FACILITIES MANAGEMENT

OPEN CALL FOR BIDS

FOR

TU-509-23
MUN 09 Feeder Replacement and Pad Mounted Switchgear

Request for Open Call Number: **TFM-048-25** Issued:

November 4, 2025

Submission Deadline: **Thursday, December 4, 2025 @ 3:00PM NST**

REQUEST FOR OPEN CALL FOR BIDS INFORMATION SHEET

Request for Open Call			
Title:	**MUN 09 Feeder Replacement & Pad mounted Switchgear**		
Open Call #:	**TFM-048-25**	Issue Date:	**November 4, 2025**
Non-Mandatory Site Visit:	**Location:** **Entrance of Engr Building**		**Date & Time:** **November 19, 2025** **@1:30 pm**
Questions Deadline:	**Eight (8) days prior to closing time, at 3:00pm (NST).**	Closing Date & Time: Bid Submission Format: Opening Date, Time & Location:	**Thursday December 4, 2025 @ 3:00 pm NST** **opencalls@mun.ca** **Thursday, December 4, 2025 @ 3:30 pm NST** **Via Conference line:** **1-416-915-6530 (toll free)** **Access Code: *2770 649 1200*** **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-048-25 MUN 09 Feeder Replacement & Pad mounted Switchgear*			
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-048-25 MUN 09 Feeder Replacement & Pad mounted Switchgear in subject line. Emails not containing this requirement information in the subject line will NOT receive a response.**

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

ABOUT MEMORIAL UNIVERSITY

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

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

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

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

Mission, Vision and Values

Vision

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

Mission

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

Values

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

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

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

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

Responsiveness: Being receptive to individuals and communities.

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

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

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

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

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

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

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

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

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

Faculty and Staff

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

Governance and Administration

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

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

Territory Acknowledgements at Memorial:

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

PROCUREMENT AND CONTRACTING DOCUMENTS GROUP

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

Open Call for Bids Strategic Procurement Sections

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

SPECIFICATIONS GROUP

General Requirements Subgroup

DIVISION 01 - GENERAL REQUIREMENTS

Facility Construction Subgroup

DIVISION 02 - EXISTING CONDITIONS

DIVISION 03 - CONCRETE

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

Facility Services Subgroup

DIVISION 26 - ELECTRICAL

END OF SECTION

PART 1 – SUBMISSION INSTRUCTIONS

1.1 Bids to be Submitted on Time

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

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

1.2 Bids to be Submitted in Prescribed Format

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

1.3 Amendment/Revision of Bids

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

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

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

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

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

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

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

1.4 Amendment of Open Call for Bid Documents

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

1.5 Withdrawal of Bids

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

1.6 Bids Irrevocable after Submission Deadline

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

1.7 Delivery

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

1.8 Signature

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

submission.

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

1.9 Closure

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

1.10 Corporations Act

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

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

[End of Part 1]

PART 2 – EVALUATION AND AWARD

2.0 Stages of Evaluation

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

2.1.0 Stage I – Mandatory Submission Requirements

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

2.1.1 Stage II – Mandatory Technical Requirements

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

2.1.2 Stage III – Pricing

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

2.2 No Amendment to Forms

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

2.3 Selection of Lowest Compliant Bidder as Preferred Supplier

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

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

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

2.4 Notice to Bidder and Execution of Agreement

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

2.5 Failure to Enter into Agreement

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

2.6 Payment Terms

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

[End of Part 2]

PART 3 – TERMS AND CONDITIONS OF THE OCB PROCESS

3.1 Open Call Incorporated into Bid

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

3.2 Bidders to Follow Instructions

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

3.3 Bids in English

All bids are to be in English only.

3.4 No Incorporation by Reference

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

3.5 References and Past Performance

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

3.6 Information in Open Call Only an Estimate

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

3.7 Bidders to Bear Their Own Costs

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

3.8 Bid to be Retained by the Owner

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

3.9 Trade Agreements

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

3.10 No Guarantee of Volume of Work or Exclusivity of Contract

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

3.11 Communication After Issuance of Open Call

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

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

3.12 All New Information to Bidders by Way of Addenda

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

3.13 Addenda and Extension of Submission Deadline

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

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

3.14 Notification to Other Bidders

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

3.15 Debriefing

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

3.16 Supplier Complaint Process

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

3.17 Conflict of Interest and Prohibited Conduct

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

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

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

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

3.18 Disqualification for Prohibited Conduct

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

3.19 Bidder Not to Communicate with Media

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

3.20 No Lobbying

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

3.21 Illegal or Unethical Conduct

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

3.22 Past Performance or Past Conduct

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

(a) illegal or unethical conduct as described above;

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

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

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

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

3.23 Confidential Information of the Owner

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

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

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

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

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

3.24 Confidential Information of 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.php?id=21 .

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

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

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

4.3.0 Contractor Safety Management

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

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

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

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

4.4.0 Contractor Safety Management Element

4.4.1 Purpose

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

4.4.2 Scope

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

4.4.3 Definitions

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

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

4.4.4 Roles and Responsibilities

4.4.4.1 Project Management Team, including Environmental Health & Safety

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

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

4.4.4.2 Contractors

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

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

4.4.5 Procedure

4.4.5.1 Considerations prior to signing of contract

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

4.4.5.2 Requirements

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

Contractors shall also provide the following:

(a) health and safety policy statement;

(b) safety program table of contents; and

(c) site hazard assessment;

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

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

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

(a) safety program and/or manual

(b) applicable documented safe work practices;

(c) inspection reports and schedules;

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

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

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

Memorial reserves the right to:

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

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

4.4.5.3 Schedule of Submissions

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

4.4.6 Post-Contract Evaluation

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

4.5 Access To Site

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

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

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

[End of Part 4]

PART 5 – GENERAL CONDITIONS

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

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

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

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

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

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

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

5.8 Corporations Act

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

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

[End of Part 5]

Part 6 – Supplementary Terms and Conditions

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

6.2 Surety

6.2.1 Bid Surety

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

The terms of the bid security will be invoked and the amount retained by the Owner if: theTenderer 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)	CAD 25,000	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:

MUN 09 Feeder Cable Replacement and Pad mounted Switchgear
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 PRICE TABLE

Hereunder is a Unit Price Table that will be used for both credits and additional work as directed by the Owner's Representative. **All items are supply and installation**. The value of any credits or additional work authorized by and measured with the Owner's Representative shall be multiplied by the stated unit prices to determine the value of any credits or additional work performed.

Item No.	Tender Item	Unit	Unit Price (HST Excluded)
1	Excavation, Waterproofing, backfilling, and reinstating landscape of tunnel construction joints as indicated in drawings and specifications.	Each	

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
Cables manufacturer	
Switchgear Manufacturer	
Waterproofing Installer	

DEPARTMENT OF FACILITIES MANAGEMENT

GENERAL CONDITIONS

AND

AGREEMENT BETWEEN OWNER AND CONTRACTOR

FOR

THE STIPULATED PRICE CONTRACT

May 2023

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

INDEX

1.0 GENERAL CONDITIONS

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.

SPECIFICATION FOR
MEMORIAL UNIVERSITY
TU-509-23
MUN-09 FEEDER CABLE REPLACEMENT
& PAD MOUNT SWITCHGEAR

ISSUED FOR TENDER

DATE:

October 23, 2025

PREPARED FOR:

Memorial University
Elizabeth Avenue
St. John's, NL A1C 5S7

MUN No: TU-509-23

PREPARED BY:

Stantec Consulting Limited
141 Kelsey Drive
St. John's, NL A1B 0L2

SCL REF. NO: 133412009

DISCIPLINE	DATE	STAMP
Electrical Specifications	2025-10-23	

PROVINCE OF NEWFOUNDLAND AND LABRADOR

pegnl

ENGINEERING
PERMIT J0291

STANTEC CONSULTING LTD.

04642

Signature or Member Number
(Member-in-Responsible Charge)

GENERAL

1.1 SCOPE

.1 Division 01 specification sections are intended to supplement the Memorial University Department of Facilities Management General Conditions and Agreement between Owner and Contractor for the Stipulated Price Contract. Where discrepancies between these sections and the Memorial University documents are noted, the latter shall rule.

1.2 SECTION INCLUDES

.1 Title and description of Work.

.2 Contractor's use of premises.

.3 Owner occupancy.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

.1 Bidders are advised that there will be a non-mandatory bidders site meeting for this project. The date and time for the bidder's site visit will be communicated by the Owner's Representative. Bidders are strongly encouraged to attend this visit prior to submitting a proposal for this work.

.2 Work of this contract comprises, but not limited to, the following:

.1 Electrical, Structural and Civil works for the installation of 12.47kV pad mounted switchgear near Kerwin Place and adjacent to the existing underground utility tunnel. The full scope of work as defined by the drawings and specifications, includes, but is not limited to the following:

.1 Supply, installation, testing and commissioning of outdoor switchgear structures.

.2 Supply, installation, testing and commissioning of new 12.47kV cable to replace existing MUN-09 feeder cable as follows:

.1 Electrical Manhole MH3-EL-9B to New Exterior Switchgear #2

.2 New Exterior Switchgear #2 to Earth Science Building

.3 Provision of all material and labor for rerouting of existing medium voltage feeders between utility tunnel and new switchgear.

.4 Installation, testing and commissioning of owner supplied medium voltage cable as follows:

.1 MUN-09 Tie (between Switchgear #1 and Switchgear #2)

.2 Switchgear #1 to SJ Carew Engineering Building.

.3 See Clause 1.5 Owner Supplied Equipment for details of owner supplied cable.

.5 Supply and installation of a cable support structure in existing manholes as outlined on the drawings.

.6 Installation of a ground grid and rods around the outdoor switchgear.

.7 Supply and install of a structural concrete support base for the new switchgear.

.8 Waterproofing of existing underground tunnel expansion joints.

.2 Unless otherwise noted, all existing cabling to be removed and disposed by the contractor. Apply any associated credit savage value to the quoted pricing.

.3 All excavating and trenching within utility easements is to be coordinated with the Owner's Representative.

.4 Work includes Commissioning of the facility as per Section 01 91 13 – Commissioning (Cx) Requirements. Activities to include a manufacturer's team for commissioning the outdoor switchgear.

.5 There are existing underground electrical conduits and ground wires in the area of new construction (see drawings for approximate layout and details). Where required, the contractor is to provide temporary support for these services during excavation and backfilling. Any damaged services are to be repaired and reinstated at the contractor's expense. Any required temporary connections or repair work are to be coordinated with the Owner's Representative.

.6 Contractor to provide a detailed phasing plan of service interruptions to Owner's Representative for review. Owner's Representative must sign off on proposed phasing plan.

1.4 CONTRACTOR USE OF PREMISES

.1 Coordinate use of premises under direction of Owner's Representative.

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

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

.4 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Owner's Representative.

1.5 OWNER SUPPLIED EQUIPMENT

.1 The Owner shall free issue the contractor the following materials and equipment for the project:

.1 Two (2) reels x 240 meters (480 meters total) of 350MCM 15kV, 133% insulation, type MV-105 cable (Prysmian Easy Gilder).

.1 Contractor will be responsible to pick-up the cable reels from the SJ Carew (Engineering) Building, ground floor mechanical room, remove quantity required for installation and return remaining cable on reels to SJ Carew (Engineering) Building mechanical room.

1.6 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.

1.7 ON-SITE DOCUMENTS

.1 Maintain at job site documents as indicated in Section 01 31 00 – Project Management and Coordination.

1.8 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.

1.9 PERMITS, FEES AND INSPECTION

.1 Submit to Authorities Having Jurisdiction number of drawings and specifications for examination and approval prior to commencement of work.

.2 The contractor is responsible to obtain all required AHJ permits (i.e. Service NL, etc.). Pay all associated permit fees.

.3 Furnish Certificates of Acceptance from all required Authorities Having Jurisdiction on completion of work to Owner's Representative.

.4 Coordinate all AHJ required inspections with the applicable authorities.

PRODUCTS (NOT APPLICABLE)

EXECUTION (NOT APPLICABLE)

END OF SECTION

GENERAL

1.1 SECTION INCLUDES

.1 Connecting to existing services.

.2 Special scheduling requirements.

1.2 RELATED SECTIONS

.1 Section 01 32 00 – Construct Progress Documentation.

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

1.3 EXISTING SERVICES

.1 Notify Owner’s Representative and utility companies of intended interruption of services and obtain required permission.

.2 Provide written request to Owner’s Representative four (4) weeks in advance of any shutdowns requiring impact of services to Owner’s premises including but not limited to power, plumbing, controls, etc.

.3 Provide for pedestrian and vehicular traffic.

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

.5 Do not excavate until all underground services are located and dig permit has been obtained from Owner's Representative.

.6 It is anticipated that multiple power interruptions will be required to the MUN Campus to complete and commission the scope of work. This work is to be completed after hours and scheduled with the Owner’s Representative a minimum of four (4) weeks prior. Contractor to pay all costs for coordination associated with this work.

PRODUCTS (NOT APPLICABLE)

EXECUTION (NOT APPLICABLE)

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 Cash allowances.

1.2 CASH ALLOWANCES

.1 Expend each allowance as directed by Owner's Representative.

.2 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.

.3 Each cash allowance will be adjusted to actual cost as defined hereunder and contract price will be amended accordingly by written order.

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

.5 Progress payments for work and material authorized under cash allowances will be made in accordance with contract terms of payment.

.6 The Contract Price and not cash allowance, includes contractor’s overhead and profit in connection with such cash allowance.

.7 Progress payments on accounts of work authorized under cash allowances shall be included in monthly certificate for payment.

.8 Schedule shall be prepared jointly by Owner's Representative and Contractor to show when items called for under cash allowances must be authorized by Owner for ordering purposes so that progress of work will not be delayed.

1.3 ALLOWANCES SCHEDULE

.1 Contingency Allowance: Include the stipulated sum/price of $25,000 for use upon Owner's instructions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

.1 Types of items described in this Section:
  .1 Administrative and procedural requirements for substitutions.

.2 Types of items you will not find described in this Section:
  .1 Products selected under an allowance.
  .2 Requirements for submitting comparable product submittals for products by listed manufacturers.
  .3 Divisions 02 through 49 Sections for specific requirements and limitations for substitutions.

1.3 DEFINITIONS

.1 Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
  .1 Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
  .2 Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 SUBMITTALS

.1 Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  .1 Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    .1 Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
    .2 Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
    .3 Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable specification section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
    .4 Product Data, including drawings and descriptions of products and fabrication and installation procedures.

.5 Samples, where applicable or requested.
.6 Certificates and qualification data, where applicable or requested.
.7 List of similar installations for completed projects with project names and addresses and names and addresses of Owner's Representatives and owners.
.8 Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
.9 Research reports evidencing compliance with building code in effect for Project.
.10 Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
.11 Cost information, including a proposal of change, if any, in the Contract Sum.
.12 Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
.13 Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

.2 Owner's Representative's Action: If necessary, Owner's Representative will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Owner's Representative will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
.1 Forms of Acceptance: Change Order, Construction Change Directive, or Owner's Representative's Supplemental Instructions for minor changes in the Work.
.2 Use product specified if Owner's Representative does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

.1 Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

.1 Coordination: Modify or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

.1 Substitutions for Cause: Submit requests for substitution immediately upon discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
.1 Conditions: Owner's Representative will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied,

Owner's Representative will return requests without action, except to record noncompliance with these requirements:

.1 Requested substitution is consistent with the Contract Documents and will produce indicated results.
.2 Substitution request is fully documented and properly submitted.
.3 Requested substitution will not adversely affect Contractor's construction schedule.
.4 Requested substitution has received necessary approvals of authorities having jurisdiction.
.5 Requested substitution is compatible with other portions of the Work.
.6 Requested substitution has been coordinated with other portions of the Work.
.7 Requested substitution provides specified warranty.
.8 If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

.2 Substitutions for Convenience: Owner's Representative will consider requests for substitution if received within 60 days after the Notice of Award. Requests received after that time may be considered or rejected at discretion of Owner's Representative.

.1 Conditions: Owner's Representative will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Owner's Representative will return requests without action, except to record noncompliance with these requirements:

.1 Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Owner's Representative for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
.2 Requested substitution does not require extensive revisions to the Contract Documents.
.3 Requested substitution is consistent with the Contract Documents and will produce indicated results.
.4 Substitution request is fully documented and properly submitted.
.5 Requested substitution will not adversely affect Contractor's construction schedule.
.6 Requested substitution has received necessary approvals of authorities having jurisdiction.
.7 Requested substitution is compatible with other portions of the Work.
.8 Requested substitution has been coordinated with other portions of the Work.
.9 Requested substitution provides specified warranty.
.10 If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

.1 Types of items described in this Section:
  .1 Administrative and procedural requirements for handling and processing Contract modifications.

.2 Types of items you will not find described in this Section:
  .1 Administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK

.1 Owner's Representative will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.

1.4 CONTENPLATED CHANGE ORDERS

.1 Owner-Initiated Contemplated Change Order: Owner's Representative will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
  .1 Proposal Requests issued by Owner's Representative are not instructions either to stop work in progress or to execute the proposed change.
  .2 Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
    .1 Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    .2 Indicate applicable delivery charges, equipment rental, and amounts of trade discounts.
    .3 Include costs of labour and supervision directly attributable to the change.
    .4 Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
    .5 Quotation Form: Use forms acceptable to Owner's Representative.

.2 Contractor-Initiated Contemplated Change Order: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Owner's Representative.

.1 Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
.2 Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
.3 Indicate applicable delivery charges, equipment rental, and amounts of trade discounts.
.4 Include costs of labour and supervision directly attributable to the change.
.5 Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
.6 Comply with requirements in Division 01 Section *Substitution Procedures* if the proposed change requires substitution of one product or system for product or system specified.
.7 Proposal Request Form: Use form acceptable to Owner's Representative.

1.5 ADMINISTRATIVE CHANGE ORDERS

.1 Allowance Adjustment: Refer to Division 01 Section *Allowances* for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

.2 Unit Price Adjustment: Refer to Division 01 Section *Unit Prices* for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit price work.

1.6 CHANGE ORDER PROCEDURES

.1 On Owner's approval of a Proposal Request, Owner's Representative will issue a Change Order for signatures of Owner and Contractor.

1.7 CONSTRUCTION CHANGE DIRECTIVE

.1 Construction Change Directive: Owner's Representative may issue a Construction Change Directiv,e as may be permitted in the Contract. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
.1 Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

.2 Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
.1 After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

.1 Types of items described in this Section:
  .1 Administrative and procedural requirements necessary to prepare and process Applications for Payment.

.2 Types of items you will not find described in this Section:
  .1 Procedural requirements governing the handling and processing of allowances.
  .2 Administrative procedures for handling changes to the contract.
  .3 Administrative requirements governing the preparation and submittal of the contractor's construction schedule.
  .4 Administrative requirements governing the preparation and submittal of the submittal schedule.
  .5 Administrative requirements governing submittal of cost breakdown information required for leed documentation.

1.3 DEFINITIONS

.1 Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

.1 Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
  .1 Correlate line items in the schedule of values with other required administrative forms and schedules, including the following:
    .1 Application for Payment forms with continuation sheets.
    .2 Submittal schedule.
    .3 Items required to be indicated as separate activities in Contractor's construction schedule.
  .2 Submit the schedule of values to Owner's Representative at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

.2 Format and Content: Use the Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
  .1 Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
    .1 Related Specification Section or Division.
    .2 Description of the Work.

.3 Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

.2 Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of Contract Sum.

.1 Include separate line items under principal subcontracts for sustainability documentation for LEED certification, if applicable, and other project closeout requirements in an amount totalling not less than five percent of the Contract Sum and subcontract amount.

.3 Round amounts to nearest whole dollar; total shall equal the Contract Sum.

.4 Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

.1 Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.

.5 Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.

.6 Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

.1 Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.

.7 Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

.1 Each Application for Payment shall be consistent with previous applications and payments as certified by Owner's Representative and paid for by Owner.

.1 Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

.2 Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

.3 Application for Payment Forms: Use forms acceptable to Owner's Representative and Owner for Applications for Payment. Submit forms for approval with initial submittal of schedule of values.

.4 Application Preparation: Complete every entry on form. Execute by a person authorized to sign legal documents on behalf of Contractor. Owner's Representative will return incomplete applications without action.

.1 Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.

.2 Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
.3 Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
.4 Indicate separate amounts for work being carried out under Owner-requested project acceleration.

.5 Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
.1 Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
.2 Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
.3 Provide summary documentation for stored materials indicating the following:
.1 Materials previously stored and included in previous Applications for Payment.
.2 Work completed for this Application utilizing previously stored materials.
.3 Additional materials stored with this Application.
.4 Total materials remaining stored, including materials with this Application.

