SCHEDULES AND DETAILS

SCALE	DRAWING NO.
DATE: 2025.07.03	E601
REVISION NO.: 0	7/9/2025 9:12:29 AM

EXISTING PANEL EMG-027

LOCATION: EXISTING CORRIDOR... | **MOUNTING:** RECESSED | **MAINS TYPE:** MCB | **MANUFACTURER:** SQUARE D
SUPPLY FROM: CSF-LVTR-017 | **ENCLOSURE:** TYPE 1 - SPRINKLERPROOF | **MAINS RATING:** 100 A | **MODEL:** NQ (CIRCUIT BREAKER TYPE)
SERVICE: 120/208 Wye, 3ϕ, 4W | **A.I.C. RATING:** 25kA | **MCB RATING:** 100 A | **BREAKERS:** TYPE QOB

LOAD DESCRIPTION	LOAD	WIRE	BREAKER	ACC	CCT	A	B	C	CCT	ACC	BREAKER	WIRE	LOAD	LOAD DESCRIPTION
EXISTING (Smoke Fire Damper, Level 5C)	500 W		20 A, 1P	EX	1	500 VA / 500 VA			2	EX	20 A, 1P		500 W	EXISTING (Elec room 5A FACP)
EXISTING (Smoke Fire Damper, Level 5C, Sha...	500 W		20 A, 1P	EX	3		500 VA / 500 VA		4	EX	20 A, 1P		500 W	EXISTING (Smoke fire damper, Level 4'C')
EXISTING (Smoke Fire Damper, Level 5C, Sha...	500 W		20 A, 1P	EX	5			500 VA / 500 VA	6	EX	20 A, 1P		500 W	EXISTING (Smoke fire damper, Level 4'C')
EXISTING (VESDA control panel)	500 W		15 A, 1P	EX	7	500 VA / 500 VA			8	EX	20 A, 1P		500 W	EXISTING (Smoke fire damper, Level 4'C', Shaft)
EXISTING SPARE	--	--	20 A, 1P	--	9		0 VA / 500 VA		10	EX	20 A, 1P		500 W	EXISTING (RPS & FATC, Penthouse (6104))
EXISTING (Elevator PE-3 cab ltg. & fan disc. sw.)	500 W		20 A, 1P	EX	11			500 VA / 500 VA	12	EX	20 A, 1P		500 W	EXISTING (Smoke fire damper, Level 4'C', Shaft)
EXISTING (Elevator PE-4 cab ltg. & fan disc. sw.)	500 W		20 A, 1P	EX	13	500 VA / 500 VA			14	EX	20 A, 1P		500 W	EXISTING (Elec room 3A FACP)
EXISTING (Elevator FE-3&4 cab grp. oper....	500 W		20 A, 1P	EX	15		500 VA / 500 VA		16	EX	20 A, 1P		500 W	EXISTING (RPS & FATC, Level 4C Elec. Rm.)
EXISTING (Snow Melt Panels, Roof Adjacent UC Connection (North PAV 'C')	500 W		30 A, 2P	EX	17			500 VA / 500 VA	18	EX	20 A, 1P		500 W	EXISTING (Elevator FE-3 cab ltg. & fan disc. sw.)
					19	0 VA / 500 VA			20	EX	20 A, 1P		500 W	EXISTING (Elevator FE-3 cab grp. oper. remote...
EXISTING (Snow Melt Panels, Roof Adjacent UC Connection (North PAV 'C')	500 W		30 A, 2P	EX	21		500 VA / 500 VA		22	EX	20 A, 1P		500 W	EXISTING (Smoke fire damper, Level 4'C', Sha...
					23			0 VA / 500 VA	24	EX	15 A, 1P		500 W	EXISTING (Smoke fire damper, Level 4'C', Sha...
EXISTING (Snow Melt Panels, Roof Adjacent UC Connection (North PAV 'C')	500 W		30 A, 2P	EX	25	500 VA / 500 VA			26	EX	20 A, 1P		500 W	EXISTING (Smoke fire damper, Level 4'C', Sha...
					27		0 VA / 500 VA		28	EX	15 A, 1P		500 W	EXISTING (Smoke fire damper, Level 4'C', Sha...
EXISTING (Snow Melt Panels, Roof Adjacent UC Connection (North PAV 'C')	500 W		30 A, 2P	EX	29			500 VA / 500 VA	30	EX	20 A, 1P		500 W	EXISTING (Smoke fire damper, Level 4'C', Sha...
					31	0 VA / 500 VA			32	EX	20 A, 1P		500 W	EXISTING (Smoke fire damper, Level 4'C')
CSFDs - WORKSPACE 5109	**1000 W**	**+ 10**	**20 A, 1P**	NW	33		1000 VA / 0 VA		34					
CSFDs - WORKSPACE 5109	**1000 W**	**+ 10**	**20 A, 1P**	NW	35			1000 VA / 0 VA	36					
CSFDs - MEETING RM. 5109B,LAB 5109C	**1000 W**	**+ 10**	**20 A, 1P**	NW	37	1000 VA / 0 VA			38					
					39				40					
					41				42					
			TOTAL WATTS			6000 VA	5000 VA	5500 VA						
			TOTAL AMPS			51 A	42 A	46 A						

COMMENTS:
BREAKER ACCESSORIES (ACC):
* - INDICATES BREAKER C/W LOCK-ON DEVICE
+ - INDICATES 2 HOUR FIRE RATED CABLE

ES - INDICATES EXISTING SPARE BREAKER
EX - INDICATES EXISTING CONNECTED LOAD AND BREAKER TO REMAIN
NW - INDICATES NEW BREAKER (CONNECTED TO NEW LOAD) TO BE INSTALLED IN PANEL. SUPPLY AND INSTALL NEW BRANCH CIRCUIT BREAKER AS INDICATED IN EXISTING PANELBOARD. TYPE AND IC RATING TO MATCH EXISTING, C/W MOUNTING HARDWARE.

CONNECTED LOAD	16500 VA
ESTIMATED DEMAND	16500 VA
TOTAL CONNECTED CURRENT	46 A
TOTAL ESTIMATED DEMAND CURRENT	46 A

NEW PANEL PP-037

LOCATION: EXISTING CORRIDOR CSF-51C1 | **MOUNTING:** RECESSED | **MAINS TYPE:** MCB
SUPPLY FROM: DP-022 | **ENCLOSURE:** TYPE 1 - SPRINKLERPROOF | **MAINS RATING:** 225 A
SERVICE: 120/208 Wye, 3ϕ, 4W | **A.I.C. RATING:** 10kA | **MCB RATING:** 225 A

LOAD DESCRIPTION	LOAD	WIRE	BREAKER	ACC	CCT	A	B	C	CCT	ACC	BREAKER	WIRE	LOAD	LOAD DESCRIPTION
WRKSTN. RECEPTS.-WORKSPACE 5109	1000 W	12	20 A, 1P		1	1000 VA / 1250 VA			2		20 A, 1P	12	1250 W	WRKSTN. RECEPTS.-WORKSPACE 5109
WRKSTN. RECEPTS.-WORKSPACE 5109	1000 W	12	20 A, 1P		3		1000 VA / 1250 VA		4		20 A, 1P	12	1250 W	WRKSTN. RECEPTS.-WORKSPACE 5109
WRKSTN. RECEPTS.-WORKSPACE 5109	1000 W	12	20 A, 1P		5			1000 VA / 1000 VA	6		20 A, 1P	12	1000 W	WRKSTN. RECEPTS.-WORKSPACE 5109
WRKSTN. RECEPTS.-WORKSPACE 5109	1000 W	12	20 A, 1P		7	1000 VA / 750 VA			8		20 A, 1P	12	750 W	WRKSTN. RECEPTS.-WORKSPACE 5109
WRKSTN. RECEPTS.-WORKSPACE 5109	750 W	12	20 A, 1P		9		750 VA / 750 VA		10		20 A, 1P	12	750 W	WRKSTN. RECEPTS.-WORKSPACE 5109
WRKSTN. RECEPTS.-WORKSPACE 5109	750 W	12	20 A, 1P		11			750 VA / 1000 VA	12		20 A, 1P	12	1000 W	WRKSTN. RECEPTS.-WORKSPACE 5109
WRKSTN. RECEPTS.-WORKSPACE 5109	500 W	12	20 A, 1P		13	500 VA / 700 VA			14		20 A, 1P	12	700 W	RECEPTS.-DIRECTOR OFFICE 5109A
WRKSTN. RECEPTS.-WORKSPACE 5109	750 W	12	20 A, 1P		15		750 VA / 600 VA		16	IG	20 A, 1P	12	600 W	RECEPTS.-MEETING ROOM 5109B
WRKSTN. RECEPTS.-WORKSPACE 5109	1000 W	12	20 A, 1P		17			1000 VA / 400 VA	18	IG	20 A, 1P	12	400 W	RECEPTS.-MEETING ROOM 5109B
WRKSTN. RECEPTS.-WORKSPACE 5109	1000 W	12	20 A, 1P		19	1000 VA / 1000 VA			20	IG	20 A, 1P	12	1000 W	RECEPTS.-TV DISPLAY-5109B, 5109C
WRKSTN. RECEPTS.-WORKSPACE 5109	1000 W	12	20 A, 1P		21		1000 VA / 600 VA		22	IG	20 A, 1P	12	600 W	RECEPTS.-LAB 5109C
WRKSTN. RECEPTS.-WORKSPACE 5109	1000 W	12	20 A, 1P		23			1000 VA / 600 VA	24	IG	20 A, 1P	12	600 W	RECEPTS.-LAB 5109C
RECEPTS.-FLR. BOX, TV DISP.-WKSP. 5109	1000 W	12	20 A, 1P	IG	25	1000 VA / 600 VA			26		15 A, 1P	12	600 W	CONTROLS - AIR TERMINAL BOXES
REFRIGERATOR-WORKSPACE 5109	1100 W	12	20 A, 1P		27		1100 VA / 600 VA		28		15 A, 1P	12	600 W	CONTROLS - AIR TERMINAL BOXES
RECEPTS.-WORKSPACE 5109	800 W	12	20 A, 1P		29			800 VA / 0 VA	30	--	20 A, 1P	--	--	SPARE
RECEPTS.-WORKSPACE 5109	800 W	12	20 A, 1P		31	800 VA / 0 VA			32	--	20 A, 1P	--	--	SPARE
RECEPTS.-WORKSPACE 5109	600 W	12	20 A, 1P		33		600 VA / 0 VA		34	--	20 A, 1P	--	--	SPARE
AUTO. DOOR OPERATORS-WORKSPACE...	1000 W	12	15 A, 1P	*	35			1000 VA / 0 VA	36	--	15 A, 1P	--	--	SPARE
RECEPTS.-FACILITIES MGMT. SPACE 5104A	750 W	12	20 A, 1P		37	750 VA / 0 VA			38	--	15 A, 1P	--	--	SPARE
WRKSTN. RECEPTS.-FACILITIES MGMT....	1000 W	12	20 A, 1P		39		1000 VA / 0 VA		40					
WRKSTN. RECEPTS.-FACILITIES MGMT....	400 W	12	20 A, 1P		41			400 VA / 0 VA	42					
RECEPTS.-FACILITIES MGMT. SPACE 5104A	750 W	12	20 A, 1P		43	750 VA / 0 VA			44					
REFRIGERATOR-FACILITIES MGMT 5104A	1100 W	12	20 A, 1P		45		1100 VA / 0 VA		46					
					47				48					
					49				50					
					51				52					
					53				54					
					55				56					
					57				58					
					59				60					
					61				62					
					63				64					
					65				66					
					67				68					
					69				70					
					71				72					
			TOTAL WATTS			11100 VA	11100 VA	8950 VA						
			TOTAL AMPS			95 A	95 A	75 A						

COMMENTS: THIS PANEL TO BE C/W AN ISOLATED GROUND BUS.