.6 Transmittal: Submit two signed original copies of each Application for Payment to Owner's Representative by a method ensuring receipt within 24 hours. Provide current Letter of Good Standing from Work Place Health and Safety authority.
.1 Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

.7 Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
.1 List of subcontractors.
.2 Schedule of values.
.3 Contractor's construction schedule (preliminary if not final).
.4 Products list (preliminary if not final).
.5 Schedule of unit prices.
.6 Submittal schedule (preliminary if not final).
.7 List of Contractor's staff assignments.
.8 List of Contractor's principal consultants.
.9 Copies of building permits.
.10 Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
.11 Initial progress report.
.12 Report of preconstruction conference.

.8 Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
.1 Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

.9 Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
  .1 Evidence of completion of Project closeout requirements.
  .2 Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
  .3 Updated final statement, accounting for final changes to the Contract Sum.
  .4 Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

GENERAL

1.1 SECTION INCLUDES

.1 Coordination work with other contractors and subcontractors under administration of Owner's Representative.

.2 Scheduled project meetings.

1.2 DESCRIPTION

.1 Coordination of progress schedules, submittals, use of site, temporary utilities, construction facilities, and construction Work, with progress of Work of other contractors and subcontractors under instructions of Owner's Representative.

1.3 PROJECT MEETINGS

.1 Project meetings to be held at times and locations as determined by Owner's Representative.

.2 Contractor will arrange project meetings and record and distribute minutes.

1.4 CONSTRUCTION ORGANIZATION AND START-UP

.1 Within 10 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.

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

.3 Agenda to include following:

.1 Appointment of official representative of participants in Work.

.2 Schedule of Work, progress scheduling in accordance with Section 01 32 00 - Construction Progress Documentation.

.3 Schedule of submission of shop drawings, samples, color chips in accordance with Section 01 33 00 - Submittal Procedures.

.4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 51 00 - Temporary Utilities.

.5 Delivery schedule of specified equipment in accordance with Section 01 32 00 - Construction Progress Documentation.

.6 Site security in accordance with Section 01 52 00 - Construction Facilities.

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

.8 As-Built drawings in accordance with Section 01 78 00 - Closeout Submittals.

.9 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.

.10 Take-over procedures, acceptance, and warranties in accordance with Section 01 77 00 - Closeout Procedures and 01 78 00 - Closeout Submittals.

.11 Monthly progress claims, administrative procedures, photographs, and holdbacks.

.12 Appointment of inspection and testing agencies or firms in accordance with Section 01 45 00 - Quality Control.

.13 Insurances and transcript of policies.

.4 Comply with Owner's Representative's allocation of mobilization areas of site; for field offices and sheds, for access, traffic, and parking facilities.

.5 During construction coordinate use of site and facilities through Owner's Representative's procedures for intra-project communications: Submittals, reports and records, schedules, coordination of drawings, recommendations, and resolution of ambiguities and conflicts.

.6 Comply with instructions of Owner's Representative for use of temporary utilities and construction facilities.

1.5 ON-SITE DOCUMENTS

.1 Maintain at job site, one copy each of the following:

.1 Contract drawings.

.2 Specifications.

.3 Addenda.

.4 Reviewed shop drawings.

.5 List of outstanding shop drawings.

.6 Change orders.

.7 Other modifications to Contract.

.8 Field test reports.

.9 Copy of approved Work schedule.

.10 Health and Safety Plan and other Safety related documents.

.11 Manufacturers' installation and application instructions.

.12 Labour conditions and wage schedules.

.13 Other documents as specified.

1.6 SCHEDULES

.1 Submit preliminary construction progress schedule in accordance with Section 01 32 00 - Construction Progress Documents to Owner's Representative coordinated with Owner's Representative's project schedule. Schedule to show anticipated progress stages and final completion of work within time period required by contract documents.

.2 After review, revise and resubmit schedule to comply with project schedule requirements.

.3 During progress of Work revise and resubmit at project progress meetings or as directed by Owner's Representative.

1.7 SUBMITTALS

.1 Make submittal to Owner's Representative for review.

.2 Submit preliminary shop drawings, product data and samples in accordance with Section 01 33 00 – Submittal Procedures for review for compliance with Contract Documents; for field dimensions and clearances, for relation to available space, and for relation to Work of other contracts. After review, revise and resubmit for transmittal to Owner's Representative.

.3 Submit requests for payment for review to Owner's Representative.

.4 Submit requests for interpretation of Contract Documents and obtain instructions through Owner's Representative.

.5 Process change orders through Owner's Representative.

.6 Deliver closeout submittals for review by Owner's Representative.

1.8 COORDINATION DRAWINGS

.1 Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

.2 Contractor to submit to the Owner's Representative, in AutoCAD format, coordination drawings, drawn accurately to a scale large enough to indicate and resolve conflicts.

.3 Indicating the functional and spatial relationships of components of architectural, structural, civil, mechanical and electrical systems.

.4 Do not base coordination drawings on standard printed data.

.5 Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.

.6 Show location and size of access doors required for access to concealed dampers, valves, and other controls.

.7 Indicate required installation sequences.

.8 Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements.

.9 Minor dimension changes and difficult installations will not be considered changes to the Contract.

.10 Owner's Representative will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination. If Owner's Representative determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, the Owner's Representative will so inform Contractor, who shall make changes as directed and resubmit.

1.9 CLOSEOUT PROCEDURES

.1 Notify Owner's Representative when Work is considered ready for Substantial Performance.

.2 Accompany Owner's Representative on preliminary inspection to determine items listed for completion or correction.

.3 Comply with Owner's Representative's instructions for correction of items of Work listed in executed certificate of Substantial Performance and for access to Owner-occupied areas.

.4 Notify Owner's Representative of instructions of items of Work determined in Engineer's final inspection.

PRODUCTS (NOT APPLICABLE)

EXECUTION (NOT APPLICABLE)

END OF SECTION

GENERAL

1.1 SCHEDULES REQUIRED

.1 Submit schedules as follows:

.1 Construction Progress Schedule.

.2 Submittal Schedule for Shop Drawings and Product Data.

.3 Submittal Schedule for Samples.

.4 Product Delivery Schedule.

.5 Cash Allowance Schedule for purchasing Products.

.6 Shutdown or closure activity.

1.2 FORMAT

.1 Prepare schedule in form of a horizontal bar chart.

.2 Provide a separate bar for each major item of work, trade or operation.

.3 Split horizontally for projected and actual performance.

.4 Provide horizontal time scale identifying first workday of each week.

.5 Format for listings: chronological order of start of each item of work.

.6 Identification of listings: By systems description.

1.3 SUBMISSION

.1 Submit initial format of schedules within 10 working days after award of Contract.

.2 Submit schedules in electronic format, forward via email as PDF files.

.3 Submit one opaque reproduction, plus 2 copies to be retained by Owner's Representative.

.4 Owner's Representative will review schedule and return review copy within 10 days after receipt.

.5 Resubmit finalized schedule within 7 days after return of review copy.

.6 Submit revised progress schedule with each application for payment.

.7 Distribute copies of revised schedule to:

.1 Job site office.

.2 Subcontractors.

.3 Other concerned parties.

.8 Instruct recipients to report to Contractor within 10 days, any problems anticipated by timetable shown in schedule.

1.4 CRITICAL PATH SCHEDULING

.1 Include complete sequence of construction activities.

.2 Include dates for commencement and completion of each major element of construction.

.3 Show projected percentage of completion of each item as of first day of month.

.4 Indicate progress of each activity to date of submission schedule.

.5 Show changes occurring since previous submission of schedule:

.1 Major changes in scope.

.2 Activities modified since previous submission.

.3 Revised projections of progress and completion.

.4 Other identifiable changes.

.6 Provide a narrative report to define:

.1 Problem areas, anticipated delays, and impact on schedule.

.2 Corrective action recommended and its effect.

.3 Effect of changes on schedules of other prime contractors.

1.5 SUBMITTALS SCHEDULE

.1 Include schedule for submitting shop drawings, product data, and samples.

.2 Indicate dates for submitting, review time, resubmission time, last date for meeting fabrication schedule.

PRODUCTS (NOT APPLICABLE)

EXECUTION (NOT APPLICABLE)

END OF SECTION

GENERAL

1.1 SECTIONS INCLUDE

.1 Shop drawings and product data.

.2 Samples.

.3 Certificates and transcripts.

1.2 ADMINISTRATIVE

.1 This section specifies general requirements and procedures for contractor's submissions of shop drawings, product data, samples and mock-ups to Owner's Representative for review. Submit promptly and in orderly sequence to not cause delay in Work. Submit with reasonable promptness and in orderly sequence so as to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.

.2 Do not proceed with work until relevant submissions are reviewed by Owner's Representative.

.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 prior to submission to Owner's Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and shall be considered rejected.

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

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

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

.9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Owner's Representative review of submission, unless Owner's Representative gives written acceptance of specific deviations.

.10 Make any changes in submissions which Owner's Representative may require consistent with Contract Documents and resubmit as directed by Owner's Representative. When resubmitting, notify Owner's Representative in writing of revisions other than those requested.

.11 Notify Owner's Representative, in writing, when resubmitting, of any revisions other than those requested by Owner's Representative.

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

1.3 SUBMITTALS

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

.2 Coordinate each submission with requirements of work and Contract Documents. Individual submissions will not be reviewed until all related information is available.

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

.4 Allow 10 working days for Owner’s Representative review of each submission.

.5 Adjustments made on shop drawings by Owner’s Representative are not intended to change contract price. If adjustments affect value of Work, state such in writing to Owner’s Representative immediately after receipt of approval of shop drawings. If value of work is to change a change order must be issued prior to proceeding with work.

.6 Accompany submissions with transmittal letter, containing:

- .1 Date.
- .2 Project title and number.
- .3 Contractor's name and address.
- .4 Identification and quantity of each shop drawing, product data and sample.
- .5 Other pertinent data.

.7 Submissions shall 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 field measurements and compliance with Contract Documents.
- .5 Details of appropriate portions of Work as applicable:
  - .1 Fabrication.

.2 Layout, showing dimensions, including identified field dimensions, and 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.

.8 After Owner's Representative review, distribute copies.

.9 Submit one electronic copy in PDF format of shop drawings for each requirement requested in specification Sections and as Owner's Representative may reasonably request.

.10 Submit electronic copy in PDF format of product data sheets or brochures for requirements requested in Specification Sections and as requested by Owner's Representative where shop drawings will not be prepared due to standardized manufacture of product.

.11 All electrical submissions to be sent by email to Stantec Document Central (1401doccontrol@stantec.com). Stantec Project Number _ MUN Project Number_Specification Section_Title of Shop Drawing ex. 133412009_TU-509-23_33 65 73_Concrete Encased Duct Banks and Manholes

.12 Delete information not applicable to project.

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

.14 Cross-reference product data information to applicable portions of Contract Documents.

.15 If upon review by Owner's 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.

.16 Samples: examples of materials, equipment, quality, finishes, workmanship. Label samples with origin and intended use.

.17 Notify Owner's Representative in writing, at time of submission of deviations in samples from requirements of contract documents.

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

.19 Adjustments made on samples by Owner's Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Owner's Representative prior to proceeding with Work.

.20 Make changes in samples, which Owner's Representative may require, consistent with Contract Documents.

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

1.4 MOCK-UPS

.1 Erect mock-ups in accordance with Section 01 45 00 - Quality Control.

1.5 PROGRESS PHOTOGRAPHS

.1 Progress photograph to be electronically formatted and labelled as to location and view.

1.6 SHOP DRAWINGS REVIEW

.1 The review of shop drawings by Owner's Representative is for the sole purpose of ascertaining conformance with the general concept. This review shall not mean that Owner's Representative approves the detail design inherent in the shop drawings, responsibility for which shall remain with the Contractor submitting same, 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 construction and contract documents. Without restricting the generality of the foregoing, the Contractor is responsible for dimensions to be confirmed and correlated at the job site, for information that pertains slowly to fabrication processes or to techniques of construction and installation and for co-ordination of the work of all sub-trades.

1.7 STRUCTURAL ATTACHMENTS

.1 Engage a third party Professional Structural Engineer, licensed to practice in the Province of Newfoundland and Labrador, for submission of stamped and signed shop drawings indicating acceptable mounting procedures for all equipment which is suspended, mounted or otherwise attached. The Structural Engineer to also verify correct installation of the equipment.

PRODUCTS (NOT APPLICABLE)

EXECUTION (NOT APPLICABLE)

END OF SECTION

GENERAL

1.1 REFERENCES

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

.2 Canadian Standards Association (CSA)

.1 CSA S269.1 Falsework for Construction Purposes.

.2 CAN/CSA-Z259.1 Safety Belts and Lanyards.

.3 CAN/CSA-Z259.10 Full body Harnesses.

.4 CAN/CSA-Z259.11 Shock Absorbers for Personal Fall Arrest Systems.

.5 CAN/CSA-Z259.2, Fall Arresting Devices, Personnel Lowering Devices and Lifelines.

.6 FCC No. 301 Standard for Construction Operations.

.7 CSA Z275.2 Occupational Safety Code for Diving Operations.

.8 CSA Z275.4 Competency Standard for Divers Operations.

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

.4 Transportation of Dangerous Goods Act Regulations.

.5 Newfoundland Occupational Health and Safety Act, Amended

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

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

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

.9 National Building Code of Canada.

1.2 SUBMITTALS

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

.1 A complete Health and Safety Risk Assessment and Management Plan.

.2 Copies of confined space entry training certificates.

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

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

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

1.3 OCCUPATIONAL HEALTH AND SAFETY (PROJECT HEALTH AND SAFETY RISK ASSESSMENT AND MANAGEMENT PLANS)

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

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

.3 Provide a copy of the Project Health and Safety Risk Assessment and Management Plan upon request to Occupational Health and Safety Branch, Department of Labour, Province of Newfoundland and Labrador and the Owner's Representative.

.4 The written Health and Safety Risk Assessment and Management Plan shall incorporate the following:

.1 A site-specific health and safety plan, refer to clause 1.5 Site-Specific Health and Safety Risk Assessment and Management Plan of this section for requirements.

.2 An organizational structure which shall establish the specific chain of command and specify the overall responsibilities of contractor's employees at the work site.

.3 A comprehensive workplan which shall:

.1 define work tasks and objectives of site activities/operations and the logistics and resources required to reach these tasks and objectives

.2 establish personnel requirements for implementing the plan, and

.3 establish site specific training and notification requirements and schedules.

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

.1 Selection criteria based on site hazards.

.2 Use, maintenance, inspection and storage requirements and procedures.

.3 Decontamination and disposal procedures.

.4 Inspection procedures prior to during and after use, and other appropriate medical considerations.

.5 Limitations during temperature extremes, heat stress and other appropriate medical consideration.

.5 An emergency response procedure, refer to Clause 1.6 Supervision and Emergency Response Procedure of this section for requirements.

.6 A hazard communication program for informing workers, visitors and individuals outside of the work area as required.

.7 A health and safety training program.

.8 General safety rules.

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

.6 Implement all requirements of the Project Health and Safety Risk Assessment and Management Plan.

.1 Ensure that every person entering the project site is informed of requirements under the Project Health and Safety Risk Assessment and Management Plan.

.2 Take all necessary measures to immediately implement any engineering controls, administrative contacts, personal protective equipment required or termination of work procedures to ensure compliance with the Project Health and Safety Risk Assessment and Management Plan.

1.4 SITE SPECIFIC HEALTH AND SAFETY PLAN

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

.1 Contain certain hazard assessment results.

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

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

.1 Be solely responsible for investigating, evaluation and managing any report of actual or potential hazards.

.2 Retain copies of all completed hazard assessments at the project site and make available to the Owner’s Representative immediately upon request.

1.5 SUPERVISION AND EMERGENCY RESCUE PROCEDURE

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

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

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

.4 Develop an emergency rescue plan for the job site and ensure that supervisors and workers are trained in the emergency rescue plan.

.5 The emergency response plan shall address, as a minimum:

.1 Pre-emergency planning.

.2 Personnel roles, lines of authority and communication.

.3 Emergency recognition and prevention.

.4 Safe distances and places of refuge.

.5 Site security and control

.6 Evacuation routes and procedures

.7 Decontamination procedures which are not covered by the site-specific safety and health plan.

.8 Emergency medical treatment and first aid.

.9 Emergency alarm, notification and response procedures including procedures for reporting incidents to local, provincial and federal government departments.

.10 PPE and emergency equipment.

.11 Procedures for handling emergency incidents.

.12 Site specific emergency response training requirements and schedules.

.6 The emergency response procedures shall be rehearsed regularly as part of the overall training program.

.7 Provide adequate first aid facilities for the jobsite and ensure that a minimum number of workers are trained in first aid in accordance with the First Aid Regulations.

1.6 CONTRACTORS SAFETY OFFICER

.1 The contractor’s Safety Officer will be solely responsible for the implementation and monitoring of the Project Health and Safety Risk Assessment and Management Plan, and will have the authority to implement health and safety changes as directed by the Owner’s Representative. The Safety Officer shall have as a minimum:

.1 Completed training in hazardous occurrence management and response/protocols.

.2 Completed training in the use, maintenance of fall protection systems.

.3 Completed training in the design and construction of scaffolding.

.4 Completed training in confined space entry protocols and techniques.

.5 Completed training in First Aid.

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

.7 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.

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

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

1.7 HEALTH AND SAFETY COMMITTEE

.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 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.

1.8 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 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 UNFORESEEN HAZARDS

.1 Should any unforeseen or peculiar safety-related factor, hazard, or condition become evident during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction. Advise Owner’s Representative verbally and in writing.

1.10 INSTRUCTION AND TRAINING

.1 Workers shall not participate in or supervise any activity on the work site until they have been trained to a level required by this job function and responsibility. Training shall as a minimum thoroughly cover the following:

.1 Federal and Provincial Health and Safety Legislation requirements including roles and responsibilities of workers and person(s) responsible for implementing, monitoring and enforcing health and safety requirements.

.2 Safety and health hazards associated with working on a contaminated site including recognition of symptoms and signs which might indicate over exposure to hazards.

.3 Limitations, use, maintenance and disinfection-decontamination of personal protective equipment associated with completing work.

.4 Limitations, use, maintenance and care of engineering controls and equipment.

.5 Limitations and use of emergency notifications and response equipment including emergency response protocol.

.6 Work practices and procedures to minimize the risk of an accident and hazardous occurrence from exposure to a hazard.

.2 Provide and maintain training of workers, as required, by Federal and Provincial legislation.

.3 Provide copies of all training certificates to Owner's Representative for review, before a worker is to enter the work site.

.4 Authorized visitors shall not access the work site until they have been:

.1 Notified of the names of persons responsible for implementing, monitoring and enforcing the health and Safety Risk Assessment and Management Plan.

.2 Briefed on safety and health hazards present on the site.

.3 Instructed in the proper use and limitations of personal protective equipment.

.4 Briefed as the emergency response protocol including notification and evacuation process.

.5 Informed of practices and procedures to minimize risks from hazards and applicable to activities performed by visitors.

1.11 CONSTRUCTION SAFETY MEASURES

.1 Observe construction safety measures of National Building Code, latest edition, Provincial Government, OH&S Act and Regulations, Workplace Health and Safety and Compensation Commission and Municipal Authority provided that in any case of conflict or discrepancy more stringent requirements shall apply.

.2 Administer the project in a manner that will ensure, at all times, full compliance with Federal and Provincial Acts, regulations and applicable safety codes and the site Health and Safety Risk Assessment and Management Plan.

.3 Provide Owner's Representative with copies of all orders, directions and any other documentation, issued by the Provincial Department of Government Services, Occupational Health and Safety branch immediately after receipt.

1.12 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 and authority having jurisdiction, and in consultation with Owner's Representative.

1.13 HEALTH AND SAFETY MONITORING

.1 Periodic inspections of the contractor's work may be carried out by the Owner's Representative to maintain compliance with the Health and Safety Program. Inspections will include visual inspections as well as testing and sampling as required.

.2 The contractor shall be responsible for any and all costs associated with delays as a result of contractor's failure to comply with the requirements outlined in this section.

1.14 NOTIFICATION

.1 For projects exceeding thirty (30) days or more, the contractor shall, prior to the commencement of work, notify in writing the Work Place Health and Safety Division, Department of Labour with the following information:

.1 Name and location of construction site.

.2 Company name and mailing address of contractor doing the work.

.3 The number of workers to be employed.

.4 A copy of the Health and Safety Risk Assessment and Management Plan if requested.

1.15 CORRECTION OF NON-COMPLIANCE

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

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

.3 Engineer/Architect may stop work if non-compliance of health and safety regulations is not corrected.

1.16 WHMIS

.1 Ensure that all controlled products are in accordance with the Workplace Hazardous Materials Information System (WHMIS) Regulations and Chemical Substances of the OH&S Act and Regulations regarding use, handling, labelling, storage, and disposal of hazardous materials.