BREAKER ACCESSORIES/COMMENTS (ACC):
* - INDICATES BREAKER C/W LOCK-ON DEVICE
IG - INDICATES THIS CIRCUIT REQUIRES AN ISOLATED GROUND WIRE, ALL RECEPTACLES ON THAT CIRCUIT SHALL RECEIVE THE ISOLATED GROUND AND SYSTEM GROUND WIRES.

CONNECTED LOAD	31150 VA
ESTIMATED DEMAND	21925 VA
TOTAL CONNECTED CURRENT	86 A
TOTAL ESTIMATED DEMAND CURRENT	61 A

Architect Prime Consultant
FOUGERE MENCHENTON ARCHITECTURE

Discipline
ELECTRICAL

Sub-Consultant: Mechanical/ Electrical
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STRUCTURAL · MECHANICAL · ELECTRICAL

PROVINCE OF NEWFOUNDLAND AND LABRADOR
PEGNL
PERMIT HOLDER
This Permit Allows
JEWER BAILEY CONSULTANTS ULC
MIRC:
To practice Professional Engineering in Newfoundland and Labrador.
Permit No. as issued by PEG N0540
which is valid for the year 2025.

Sub-Consultant:

Client:
MEMORIAL UNIVERSITY OF NEWFOUNDLAND

Drawn: E.D.	Checked: D.C.
Designed: E.D.	Approved: D.C.

Consultants Project No.
JBC-24-C-156

Professional Stamp & Permit.
REGISTERED PROFESSIONAL ENGINEER
PEGNL
DUSTIN O. COLE
SIGNATURE
2025.07.03
DATE
NEWFOUNDLAND & LABRADOR

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No.	Revisions	MM/DD/YY
0	ISSUED FOR TENDER	2025.07.03
D	ISSUED FOR 90% REVIEW	2025.05.06
C	ISSUED FOR 66% REVIEW	2025.03.31
B	ISSUED FOR 33% REVIEW	2025.02.14
A	ISSUED FOR CLIENT REVIEW	2025.01.17

Drawing Nomenclature
Detail/Section No. → 3 / A-1 ← Dwg. No. where detailed

PROJECT TITLE
CERC FIT UP

Client's Project No.: CFS-103-23

DRAWING TITLE
ELECTRICAL SCHEDULES AND DETAILS

SCALE	DRAWING NO. E602
DATE 2025.07.03	
REVISION NO. 0	7/9/2025 9:12:29 AM

TECHNOLOGY JUNCTION BOX LEGEND

TYPE			DIMENSIONS							
TAG	MOUNTING	FUNCTION	HEIGHT (mm)	WIDTH (mm)	DEPTH (mm)	ENCLOSURE DESCRIPTION	ENCLOSURE MAKE & MODEL	MOUNTING STYLE	REFERENCE DETAIL	NOTES	LEVEL
J5	WALL	AV I/O PANEL - SMALL	120	120	50	PULL BOX W/RAISED TWO-DEVICE COVER	RACO 258, 259 OR 265	500mm A.F.F. - FLUSH (UNLESS INDICATED OTHERWISE)	--	[A]	LEVEL 5
J7	WALL	EXTRON TOUCH PANEL	120	120	50	PULL BOX W/ DUAL GANG MUDRING	RACO 258, 259 OR 265	2135mm A.F.F. - FLUSH (UNLESS INDICATED OTHERWISE)		[A], SUPPLY AND INSTALL 27mm CONDUIT CONSEALED IN WALL FROM BOX TO A/V BOX BEHIND FLAT PANEL DISPLAY.	LEVEL 5
J8	WALL	FUTURE LECTURE CAPTURE EQUIPMENT	120	120	50	PULL BOX W/ DUAL GANG MUDRING, C/W STAINLESS STEEL BLANK COVER PLATE.	RACO 258, 259 OR 265	2135mm A.F.F. - FLUSH (UNLESS INDICATED OTHERWISE). CONFIRM MOUNTING HEIGHT PRIOR TO ROUGH-IN.		[A]. SUPPLY AND INSTALL 27mm CONDUIT CONSEALED IN WALL FROM BOX TO CEILING SPACE.	LEVEL 5

TECHNOLOGY NETWORK JUNCTION BOX LEGEND

TYPE			DIMENSIONS							
TAG	MOUNTING	FUNCTION	HEIGHT (mm)	WIDTH (mm)	DEPTH (mm)	ENCLOSURE DESCRIPTION	ENCLOSURE MAKE & MODEL	MOUNTING STYLE	REFERENCE DETAIL	NOTES	LEVEL
N2A	WALL	NETWORK OUTLET - STANDARD	94	60	69	PULL BOX W/RAISED SINGLE-DEVICE COVER	RACO 258, 259 OR 265	450mm A.F.F. - FLUSH (UNLESS OTHERWISE INDICATED)		[A], [B], [C]	LEVEL 5
N2B	WALL	NETWORK OUTLET - STANDARD	120	120	50	PULL BOX W/RAISED SINGLE-DEVICE COVER	RACO 258, 259 OR 265	450mm A.F.F. - FLUSH (UNLESS OTHERWISE INDICATED)		[A], [B], [C]	LEVEL 5
N2C	SYSTEMS FURNITURE	NETWORK OUTLET - STANDARD	120	120	50	OUTLET BOX WITHIN SYSTEMS FURNITURE. COORDINATE WITH FURNITURE SUPPLIER PRIOR TO INSTALLATION.	---	MOUNTED WITHIN SYSTEMS FURNITURE. COORDINATE WITH FURNITURE SUPPLIER PRIOR TO INSTALLATION.			LEVEL 5
N8G	CEILING	NETWORK OUTLET - WAP CEILING	120	120	50	PULL BOX W/BLANK COVER	RACO 258, 259 OR 265	500mm ABOVE LAY-IN/GYPSUM CEILING		[B]	LEVEL 5