.2 Deliver copies of relevant Material Safety Data Sheets (MSDS) to job site and the Engineer/Architect. The MSDS must be acceptable to Labour Canada and Health and Welfare Canada for all controlled products that will be used in the performance of this work.

.3 Train workers required to use or work in close proximity to controlled products as per OH&S Act and Regulations.

.4 Label controlled products at jobsite as per OH&S and Regulations.

.5 Provide appropriate emergency facilities as specified in the MSDS where workers might be exposed to contact with chemicals, e.g. eye-wash facilities, emergency shower.

.1 Workers to be trained in use of such emergency equipment.

.6 Contractor shall provide appropriate personal protective equipment as specified in the MSDS where workers are required to use controlled products.

.1 Properly fit workers for personal protective equipment

.2 Train workers in care, use and maintenance of personal protective equipment.

.7 No controlled products are to be brought on-site without prior approved MSDS.

.8 The MSDS are to remain on site at all times.

1.17 OVERLOADING

.1 Ensure no part of work or associated equipment is subjected to loading that will endanger its safety or will cause permanent deformation.

1.18 FALSEWORK

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

1.19 SCAFFOLDING

.1 Design, erect and maintain scaffolding in accordance with CSA S269.2 and Sections 91-97 of the OH&S Act and Regulations.

.2 Ensure that fall-restraint or fall-arrest devices are used by all workers working at elevations greater than 3.05 metres above grade or floor level in accordance with CSA Z259.

1.20 PERSONAL PROTECTIVE EQUIPMENT

.1 Ensure workers on the jobsite use personal protective equipment appropriate to the hazards identified in the Risk Assessment and Management Plan and those workers are trained in the proper care, use, and maintenance of such equipment.

.2 PPE selections shall be based on an evaluation of the performance characteristics of the PPE relative to the requirements and limitations of the site, task-specific conditions, duration and hazards and potential hazards identified on site.

.3 Provide workers and visitors to the site with proper respiratory protection equipment.

.1 No work shall be performed in an area where an airborne contaminant exceeds one half (½) the IDLH concentration.

.2 Respiratory protection shall be provided in accordance with the requirements of the Occupational Health and Safety Branch, Department of Labour of the Province of Newfoundland and Labrador and these specifications.

.3 Establish, implement and maintain a respirator inspection and maintenance program.

.4 Copies of all respirator owner’s maintenance manuals, shall be kept at all times at the contractor’s site office.

.4 Provide and maintain a supply of dermal protection equipment to allow visitors and all workers proper dermal protection.

.1 Dermal protection shall be sufficient to act as a protective barrier between the skin and an airborne contaminant or hazardous material. Dermal protection shall also be provided for all physical hazards.

.2 Dermal protection equipment shall not be used after exceeding 75% of the break through time. The break through time shall be based on the contaminant which requires the least amount of time to break through the protective equipment

.3 Copies of all dermal protection user specifications, owners and maintenance manuals shall be kept at all times at the contractor’s site office.

.4 Establish, implement and maintain air inspection program to ensure proper dermal protection in accordance with CSA, NIOSH, U.S. EPA and manufacturer's requirements.

.5 Provide all workers and up to five (5) visitors to the site with proper hearing protection. Workers and visitors shall not be exposed to noise levels greater than 85 dB (A) over an eight hour shift without proper hearing protection.

.6 Provide all workers and up to five (5) visitors to the site with CSA approved eye protection sufficient to act as a protective barrier between the eye and airborne contaminants, hazardous materials and physical hazard.

.7 Provide workers and up to five (5) visitors to the site with CSA approved hard hats.

1.21 TRAFFIC CONTROL

.1 Provide traffic control measures when working on, or adjacent to, roadways in accordance with the "Traffic Control Manual for Roadwork Operations", Department of Transportation and Works.

1.22 EXCAVATION SAFETY

.1 Protect excavations more than 1.25 metres deep against cave-ins or wall collapse by side wall sloping to the appropriate angle of repose, an engineered shoring/sheathing system or an approved trench box.

.1 Provide a ladder which can extend from the bottom of the excavation to at least 0.91 metres above the top of the excavation.

.2 Ensure that all excavations less than 1.25 metres deep are effectively protected when hazardous ground movement may be expected.

.3 Design trench boxes, certified by a registered Professional Engineer, and fabricated by a reputable manufacturer. Provide the manufacturer's Depth Certificate Statement permanently affixed. Use trench boxes in strict accordance with manufacturer's instructions and depth certification data.

.4 For excavations deeper than six (6) metres, provide a certificate from a registered Professional Engineer stating that the protection methods proposed have been properly designed in accordance with accepted engineering practice. The engineer's certificate shall verify that the trench boxes, if used, are properly designed and constructed to suit the depth and soil conditions.

.5 Ensure that the superintendent and every crew chief, foreperson and lead hand engaged in trenching operations or working in trenches have in his/her possession a copy of the Department of Labour's "Trench Excavation Safety Guide".

1.23 CONFINED SPACE WORK

.1 Comply with requirements of Canada Occupational Safety and Health Regulations, Part XI and Consolidated Regulations Newfoundland and Labrador (CRNL) OH&S 1165/96.

.2 Provide approved air monitoring equipment where workers are working in confined spaces and ensure any test equipment to be used is calibrated, in good working order and used by trained persons.

.3 Develop a confined space entry program specific to the nature of work performed and in accordance with OH&S Act and Regulations and ensure supervisors and workers are trained in the confined space entry program.

.1 Ensure that personal protective equipment and emergency rescue equipment appropriate to the nature of the work being performed is provided and used.

.4 Provide and maintain training of workers, as required by the Federal and Provincial Legislation.

.5 Provide Owner's Representative with a copy of an "Entry Permit" for each entry into the confined space to ensure compliance with Federal and Provincial Legislation.

1.24 HAZARDOUS MATERIALS

.1 Should material resembling hazardous materials (asbestos/mould) be encountered during the execution of work and notify Owner's Representative. Do not proceed until written instructions have been received from Owner's Representative.

.2 Unless otherwise noted, for hazardous materials abatement and repair, employ the services of a recognized Environmental Consultant to provide all air monitoring and testing services for regulatory requirements.

1.25 HEAVY EQUIPMENT

.1 Ensure mobile equipment used on jobsite is of the type specified in OH&S Act and Regulations fitted with a Roll Over Protective (ROP) Structure.

.2 Provide certificate of training in Power Line Hazards for operators of heavy equipment.

.3 Obtain written clearance from the power utility where equipment is used in close proximity to (within 5.5 metres) overhead or underground power lines.

.4 Equip cranes with:

.1 A mechanism which will effectively prevent the hook assembly from running into the top boom pulley.

.2 A legible load chart.

.3 A maintenance log book.

1.26 WORK STOPPAGE

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

PRODUCTS (NOT APPLICABLE)

EXECUTION (NOT APPLICABLE

END OF SECTION

GENERAL

1.1 FIRES

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

1.2 DISPOSAL OF WASTES

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

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

1.3 DRAINAGE

.1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.

.2 Do not pump water containing suspended materials into waterways, sewer or drainage systems.

.3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

1.4 SITE CLEARING AND PLANT PROTECTION

.1 Protect trees and plants on site and adjacent properties where indicated.

.2 Wrap in burlap, trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 meter.

.3 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.

.4 Minimize stripping of topsoil and vegetation.

.5 Restrict tree removal to areas indicated or designated by Owner’s Representative.

1.5 POLLUTION CONTROL

.1 Maintain temporary erosion and pollution control features installed under this contract.

.2 Control emissions from equipment and plant to local authority’s emission requirements.

.3 Prevent sandblasting and other extraneous materials from contaminating air beyond application area, by providing temporary enclosures.

.4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

1.6 NOTIFICATION

.1 Owner’s Representative will notify Contractor in writing of observed non-compliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and

other elements of environmental protection. Contractor: after receipt of such notice, inform Owner's Representative of proposed corrective action and take such action as approved by Owner's Representative.

.2 Owner's Representative may issue stop order of work until satisfactory corrective action has been taken.

.3 No time extensions will be granted, or equitable adjustments allowed to Contractor for such suspensions.

PRODUCTS (NOT APPLICABLE)

EXECUTION (NOT APPLICABLE)

END OF SECTION

GENERAL

1.1 REFERENCES AND CODES

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

.2 Meet or exceed the requirements of:

.1 Contract documents.

.2 Specified standards, codes, and referenced documents.

1.2 HAZARDOUS MATERIAL DISCOVERY

.1 Asbestos: stop work immediately should materials believed to contain asbestos be encountered in during the execution of the work and notify Owner's Representative. Do not proceed until written instructions have been received from Owner's Representative. Perform asbestos abatement and repair in accordance with Newfoundland and Labrador Asbestos Abatement Regulations, Latest Edition.

.2 Mould: stop work immediately should material resembling mould be encountered during the execution of work and notify Owner's Representative. Do not proceed until written instructions have been received from Owner's Representative.

1.3 BUILDING SMOKING ENVIRONMENT

.1 Comply with smoking restrictions.

1.4 RELICS AND ANTIQUITIES

.1 Protect relics, antiquities, items of historical or scientific interest such as cornerstones and contents, commemorative plaques, inscribed tablets, and similar objects found during course of work.

.2 Give immediate notice to Owner's Representative and await Owner's Representative's written instructions before proceeding with work in this area.

.3 Relics, antiquities and items of historical or scientific interest remain Her Majesty's property.

PRODUCTS (NOT APPLICABLE)

EXECUTION (NOT APPLICABLE)

END OF SECTION

GENERAL

1.1 SECTIONS INCLUDE

.1 Inspection and testing, administrative and enforcement requirements.

.2 Tests and mix designs.

.3 Mock-ups.

.4 Mill tests.

.5 Equipment and system adjust and balance.

1.2 INSPECTION

.1 Allow Owner's Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.

.2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Owner's Representative instructions.

.3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.

.4 Owner's Representative may order any part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Owner's Representative shall pay cost of examination and replacement.

1.3 INDEPENDENT INSPECTION AGENCIES

.1 Independent Inspection/Testing Agencies will be engaged by Owner's Representative for purpose of inspecting and/or testing portions of Work.

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

.3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.

.4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Owner's Representative at no cost to Owner's Representative. Pay costs for retesting and reinspection.

1.4 ACCESS TO WORK

.1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.

.2 Co-operate to provide reasonable facilities for such access.

1.5 PROCEDURES

.1 Notify appropriate agency and Owner's Representative in advance of requirement for tests, in order that attendance arrangements can be made.

.2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in an orderly sequence so as not to cause delay in Work.

.3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.6 REJECTED WORK

.1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Owner's Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.

.2 Make good other Contractor's work damaged by such removals or replacements promptly.

.3 If in opinion of Owner's Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner may deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which shall be determined by Owner's Representative.

1.7 REPORTS

.1 Submit 3 copies of inspection and test reports to Owner's Representative, plus electronic copies in PDF format.

.2 Provide copy to Subcontractor of work being inspected or tested, manufacturer or fabricator of material being inspected or tested.

1.8 MOCK-UPS

.1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of all Sections required to provide mock-ups.

.2 Construct in all locations acceptable to Owner's Representative as specified in specific Section.

.3 Prepare mock-ups for Owner's Representative review with reasonable promptness and in an orderly sequence, so as not to cause any delay in Work.

.4 Failure to prepare mock-ups in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.

.5 Remove mock-up at conclusion of Work or when acceptable to Owner's Representative

.6 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.

.7 Reviewed and accepted mock-ups will become standards of workmanship and material against which installed work will be verified.

.8 Mock-ups may remain as part of Work.

1.9 EQUIPMENT AND SYSTEMS

.1 Submit adjustment and balancing reports for electrical systems.

.2 Electrical – Coordinate with electrical division.

PRODUCTS (NOT APPLICABLE)

EXECUTION (NOT APPLICABLE)

END OF SECTION

GENERAL

1.1 INSTALLATION AND REMOVAL

.1 Provide temporary utilities controls in order to execute work expeditiously.

.2 Remove from site all such work after use.

1.2 DEWATERING

.1 Provide temporary drainage and pumping facilities to keep excavations and site free from standing water.

1.3 WATER SUPPLY

.1 Arrange for connection with Owner's Representative and pay all costs for installation, maintenance and removal.

1.4 TEMPORARY POWER AND LIGHT

.1 Provide and pay for temporary power during constructing for temporary lighting, heating, site construction trailers and operating of power tools in accordance with governing regulations and the Canadian Electrical Code, latest edition.

.2 Arrange for connection. Pay all costs for installation, maintenance and removal of cables, distribution and branch panel boards, poles, lighting, heating and general power receptacles as required.

.3 Temporary power for electric cranes and other equipment requiring in excess of above is responsibility of Contractor.

.4 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lux. Temporary lighting to consist of wiring, pig tail sockets and LED shatterproof lamps to provide a minimum light level of 162 lux.

.5 Electrical power and lighting systems installed under this contract may be used for construction requirements only with prior approval of the Owner's Representative provided that guarantees are not affected. Make good damage to electrical system caused by use under this contract.

.6 Pay for all electrical energy charges associated with temporary power up to date of substantial completion.

1.5 TEMPORARY HEATING AND VENTILATION

.1 Pay for costs of temporary heat and ventilation used during construction, including costs of installation, fuel operation, maintenance and removal of equipment. Use of direct, fired heaters discharging waste products into work areas will not be permitted unless prior approval is given by Owner's Representative.

.2 Construction heaters used inside building must be vented to outside or be non-flameless type. Solid fuel salamanders are not permitted.

.3 Provide temporary heat and ventilation in enclosed areas as required to:

.1 Facilitate progress of Work.

.2 Protect Work and products against dampness and cold.

.3 Prevent moisture condensation on surfaces.

.4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.

.5 Provide adequate ventilation to meet health regulations for safe working environment.

.4 Maintain temperatures of minimum 10°C and relative humidity less than 60% in areas where construction is in progress.

.1 Maintain minimum temperature of 10°C or higher where specified as soon as finished work is commenced. Maintain until acceptance of structure by Owner's Representative.

.2 Maintain ambient temperature and humidity levels as required for comfort of personnel.

.5 Ventilating:

.1 Prevent accumulations of dust, fumes, mists, vapors or gases in areas occupied during construction.

.2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.

.3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.

.4 Ventilate storage spaces containing hazardous or volatile materials.

.5 Ventilate temporary sanitary facilities.

.6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.

.6 Maintain strict supervision of operation of temporary heating and ventilating equipment to:

.1 Conform to applicable codes and standards.

.2 Enforce safe practices.

.3 Prevent abuse of services.

.4 Prevent damage to finishes.

.5 Vent direct-fired combustion units to outside.

.7 Be responsible for damage to Work due to failure in providing adequate heat, humidity and protection during construction.

.8 Use of new or existing systems for temporary heating, ventilating or air conditioning will not be permitted.

1.6 FIRE PROTECTION

.1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction and governing codes, regulations and bylaws.

.2 Burning rubbish and construction waste materials is not permitted on site.

1.7 SANITARY FACILITIES

.1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.

.2 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.

.3 When permanent water and drain connections are completed, provide temporary water closets and urinals complete with temporary enclosures, inside building. Permanent facilities may be used on approval of Owner's Representative.

1.8 REMOVAL OF TEMPORARY FACILITIES

.1 Remove temporary facilities from site when directed by Owner's Representative.

.2 When project is closed down at end of construction season keep temporary facilities operational until close down or removal is approved by Owner's Representative.

PRODUCTS (NOT APPLICABLE)

EXECUTION (NOT APPLICABLE)

END OF SECTION

GENERAL

1.1 SECTION INCLUDES

.1 Construction aids.

.2 Office and sheds.

.3 Parking.

.4 Project identification.

1.2 INSTALLATION AND REMOVAL

.1 Provide construction facilities in order to execute work expeditiously.

.2 Remove from site all such work after use.

1.3 SCAFFOLDING

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

.2 Erect scaffolding independent of walls. Remove promptly when no longer required. Refer to Section 01 35 29.06 – Health and Safety Requirements.

1.4 HOISTING

.1 Provide, operate and maintain hoists cranes required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for use thereof.

.2 Hoists cranes shall be operated by certified operator.

1.5 SITE STORAGE/LOADING

.1 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.

.2 Do not load or permit to load any part of Work with a weight or force that will endanger the Work.

1.6 CONSTRUCTION PARKING

.1 Parking will be permitted on site provided it does not disrupt performance of work or not required by the owner's staff. Obtain permission from Owner's Representative.

.2 Provide and maintain adequate access to project site.

.3 If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractor's use of roads.

1.7 EQUIPMENT, TOOL AND MATERIALS STORAGE

.1 Provide and maintain, in a clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.

.2 Locate materials not required to be stored in weatherproof sheds on site in a manner to cause least interference with work activities.

1.8 SANITARY FACILITIES

.1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.

.2 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.

1.9 CLEAN-UP

.1 Remove construction debris, waste materials, packaging material from work site daily.

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

.3 Store materials resulting from demolition activities that are salvageable.

PRODUCTS (NOT APPLICABLE)

EXECUTION (NOT APPLICABLE)

END OF SECTION

GENERAL

1.1 SECTION INCLUDES

.1 Barriers.

.2 Environmental Controls.

.3 Traffic Controls.

.4 Fire Routes.

1.2 INSTALLATION AND REMOVAL

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

.2 Remove from site all such work after use.

1.3 HOARDING

.1 Hoarding enclosures are not permitted within the substation yard. A temporary rope fence was installed under the CP1 Civil works package which serves to delineate the area of the yard accessible to the CP2 contractor. Refer to drawings for exact locations. The CP2 contractor is not permitted to cross the rope fence without prior written consent from NL Power and the Owner's Representative.

.2 Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.

1.4 GUARD RAILS AND BARRICADES

.1 Provide as required by governing authorities.

1.5 ACCESS TO SITE

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

.2 If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractor’s use of roads.

1.6 PUBLIC TRAFFIC FLOW

.1 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect the public.

.2 Contractor is responsible to install temporary controls to prevent access to areas where truck and crane equipment is operating in accordance with OH&S and MUN Safety procedures.

1.7 FIRE ROUTES

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

1.8 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

.1 Protect surrounding private and public property from damage during performance of Work.

.2 Be responsible for damage incurred.

1.9 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 Owner's Representative locations and installation schedule 3 days prior to installation.

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

PRODUCTS (NOT APPLICABLE)

EXECUTION (NOT APPLICABLE)

END OF SECTION

GENERAL

1.1 SECTION INCLUDES

.1 Product quality, availability, storage, handling, protection, and transportation.

.2 Manufacturer's instructions.

.3 Quality of Work, coordination and fastenings.

1.2 REFERENCES

.1 Within text of each specifications section, reference may be made to reference standards. Conform to these reference standards, in whole or in part as specifically requested in specifications.

.2 Conform to latest date of issue of referenced standards in effect on date of submission of Tenders, except where specific date or issue is specifically noted.

1.3 QUALITY

.1 Products, materials, equipment and articles (referred to as products throughout specifications) incorporated in Work shall be new, not damaged or defective, and of best quality (compatible with specifications) for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.

.2 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.

.3 Should any dispute arise as to quality or fitness of products, decision rests strictly with Owner’s Representative based upon requirements of Contract Documents.

.4 Within 7 (seven) days of written request by Owner’s Representative, submit following information for material and equipment proposed for supply:

.1 Name and address of manufacturer.

.2 trade name, model and catalogue number,

.3 performance, descriptive and test data,

.4 manufacturer’s installation or application instructions,

.5 evidence of arrangements to procure.

.5 Use products of one manufacturer for material and equipment of same type or classification unless otherwise specified.

.6 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 any items. If delays in supply of products

are foreseeable, notify Owner's 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 Owner's Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Owner's 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 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 Owner's Representative.

.9 Touch-up damaged factory finished surfaces to Owner's Representative 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.

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 Owner's Representative in writing, of conflicts between specifications and manufacturer's instructions, so that Owner's Representative may establish course of action.

.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Owner's 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 Owner's 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. Owner's 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 Owner's Representative, whose decision is final.

1.9 CO-ORDINATION

.1 Ensure cooperation 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 Before installation, inform Owner's Representative if there is interference. Install as directed by Owner's Representative.

1.11 REMEDIAL WORK

.1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Coordinate adjacent affected Work as required.

.2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.12 FASTENINGS GENERAL

.1 Provide metal fastenings and accessories in same texture, colour and finish as base metal in which they occur. Prevent electrolytic action between dissimilar metals. Use non-corrosive fasteners, anchors and spacers for securing exterior work, unless stainless steel or other material is specifically requested in affected specification section.

.2 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood plugs are not acceptable.

.3 Conceal fasteners where indicated. Space evenly and lay out neatly.

.4 Fastenings which cause Spalding or cracking are not acceptable.

.5 Obtain Owner's Representative's approval before using explosive actuated fastening devices. If approval is obtained comply with CSA Z166.

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. 316 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 any part of building. Do not cut, drill or sleeve any load bearing structural member, unless specifically indicated, without written approval of Owner's 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.

.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.

.3 Submit schedule to and obtain approval from Owner's Representative for any shut-down or closure of active services or facility. Adhere to approved schedule and provide notice to affected parties.

.4 Where unknown services are encountered, immediately advise Owner's Representative and confirm findings in writing.

.5 Remove abandoned services lines within 2m of structures. Cap or otherwise seal lines at cut-off points as directed by Owner's Representative.

1.16 SELECTION OF MATERIAL AND EQUIPMENT

.1 Material and equipment will be specified in the tender documents, and selected by Contractor, by one or more of the following methods:

.1 Specification by reference to a relevant Standard, such as CSA, ASTM, ULC, etc., select any material or equipment that meets or exceeds the specified.

.2 Specification by reference to an accepted product evaluation publication, such as the CGSB "Qualified Products List", or CCMC Registry of Product Evaluations", - select any manufacturer's product so listed.

.3 Specification by Prescriptive or Performance specification – select any material or equipment meeting or exceeding specification.

.4 Specification by identification of one or more Manufacturer's specific product(s) as an "Acceptable Product", along with a listing of other manufacturers who may offer equivalent products – select any product so named, or select from equivalent product(s) of other listed manufacturers.

.2 "Acceptable Product" is deemed to be a complete and working commodity as described by a manufacturer's name, catalogue number, trade name, or any combination thereof, and will constitute the minimum standard of acceptance.

.3 Owner's Representative will determine acceptability of Contractor's selection of material and equipment at time of Shop Drawing review.

.4 When material or equipment is specified by a Standard, Prescriptive or Performance specification, upon request of the Owner's Representative, obtain from manufacturer an independent laboratory reporting, showing that material or equipment meets or exceeds the specified requirements.

1.17 SUBSTITUTION OF MATERIAL AND EQUIPMENT

.1 Prior to Tender closing bidders may propose addition of other manufacturer's names to those listed in the tender documents providing requests are made in writing at least 7 days prior to tender closing date or bid depository where bid depository is used. Owner's Representative will inform all prospective bidders of decision by addendum, issued at least 5 days prior to the tender closing date.

.2 Where no manufacturer's names are listed, the onus is on contractor to provide material and equipment to meet performance specification.

.3 After Contract award substitutions of material or equipment, other than as selected by Contractor from those specified, will be considered by Owner's Representative only if:

.1 material or equipment selected from those specified are not available

.2 delivery date of material or equipment selected from those specified would unduly delay completion of the Contract; or

.3 alternative material or equipment to those specified, provided they are determined by the Owner's Representative to be equivalent to or better than those specified, will result in a credit to the Contract amount.

.4 Requests for substitutions after Contract award must be accompanied by sufficient information in the form of shop drawings, manufacturer's literature, samples or other data to permit proper investigation of the substitutes used. Requests must also include statements of respective costs of material or equipment originally specified and the proposed substitution.

.5 Should a proposed substitution be accepted after Contract award either in part or in whole, assume full responsibility and costs when substitution affects other work on Project. Contractor to pay for design or drawing changes required as a result of the substitution.

.6 Amounts of all credits arising from approval of substitutions after Contract award will be determined by Owner's Representative and the Contract amount will be reduced accordingly.

PRODUCTS (NOT APPLICABLE)

EXECUTION (NOT APPLICABLE)

END OF SECTION

GENERAL

1.1 SECTION INCLUDES

.1 Recording of subsurface conditions found.

1.2 EXISTING SERVICES

.1 Where work involves breaking into or connecting to existing services, carry out work at times directed by authorities having jurisdiction, with minimum of disturbance to pedestrian and vehicular traffic.

.2 Before commencing work, establish location and extent of service lines in area of Work and notify Owner’s Representative of findings.

.3 Remove abandoned service lines within 2 meter of structures. Cap or otherwise seal lines at cut-off points as directed by Owner’s Representative.

1.3 LOCATION OF EQUIPMENT AND FIXTURES

.1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.

.2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.

.3 Inform Owner’s Representative of impending installation and obtain approval for actual location.

.4 Submit field drawings to indicate relative position of various services and equipment when required by Owner’s Representative.

1.4 RECORDS

.1 Maintain a complete, accurate log of work as it progresses.

.2 Record locations of maintained, re-routed and abandoned service lines.

1.5 SUBSURFACE CONDITIONS

.1 Promptly notify Consultant in writing if subsurface conditions at Place of Work differ materially from those indicated in Contract Documents, or a reasonable assumption of probable conditions based thereon.

.2 After prompt investigation, should Owner’s Representative determine that conditions do differ materially, instructions will be issued for changes in Work.

PRODUCTS (NOT APPLICABLE)

EXECUTION (NOT APPLICABLE)

END OF SECTION

GENERAL

1.1 SECTION INCLUDES

.1 Requirements and limitations for cutting and patching the Work.

1.2 SUBMITTALS

.1 Submit written request in advance of cutting or alteration which affects:

.1 Structural integrity of any element of Project.

.2 Integrity of weather-exposed or moisture-resistant elements.

.3 Efficiency, maintenance, or safety of any operational element.

.4 Visual qualities of sight-exposed elements.

.5 Work of Owner or separate contractor.

.2 Include in request:

.1 Identification of Project.

.2 Location and description of affected Work.

.3 Statement on necessity for cutting or alteration.

.4 Description of proposed Work, and products to be used.

.5 Alternatives to cutting and patching.

.6 Effect on Work of Owner or separate contractor.

.7 Written permission of affected separate contractor.

.8 Date and time work will be executed.

1.3 PREPARATION

.1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.

.2 After uncovering, inspect conditions affecting performance of Work.

.3 Beginning of cutting or patching means acceptance of existing conditions.

.4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.

.5 Provide protection from elements for areas which may be exposed by uncovering work; maintain excavations free of water.

.6 Obtain Owner’s Representative’s approval before cutting, boring or sleeving load-bearing members.

1.4 EXECUTION

.1 Execute cutting, fitting, and patching including excavation and fill, to complete Work.

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

.3 Uncover Work to install ill-timed Work.

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

.5 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.

.6 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.

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

.8 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.

.9 Restore work with new products in accordance with requirements of Contract Documents.

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

.11 Refinish surfaces to match adjacent finishes: For continuous surfaces refinish to nearest intersection; for an assembly, refinish entire unit.

.12 Make cuts with clean, true, smooth edges.

.13 Where new work connects with existing, and where existing work is altered, cut, patch and make good to match existing work.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

PRODUCTS (NOT APPLICABLE)

EXECUTION (NOT APPLICABLE)

END OF SECTION

GENERAL

1.1 GENERAL

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

.2 Store volatile waste in covered metal containers and remove from premises at end of each working day.

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

1.2 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by Owner or other Contractors.

.2 Remove waste materials and debris from site at the end of each working day. Do not burn waste materials on site.

.3 Clear snow and ice from access to building.

.4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.5 Provide on-site containers for collection of waste materials and debris.

.6 Clean interior areas prior to start of finish work, maintain areas free of dust and other contaminants during finishing operations.

.7 Store volatile waste in covered metal containers, and remove from premises at end of each working day.

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

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

.10 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.3 FINAL CLEANING

.1 Refer to General Conditions.

.2 When Work is Substantially Performed, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.

.3 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.

.4 When the Work is Totally Performed, remove surplus products, tools, construction machinery and equipment. Remove waste products and debris other than that caused by the Owner or the Contractors.

.5 Remove waste materials from the site at regularly scheduled times or dispose of as directed by the Owner’s Representative. Do not burn waste materials on site.

.6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.7 Leave the work broom before the inspection process commences.

.8 Clean and polish glass, hardware, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.

.9 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, walls, floors and ceilings.

.10 Clean lighting reflectors, lenses and other lighting surfaces.

.11 Vacuum clean and dust building interiors, behind grilles, louvers and screens.

.12 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

.13 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.

.14 Remove dirt and other disfiguration from exterior surfaces.

.15 Clean and sweep roofs.

.16 Sweep and wash clean paved areas.

.17 Clean equipment and fixtures to a sanitary condition; clean or replace filters of mechanical equipment.

.18 Remove snow and ice from access to building.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PRODUCTS (NOT APPLICABLE)

EXECUTION (NOT APPLICABLE)

END OF SECTION

GENERAL

1.1 DEFINITIONS

.1 Recyclable: Ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse by others.

.2 Recycle: Process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.

.3 Recycling: Process of sorting, cleansing, treating, and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

.4 Reuse: Repeated use of product in same form but not necessarily for same purpose. Reuse includes:

.1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.

.2 Returning reusable items including pallets or unused products to vendors.

.5 Salvage: Removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.

.6 Separate Condition: Refers to waste sorted into individual types.

.7 Source Separation: Acts of keeping different types of waste materials separate beginning from first time they became waste.

1.2 STORAGE, HANDLING AND PROTECTION

.1 Unless specified otherwise, materials for removal become Contractor's property.

.2 Protect, stockpile, store and catalogue salvaged items.

.3 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to approved local facility.

.4 Protect structural components not removed for demolition from movement or damage.

.5 Support affected structures. If safety of building is endangered, cease operations and immediately notify Owner’s Representative.

.6 Protect surface drainage, mechanical and electrical from damage and blockage.

.7 Separate and store materials produced during dismantling of structures in designated areas.

.8 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.

.1 On-site source separation is recommended.

1.3 DISPOSAL OF WASTES

.1 Do not bury rubbish or waste materials.

.2 Do not dispose of any waste into waterways, storm, or sanitary sewers.

.3 Remove materials from deconstruction as deconstruction/disassembly work progresses.

.4 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in pre-demolition material audit.

1.4 USE OF SITE AND FACILITIES

.1 Execute work with least possible interference or disturbance to normal use of premises.

.2 Provide security measures approved by Owner's Representative.

1.5 SCHEDULING

.1 Coordinate Work with other activities at site to ensure timely and orderly progress of Work.

PRODUCTS (NOT APPLICABLE)

EXECUTION

3.1 APPLICATION

.1 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

3.2 CLEANING

.1 Remove tools and waste materials on completion of work and leave work area in clean and orderly condition.

.2 Clean-up work area as work progresses.

.3 Source separate materials to be reused/recycled into specified sort areas.

3.3 DIVERSION OF MATERIALS

.1 From following list, separate materials from general waste stream and stockpile in separate piles or containers, as reviewed by Owner's Representative and consistent with applicable fire regulations.

.1 Mark containers or stockpile areas.

.2 Provide instruction on disposal practices.

END OF SECTION

GENERAL

1.1 FINAL INSPECTION AND DECLARATION PROCEDURES

.1 Contractor's Inspection: The Contractor and all Subcontractors shall conduct an inspection of Work, identify deficiencies and defects; repair as required. Notify the Owner's Representative in writing of satisfactory completion of the Contractor's Inspection and that corrections have been made. Request an Owner's Representative's Consultant's Inspection.

.2 Owner's Representative's Inspection: Owner's Representative and the Contractor will perform an inspection of the Work to identify obvious defects or deficiencies. The contractor shall correct Work accordingly.

.3 Completion: submit written certificate that the following have been performed:

- .1 Work has been completed and inspected for compliance with Contract Documents.
- .2 Defects have been corrected and deficiencies have been completed.
- .3 Equipment and systems have been tested, adjusted and balanced and are fully operational.
- .4 Certificates required by Fire Commissioner, and utility companies have been submitted.
- .5 Operation of systems have been demonstrated to Owner's personnel.
- .6 Work is complete and ready for Final Inspection.

.4 Final Inspection: When items noted above are completed, request final inspection of Work by the Owner's Representative, Owner's Representative and the Contractor. If Work is deemed incomplete by the Owner's Representative, complete outstanding items and request a reinspection.

.5 Declaration of Substantial Performance: When the Owner's Representative considers deficiencies and defects have been corrected and it appears requirements of Contract have been substantially performed, make application for Certificate of Substantial Performance. Refer to General Conditions for specifics to application.

.6 Commencement of Lien and Warranty Periods: The date of Owner's Representative acceptance of the submitted declaration of Substantial Performance shall be the date for commencement for the warranty period and commencement of the lien period.

.7 Declaration of Total Performance: When the Owner's Representative considers final deficiencies and defects have been corrected and it appears requirements of the Contract have been totally performed, make application for certificate of Total Performance. Refer to General Conditions for specifics to application. If work is deemed incomplete by the Consultant, complete the outstanding items and request a reinspection.

1.2 REINSPECTION

.1 Should status of work require reinspection by Owner's Representative due to failure of work to comply with Contractor's claims for inspection, Owner will deduct amount of compensation for reinspection services from payment to Contractor.

PRODUCTS (NOT APPLICABLE)

EXECUTION (NOT APPLICABLE)

END OF SECTION

GENERAL

1.1 SECTION INCLUDES

.1 As-built, samples, and specifications.

.2 Equipment and systems.

.3 Product data, materials and finishes, and related information.

.4 Operation and maintenance data.

.5 Spare parts, special tools and maintenance materials.

.6 Warranties and bonds.

1.2 RELATED SECTIONS

.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 (Cx) Requirements.

1.3 SUBMISSION

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

.2 Submit one electronic pdf copy of completed volumes in final form 15 days prior to final inspection.

.3 Copy will be returned after final inspection, with Owner’s Representative’s comments.

.4 Revise content of documents as required prior to final submittal.

.5 Two weeks prior to Substantial Performance of the Work, submit to the Owner’s Representative, and electronic PDF copy of operating and maintenance manuals.

.6 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.

.7 If requested, furnish evidence as to type, source and quality of products provided.

.8 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.

.9 All PDF documents to be submitted via email to 1401doccontrol@stantec.com.

1.4 FORMAT

.1 Organize data in the form of an instructional manual.

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

.3 Arrange content under Section numbers and sequence of Table of Contents.

.4 Provide tabbed index for each separate product and system, with typed description of product and major component parts of equipment.

.5 Text: Manufacturer's printed data, or typewritten data.

.6 Drawings: provide with text in electronic PDF format.

.7 Provide CAD files in DWG format.

1.5 CONTENTS - EACH VOLUME

.1 Table of Contents: provide title of project; names, addresses, and telephone numbers of Consultant and Contractor with name of responsible parties; schedule of products and systems, indexed to content of 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 clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.

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

.5 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

.6 Training: Refer to Section 01 91 13 – General Commissioning (Cx) Requirements.

1.6 AS-BUILTS AND SAMPLES

.1 In addition to requirements in General Conditions, maintain at the site for Owner’s Representative one record copy of:

.1 Contract Drawings.

.2 Specifications.

.3 Addenda.

.4 Change Orders and other modifications to the Contract.

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

.6 Field test records.

.7 Inspection certificates.

.8 Manufacturer's certificates.

.2 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.

.3 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.

.4 Keep record documents and samples available for inspection by Owner's Representative.

1.7 RECORDING ACTUAL SITE CONDITIONS

.1 Record information on set of drawings, provided by Owner's Representative.

.2 Provide red color pens for recording information.

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

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

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

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

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

.4 Field changes of dimension and detail.

.5 Changes made by change orders.

.6 Details not on original Contract Drawings.

.7 References to related shop drawings and modifications.

.5 Specifications: legibly 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: submit manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.

.7 At completion of project, provide all recorded information on print drawings. Transfer recorded information to AutoCAD files in DWG format. Submit DWG files, also with electronic files in PDF format as part of the Closeout Submittals.

1.8 EQUIPMENT AND SYSTEMS

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

.2 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. Include regulation, control, stopping, shut-down, and

emergency instructions. 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

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

1.9 MATERIALS AND FINISHES

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

.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.

1.10 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 location as directed; place and store.

.4 Receive and catalogue all items. Submit inventory listing to Owner’s Representative. Include approved listings in Maintenance Manual.

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

1.11 MAINTENANCE MATERIALS

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

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

.3 Deliver to site location as directed; place and store.

.4 Receive and catalogue all items. Submit inventory listing to Owner's Representative. Include approved listings in Maintenance Manual.

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

1.12 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 project site place and store.

.4 Receive and catalogue all items. Submit inventory listing to Owner's Representative. Include approved listings in Maintenance Manual.

1.13 STORAGE, HANDLING AND PROTECTION

.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 to satisfaction of Owner's Representative.

1.14 WARRANTIES AND BONDS

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

.2 Submit warranty management plan to Owner's Representative's approval.

.3 Warranty management plan to include required actions and documents to assure that Owner 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 Assemble approved information in electronic PDF format and submit upon acceptance of work. Organize file as follows:

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

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

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

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

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

.6 Co-execute submittals when required.

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

.6 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 roofs, HVAC balancing, pumps, motors, transformers, 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 Procedure and status of tagging of equipment covered by extended warranties.

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

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

.8 Written verification will follow oral instructions. Failure to respond will be cause for the Owner's Representative to proceed with action against Contractor.

1.15 PRE-WARRANTY CONFERENCE

.1 Meet with Owner's Representative to develop understanding of requirements of this section. Schedule meeting prior to contract completion, and at time designated by Owner's Representative.

.2 Owner's Representative will establish communication procedures for:

.1 Notification of construction warranty defects.

.2 Determine priorities for type of defect.

.3 Determine reasonable time for response.

1.16 WARRANTY TAGS

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

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

.3 Indicate 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.

PRODUCTS (NOT APPLICABLE)

EXECUTION (NOT APPLICABLE)

END OF SECTION

GENERAL

1.1 SUMMARY

.1 Section Includes

.1 General requirements relating to commissioning of project's components and systems, specifying general requirements for Installation Verification and Performance Verification of components, equipment, sub-systems, systems, and integrated systems.

.2 Acronyms

.1 CxA – Commissioning Authority.

.2 Cx – Commissioning.

.3 EMCS – Energy Monitoring and Control Systems.

.4 O&M – Operation and Maintenance.

.5 PV – Performance Verification.

.6 TAB – Testing, Adjusting and Balancing.

.7 GC – General Contractor

.8 TSI – Technical Services Inspector

1.2 COMMISSIONING INTENT

.1 Undertake Cx to bring the facility to a fully operational state and free of deficiencies in the most effective and timely manner available, ensuring the design intent is met by all systems.

.2 Cx incorporates inspection and quality assurance activities as construction progresses, including start up, installation verification, performance verification, fine tuning, and operator training.

.3 Bear all costs associated with the required personnel and test equipment as outlined in specification sections and all costs with organizing and managing the activities of the applicable subtrades as identified in this section.

.4 Fully document all tests and inspections performed during the construction, at start up, installation verification and performance verification and fine tuning. Incorporate into final commissioning documentation.

.5 Provide direct training to designated staff responsible for the operation and maintenance of the building equipment and systems.

1.3 COMMISSIONING OVERVIEW

.1 Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished project.

.2 Cx is an intensive quality assurance process that begins at the beginning of the project and continues through to the first year of occupancy. The process focuses upon verifying and documenting that the facility and all of its systems and

assemblies are planned, designed, installed, tested, operated, and maintained to meet the Owners Project Requirements.

.3 Cx activities supplement field quality and testing procedures described in relevant technical sections.

.4 Cx identifies issues in Planning and Design stages which are addressed during Construction and Cx stages to ensure the built facility is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. Cx activities include transfer of critical knowledge to facility operational personnel.

.5 Complete inspection and verification activities as required by the specifications as construction progresses.

.6 Take responsibility to:

.1 Prepare the commissioning manual in consultation with the product manufacturer's requirements.

.2 Review the Cx manual with the commissioning team.

.3 Complete all items as identified in the Cx manual. This includes work by subcontractors, test agencies, equipment representatives and manufacturer agents.

.4 Review Contract Documents and inspect the Work to ensure completeness of the Work and compliance with the Contract Documents.

.5 Correct deficiencies resulting from installation and performance verifications.

.6 Test, adjust and balance equipment and systems identified in Divisions 2-44.

.7 Submit the completed manual and project as-built documents as specified.

.8 Update the documentation manuals prior to each project meeting.

.7 The Substantial Completion Certificate will not be issued until the commissioning process is completed and the final reports and commissioning documentation are received.

.8 The Cx Manual provides direction for the Cx process during design and construction, provides resolution for issues such as scheduling, roles and responsibilities, lines of communication and reporting, approvals and coordination.

1.4 COMMISSIONING TEAM

.1 The commissioning team shall consist of:

.1 Owner’s User Representatives.

.2 General Contractor (GC):

.1 Mechanical Contractor.

.2 Controls Contractor (CC).

.3 Electrical Contractor.

.4 Fire Alarm Contractor.

.5 Communications Systems Contractor.

.3 Contractor's Commissioning Authority (CxA).

.4 Manufacturer's Technicians.

.5 Testing Agencies.

.6 Design Consultant (DC).