DOOR CARD ACCESS SYSTEMS

RTE — REQUEST TO EXIT

PS — POWER SUPPLY FOR CARD ACCESS - ELECTRICAL TO RUN A 120 VOLT SUPPLY TO EACH LOCATION AND SHALL ALSO PROVIDE CONDUITS FOR LOW VOLTAGE WIRING FROM THE POWER SUPPLY TO DOOR FRAME. (TWO 21mm CONDUITS TO EACH DOOR FRAME)

BUILDING ACCESS/CONTROL SYSTEMS

MAG — MAGNETIC DOOR LOCK

DO — AUTOMATIC DOOR OPERATOR

PB — PUSHBUTTON FOR DOOR OPERATOR - EXACT LOCATION AS PER ARCHITECTURAL. ELECTRICAL TO PROVIDE BOXES AT PUSHBUTTON LOCATIONS AND PROVIDE CONDUIT FROM PUSHBUTTON TO DOOR OPERATOR, LOW VOLTAGE WIRING BY DOOR HARDWARE INSTALLER

PS — POWER SUPPLY FOR DOOR HARDWARE - ELECTRICAL TO RUN A 120 VOLT SUPPLY TO EACH LOCATION AND SHALL ALSO PROVIDE CONDUITS FOR LOW VOLTAGE WIRING FROM THE POWER SUPPLY TO DOOR FRAME. (TWO 21mm CONDUITS TO EACH DOOR FRAME)

TELECOMMUNICATION SYSTEMS

△ — NETWORK WALL OUTLET

▲ — NETWORK CEILING MOUNTED OUTLET

□ — JUNCTION BOX - WALL MOUNTED. TAG INDICATES TYPE. REFER TO TECHNOLOGY JUNCTION BOX LEGEND FOR DESCRIPTION AND DETAILS.

⊠ — DATA CABLE MANAGEMENT SERVICE POLE -SUPPLIED AND INSTALLED BY FURNITURE SUPPLIER. ELECTRICAL CONTRACTOR TO RUN DATA CABLING FROM DATA OUTLETS IN SYSTEM FURNITURE, HORIZONTALLY WITHIN CHANNELS IN FURNITURE PARTITION PANELS, THROUGH TO SERVICE POLE, UP VERTICALLY WITHIN SERVICE POLE IN SEPARATE CHANNEL, THROUGH CONDUIT TO CLOSEST RUN OF BASKET TRAY TO DATA RACKS.

CONDUIT SIZE DESIGNATION

INCHES	METRIC DESIGNATOR
1/2	16mm
3/4	21mm
1	27mm
1 1/4	35mm
1 1/2	41mm
2	53mm
2 1/2	63mm
3	78mm
3 1/2	91mm
4	103mm
5	129mm
6	155mm
8	200mm

SECURITY SYSTEMS

CR — CARD READER

DRAWING NUMBERING SYSTEM

TXXX

- T — TECHNOLOGY INFRASTRUCTURE PLANT/AREA/FACILITY/ BUILDING NUMBER
- XX — SUBSYSTEM NUMBER
- XX — SEQUENTIAL NUMBER

SUBSYSTEM NUMBER

0XX LEGEND	5XX ELECTRICAL DETAILS
1XX DEMOLITION	6XX ELECTRICAL SCHEDULES
2XX ELECTRICAL DISTRIBUTION PLANS	7XX SINGLE LINE DIAGRAMS
3XX LIGHTING SYSTEMS PLANS	
4XX POWER SYSTEMS PLANS	

TECHNOLOGY SYMBOLS NUMBERING SYSTEM

N2A

- N — N-NUMBER DESIGNATES BOX-TYPE AND MOUNTING STYLE.
- 2 — LETTER DESIGNATES CABLE TYPE AND QUANTITY AS PER TELECOM CABLING LEGEND.
- A

TELECOM CABLING LEGEND

TYPE	CABLING	DETAIL
A	(1) CAT6 CABLE	7/T701
B	(2) CAT6 CABLES	6/T701
G	(2) CAT6A CABLES	

LIST OF DRAWINGS

T001	TECHNOLOGY INFRASTRUCTURE LEGEND
T401	REVISED DATA FLOOR PLAN - LEVEL 5, PAV-A
T701	TECHNOLOGY INFRASTRUCTURE DETAILS

LEGEND NOTES

[A] RACO JUNCTION BOXES W/RAISED DEVICE COVERS
PROVIDE A RAISED SINGLE OR TWO DEVICE COVER AS SPECIFIED OF APPROPRIATE DEPTH TO MATCH WALL THICKNESS.

[B] POWER RECEPTACLES ADJACENT STANDARD NETWORK WALL OUTLETS
N2 STANDARD NETWORK WALL OUTLETS SHOULD HAVE A DUPLEX POWER RECEPTACLE LOCATED WITHIN 36" OF THE TELECOMMUNICATIONS WALL OUTLET. IDEALLY, THE NETWORK OUTLET BOX WILL BE MOUNTED TO ONE SIDE OF A STUD, AND THE POWER BOX TO THE OPPOSITE SIDE OF THE STUD. SEE 4/T701

[C] NO SUBSTITUTION NO KNOWN EQUIVALENT FOR THIS DEVICE

GENERAL NOTES

SUBSTITUTIONS
THE MANUFACTURER AND MODEL OF JUNCTION BOXES NAMED IN THE TECHNOLOGY SYMBOLS LEGEND HAVE BEEN LISTED TO ESTABLISH THE DESIRED LEVEL OF QUALITY AND PERFORMANCE FOR EACH DEVICE. UNLESS OTHERWISE INDICATED, THE INSTALLING CONTRACTOR MAY SUBSTITUTE THESE DEVICES WITH EQUIVALENT PRODUCT BY OTHER MANUFACTURERS.

DEVICE MOUNTING
DEVICE SPECIFIED MOUNTING STYLE ELEVATIONS ARE "ON CENTER" UNLESS OTHERWISE NOTED.