.2 Roles of the commissioning team shall be as follows:

.1 CxA (Contractor's Commissioning Authority):

.1 Reviews design documents.

.2 Produces the Commissioning Manual for review by the Owner's Representative and DC, and modifies based on their comments as necessary.

.3 Provides guidance on the Commissioning Process, and responsibilities of Commissioning Team members.

.4 Reviews contractor shop drawings for related commissioning information.

.5 Coordinates and chairs (in person or via teleconference) the commissioning kick-off meeting and progress meetings.

.6 Prepares and distributes the meeting agenda and minutes.

.7 Attends when necessary Installation Verification.

.8 Reviews completed Installation Verification checklists and signs off.

.9 Attends Performance Verification and signs off on check lists.

.10 Attends owner training sessions.

.11 Verifies that training is complete.

.12 Reviews completed Cx manual.

.13 Verifies that seasonal or deferred Commissioning is completed.

.14 Coordinates ten (10) month building review.

.2 GC (General Contractor):

.1 Maintains as-built drawings on site during construction.

.2 Submits shop drawing in accordance with the specifications.

.3 Ensures the Cx Manual is on site and being completed and kept up to date by all sub-trades.

.4 Executes the Cx process ensuring that sub-trades perform their responsibilities and integrate Cx into the construction process.

.5 Ensures equipment manufacturers and vendors provide documentation to facilitate the Commissioning work and perform startups.

.6 Coordinates and schedules Cx activities, submits schedule for review and comment by Owner's staff.

.7 Conducts Installation Verification and signs off checklists.

.8 Provides written confirmation all systems are operational prior to start of Performance Verification.

.9 Conducts Performance Verification with all required Commissioning Team members present.

.10 Ensures that all required personnel are available for the verification.

.11 Maintains an up to date version of the Cx manual on site with checklists completed on installed/operational systems.

.12 Provides all required training.

.13 Coordinates location, schedule.

.14 Provides facilities (location, materials).

.15 Ensures qualified factory trained technicians are available to facilitate training.

.16 Provides copies of all training material.

.17 Obtains occupancy approvals/permits.

.18 Submits completed manual to CM.

.3 Sub Trades:

.1 Demonstrates correct system performance.

.2 Perform commissioning duties as directed by the GC.

.4 DC (Design Consultant):

.1 Reviews drafts of the Cx Manual, including the installation and Performance Verification checklists, and provides comments to the Owner’s Representative.

.2 Incorporates commissioning specification into the project documents.

.3 Reviews contractor shop drawing submittals.

.4 Attends periodic site visits to ensure systems meet the design intent and operate as outline in the specifications.

.5 Attends and signs off checklist for Installation Verification.

.6 Attends Performance Verification and signs off on checklists for the appropriate discipline.

.7 Provides system overview during training.

.8 Attends training as required.

.9 Attends commissioning meetings.

.10 Attends ten (10) month building review activities.

.5 Owner’s Representative:

.1 Reviews all design documents and provides comments to the DC.

.2 Coordinates maintenance staff participation in Cx activities.

.3 Reviews O&M documentation and attends training.

.4 Attends all training sessions.

.5 Provides maintenance representatives to facilitate the ten (10) month building review as necessary.

.6 Attends commissioning meetings as necessary .

1.5 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS

.1 During Cx, should equipment, system components, and associated controls be identified as incorrectly installed, malfunctioning or not performing as per specifications, the contractor shall correct deficiencies, re-verify equipment and components within the system, including related systems as deemed necessary by Owner's Representative, to ensure effective and accurate operation.

.2 Minor deficiencies may be corrected at the time of identification. For systems requiring major repairs, the Commissioning Team shall move on to the next system to be commissioned. The Contractor shall notify the Owner's Representative when the work is complete.

.3 Costs for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be borne by Contractor.

1.6 CONFLICTS

.1 Report conflicts between requirements of this section, other sections, and the Cx Manual to the Owner's Representative to obtain clarification prior to the start of work.

.2 Failure to report conflict and obtain clarification will result in application of most stringent requirement.

1.7 SUBMITTALS

.1 Prior to starting Cx the Contractor shall provide a set of equipment and system submittals. These submittals are supplemented by the installation and start-up procedures, O&M data, performance data, control drawings and any changes that may affect commissioned systems.

.2 Submit no later than four (4) weeks after award of Contract:

.1 Name of Contractor's Cx Authority (CxA).

.2 Preliminary Cx schedule. Submit final Cx schedule for review prior to performance verification.

.3 Submit the names of all personnel for approval by the Owner's Representative. Designate who has managerial responsibilities for coordination of installation verification and performance verification.

.4 Submit documentation to confirm personnel compliance with quality assurance provisions.

.3 Any changes to the information submitted must be re-submitted Ensure certified trades persons, certified testing agencies and/or factory authorized personnel participate in commissioning tasks.

.4 Prior to start of Performance Verification:

.1 Submit TAB report to CxA for review.

.2 Submit start-up documentation to CxA for review.

.3 Submit completed Installation Verification checklists.

.5 Fifteen (15) days prior to application for Substantial Completion:

.1 Submit three (3) copies of final commissioning manual and applicable forms to the Owner's Representative for review.

.2 Submit reports of performance verifications postponed due to seasonal, climatic, occupancy, or other reasons beyond the Contractor's control, promptly after execution of those services.

.6 Ensure each form bears the required signatures as indicated on the form.

.7 Submit as-built drawings, schematics, O&M manuals, maintenance materials and warranties to Owner's Representative for review.

.8 Where structurally attached equipment is included in the scope of work, engage a third party Professional Structural Engineer, licensed to practice in the Province of Newfoundland and Labrador, for submission of stamped and signed shop drawings indicating acceptable mounting procedures for all equipment which is suspended, mounted or otherwise attached. The Structural Engineer to also verify correct installation of the equipment.

1.8 COMMISSIONING DOCUMENTATION

.1 Refer to Section 01 91 33 - Commissioning (Cx) Forms for requirements and instructions for use as well as the Cx Manual.

.2 Checklists will be prepared by the contractor in consultation with the equipment manufacturer's recommendations during the construction stage.

.3 Installing subcontractors are to date and initial the checklists as construction and verifications are completed.

.4 Once all documents have been reviewed and accepted the general contractor shall submit final commissioning documents in electronic form (PDF) and original signed copies.

1.9 COMMISSIONING SCHEDULE

.1 Submit preliminary Cx schedule in Gantt Chart format to Owner's Representative no later than four (4) weeks after award of contract.

.2 Submit final Cx schedule in Gantt Chart format to Owner's Representative for review four (4) weeks prior to performance verification.

.3 Provide adequate time for Cx activities prescribed in technical sections, commissioning sections and the Cx manual including all on site activities as well as documentation procedures. Time should be allowed for re-verification should any system be rejected upon completion of initial verification.

.4 Provide adequate time for training.

1.10 COMMISSIONING MEETINGS

.1 The GC will convene Cx meeting consisting of all members of the design and construction teams to address building systems to be commissioned. Items to be discussed will include commissioning requirements, completion and start-up schedules, and roles and responsibilities.

.2 CxA to make necessary updates and changes to the Cx Manual and deliver to the Owner's Representative.

.3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.

.4 Meetings will be chaired by the CxA, meeting minutes will be prepared and issued by the CxA. Clarifications to the minutes must be submitted within 5 days of issue, after which, the issued set becomes the official project record.

.5 Ensure subcontractors and relevant manufacturer representatives are present Cx meetings.

1.11 STARTING AND TESTING

.1 Contractor assumes liabilities and costs for inspections, including disassembly and re-assembly after approval, starting, testing and adjusting, and supply of testing equipment, and all associated costs of installation and performance verification.

1.12 WITNESSING OF STARTING AND TESTING

.1 Provide twenty eight (28) days' notice prior to commencement.

.2 Owner's Representative to witness start-up and testing.

.3 CxA to be present at tests performed and documented by sub-trades, suppliers and equipment manufacturers.

1.13 MANUFACTURER'S INVOLVEMENT

.1 The Contractor shall obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems..

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

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

.2 Integrity of warranties:

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

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

.3 Qualifications of manufacturer's personnel:

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

.2 Ability to interpret test results accurately.

.3 Ability to report results in clear, concise, logical manner.

1.14 PROCEDURES

.1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting Performance Verification.

.2 Conduct Commissioning in following distinct phases:

.1 Included in delivery and installation:

.1 Verification of conformity to specification, approved shop drawings and completion of product information report forms.

.2 Visual inspection of quality of installation.

.2 Installation Verification: follow accepted start-up procedures.

.3 Performance Verification: document equipment performance. Include repetition of tests after correcting deficiencies.

.4 Post-substantial performance verification: to include fine-tuning.

.3 Document required tests on checklists provided in the Cx Manual as well on any supplied Manufacturer forms.

.4 Failure to follow accepted Commissioning Processes will result in re-evaluation of equipment by an independent testing agency selected by the Owner's Representative. If results reveal that equipment Commissioning Process was not in accordance with requirements, and resulted in damage to equipment, implement following:

.1 Minor equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by Owner's Representative.

.2 Major equipment/systems: If evaluation report concludes that major damage has occurred, Owner's Representative shall reject equipment to be removed from site and replaced with new.

.3 Subject new equipment/systems to specified Commissioning Process.

1.15 COMMISSIONING DOCUMENTATION

.1 Assemble Installation Verification documentation and submit to Owner's Representative for approval before commencement of Performance Verification.

.2 Installation Verification documentation to include:

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

.2 Inspection reports.

.3 Signed Installation Verification check lists.

.4 Start-up reports.

.5 Step-by-step description of complete start-up procedures, to permit the contractor or Owner's Representative to repeat start-up at any time.

1.16 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS

.1 After Performance Verification, operate and maintain equipment and systems as directed by equipment/system manufacturer.

.2 With assistance of manufacturer develop written maintenance program and submit to Owner's Representative for approval before implementation.

.3 After completion of commissioning, operate and maintain systems until issuance of Substantial Completion

1.17 TEST RESULTS

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

.2 Provide personnel, resources and materials, assume all costs for re-verification.

1.18 INSTRUMENTS / EQUIPMENT

.1 Submit to Owner's Representative for review and approval:

.1 Complete list of instruments proposed to be used.

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

.2 Provide all required equipment to complete commissioning.

1.19 PERFORMANCE VERIFICATION

.1 Start Performance Verification after elements of building affecting start-up and performance verification of systems have been completed.

.2 Ensure all HVAC systems have been thoroughly cleaned.

.3 Conduct performance verification once identified pre-requisite activities are completed for a system and approved by the Owner's Representative.

.4 Test all building systems including architectural, structural, civil, mechanical and electrical components and operating procedures by challenging these systems to realistic operating conditions and train operational staff.

.5 Run systems through all sequences of operation and verify response of components.

.6 Notwithstanding all-inclusive requirements specified in this section, additional separate commissioning may be required at a later date for equipment and systems whose full operation is dependent on seasonal conditions. Job conditions for Peak Performance Verification are as follows:

.1 Summer sequence commissioning to take place between June 1st and September 15th when outside ambient temperatures are at least 22°C;

.2 Winter sequence commissioning to take place between November 1st and March 31st when outside ambient temperature is no greater than minus 10°C.

.7 Carry out Cx:

.1 Under actual operating conditions, over entire operating range, in all modes.

.2 On independent systems and interacting systems.

.8 Cx procedures to be repeatable and reported results are to be verifiable.

.9 Follow equipment manufacturer's operating instructions.

.10 EMCS trending to be available as supporting documentation for performance verification.

.11 Contractor to obtain all documentation, including updated points list, controls sequences and setpoints, and submit documentation to Owner’s Representative for review. At completion of commissioning, scan completed manuals to electronic format in PDF format as required and submit to Owner’s Representative.

1.20 WITNESSING COMMISSIONING

.1 CxA along with designated representatives to witness activities and verify results.

1.21 AUTHORITIES HAVING JURISDICTION

.1 Where specified start-up, testing or commissioning procedures duplicate verification requirements of authority having jurisdiction, arrange for authority to witness procedures so as to avoid duplication of tests and to facilitate expedient acceptance of facility.

.2 Obtain certificates of approval, acceptance and compliance with rules and regulation of authority having jurisdiction.

1.22 REPEAT VERIFICATIONS

.1 Assume costs incurred by Owner’s Commissioning representatives for second and subsequent verifications where:

.1 Verification of reported results fails to receive Owner’s Representative's approval.

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

.3 Owner’s Representative deems Contractor's request for second verification was premature.

1.23 DEFICIENCIES, FAULTS, DEFECTS

.1 Report problems, faults or defects affecting Cx to Owner’s Representative in writing. Stop Cx until problems are rectified. Proceed with written approval from Owner’s Representative.

.2 Correct deficiencies found during start-up and Cx to satisfaction of Owner’s Representative.

1.24 COMPLETION OF COMMISSIONING

.1 Upon completion of Cx leave systems in normal operating mode.

.2 Except for warranty and seasonal verification activities, complete Cx prior to application for Substantial Completion.

.3 Cx to be considered complete when all Cx deliverables have been submitted and accepted by Owner's Representative.

.4 The CxA is to compile a Final Commissioning Report summarizing all tasks, findings and documentation of the commissioning process. The Final Commissioning Report is to incorporate all test reports by sub-contractors, manufacturer's and controlling authorities including the following list. The Contractor shall turn over all materials per this specification.

.1 Evaluation of operating condition of the systems at the time of functional test completion.

.2 Deficiencies that were discovered and measures taken to correct them.

.3 Functional test procedures and results.

.4 Documentation of all commissioning field activities as they progressed.

.5 Description and estimated schedule of required deferred testing.

.5 The Contractor to provide O&M manuals, maintenance materials, warranties and training records.

1.25 ACTIVITIES UPON COMPLETION OF COMMISSIONING

.1 When changes are made to baseline components or system settings established during Cx process notify the Owner's Representative. The CxA will update and provide Cx forms for affected item.

1.26 TRAINING

.1 In accordance with Section 01 91 41 - Commissioning (Cx) – Training, the Cx Manual and respective technical sections.

1.27 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS

.1 Supply, deliver, and document maintenance materials, spare parts, and special tools as specified in contract. Provide transmittal documenting all materials provided.

1.28 OCCUPANCY

.1 Cooperate fully with Owner's Representative during stages of acceptance and occupancy of facility.

1.29 PERFORMANCE VERIFICATION TOLERANCES

.1 Application tolerances:

.1 Specified range of acceptable deviations of measured values from specified values or specified design criteria, except for special areas, to be within +/- 5 % 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 identified, recorded values to be within +/- 2 % of specified values.

PRODUCTS (NOT APPLICABLE)

EXECUTION

3.1 SCHEDULE

.1 Provide a detailed schedule as per this section for on-site verification activities by the commissioning team based on the Cx Manual provided by the CxA. Be responsible for resource allocation respecting the exact number and duration for personnel required to perform the tasks required.

.2 This schedule shall be submitted with the general construction schedule monthly. The level of detail shall increase as the construction progresses.

3.2 COMMISSIONING TASKS

.1 Prepare manual and complete commissioning tasks in accordance with all manufacturer's recommendations. Further specifics are provided within applicable specification sections.

END OF SECTION

GENERAL

1.1 SECTION INCLUDES

.1 Commissioning forms to be completed for equipment, systems and integrated systems.

1.2 INSTALLATION VERIFICATION CHECK LISTS

.1 Prior to initiation of Performance Verification the Contractor’s CxA will develop and provide the required project specific Cx Manual which will include the Installation Verification check lists.

.2 Completed Installation Verification Checklists to be submitted to for review and approval.

.3 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.

.4 Equipment manufacturer's installation/start-up check lists are acceptable for use in conjunction with installation verification check lists forming part of the Cx manual. Manufacturer’s check sheets used must be attached to final document submittals.

.5 Installer to sign check lists upon completion, certifying stated checks and inspections have been performed. Completed check lists to be submitted by the contractor at completion of the Commissioning Process.

.6 Use of check lists will be considered part of commissioning process.

1.3 PERFORMANCE VERIFICATION CHECK LISTS

.1 The Contractor's Commissioning Authority (CxA) will develop and provide the required project specific Cx Manual including the Performance Verification check lists.

.2 Completed Performance Verification Checklists to be submitted to Owner’s Representative for review and approval.

.3 Strategy for Use:

.1 Contractor will provide required shop drawings information and verify correct installation and operation of items indicated on these forms.

.2 Confirm operation as per design criteria and intent.

.3 Identify variances between design and operation and reasons for variances.

.4 Verify operation in specified normal and emergency modes and under specified load conditions.

.5 Record analytical and substantiating data.

.6 Verify reported results.

.7 Form to bear signatures of recording technician and reviewed and signed off by General Contractor, Installing Contractor, Consultant, Owner's Representative, and the CxA.

.8 Reported results in true measured SI (metric) unit values.

.9 Maintain copy on site during start-up, testing and commissioning period.

.10 Forms to be both hard copy and electronic format.

.11 .4 Upon completion of Performance Verification the CxA shall submit all completed checklists to the Owner's Representative.

.12 .5 Final submittal shall include all Installation Verification, Performance Verification check lists, training records, maintenance materials transmittals, written warranties and a list of all Cx activities postponed due to seasonal, climatic, occupancy, or other reasons beyond the contractor's control.

PRODUCTS (NOT APPLICABLE)

EXECUTION (NOT APPLICABLE)

END OF SECTION

GENERAL

1.1 SECTION INCLUDES:

.1 This Section specifies roles and responsibilities of Commissioning Training.

1.2 TRAINEES

.1 Trainees: personnel selected for operating and maintaining this facility including, but not limited to, Owner's Representative, building operators, maintenance staff, security staff, and technical specialists as required.

.2 Trainees may be available for training during any stage of construction.

1.3 INSTRUCTORS

.1 The Contractor supplied Cx Manual will contain:

.1 Descriptions of systems.

.2 Instruction on design philosophy, design criteria, and design intent.

.2 Contractor and certified factory-trained manufacturers' personnel to provide instruction on the following:

.1 Start-Up, operation, shut-down and maintenance of equipment, components and systems.

.2 Control features and reasons for, results of, implications on associated systems of adjustment of set points of control and safety devices.

.3 Instructions on servicing, maintenance and adjustment of systems, equipment and components.

.4 Training to be completed after Installation and Performance Verification are completed.

1.4 TRAINING OBJECTIVES

.1 Training to be detailed and of sufficient duration to ensure:

.1 Safe, reliable, cost-effective, energy-efficient operation of systems in normal and emergency modes under all conditions.

.2 Effective on-going inspection, measurements of system performance.

.3 Proper preventive maintenance, diagnosis, trouble-shooting and maintenance.

.4 Ability to update documentation.

.5 Ability to operate equipment and systems under emergency conditions until appropriate qualified assistance arrives.

1.5 TRAINING MATERIALS

.1 Instructors to be responsible for content and quality. Provide copies for all those in attendance.

.2 Training materials to include:

.1 "As-Built" Contract Documents.

.2 Operating Manual.

.3 Maintenance Manual.

.4 Testing, adjusting and balancing and performance verification reports where applicable.

.3 Owner’s Representative will review training manuals.

.4 Training materials to be in a format that permits future training procedures to the same degree of detail with or without the instructor.

1.6 SCHEDULING

.1 Contractor to include in schedule time for training. Provide a detailed commissioning schedule indicating all Cx tasks and training.

.2 Deliver training during regular working hours, training sessions to be determined in Commissioning meetings.

.3 Training to be completed prior to Substantial Completion.

1.7 RESPONSIBILITIES

.1 Be responsible for:

.1 Implementation of training activities,

.2 Coordination among instructors,

.3 Quality of training, training materials,

.2 Owner’s Representative will evaluate training and materials.

.3 Upon completion of training, provide written report, signed by Instructors, witnessed by Owner’s Representative. Include list of those in attendance.

1.8 TRAINING CONTENT

.1 Training to include demonstrations by Instructors using the installed equipment and systems.

.2 Content includes:

.1 Review of facility and occupancy profile.

.2 Functional requirements.

.3 System philosophy, limitations of systems and emergency procedures.

.4 Review of system layout, equipment, components and controls.

.5 Equipment and system start-up, operation, monitoring, servicing, maintenance and shut-down procedures.

.6 System operating sequences, including step-by-step directions for starting up, shut-down, operation of valves, dampers, switches, adjustment of control settings and emergency procedures.

.7 Maintenance and servicing.

.8 Trouble-shooting diagnosis.

.9 Inter-Action among systems during integrated operation.

.10 Review of O&M documentation.

.3 Provide specialized training as specified in relevant Technical Sections of the construction specifications.

PRODUCTS (NOT APPLICABLE)

EXECUTION (NOT APPLICABLE)

END OF SECTION

GENERAL

1.1 SECTIONS INCLUDES

.1 Methods and procedures for demolishing, salvaging, recycling and removing sitework items designated to be removed in whole or in part, and for backfilling resulting trenches and excavations.