JUNCTION BOX COVERS
UNLESS OTHERWISE DIRECTED, ALL JUNCTION BOXES MUST BE PROVIDED WITH A COVER. WHERE RAISED DEVICE COVERS ARE SPECIFIED IN THE SCHEDULE, MATCH COVER DEPTH TO WALL THICKNESS. WHERE JUNCTION BOXES ARE MOUNTED AT OR ABOVE FINISHED CEILING HEIGHT, INSTALL JUNCTION BOX WITH OPEN SIDE FACING DOWN.

CONDUIT RUNS:
ALL CONDUIT RUNS SHALL BE STEEL, THIN-WALL ELECTRICAL METALLIC TUBING (EMT) UNLESS OTHERWISE INDICATED. CONDUIT SIZES AND TERMINATIONS SHALL BE AS INDICATED ON THE TECHNOLOGY SYSTEMS INFRASTRUCTURE DRAWINGS. CONDUIT ROUTING IS AT CONTRACTOR'S DISCRETION BUT THE CONTRACTOR SHALL PROVIDE A PULL BOX IMMEDIATELY BEFORE AND AFTER ANY CONDUIT RUN SECTION CONTAINING TWO NINETY-DEGREE TURNS, OR ANY SINGLE RUN EXCEEDING FIFTY FEET IN LENGTH REGARDLESS OF WHETHER PULL BOXES ARE SHOWN ON THE DRAWINGS OR NOT. ALL CONDUIT RUNS SHALL BE PROVIDED WITH A PULL STRING. REFER TO DIVISION 26 CONDUIT SPECIFICATION FOR PRODUCTS AND INSTALLATION REQUIREMENTS.

CONDUIT STUBS:
PROVIDE A NYLON BUSHING ON ALL CONDUIT STUBS AND NON-TERMINATED CONDUIT ENDS TO PROTECT WIRE PULLS.

POWER RECEPTACLES:
POWER RECEPTACLES INDICATED ON THE TECHNOLOGY INFRASTRUCTURE DRAWINGS ARE SHOWN FOR COORDINATION PURPOSES ONLY. REFER TO THE ELECTRICAL DRAWINGS FOR COMPLETE POWER LAYOUTS AND CIRCUITING DETAILS.

GROUND COMMUNICATIONS SYSTEMS AND EQUIPMENT IN ACCORDANCE WITH ANSI/TIA/EIA-607 GROUNDING STANDARD AND APPLICABLE CEC REQUIREMENTS EXCEPT WHERE THE DRAWINGS OR SPECIFICATIONS EXCEED CEC REQUIREMENTS. ALL RACKS, METALLIC BACKBOARDS, CABLE SHEATHS, METALLIC STRENGTH MEMBERS, SPLICE CASES, CABLE TRAYS, ETC. ENTERING OR RESIDING IN TECHNICAL EQUIPMENT SPACES SHALL BE GROUNDED TO THEIR RESPECTIVE GROUND SYSTEM USING A MINIMUM #6 AWG COPPER BONDING CONDUCTOR AND COMPRESSION CONNECTORS. ALL WIRES USED FOR TECHNICAL POWER SYSTEMS GROUNDING PURPOSES SHALL BE IDENTIFIED WITH GREEN INSULATION OR IDENTIFIED AT EACH TERMINATION POINT WITH A WRAP OF GREEN TAPE. ALL CABLES AND BUS BARS SHALL BE IDENTIFIED AND LABELED "TECHNICAL POWER SYSTEM GROUND".

FIRESTOPPING:
PROVIDE THROUGH-PENETRATION FIRE STOP SYSTEMS TO PREVENT THE SPREAD OF FIRE THROUGH OPENINGS MADE IN FIRE-RATED WALLS OR FLOORS TO ACCOMMODATE PENETRATING ITEMS SUCH AS CONDUIT, CABLES AND CABLE RACEWAYS. FIRE STOP SHALL RESTORE FLOOR AND WALL TO ORIGINAL FIRE RATED INTEGRITY AND SHALL BE WATERPROOF. THE FIRE STOP SYSTEMS AND PRODUCTS SHALL HAVE BEEN TESTED IN ACCORDANCE WITH ULC PROCEDURES AND MATERIALS SHALL BE ULC CLASSIFIED AS MATERIALS FOR USE IN THROUGH-PENETRATION FIRE STOPS.

THE FIRE STOP SYSTEM SHALL COMPLY WITH THE CEC AND WITH NFPA 101-LIFE SAFETY CODE (LATEST EDITION) AND SHALL BE MADE AVAILABLE FOR INSPECTION BY THE LOCAL INSPECTION AUTHORITIES PRIOR TO CABLE SYSTEM ACCEPTANCE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE FIRE RATING OF ALL WALLS AND FLOORS HAVING CABLING PENETRATIONS. COORDINATE SEALANT INSTALLATION WITH WORK OF OTHER TRADES. REFER TO GENERAL AND/OR ELECTRICAL SPECIFICATION SECTIONS FOR FURTHER MATERIAL AND INSTALLATION PARAMETERS. COORDINATE INSTALLATION WITH THE GENERAL CONTRACTOR ON SITE.

FIRE STOP SYSTEMS SHALL BE UL/ULC CLASSIFIED TO ASTM E814 (UL1479) AND SHALL BE APPROVED BY A QUALIFIED PROFESSIONAL ENGINEER, LICENSED IN THE PROVINCE WHERE THE WORK IS TO BE PERFORMED. A DRAWING SHOWING THE PROPOSED FIRE STOP SYSTEM, STAMPED/EMBOSSED BY THE PROFESSIONAL ENGINEER. SHALL BE PROVIDED TO THE OWNER'S TECHNICAL REPRESENTATIVE PRIOR TO INSTALLING THE FIRE STOP SYSTEM(S).