1.2 SUBMITTALS

.1 Shop drawings

.1 Submit for approval drawings, diagrams or details showing sequence of demolition work and supporting structures and underpinning, where required by authorities having jurisdiction.

.2 Submit drawings stamped and signed by qualified professional engineer licensed in Province of Newfoundland and Labrador, Canada.

.2 Hazardous Materials: provide description of Hazardous Materials and Notification of Filing with proper authorities prior to beginning of Work as required.

.3 Submit plan indicating:

.1 Descriptions of and anticipated quantities of materials to be salvaged, reused, recycled and landfilled.

.2 Schedule of selective demolition.

.3 Number and location of dumpsters.

.4 Anticipated frequency of tippage.

.4 Submit copies of certified weigh bills, bills of landing from authorized disposal sites and reuse and recycling facilities for material removed from upon request from Owner’s Representative.

1.3 QUALITY ASSURANCE

.1 Convene pre-installation meeting one week prior to beginning work of this section to:

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Co-ordination with building subtrades.

.2 Arrange for site visit with Owner’s Representative to examine existing site conditions adjacent to demolition work, prior to start of Work.

.3 Hold project meetings every month.

.1 Ensure key personnel, site supervisor, project manager, subcontractor representatives attend.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Protect existing items designated to remain and items designated for salvage. In event of damage to such items, immediately replace or make repairs to approval of Owner's Representative and at no cost to Owner's Representative.

.2 Remove and store materials to be salvaged, in manner to prevent damage.

.3 Store and protect in accordance with requirements for maximum preservation of material.

1.5 SITE CONDITIONS

.1 In all circumstances ensure that demolition work does not adversely affect adjacent water courses groundwater and wildlife, or contribute to excess air and noise pollution.

.2 Do not dispose, of waste or volatile materials such as mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers. Ensure proper disposal procedures are maintained throughout project.

.3 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers, or onto adjacent properties.

.4 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authorities.

.5 Protect trees, plants and foliage on site and adjacent properties where indicated.

1.6 EXISTING CONDITIONS

.1 Prior to start of any demolition work remove contaminated or hazardous materials as defined by authorities having jurisdiction from site and dispose of at designated disposal facilities

1.7 SCHEDULING

.1 Employ necessary means to meet project timelines without compromising specified minimum rates of material diversion.

.2 Notify Owner's Representative in writing when unforeseen delays occur.

PRODUCTS (NOT APPLICABLE)

EXECUTION

3.1 PREPARATION

.1 Inspect site with Owner's Representative and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.

.2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.

.3 Notify and obtain approval of utility companies before starting demolition.

3.2 REMOVAL OPERATIONS

.1 Remove items as indicated.

.2 Do not disturb items designated to remain in place.

.3 Removal of Pavements, Curbs and Gutters

.1 Square up adjacent surfaces to remain in place by saw cutting or other method approved by Owner's Representative.

.2 Protect adjacent joints and load transfer devices.

.3 Protect underlying and adjacent granular material.

.4 When removing asphalt pavement for subsequent incorporation into hot mix asphalt concrete paving, prevent contamination with base course aggregates.

.5 When removing pipes under existing or future pavement area, excavate at least 300mm below pipe invert.

.6 Removal from site

.1 Interim removal of stockpiled material will be required by Owner's Representative, if it is deemed to interfere with operations of Owner's Representative, Owner or other contractors.

.7 Sealing

.1 .1 Seal pipe ends and walls of manholes or catch basins as indicated. Securely plug to form watertight seal.

.8 Backfill

.1 .1 Backfill in areas as indicated

3.3 RESTORATION

.1 Restore areas and existing works outside areas of demolition to match conditions of adjacent, undisturbed areas.

.2 Use soil treatments and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

3.4 CLEAN UP

.1 Upon completion of work, remove debris, trim surfaces and leave work site clean.

.2 Use cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

END OF SECTION

GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CAN/CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CSA-O86S1, Supplement No. 1 to CAN/CSA-O86-01, Engineering Design in Wood.

.3 CSA O121, Douglas Fir Plywood.

.4 CSA O151, Canadian Softwood Plywood.

.5 CSA S269.1, Falsework for Construction Purposes.

.6 CAN/CSA-S269.3, Concrete Formwork.

1.2 SUBMITTALS

.1 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CSA S269.1, for falsework drawings. Comply with CAN/CSA-S269.3, for formwork drawings.

.2 Indicate formwork design data, such as permissible rate of concrete placement, and temperature of concrete, in forms.

.3 Indicate sequence of erection and removal of formwork/falsework as directed by Owner’s Representative.

.4 Each shop drawing submission shall bear stamp and signature of qualified professional engineer licensed in Province of Newfoundland and Labrador, Canada.

PRODUCTS

2.1 MATERIALS

.1 Formwork materials:

.1 For concrete without special architectural features, use wood and wood product formwork materials to CSA-O121.

.2 For concrete with special architectural features, use formwork materials to CSA-A23.1/A23.2.

.2 Tubular column forms: round, spirally wound laminated fiber forms, internally treated with release material. Spiral pattern to show in hardened concrete.

.3 Form ties:

.1 For concrete not designated 'Architectural', use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm dia. in concrete surface.

.2 For Architectural concrete, use snap ties complete with plastic cones and light grey concrete plugs.

.4 Form liner:

.1 Plywood: medium density overlay Douglas Fir to CSA O121, Canadian Softwood Plywood to CSA O151, T and G thickness as indicated.

.5 Form release agent: chemically active release agents containing compounds that react with free lime in concrete resulting in water insoluble soaps, non-toxic, biodegradable.

.6 Falsework materials: to CSA-S269.1.

EXECUTION

3.1 FABRICATION AND ERECTION

.1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.

.2 Fabricate and erect falsework in accordance with CSA S269.1.

.3 Refer to drawings for concrete members requiring exposed finishes.

.4 Do not place shores and mud sills on frozen ground.

.5 Provide site drainage to prevent washout of soil supporting mud sills and shores.

.6 Fabricate and erect formwork in accordance with CAN/CSA-S269.3, to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.

.7 Align form joints and make watertight. Keep form joints to minimum.

.8 Locate horizontal form joints for exposed columns 2400 mm above finished floor elevation.

.9 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise.

.10 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.

.11 Construct forms for architectural concrete, and place ties as indicated and/or as directed. Joint pattern not necessarily based on using standard size panels or maximum permissible spacing of ties.

.12 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections. Ensure that all anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.

.13 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.

3.2 REMOVAL AND RESHORING

.1 Leave formwork in place for following minimum periods of time after placing concrete.

.1 3 days for walls and sides of beams.

.2 5 days for columns.

.3 1 day for footings and abutments.

.2 Provide all necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.

.3 Space reshoring in each principal direction at not more than 3000 mm apart.

.4 Re-use formwork and falsework subject to requirements of CSA-A23.1A23.2.

END OF SECTION

GENERAL

1.1 REFERENCES

.1 American Concrete Institute (ACI)

.1 ANSI/ACI 315, Details and Detailing of Concrete Reinforcement.

.2 ACI 315R, Manual of Engineering and Placing Drawings for Reinforced Concrete Structure.

.2 American Society for Testing and Materials International (ASTM)

.1 ASTM A185/A185M, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.

.2 ASTM A497/A497M, Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.

.3 Canadian Standards Association (CSA)

.1 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of test and Standard Practices for Concrete.

.2 CSA-A23.3, Design of Concrete Structures.

.3 CAN/CSA-G30.18, Billet-Steel Bars for Concrete Reinforcement, A National Standard of Canada.

.4 CSA-G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel /Structural Quality Steel.

.5 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.

.6 CSA W186, Welding of Reinforcing Bars in Reinforced Concrete Construction.

1.2 SUBMITTALS

.1 Indicate on shop drawings, bar bending details, lists, quantities of reinforcement, sizes, spacings, locations of reinforcement and mechanical splices if approved by Owner's Representative, with identifying code marks to permit correct placement without reference to structural drawings. Indicate sizes, spacings and locations of chairs, spacers and hangers. Prepare reinforcement drawings in accordance with Reinforcing Steel Manual of Standard Practice - by Reinforcing Steel Institute of Canada. ANSI/ACI 315 and ACI 315R, Manual of Engineering and Placing Drawings for Reinforced Concrete Structure.

.2 Detail lap lengths and bar development lengths to CSA-A23.3, unless otherwise indicated.

PRODUCTS

2.1 MATERIALS

.1 Substitute different size bars only if permitted in writing by Owner's Representative.

.2 Reinforcing steel: billet steel, grade 400, deformed bars to CAN/CSA-G30.18, unless indicated otherwise.

.3 Cold-drawn annealed steel wire ties: to ASTM A497/A497M.

.4 Welded steel wire fabric: to ASTM A185/A185M. Provide in flat sheets only.

.5 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.

.6 Mechanical splices: subject to approval of Owner's Representative.

.7 Plain round bars: to CSA-G40.20/G40.21.

2.2 FABRICATION

.1 Fabricate reinforcing steel in accordance with CSA-A23.1A23.2, ACI 315, and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.

.2 Obtain Owner's Representative's approval for locations of reinforcement splices other than those shown on placing drawings.

.3 Upon approval of Owner's Representative, weld reinforcement in accordance with CSA W186.

.4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

2.3 SOURCE QUALITY CONTROL

.1 Upon request, provide Owner's Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to commencing reinforcing work.

.2 Upon request inform Owner's Representative of proposed source of material to be supplied.

EXECUTION

3.1 FIELD BENDING

.1 Do not field bend or field weld reinforcement except where indicated or authorized by Owner's Representative.

.2 When field bending is authorized, bend without heat, applying a slow and steady pressure.

.3 Replace bars which develop cracks or splits.

3.2 PLACING REINFORCEMENT

.1 Place reinforcing steel as indicated on reviewed placing drawings and in accordance with CSA-A23.1/A23.2.

.2 Use plain round bars as slip dowels in concrete. Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint. When paint is dry, apply a thick even film of mineral lubricating grease.

.3 Prior to placing concrete, obtain Owner's Representative approval of reinforcing material and placement.

.4 Ensure cover to reinforcement is maintained during concrete pour.

.5 All reinforcing steel in electrical manholes, pull pits and other concrete slabs and structures to be bonded to ground using a #3/0 bare copper ground wire.

END OF SECTION

GENERAL

1.1 MEASUREMENT PROCEDURES

.1 Cast-in-place concrete will not be measured but will be paid for as a fixed price item.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM)

- .1 ASTM C260, Standard Specification for Air-Entraining Admixtures for Concrete.
- .2 ASTM C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- .3 ASTM C494/C494M, Standard Specification for Chemical Admixtures for Concrete.
- .4 ASTM D412, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
- .5 ASTM D624, Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
- .6 ASTM D1751, Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

.2 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-51.34, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

.3 Canadian Standards Association (CSA)

- .1 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .2 CAN/CSA-A23.2, Methods of Test for Concrete.
- .3 CAN3-A266.4, Guidelines for the Use of Admixtures in concrete.
- .4 CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- .5 CSA A3001, Cementitious Materials for Use in Concrete.

1.3 ACRONYMS AND TYPES

.1 Cement: hydraulic cement or blended hydraulic cement (XXb - where b denotes blended).

- .1 Type GU or GUb - General use cement.

1.4 SUBMITTALS

.1 At least 4 weeks prior to commencing work, inform Owner’s Representative of proposed source of aggregates and provide access for sampling.

.2 Submit testing results and reports for review by Owner's Representative and do not proceed without written approval when deviations from mix design or parameters are found.

.3 Certificates:

.1 Minimum 4 weeks prior to starting concrete work submit to Owner's Representative manufacturer's test data and certification by qualified independent inspection and testing laboratory that following materials will meet specified requirements:

.1 Portland cement.

.2 Blended hydraulic cement.

.3 Supplementary cementing materials.

.4 Grout.

.5 Admixtures.

.6 Aggregates.

.7 Water.

.8 Waterstops.

.9 Waterstop joints.

.10 Joint filler.

.2 Provide certification that mix proportions selected will produce concrete of quality, yield and strength as specified in concrete mixes, and will comply with CSA-A23.1/A23.2.

.3 Include separate submission of Concrete Mix Design from specialist third party, or from ready mix plant supported with recent records of compressive strength testing for other customers of the same mix.

.4 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CSA-A23.1/A23.2.

1.5 SOURCE QUALITY CONTROL

.1 Have all concrete produced and delivered by a ready-mix plant that is a member of the Atlantic Provinces Ready Mixed Concrete Association (APRMCA) and holds a current "Certificate of Ready Mixed Concrete Production Facilities" issued by the Association. Submit a copy of this certificate to the Owner's Representative for approval.

1.6 QUALITY ASSURANCE

.1 Minimum 4 weeks prior to starting concrete work, submit proposed quality control procedures in accordance with Section 01 45 00 - Quality Control for Owner's Representative approval for following items:

.1 Falsework erection.

.2 Hot weather concrete.

.3 Cold weather concrete.

.4 Curing.

.5 Finishes.

.6 Formwork removal.

.7 Joints.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Concrete hauling time: maximum allowable time for concrete to be delivered to site of Work and discharged not to exceed 120 minutes after batching.

.1 Modifications to maximum time limit must be agreed to Owner's Representative and concrete producer as described in CSA A23.1/A23.2.

.2 Deviations to be submitted for review by Owner's Representative.

.2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

.3 Waste Management and Disposal:

.1 Divert unused concrete materials from landfill to local facility approved by Owner's Representative.

.2 Provide an appropriate area on the job site where concrete trucks can be safely washed.

.3 Divert unused admixtures and additive materials (pigments, fibres) from landfill to official hazardous material collections site as approved by the Owner's Representative.

.4 Unused admixtures and additive materials must not be disposed of into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.

.5 Prevent admixtures and additive materials from entering drinking water supplies or streams. Using appropriate safety precautions, collect liquid or solidify liquid with inert, noncombustible material and remove for disposal. Dispose of waste in accordance with applicable local, Provincial and National regulations.

PRODUCTS

2.1 MATERIALS

.1 Portland cement: to CAN/CSA A3001, Type GU.

.2 Water: to CAN/CSA-A23.1.

.3 Aggregates: to CSA-A23.1.

.4 Coarse aggregates to be normal density to CSA-A23.1/A23.2.

.5 Admixtures:

.1 Air entraining admixture: to ASTM C260.

.2 Chemical admixtures: to ASTM C494, Owner's Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.

.6 Non premixed dry pack grout: composition of non metallic aggregate Portland cement with sufficient water for the mixture to retain its shape when made into a ball by hand and capable of developing compressive strength of 50 MPa at 28 days.

.7 Ribbed waterstops: extruded PVC of sizes indicated shop welded corner and intersecting pieces.

.1 Tensile strength: to ASTM D412, method A, Die "C".

.2 Elongation: to ASTM D412, method A, Die "C", minimum 275%.

.3 Tear resistance: to ASTM D624, method A, Die "B".

.8 Premoulded joint fillers:

.1 Bituminous impregnated fiber board: to ASTM D1751.

.9 Polyethylene film: minimum mm thickness to ASTM C171.

.10 Bonding adhesive: as approved by Owner's Representative.

2.2 MIXES

.1 Proportion normal density concrete in accordance with CSA-A23.1.A23.2, Alternative 1, to give the following quality and yield for all concrete.

.1 Cement: Type GU Portland Cement

.2 Minimum compressive strength at 28 days: minimum 32 MPa or as per drawings

.3 Maximum water to cement ration: 0.45

.4 Class of exposure: C-2

.5 Nominal size of coarse aggregate: 20 mm

.6 Slump at time and point of discharge: 75 to 100 mm

.7 Air content: 5 to 8%

EXECUTION

3.1 PREPARATION

.1 Obtain Owner's Representative approval before placing concrete. Provide 24 h notice prior to placing of concrete.

.2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing. All reinforcing steel in electrical manholes, pull pits and other concrete slabs and structures to be bonded to ground using a #3/0 bare copper ground wire.

.3 During concreting operations:

.1 Development of cold joints not allowed.

.2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.

.4 Pumping of concrete is permitted only after approval of equipment and mix.

.5 Ensure reinforcement and inserts are not disturbed during concrete placement.

.6 Prior to placing of concrete obtain Owner's Representative approval of proposed method for protection of concrete during placing and curing in adverse weather.

.7 Protect previous Work from staining.

.8 Clean and remove stains prior to application for concrete finishes.

.9 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

.10 Do not place load upon new concrete until authorized by Owner's Representative.

3.2 CONSTRUCTION

.1 Do cast-in-place concrete work in accordance with CSA-A23.1/A23.2.

.2 Sleeves and inserts.

.1 No sleeves, ducts, pipes or other openings shall pass through joists, beams, column capitals or columns, except where indicated or approved by Owner's Representative.

.2 Where approved by Owner's Representative, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere. Sleeves and openings greater than 100 x 100 mm not indicated, must be approved by Owner's Representative.

.3 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications from Owner's Representative before placing of concrete.

.4 Check locations and sizes of sleeves and openings shown on drawings.

.5 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.

.3 Anchor bolts.

.1 Set anchor bolts to templates under supervision of appropriate trade prior to placing concrete.

.2 With approval of Owner's Representative, grout anchor bolts in preformed holes or holes drilled after concrete has set. Formed holes to be minimum 100 mm diameter. Drilled holes to be manufacturers' recommendations.

.3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.

.4 Set bolts and fill holes with shrinkage compensating grout.

.5 Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to ambient temperature at time of erection.

.4 Grout under base plates using procedures in accordance with manufacturer's recommendations which result in 100 % contact over grouted area.

.5 Finishing.

.1 Finish concrete in accordance with CSA-A23.1/A23.2.

.2 Use procedures acceptable to Owner's Representative or those noted in CSA-A23.1/A23.2, to remove excess bleed water. Ensure surface is not damaged.

.3 Wet cure using polyethylene sheets placed over sufficiently hardened concrete to prevent damage. Overlap adjacent edges 150 mm and tightly seal with sand on wood planks. Weigh sheets down to maintain close contact with concrete during the entire curing period.

.4 Where burlap is used for moist curing, place two prewetted layers on concrete surface and keep continuously wet during curing period.

.5 Finish concrete floor to meet requirements of CSA-A23.1/A23.2.

.6 Concrete floor to have finish hardness equal or greater than Mohs hardness in accordance with CSA-A23.1/A23.2.

.7 Provide swirl-trowelled finish for exterior walks, ramps, pads.

.8 Provide float finish for interior floor slabs.

.9 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges unless otherwise indicated.

.6 Waterstops.

.1 Install waterstops to provide continuous water seal.

.2 Do not distort or pierce waterstop in such a way as to hamper performance.

.3 Do not displace reinforcement when installing waterstops.

.4 Use equipment to manufacturer's requirements to field splice waterstops.

.5 Tie waterstops rigidly in place.

.6 Use only straight heat sealed butt joints in field.

.7 Use factory welded corners and intersections unless otherwise approved by Owner's Representative.

.7 Joint fillers.

.1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Owner's Representative.

.2 When more than one piece is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.

.3 Locate and form, isolation, construction and expansion joints as indicated. Install joint filler.

.4 Use 12 mm thick joint filler to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to within 12 mm of finished slab surface unless indicated otherwise.

.8 Dampproof membrane.

.1 Install dampproof membrane under concrete slabs-on-grade inside building.

.2 Lap dampproof membrane minimum 150 mm at joints and seal.

.3 Seal punctures in dampproof membrane before placing concrete. Use patching material at least 150 mm larger than puncture and seal.

3.3 SITE TOLERANCE

.1 Concrete slab tolerances in accordance with CSA-A23.1/A23.2, F-number Method, FF =25, FL = 20.

3.4 FIELD QUALITY CONTROL

.1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by Owner's Representative in accordance with CSA-A23.1/A23.2, and Section 01 45 00 - Quality Control.

.2 Use cash allowance specified under 01 21 00 – Allowances for costs of tests as specified in Section 01 29 83 - Payment Procedures for Testing Laboratory Services. Costs of retesting due to deficient work will be paid for by contractor, by credit change order.

.3 Cure cylinders on job site under same conditions as concrete which they represent.

.4 Non-destructive Methods for Testing Concrete shall be in accordance with CSA-A23.1/A23.2.

.5 Provide Certificate of Field Quality Inspection and Testing to Owner's Representative.

.6 Inspection or testing by Owner's Representative will not augment or replace Contractor quality control nor relieve the Contractor of his contractual responsibility.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 33 46 00 - Drainage Board

1.2 REFERENCE STANDARDS

.1 ASTM International (ASTM)

.1 ASTM D449-03, Standard Specification for Asphalt Used in Dampproofing and Waterproofing.

.2 ASTM D6164-05, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.

.2 Canadian General Standards Board (CGSB)

.1 CGSB 37-GP-9Ma-83, Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing and Waterproofing.

.3 CSA Group (CSA)

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Convene preinstallation meeting one week prior to beginning waterproofing Work, with Owners Representative in accordance with 01 32 18 to:

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Coordination with other building subtrades.

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

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Provide two copies of most recent technical waterproofing components data sheets describing materials' physical properties and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Provide two copies of WHMIS SDS in accordance with Section 1 33 00 - Submittal Procedures, and indicate VOC content for:

.1 Primers.

.3 Provide shop drawings and indicate:

.1 Flashing details.

.4 Manufacturer's Certificate: certify that products meet or exceed specified requirements.

.5 Test and Evaluation Reports: submit laboratory test reports certifying compliance of bitumens with specification requirements.

.6 Manufacturer's Installation Instructions: indicate special precautions required for seaming the membrane.

.7 Manufacturer's field report: in accordance with Section01 45 00 - Quality Assurance.

.8 Reports: indicate procedures followed, ambient temperatures and wind velocity during application.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Provide and maintain dry, off-ground weatherproof storage.

.2 Store rolls of felt and membrane in upright position.

.1 Store membrane rolls with salvage edge up.

.3 Remove only in quantities required for same day use.

.4 Store sealants at +5 degrees C minimum.

.5 Handle waterproofing materials in accordance with manufacturer's written directives, to prevent damage or loss of performance.

1.6 SITE CONDITIONS

.1 Ambient Conditions

.1 Do not install waterproofing when temperature remains below -18 degrees C for torch application, or to manufacturers' recommendations for mop application.

.2 Minimum temperature for solvent-based adhesive is -5 degrees C.

.2 Install waterproofing on dry deck, free of snow and ice, use only dry materials and apply only during weather that will not introduce moisture into waterproofing system.

1.7 WARRANTY

.1 Manufacturer's standard form in which manufacturer agrees to replace waterproofing material that does not comply with requirements or that fails to remain watertight within warranty period.

.1 Warranty does not include failure of waterproofing due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate exceeding 1.6 mm in width.

PART 2 PRODUCTS

2.1 PERFORMANCE CRITERIA

.1 Waterproofing System: capable of resisting moisture/water head of 16,000 – 20,000mm, and preventing moisture migration to interior.

.2 Compatibility between components of waterproofing system is essential. Provide written declaration to Owner's Representative stating that materials and components, as assembled in system, meet this requirement.

2.2 WATERPROOFING MEMBRANE

.1 Self adhesive waterproofing membrane: Not less than 1.5 mm thick, SBS modified bitumen, woven polyethylene facer with self-adhesive side covered by a silicone release sheet.

.1 CAN/CGSB-37.56-M compliant.

.1 Physical Properties:

.1 Static puncture resistance: 400N

.2 Tensile strength, MD/XD: 11.3 / 15.4 kN/m.

.3 Ultimate elongation, MD/XD: 40/25 %

.4 Tear Resistance, MD/XD: 375 / 400 N.

2.3 PRIMER FOR SELF-ADHESIVE MEMBRANES

.1 A blend of elastomeric bitumen, volatile solvents, and adhesive enhancing resins used to prime porous substrates and non-porous substrates such as wood, concrete or metal to enhance the adhesion of self-adhesive membranes at temperatures above -10°C or;

.2 A water-base polymeric primer that contain no bitumen which is used to enhance adhesion of self-adhesive membranes on most surfaces. For use when solvent based primer are not recommended.

2.4 DRAINAGE / PROTECTION BOARD

.1 As per section 33 46 00 - Drainage Board

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION OF SURFACES

.1 Surface examination and preparation must be completed in conformance with manufacturers recommendations.

.2 Before waterproofing work begins, the Owners representative and the membrane contractor’s foreman will inspect and approve substrate condition and ensure that related work has been properly executed. If necessary, a non-conformity notice will be issued to the contractor so that required corrections can be made. The start of the membrane application will mean that substrate conditions are acceptable for work completion.

.3 Before commencing work, all surfaces must be smooth, dry, clean and free of ice and debris as per manufacturer’s recommendations.

.4 No materials will be installed during rain or snowfall.

.5 Concrete must be cured a minimum of fourteen (14) days and an adhesion test is recommended before membrane application.

.6 Verify the compatibility of all membrane components with curing compounds, coatings or other materials which are already installed on the surfaces to be treated.

.7 Any cracks over 3 mm wide should be reported to the design professional. After approval from the qualified authority, the crack should be filled in with waterproofing mastic. A 150 mm 152.4 mm wide strip of membrane should be installed, centered over the crack.

3.2 METHOD OF EXECUTION

.1 Work shall be performed on a continuous basis as surface and weather conditions allow.
Adjoining surfaces shall be protected against any damage that could result from the waterproofing installation.

3.3 PRIMER APPLICATION

.1 Surface where membrane is applied shall receive an SBS synthetic rubber primer coating at the rate of: (porous surfaces: 0.3 to 0.5 L/m2, non-porous surfaces: 0.1 to 0.25 L/m2). . If not covered the same day, primed surfaces must be re-primed.

3.4 WATERPROOFING MEMBRANE INSTALLATION

.1 All small protrusions (pipes, etc.) through the waterproofing membrane, should be pre-stripped with a membrane and sealed with waterproofing mastic.

.2 To begin application, align the first roll of membrane to a previously drawn chalk line.

.3 All edges must be pre-stripped with a 150 mm (6 in.) wide strip of membrane centered on the corner. This membrane must be installed in direct contact with the substrate not leaving any voids under the membrane strip.

.4 Install the membrane onto the primed surface by peeling back the paper backing on the underside and adhering the membrane to the surface.

.5 Subsequent rolls must be installed in the same manner and should be aligned with the preceding roll with a side lap of at least 75 mm. End laps must be overlapped at least 150 mm.

.6 Holes and tears in the membrane must be repaired with the appropriate membrane material. The repair must exceed the affected surface area by at least 75 mm. The membrane piece applied for the repair must be sealed around its edges with mastic.

.7 Use a roller approved by manufacturer to apply pressure over the entire surface of the membrane to ensure perfect adhesion.

.8 The contractor shall verify meticulously the membrane installation at the end of each day of work and before backfilling.

.9 The uppermost edge of the membrane is to be mechanically fastened to the concrete substrate using applicable fasteners and termination bars.

.10 Apply mastic on the top edge of membrane to prevent water infiltration.

.11 Any waterproofing membrane left exposed after backfilling shall be protected from ultra violet and mechanical damages.

3.5 PROTECTION OF IN-PLACE CONDITIONS

.1 Cover walls, walks, slopped roofs and adjacent work where materials hoisted or used.

.2 Use warning signs and barriers. Maintain in good order until completion of Work.

.3 Clean off drips and smears of bituminous material immediately.

.4 Dispose of rain water off roof and away from face of building until roof drains or hoppers installed and connected.

.5 Protect roof from traffic and damage. Comply with precautions deemed necessary by Owners Representative.

.6 At end of each day's work or when stoppage occurs due to inclement weather, provide protection for completed Work and materials out of storage.

.7 Metal connectors and decking will be treated with rust proofing or galvanization.

3.6 SITE QUALITY CONTROL

.1 Inspections:

.1 Inspection and testing of waterproofing application will be carried out by testing laboratory designated by Owners Representative.

3.7 CLEANING

.1 Remove bituminous markings from finished surfaces.

.2 In areas where finished surfaces are soiled caused by work of this section, consult manufacturer of surfaces for cleaning advice and complying with their documented instructions.

.3 Repair or replace defaced or disfigured finishes caused by work of this section.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes: Geocomposite Foundation Drainage Installation.

1.2 RELATED SECTIONS

.1 Section 07 92 00 - Joint Sealants

1.3 REFERENCES

.1 National Building Code of Canada (latest edition).

.2 American Society for Testing and Materials (ASTM).

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

.1 Safety Data Sheets (SDS)

1.4 SUBMITTALS

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

.2 Product Data: Submit manufacturer’s product data and installation instructions.

.3 Quality Assurance/Control Submittals: Submit the following:

.1 Certificates: Submit certificate that applicator complies with requirements of this section.

1.5 QUALITY ASSURANCE

.1 Preinstallation conference: Coordinate with conference scheduled for waterproofing materials. Follow requirements indicated in waterproofing materials section.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery: Deliver materials in manufacturer’s original, unopened, undamaged containers with identification labels intact.

.3 Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

1.7 SEQUENCING AND SCHEDULING

.1 Schedule installation after waterproofing installation but prior to backfill.

1.8 WARRANTY

.1 Manufacturer’s Material Only Warranty.

PART 2 PRODUCTS

2.1 2GEOCOMPOSITE FOUNDATION DRAINAGE

.1 Drainage Mat Foundation Drainage Roll:

.1 Core Material: Black, high impact polypropylene

.1 Light duty, impermeable polymeric sheet

.2 Compression – 525 kPa

.3 Foundation drainage rate - 700L /min/m²

.2 Fabric Material: Black, non-woven filter fabric

.1 Flow – 15300L /min/m²

.2 Puncture – 30 kg

.3

.2 Plastic or resin material compatible with the waterproofing membrane.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Comply with the most current written installation instructions and recommendations of the manufacturer.

3.2 EXAMINATION

.1 Site Verification of Condition:

.1 Verify that waterproofing is in place.

.2 Verify that site conditions are acceptable for application of the roll.

.3 Do not proceed with application until unacceptable conditions are corrected.

3.3 PREPARATION

.1 Surface Preparation:

.1 Application of waterproofing membrane

3.4 INSTALLATION

.1 Install Drainage Mats after membrane has been applied. Place and secure to substrate according to manufacturer’s current written instructions.

.2 Backfill and Drainage

.1 5-25mm Gravel or equivalent must go no less than 610mm high at the base of the foundation and 305mm in depth away from the foundation walls or as required per local code.

.2 Adequate interior and exterior foundation drainage at the base of the foundation walls, across any floors or adjacent flower beds must be properly installed and functioning properly.

.3 Backfilling should begin no sooner than 24 hours after the installation of the board but must be backfilled within 15 days.

3.5 CLEANING

.1 Progress cleaning in accordance with Section 01 74 00 - Cleaning.

.2 Final cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

.3 Waste Management: separate waste materials for reuse and/or recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 03 30 00 Cast-in-Place Concrete

1.2 REFERENCE STANDARDS

.1 ASTM International (ASTM):

.1 ASTM C578-23 Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation

.2 ASTM E96/E96M-24a– Standard Test Methods for Water Vapor Transmission of Materials.

.3 ASTM E84-24 Standard Test Method for Surface Burning Characteristics of Building Materials

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS):

.1 Safety Data Sheets (SDS)

.3 Underwriters Laboratories of Canada (ULC):

.1 CAN/ULC S701 Type 4

.2 CAN/ULC-701.1:2022, Standard for Thermal Insulation, Polystyrene Boards

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Coordination: Coordinate work of other Subcontractors adjacent and penetrating board insulation which must be completed before or after insulation work.

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 literature, and data sheets for each type of board insulation. Include product characteristics, performance criteria, physical sizes, and limitations.

.2 Submit WHMIS SDS

.3 Certificates: When requested, submit manufacturer's product certificates certifying materials comply with specified performance characteristics and criteria and physical requirements.

.4 Test Reports: Submit certified test reports showing compliance with specified performance characteristics and physical properties.

.5 Manufacturer's Instructions: Submit manufacturer's installation instructions.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Perform in accordance with Section 01 61 00 - Common Product Requirements.

.1 Deliver board insulation marked with its thermal resistance value, associated reference standard number, Type, and Class. Packaged in accordance with the associated reference standard.

.2 Storage and Handling Requirements:

.1 Store materials in a clean, dry area and in accordance with manufacturer's recommendations.

.2 Store and protect plastic insulation from sunlight except as necessary during installation, protect from ignition sources, hydrocarbons, other petroleum derivatives, and other products that may cause degeneration.

.3 Adhere to the Construction Waste Management Plan related to Work of this Section.

.4 Packaging Waste Management: Perform in accordance with Section 01 74 21 - Waste Management and Disposal

PART 2 PRODUCTS

2.1 INSULATION

.1 Extruded polystyrene (XPS): To CAN/ULC-701, for applications below grade, vertically and horizontally.

.1 Type: 4.

.2 Compressive strength: Minimum 275 kPa.

.3 Board thickness: 50 or 100 mm or as indicated on Drawings.

.4 Size: To manufacturer's standard.

.5 Edges: shiplapped.

2.2 ADHESIVE

.1 Adhesive for Polystyrene: Synthetic rubber-based insulation adhesive compatible with polystyrene insulation, type as recommended by insulation manufacturer.

.1 VOC emission: Maximum 250 g/L.

.2 Solvent-based adhesives are not acceptable with polystyrene insulation.

PART 3 EXECUTION

3.1 3.1EXAMINATION

.1 Verification of Conditions: Verify that conditions of substrate previously installed are clean, dry, smooth, and acceptable for application of board insulation in accordance with manufacturer's instructions.

.1 Inspect substrates in presence of Owner's Representative.

.2 Inform GC 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 Owner's Representative.

3.2 INSTALLATION - GENERAL

.1 Install insulation to maintain continuity of thermal protection to building elements and spaces.

.2 Cut and trim insulation neatly to fit spaces. Butt joints tightly.

.3 In multi-layered applications, offset vertical and horizontal joints.

.4 Use only insulation boards free from chipped or broken edges.

.5 Use largest possible boards to reduce number of joints.

.6 In multiple layer applications offset both vertical and horizontal joints

.7 Do not enclose, cover, or perform backfilling of insulation until it has been reviewed and accepted by Owner's Representative.

3.3 INSTALLATION - PERIMETER BELOW GRADE INSULATION

.1 Exterior application: extend boards as indicated on Drawings. Install on exterior face of concrete wall with adhesive.

3.4 CLEANING

.1 Progress Cleaning: Perform in accordance with Section 01 74 11 - Cleaning.

.2 Final Cleaning: Perform in accordance with Section 01 74 11 – Cleaning upon completion.

.3 Waste Management: Perform in accordance with Section 01 74 21 - Waste Management and Disposal

3.5 PROTECTION

.1 Temporarily protect installed board insulation from inclement weather and sunlight in excess of 3 weeks.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 03 30 00 - Cast-in-Place Concrete.

1.2 REFERENCE STANDARDS

.1 ASTM International (ASTM):

.1 ASTM C834-17(2023), Standard Specification for Latex Sealants

.2 ASTM C919-22, Standard Practice for Use of Sealants in Acoustical Applications

.3 ASTM C920-18, Standard Specification for Elastomeric Joint Sealants

.4 ASTM C1330-23, Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants

.5 ASTM D2240-15(2021), Standard Test Methods for Rubber Property, Durometer Hardness

.2 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

.3 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards:

.1 SCAQMD Rule 1168-A2017, Adhesives and Sealants Applications

.4 ULC Standards/ UL Canada (ULC):

.1 CAN/ULC 115-2018, Standard Method of Fire Tests of Firestop Systems

1.3 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 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 Owners 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.

1.4 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.

1.5 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 45 00 - Quality Control.

.2 Before performing sealant work do sample applications of each type of sealant for review.

.3 Site locations for sample applications shall be designated by Owners 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.

1.6 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, with manufacturer's label.

.3 Storage and Handling Requirements:

.1 Store materials 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 Owners Representative.

1.7 AMBIENT CONDITIONS

.1 Proceed with installation of joint sealants only when:

.1 Ambient and substrate temperature conditions are within limits permitted by joint sealant manufacturer or are above 4.4 degrees C.

.2 Joint substrates are dry.

.3 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.

.2 Ventilate area of work as directed by Owners 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 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.

2.2 SEALANT MATERIALS

.1 In air handling units and supply air system, use sealants without strong odours, without toxic chemicals, and are mould-resistant. 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 Provide primers in accordance with manufacturer recommendation.

2.3 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-4: Silicone Sealant; structural glazing.

.1 To ASTM C920: type S; grade NS; class 25; use NT, A, G, O.

.4 Type S-5: Acoustical Sealant; interior, non-skimming, non-hardening, simple component synthetic rubber sealant, to ASTM C919.

.5 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.

.6 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.

.7 Type S-8: Horizontal joint sealant; two component, self-levelling.

.1 To ASTM C920: type M; grade P; class 25; use T, M, O.

.8 Type S-9: One part moisture curing, low modulus polyurethane sealant for sealing joints in level and slightly slope surfaces conforming to ASTM C920, type S, grade P, class 50, use T, M, A,O, MC-1-25-B-N.

.9 Type S-11 Control Joint Sealant: Two component, polyurea based, load bearing, self levelling sealant.

.10 Type S-13: One-component polyurethane sealant; medium-modulus, non-sag, low-VOC, UV stable, to CAN/CGSB-19.24.

.11 Type S16: To ASTM C920, aviation fuel-resistant; polyurethane elastomeric, chemical cured.

2.4 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-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 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-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.

.12 Use sealant S-13 for sealing exterior holes and penetrations around pipes and other services passing through concrete foundations and requiring greater movement capability.

2.5 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.

.1 Size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

.2 Non adhering to sealant, to maintain two sided adhesion across joint.

.3 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.

.4 Bond Breaker Tape:

.1 Polyethylene bond breaker tape or other tape recommended by sealant manufacturer which will not bond to sealant.

.2 Bond Breaker: Pressure-sensitive plastic tape that will not bond to sealants.

.3 Joint Cleaner: Provide a non-corrosive and non-staining type, compatible with joint forming materials and sealant in accordance with sealant manufacturer's recommendations

.4 Primer: Provide in accordance with sealant manufacturer's recommendations.

.5 Masking Tape: Non-absorbent type, non-staining, compatible with joint sealant and joint substrates.

2.6 COLOUR

.1 Sealant Colours: Match colour of adjacent materials where visible, as selected by Owners Representative, from manufacturer's complete 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 Owners 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 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 11 - 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 11 - Cleaning upon completion.

.3 Waste Management: Perform in accordance with Section 01 74 21 - Construction/Demolition 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 structural glazing silicone Type S-4 for sealing structural glass, interior and exterior.

.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 single component sealant type S-7, at perimeters of exterior openings where frames meet exterior facade of building (e.g., brick, block, precast masonry).

.8 Use multicomponent sealant Type S-8 for horizontal joint sealant of plaza, floors and decks, exterior areas only, subject to pedestrian and vehicular traffic.

.9 Use sealant Type S-8 for exterior joints in horizontal wearing surfaces.

.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-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 sealant S-13 for exterior holes and penetrations around pipes and other services passing through concrete foundations and requiring greater movement capability.

.13 Use sealant S-16 in pavement wherever fuel oils may be present

.14 In addition, provide joint sealants at the following conditions:

.15 Seal perimeters of hollow metal door frames on both sides.

.16 Seal control joints in gypsum board , except where prefabricated control joints are specified.

.17 Seal junctures between interior partitions with exterior walls.

.18 Seal window and door frames around the inside perimeter, so that an airtight seal is obtained , as indicated on Drawings.

.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 Coping joints and coping-to facade joints.

.23 Cornice and wash (or horizontal surface joints).

.24 Seal interior perimeters of exterior openings as detailed on Drawings.

.25 Joints of underside of precast beams or planks.

.26 Movement, control and expansion joints on the interior of exterior surfaces of unit masonry walls.

.27 Interior control and expansion joints in floor surfaces.

.28 Perimeters of interior frames , as detailed.

.29 Movement, control and expansion joints in exterior surfaces of unit masonry walls.

.30 Joints at tops of non-load bearing masonry walls at the underside of poured concrete.

.31 Exposed interior control joints in gypsum board.

.32 Seal at all locations where dissimilar material meet.

.33 Refer to Section 07 84 00 - Fire Stopping for additional requirements.

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 33.

1.2 REFERENCES

.1 Codes and standards referenced in this section refer to the latest edition thereof.

.2 Canadian Standards Association (CSA)

.1 CSA C22.1, Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.

.2 CAN/CSA-22.3 No. 1, Overhead Systems.

.3 CAN3-C235, Preferred Voltage Levels for AC Systems, 0 to 50,000V.

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, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

1.5 SUBMITTALS

.1 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.

.2 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.

.3 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.

.4 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 PART 3 - LOAD BALANCE.

.4 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Owner’s Representative.

.5 Manufacturer's Field Reports: submit to Owner’s Representative within 7 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.

.6 Single Line Electrical Diagrams

.1 Provide single line electrical diagrams in glazed frames as follows:

.1 Electrical distribution system: locate in Main Electrical (ME) Substation and Secondary Electrical (SE) Substation.

.2 Drawings: 600 x 900 mm minimum size.

.7 All submittals shall be in standard electronic PDF format.