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Sub-Consultant: Mechanical/ Electrical
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Sub-Consultant:

Client: MEMORIAL UNIVERSITY OF NEWFOUNDLAND

Drawn:	Checked:
E.D.	D.C.
Designed: E.D.	Approved: D.C.

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DUSTIN C. COLE
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2025.07.03
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Drawing Nomenclature
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PROJECT TITLE
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Client's Project No.: CFS-103-23

DRAWING TITLE
TECHNOLOGY INFRASTRUCTURE LEGEND

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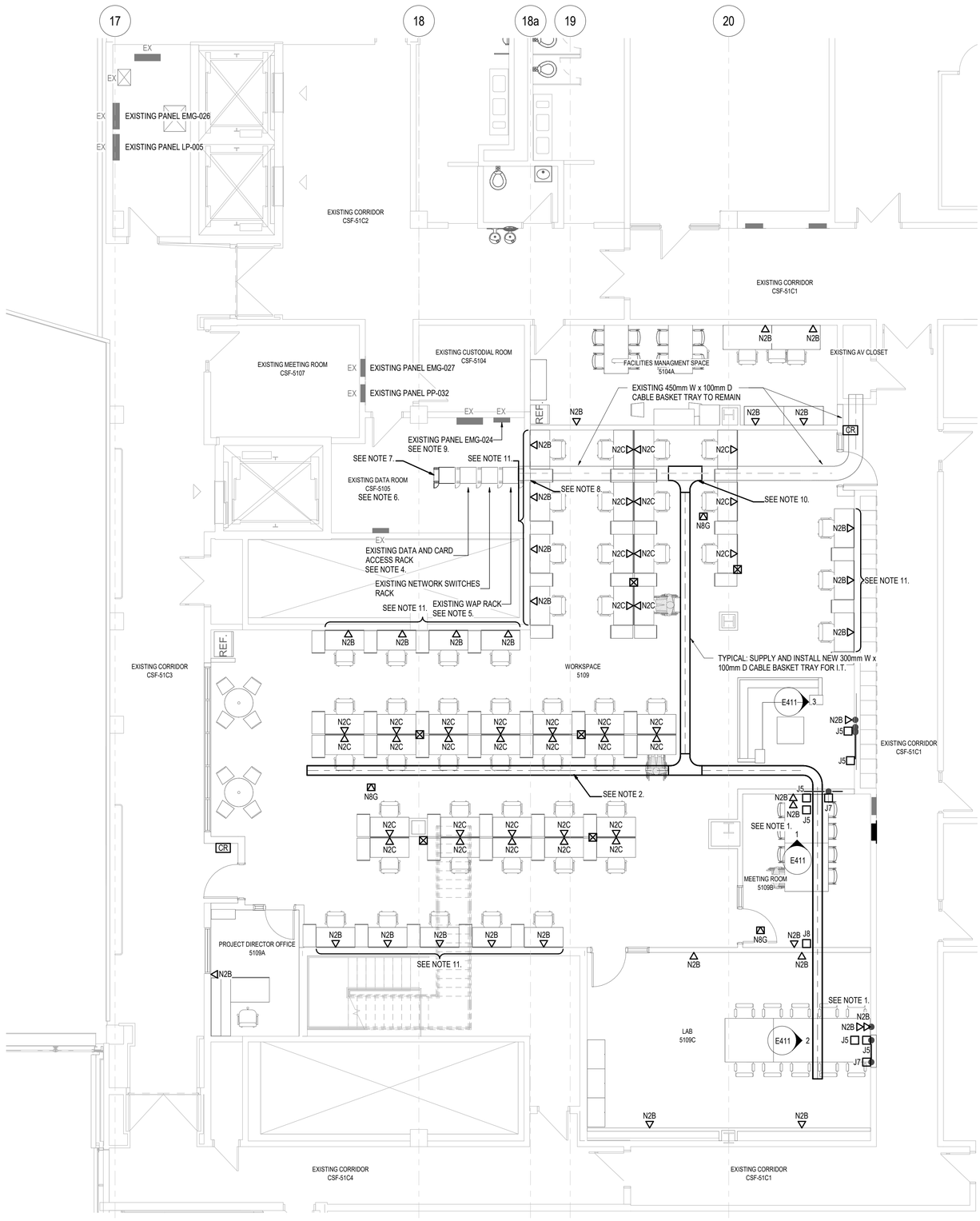

1 REVISED DATA SYSTEMS FLOOR PLAN - LEVEL 5, PAV-A

T401 — 1 : 75

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0mm 50 100 150 200 250 — 1:5
0mm 100 200 300 400 500 — 1:10
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0mm 1.0 2.0 3.0 3.75 — 1:75
0mm 1.0 2.0 3.0 4.0 5.0 — 1:100
0mm 1.25 2.5 3.75 5.0 6.25 — 1:125
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NOTES:

1. ELECTRICAL CONTRACTOR TO COORDINATE LOCATION AND MOUNTING HEIGHT OF NETWORK OUTLETS ON SITE WITH GENERAL CONTRACTOR AND FURNITURE SUPPLIER PRIOR TO ROUGH IN.
2. PROVIDE CABLE TRAY OFFSETS (AS REQUIRED) TO AVOID INTERFERENCE. (TYPICAL)
3. CONDUIT DROPS FROM THE TRAY TO THE OUTLETS/DEVICE SHALL BE INSTALLED SUCH THAT IT MINIMIZES THE TOTAL LENGTH OF THE OVERALL RUN OF CABLE.
4. SUPPLY AND INSTALL NEW PATCH PANELS IN THIS SECTION OF THE RACK FOR ALL DATA AND CARD ACCESS CONNECTIONS. DATA AND CARD ACCESS TO BE INSTALLED IN SEPARATE PATCH PANELS. CONTRACTOR TO CONFIRM EXACT LOCATION OF DATA AND CARD ACCESS RACK PRIOR TO INSTALLATION. IF EXISTING RACK IS FULL, INSTALL NEW PATCH PANELS IN NEW RACK.
5. SUPPLY AND INSTALL NEW PATCH PANELS IN THIS SECTION OF THE RACK FOR ALL WAP CONNECTIONS. WAPS TO BE INSTALLED IN SEPARATE PATCH PANELS. CONTRACTOR TO CONFIRM EXACT LOCATION OF WAP RACK PRIOR TO INSTALLATION.
6. ALL CAT 6A/6 WIRING TO BE GREEN. DATA AND CARD ACCESS JACKS TO BE BLUE, AND WAP TO BE RED.
7. SUPPLY AND INSTALL A NEW 4-POST RACK, PATCH PANELS, JACKS, OUTLETS, PATCH CORDS, NETWORK SWITCHES, RISER CABLING, BACKBONE CABLING AND CROSS CONNECTION HARDWARE TO CONNECT NEW RACK INTO EXISTING DATA SYSTEM. ALL NEW EQUIPMENT TO MATCH EXISTING AND ALL NEW CONNECTIONS METHODS TO MATCH EXISTING AND BE IN ACCORDANCE WITH MUNET SPECIFICATIONS.
8. WHERE DATA CABLE TRAY PASSES THROUGH FIRE RATED PARTITIONS AND WALLS THE OPENINGS ARE PRESENTLY SEALED USING FIRE RATED MATERIALS. AT THESE LOCATIONS, CONTRACTOR TO ADJUST AND MODIFY THE SEALANT TO MAKE ROOM FOR THE NEW CABLING BEING INSTALLED UNDER THIS CONTRACT. UPON COMPLETION OF THE NEW CABLE INSTALLATION, CONTRACTOR TO RE-SEAL THE PENETRATION WITH THE METHOD TO MATCH EXISTING, USING A 1" BEAD INTUMESCENT SEALANT PUTTY AND COMPOSITE SHEETS, TO ENSURE A COMPLETE SMOKE AND FIRE SEAL IS ACHIEVED, WITH A RATING TO MATCH EXISTING.
9. CONTRACTOR IS RESPONSIBLE TO COORDINATE ACCESS CONTROLLER FOR DOOR HARDWARE WITH THE CARD ACCESS SUPPLIER AND DOOR HARDWARE REQUIREMENTS AND PROVIDE RECEPTACLES AND HARDWIRED CONNECTIONS AS REQUIRED. CIRCUITS FOR SUCH SHALL COME FROM PANEL EMG-024. EXISTING PANEL EMG-024 IS A SQUARE D NQ CIRCUIT BREAKER TYPE, 120/208V, 3Ø, 4W, SURFACE MOUNTED. SUPPLY AND INSTALL NEW BREAKERS IN EXISTING PANEL AS REQUIRED TO ACHIEVE NUMBER OF CIRCUITS REQUIRED FOR CARD ACCESS AND DOOR HARDWARE. CIRCUITS FOR DOOR HARDWARE AND CARD ACCESS ARE PERMITTED TO BE SHARED WHERE LOADING PERMITS.
10. SUPPLY AND INSTALL PREFORMED TEE FITTING FOR CABLE BASKET TRAY IN THIS LOCATION. MODIFY EXISITNG CABLE BASKET TRAY TO ALLOW FOR INSTALLATION OF TEE FITTING. ENSURE ALL NEW CABLE BASKET TRAY SECTIONS AND RUNS ARE BONDED TOGETHER WITH BONDING CONDUCTORS SIZED ACCORDING TO THE CEC.
11. THE EXACT LOCATION OF RECEPTACLES AND DATA OUTLETS ON THESE WALLS MAY NEED TO ADJUST LOCATION AND/OR MOUNTING HEIGHT. CONTRACTOR SHALL COORDINATE WITH MUN REPRESENTATIVE ON-SITE PRIOR TO ROUGH-IN.

Architect Prime Consultant

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PROJECT TITLE
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Client's Project No.: CFS-103-23

DRAWING TITLE
REVISED DATA FLOOR PLAN - LEVEL 5, PAV-A

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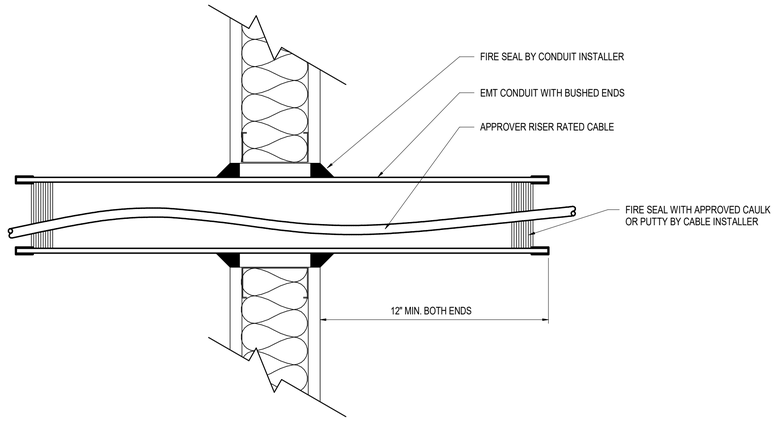
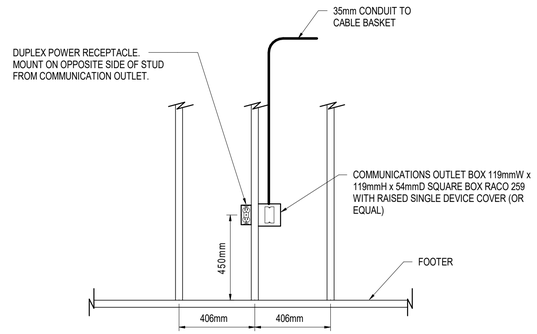


2 T701 PENETRATION OF RATED PARTITION CONDUIT WITH CABLE HORIZONTAL

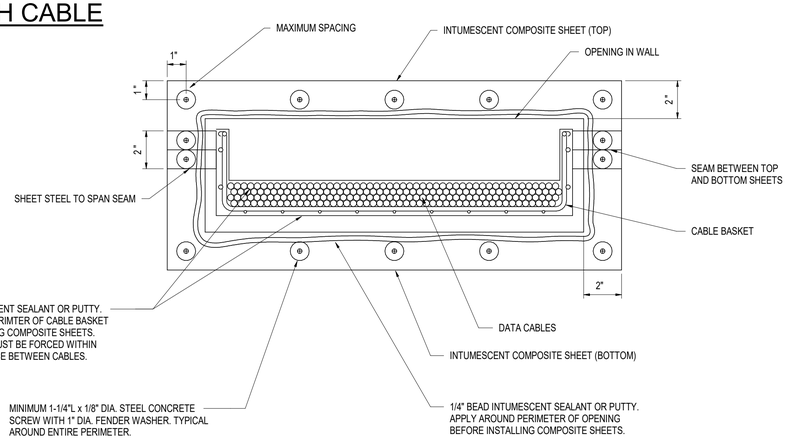
N.T.S.



NOTE: LOCATE POWER RECEPTACLE ON SIDE OF STUD CLOSEST TO ROOM ENTRANCE.

4 T701 OFFICE COMMUNICATIONS OUTLET AND ASSOCIATED POWER RECEPTACLE

N.T.S.

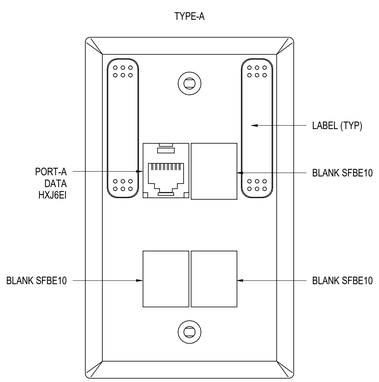


NOTES:

1. THIS INSTALLATION MUST BE APPLIED TO BOTH SIDES OF THE WALL OPENING.
2. CONTRACTOR MUST REMOVE EXISTING FIRE RATED MATERIAL FROM TRAY AND AT WALL ASSEMBLY AS REQUIRED TO FACILITATE THE INSTALLATION OF NEW CABLING. REINSTALL AS PER THIS DETAIL UPON COMPLETION OF NEW CABLE INSTALLATION.

3 T701 PENETRATION OF RATED PARTITION CABLE BASKET WITH CABLE

N.T.S.



7 T701 FACEPLATE TYPE A

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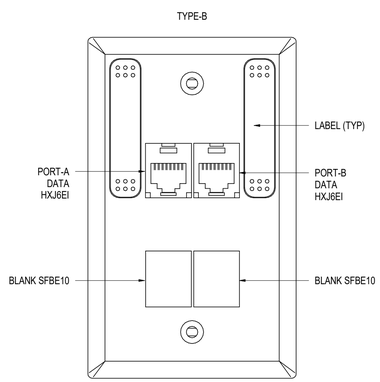

6 T701 FACEPLATE TYPE B

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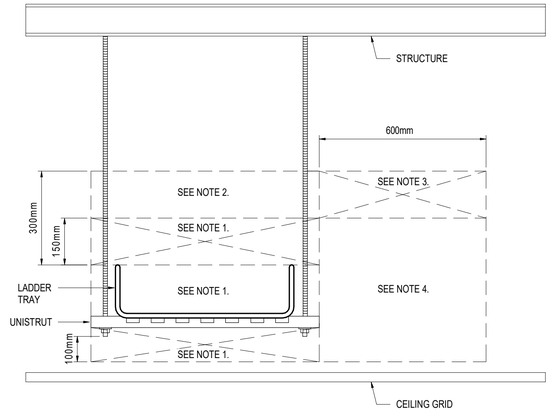
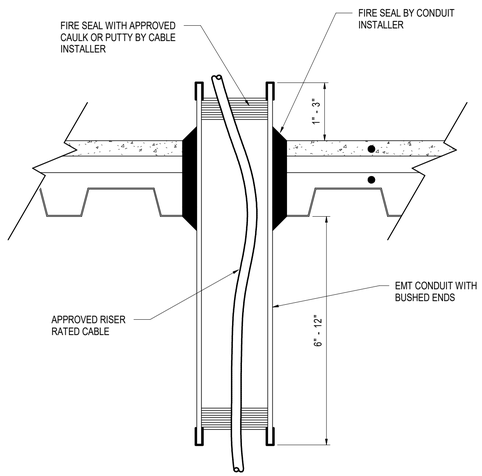


NOTES:

1. NO OTHER TRADE ELEMENTS SHALL BE PERMITTED INSIDE CLEARANCE SPACE.
2. TRADE ELEMENTS RUNNING PARALLEL WITH TRAY SHALL NOT BE PERMITTED IN CLEARANCE SPACE, HOWEVER, TRADE ELEMENTS PERIODICALLY CROSSING THE LADDER TRAY (I.E. PERPENDICULAR) SHALL BE PERMITTED WITHIN CLEARANCE SPACE.
3. TRADE ELEMENTS RUNNING PARALLEL WITH TRAY SHALL NOT BE PERMITTED WITHIN CLEARANCE SPACE, HOWEVER, TRADE ELEMENTS RUNNING VERTICAL AND PERPENDICULAR TO TRAY, SHALL BE PERMITTED TO PERIODICALLY CROSS CLEARANCE SPACE.
4. TRADE ELEMENTS RUNNING PARALLEL WITH TRAY SHALL NOT BE PERMITTED WITHIN CLEARANCE SPACE, HOWEVER, TRADE ELEMENTS RUNNING VERTICAL, SHALL BE PERMITTED TO PERIODICALLY CROSS CLEARANCE SPACE.

1 T701 TYPICAL TRAY CLEARANCES

N.T.S.



5 T701 PENETRATION OF RATED PARTITION CONDUIT WITH CABLE VERTICAL

N.T.S.

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PROJECT TITLE

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DRAWING TITLE

TECHNOLOGY INFRASTRUCTURE DETAILS

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