.8 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 Note: Shop drawing review is for general compliance with Contract Documents. No responsibility is assumed by the Engineer for correctness of dimensions or details. Corrections or comments, or lack thereof, made on the shop drawings during the Engineer's review does not relieve the Contractor from compliance with the requirements of the drawings and specifications.

.8 If changes are required, notify Engineer of these changes before they are made.

.9 Operation and Maintenance Data:

.1 Provide operation and maintenance data for incorporation into operation and maintenance manuals.

.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.

.3 As-Built Drawings – Submit in accordance with Division 01.

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 Locate all existing underground services and make all parties aware of their existence and location.

.4 Where interference occurs, Owner's Representative must approve relocation of equipment and materials regardless of installation order.

.5 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 600 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 AS-BUILT 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 as-built 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 as-built 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 specifications.

.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 This contractor is responsible to maintain fire and smoke ratings around electrical conduits, cables, raceway and, cable trays passing through rated floor, ceiling and wall assemblies.

.2 Refer to drawings for identification of rated assemblies.

.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: Hilti, Nelson, Fire Stop Systems, 3M or approved equal. Material of same manufacturer to be used throughout project by this contractor.

1.14 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 Section 4.1.9.

.3 Mount base mounted equipment on chamfered edge housekeeping pads, minimum of 100 mm high and 50 mm larger than equipment dimensions all around. Concrete is specified in Division 3.

1.15 ANCHOR BOLTS AND TEMPLATES

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

1.16 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 Consultant.

.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.

.5 Acceptable manufacturers: (Buensod)(Le Hage)(Zurn).

PART 2 PRODUCTS

2.1 CONTROLS

.1 Supplier and installer responsibility is indicated on the electrical drawings.

2.2 FINISHES

.1 All electrical panel boards, switchgear, high voltage cables (outer jacket), busduct, junction box covers, conduit and transformers for this project must be color coded in accordance with the following:

.1 Normal Power 15 kv TPG Buttercup Pantone 12-0752

.2 Essential Power 5 kv Orangeade Pantone 17-1461

.3 Normal Power 600 v Iced Aqua Pantone 13-5410

.4 Essential Power 600 v TPG Barrier Reef Pantone 17-4530

.5 Normal Power 208 v TPG Beachnut Pantone 14-0425

.6 Essential Power 208 v TPG Avocado Pantone 18-0430

.2 Refer to Appendix 2 for further details of color coding requirements.

.3 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two (2) coats of finish enamel.

.1 Transfer switches to be painted Essential 600 V or Essential 208V as required.

.2 Paint outdoor electrical equipment “equipment green” finish to EEMAC Y1-1.

2.3 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.

2.4 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 warning labels on all major electrical components including switchgear, panelboards, disconnects, splitters and switches. Refer to Clause 3.8 for 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 white face, black 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	12mm 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 Transformers: indicate capacity, primary and secondary voltages and transformer number.

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 C22.1-09, Canadian Electrical Code.

.4 Use colour coded wires in communication cables, matched throughout system.

.5 Medium voltage cable labeling:

.1 All medium voltage conductors to be labeled with engraved lamacoid type tie-on cable labels inside all manholes, utility tunnels and cable vaults.

.2 Labels to measure minimum 53mm high and 200mm long.

.3 Provide labels on each phase conductor or multi-conductor cable.

.4 Labels to be applied where cables enter and leave manholes, tunnels or vaults. Provide additional labels as required such that the maximum spacing between labels does not exceed 1800mm in manholes and vaults and 6000mm in tunnels.

.5 Engrave nameplates with minimum 25mm bold face lettering denoting feeder designation (i.e. MUN-01, MUN-02, etc.).

.6 Labels to be bright yellow in color with black lettering.

.7 Nameplates to be predrilled and fixed with tie-wraps or stainless steel wire. Dual slots at each end of the labels shall be sized to suit larger tie-wraps or stainless steel wire.

.8 Submit nameplate schedule for review prior to ordering.

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 meter intervals.

.3 Refer to 2.02 – Finishes for line voltage systems color coding.

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 Engineer. 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 sleeves installed in foundation walls to accommodate the work of this Division. Seal the space between the sleeve and conduit by packing with oakum and sealing with mastic to form a waterproof seal.

2.12 HANGERS

.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.

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.

2.14 ARC FLASH WARNING LABELS

.1 The Owner's Representative will complete an arc flash, short circuit and coordination study for the project. A PDF of the study and associated equipment labels will be provided to the contractor prior to substantial completion.

.2 The contractor shall print a copy of the PDF labels provided by the Owner's Representative on 88.9 mm. x 127 mm. thermal transfer type labels of high adhesion polyester for equipment added or modified under the contract scope.

.3 All labels will be based on recommended overcurrent device settings and will be provided for the results of the short circuit analysis by the Owner's Representative after any system changes, upgrades or modifications have been incorporated.

.4 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.

.5 Labels shall be machine printed, with no field markings.

.6 Arc flash labels shall be provided in the following manner and all labels shall be based on recommended overcurrent device settings.

.1 For each 600, 480 and applicable 208 volt panelboard, one arc flash label shall be provided.

.2 For each motor control center, one arc flash label shall be provided.

.3 For each low voltage switchboard, one arc flash label shall be provided.

.4 For each switchgear, one flash label shall be provided.

.5 For medium voltage switches one arc flash label shall be provided.

PART 3 EXECUTION

3.1 COORDINATION OF OUTAGES

.1 The Contractor is required to submit a detailed Method of Procedure (MOP) for each planned electrical system outage during construction at least four weeks prior to the outage. Each Method of Procedure is to be submitted for approval to the Owner's Representative prior to any work proceeding on site. See attached sample form in Appendix 3.

3.2 NAMEPLATES AND LABELS

.1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

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.

3.5 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 – Commissioning (Cx) Requirements.

.4 Conduct and pay for following tests:

.1 Nedium voltage power distribution system including phasing, voltage, and grounding.

.2 Systems: data infrastructure, etc.

.5 Furnish manufacturer’s certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer’s instructions.

.6 Insulation resistance testing.

.1 Megger and record circuits, feeders and equipment up to 350 V with a 500 V instrument.

.2 Megger and record 350-600 V circuits, feeders and equipment with a 1000 V instrument.

.3 Check resistance to ground before energizing and record value.

.7 Provide instruments, meters, equipment and personnel required to conduct tests during and conclusion of project.

.8 Submit test results for Owner’s Representative’s review and include in Commissioning Manuals specified in Section 01 91 13 – Commissioning (Cx) Requirements.

3.7 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.

3.8 COORDINATION OF PROTECTIVE DEVICES/ARC FLASH ANALYSIS

.1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings as obtained from the Arc Flash, Short Circuit and Coordination Studies prepared by the Owner's Representative.

END OF SECTION

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 REFERENCES

.1 Codes and standards referenced in this section refer to the latest edition thereof.

.2 CSA (Canadian Standards Association).

.3 Underwriters Laboratories of Canada.

1.4 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.

1.5 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 field tests will include but not be limited to the following aspects:

.1 Medium voltage testing to ground of electrically insulated devices;

.2 Verification of all device fuse ratings;

.3 Power Factor testing of all electrically insulated devices, bushings, and cables;

.4 Ratio testing of power, voltage, and current transformers;

.5 Megger testing of all control and instrumentation cables;

.6 Verification of all relays settings and programmed internal logic;

.7 Verification of proper torque on all LV and MV terminal connections;

.8 Verification of all station service and DC control voltages;

.9 Verification of battery voltage and capacity and battery charger functions;

.10 Ringing out of wire connections and interconnections internal and external to the switchgear;

.11 Verification of all bonding connections;

.12 Trip testing of all relay input points at the source device;

.13 Trip testing of all relay output points;

.14 Verification of all control functions;

.15 Verification of all alarms and indications;

.16 Verification that all CT circuits are grounded and have short circuit impedances, and all PT circuits do not have a short impedance;

.17 Verification of all CT and PT protection and metering circuits through primary and secondary current and voltage injection;

.18 Verification of primary and secondary voltage phasing;

.19 Testing of interlocks.

.3 The Commissioning activities shall be co-ordinated by the Commissioning Authority.

.4 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.

.5 Contractor shall be responsible to update all documentation with information and any changes duly noted during the Commissioning exercise.

.6 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.

1.6 SUBMITTALS

.1 A commissioning document shall be prepared by the Contractor's Commissioning Authority 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.

1.7 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.

1.8 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 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.

1.9 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.

1.10 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 – 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

GENERAL

1.1 REFERENCES

.1 Codes and standards referenced in this section refer to the latest edition thereof.

.2 Canadian Standards Association (CSA)

.1 CAN/CSA-C22.2 No. 131, Type TECK90 Cable.

.2 CAN/CSA-C49.1, Round Wire, Concentric Lay, Overhead Electrical Conductors.

.3 National Electrical Manufacturers' Association (NEMA)/Insulated Cable Engineers Association (ICEA)

.1 NEMA WC3-ICEA S-19-81, Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

.2 NEMA WC7 ICEA S-66-524, Cross-Linked Polyethylene Wire and Cable for Transmission and Distribution.

1.2 SUBMITTALS

.1 Provided manufacturer's printed product literature, specifications, data sheet and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence and cleaning procedures.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver and offload materials in accordance with manufacturer's written instructions.

1.4 CLOSEOUT SUBMITTALS

.1 Test Reports: Indicate results of cable test in tabular form and in plots of current versus voltage for incremental voltage steps, and current versus time at 30 second intervals at maximum voltage.

PRODUCTS

2.1 ETHYLENE PROPYLENE RUBBER (EPR) INSULATED CABLES 15 KV

.1 Cable is supplied by Owner's Representative as outlined on the drawings.

.2 Reels are stored at the South Campus Boiler Room. Contractor is responsible to retrieve reels, transport to install site and offload for use on this project. Any remaining cable to be returned on reels to South Campus Boiler Room. Empty reels to also be returned to South Campus Boiler Room or disposed of at Owner's Representative's discretion.

.3 Stranded copper circuit conductors.

.4 Insulation: Ethylene Propylene Rubber rated at 105˚C, 15 KV. Insulation level 133%.

.5 Prysmian Easy Glider, 350MCM, copper, Type MV-105.

2.2 TECK POWER CABLE 1001 – 15000 V

.1 Cable: to CAN/CSA-C22.2 No. 131 and CSA C68.10.

.2 Bare copper grounding conductor, #3 AWG minimum.

.3 Copper or aluminum circuit conductors, size and number as indicated on drawings.

.4 Semi-conducting, thermosetting conductor shield

.5 Insulation: 15kV, 133% rated chemically cross-linked thermosetting polyethylene rated RW90 15 kV to NEMA WC7 ICEAS-66-524.

.6 Insulation shielding: semi-conducting non-metallic tape over insulation and served wire shield over tape to NEMA WC3 ICEAS-19-81.

.7 Separator tape over conductor assembly.

.8 Inner jacket of PVC.

.9 Interlocked steel armour.

.10 Overall PVC jacket rated minus 40˚C.

.11 FT4 rated, sunlight resistant

2.3 MEDIUM-VOLTAGE TAPES

.1 Ethylene/propylene rubber-based, 0.76-mm splicing tape, rated for 130 deg C operation. Minimum 20 mm wide.

.2 Silicone rubber-based, 0.30-mm self-fusing tape, rated for 130 deg C operation. Minimum 38 mm wide.

.3 Insulating-putty, 3.175-mm elastic filler tape. Minimum 38 mm wide.

2.4 ARC-PROOFING MATERIALS

.1 Tape for First Course on Metal Objects: 250-micrometer- thick, corrosion-protective, moisture-resistant, PVC pipe-wrapping tape.

.2 Arc-Proofing Tape: Fireproof tape, flexible, conformable, intumescent to 0.76 mm thick, and compatible with cable jacket.

.3 Glass-Cloth Tape: Pressure-sensitive adhesive type, 25 mm wide.

EXECUTION

3.1 INSTALLATION

.1 Cables

.1 Install cables according to IEEE 576 and CSA C22.1 .

.2 Proof conduits prior to conductor installation by passing a wire brush mandrel and then a rubber duct swab through the conduit. Separate the wire brush and the rubber swab by 1200 to 1800 mm on the pull rope.

.1 Wire Brush Mandrel: Consists of a length of brush approximately the size of the conduit inner diameter with stiff steel bristles and an eye on each end for attaching the pull ropes. If an obstruction is felt, pull the brush back and forth repeatedly to break up the obstruction.

.2 Rubber Duct Swab: Consists of a series of rubber discs approximately the size of the conduit inner diameter on a length of steel cable with an eye on each end for attaching the pull ropes. Pull the rubber duct swab through the duct to extract loose debris from the duct.

.3 Pull Conductors: Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

.1 Use manufacturer-approved pulling compound or lubricant that does not deteriorate conductor or insulation.

.2 Use pulling means, including fish tape, cable, rope, and basket-weave cable grips, that do not damage cables or raceways. Do not use rope hitches for pulling attachment to cable.

.3 Use pull-in guides, cable feeders, and draw-in protectors as required to protect cables during installation.

.4 Do not pull cables with ends unsealed. Seal cable ends with rubber tape.

.5 Use a dynamometer and record tension for all pulls in excess of 30 meters.

.4 Cable in vaults (maintenance holes), handholes, pull boxes, and junction boxes:

.1 Train cables around walls by making at least one complete circle, touching each wall.

.2 Support cables at intervals not to exceed 1050mm. Tie wrap cables to non-conducting cable supports.

.3 Mark cables with source, voltage, and phase identification.

.5 Install sufficient cable length to remove cable ends under pulling grips and to remove length of conductor damaged during pulling.

.6 Install cable splices at pull points and elsewhere as indicated; use standard kits. Use dead-front separable insulated connectors in pull boxes, handholes, maintenance holes and other indicated locations.

.7 Cable Shields

.1 Cable shield bonding conductor shall match ampacity of cable shield.

.2 Follow cable and termination kit manufacturer’s instructions for bonding of shields to ground.

.3 Ground cable shields at terminations, splices, and separable insulated connectors.

.4 Ground metal bodies of terminators, splices, cable and separable insulated-connector fittings, and hardware.

.5 Ground cable shields at source connection point only. Maintain shield continuity and connections to metal connection hardware at all connection points.

.2 Terminations (bolted):

.1 Install terminations at ends of conductors

.2 Seal multiconductor cable ends with standard kits

.3 Separable Insulated Connectors: Install separable insulated-connector components as follows:

.1 Comply with manufacturer’s instructions.

.2 Protective Cap: At each terminal junction, with one on each terminal to which no feeder is indicated to be connected.

.3 Portable Feed-Through Accessory: At each terminal junction, with one on each terminal.

.4 Standoff Insulator: At each terminal junction, with one on each terminal.

.4 Arc Proofing: Unless otherwise indicated, arc proof medium-voltage cable at locations not protected by conduit, cable tray, direct burial, or termination materials. In addition to arc-proofing tape manufacturer's written instructions, apply arc proofing as follows:

.1 Clean cable sheath.

.2 Wrap metallic cable components with 250-micrometer pipe-wrapping tape.

.3 Smooth surface contours with electrical insulation putty.

.4 Apply arc-proofing tape in one half-lapped layer with coated side toward cable.

.5 Band arc-proofing tape with two layers of 25-mm- wide half-lapped, adhesive, glass-cloth tape at each end of the arc-proof tape.

.5 Seal around cables passing through fire-rated elements according to Division 07.

.6 Termination of all 15kV cables, including cables supplied by Owner's Representative, by this division.

3.2 FIELD TESTING

.1 Engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

.2 Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

.3 The testing agency shall perform the following tests and inspections:

.1 Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Ch. 7.3.3 Shielded Cables, Medium- and High-Voltage. Certify compliance with test parameters.

.2 After installing medium-voltage cables and before electrical circuitry has been energized, test for compliance with requirements.

.3 Visual and Mechanical Inspections

.1 Inspect exposed cable section for physical damage in equipment vaults and maintenance holes.

.2 Verify cable is supplied and connected in accordance with single line diagram.

.3 Inspect for shield grounding, cable support, and termination.

.4 Visible cable bends shall be checked against ICEA or manufacturer's minimum allowable bending radius.

.5 Inspect for proper fireproofing in common cables areas.

.6 Inspect all splices and load break elbows for proper installation according to manufacturers' instructions.

.4 Electrical Tests

.1 Perform resistance measurements through bolted connections with a low-resistance ohmmeter, in accordance with NETA ATS, Section 7.3.3.B.1 and 7.3.3.B.2.

.2 Perform full dielectric absorption tests on each power cable with a 5000-volt insulation-resistance test set. Perform the tests on each cable. Completely isolate each power cable installation from extraneous electrical connections at cable terminations and joints. Observe all safety precautions.

.1 Apply the test for a long enough time to fully charge the cable. Record readings every 15 seconds during the first 3 minutes of test and at 1 minute intervals thereafter. Record megohm readings versus time and cable temperature versus time.

.2 Continue the test until three equal readings, 1 minute apart, are obtained. Minimum reading is 200 megohms at an ambient temperature of 20 degrees C. Correct all readings taken at other than 20 degrees C ambient temperatures.

.3 Following successful completion of the test, apply grounds to the cable and shield for a period of time adequate to drain all stored potential.

.4 Provide results of the second dielectric absorption test that agree with the first test and that indicate no permanent injury to the cable caused by the high-potential test.

.3 Perform a shield continuity test on each power cable.

.4 Perform time domain reflectometer measurements on each power cable

.5 Very Low Frequency (VLF) Dielectric Withstand Testing

.1 Perform VLF dielectric withstand test and summarize pass/fail results per IEEE 400.2 Field Testing of Shielded Power Cable Systems Using Very Low Frequency.

.2 Perform tests with cable and terminations in place, off line, prior to energization.

.3 Each conductor shall be individually tested with all other conductors grounded. All shields shall be grounded.

.4 Terminations shall be properly corona suppressed by guard ring, field reduction sphere, or other suitable methods.

.5 Unless otherwise recommended by IEEE 400.2 or the cable manufacturer utilize the following:

.1 Waveform: Sinusoidal

.2 Frequency: 0.1 Hz

.6 Test Voltage: The maximum test voltage shall not exceed the limits for terminators as specified in ANSI/IEEE 48, IEEE 386, or the manufacturer's specifications.

.6 Perform Tan-delta testing of each cable segment and each phase in accordance with IEEE 400 Guide for Field Testing and Evaluation of the Insulation of Shielded Power Cable Systems Rated 5kV and Above, using 0.1Hz VLF. Test at a minimum of 6 voltage steps from Uo to 2.0Uo.

.4 Medium-voltage cables will be considered defective if they do not pass tests and inspections.

.5 Prepare test and inspection reports.

3.3 IDENTIFICATION

.1 Label cables in manholes, tunnels and vaults in accordance with Section 26 05 00 - Common Work Requirements – Electrical.

.2 Identify phase and circuit number of each conductor at each splice, termination, pull point, and junction box. Arrange identification so that it is unnecessary to move the cable or conductor to read the identification.

END OF SECTION

GENERAL

1.1 SECTION INCLUDES

.1 Materials and installation for wire and box connectors.

1.2 REFERENCES

.1 Codes and standards referenced in this section refer to the latest edition thereof.

.2 Canadian Standards Association (CSA)

.1 CAN/CSA-C22.2 No.18, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.

.2 CSA C22.2 No.65, Wire Connectors.

.3 National Electrical Manufacturers Association (NEMA)

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 Clamps or connectors for armoured cable, flexible conduit as required to: CAN/CSA-C22.2 No.18.

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.

END OF SECTION

GENERAL

1.1 RELATED SECTIONS

.1 Refer to drawings for wiring type required under different applications.

1.2 REFERENCES

.1 Codes and standards referenced in this section refer to the latest edition thereof.

.2 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.

PRODUCTS

2.1 BUILDING WIRES

.1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.

.2 Copper conductors: size as indicated, with 600 V insulation of chemically cross-linked thermosetting polyethylene material rated RW90 as indicated.

.3 Copper conductors: size as indicated, with thermoplastic insulation type TWH rated at 600 V, typically used for insulated ground wires.

2.2 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 Type: ethylene propylene rubber.

.2 Chemically cross-linked thermosetting polyethylene rated type RW90, 600 V.

.4 Inner jacket: polyvinyl chloride material.

.5 Armour: interlocking.

.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.

2.3 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 double split rings.

2.4 CONTROL CABLES

.1 Low energy 300 V control cable: stranded annealed copper conductors sized as indicated, with PVC insulation type TW -40C polyethylene insulation with shielding of tape coated with paramagnetic material wire braid over each conductor and overall covering of PVC jacket.

.2 .2 Twisted Shielded Cable (Non-Plenum Rated): Single twisted pair 18/2 polyethylene insulation copper conductors, aluminum foil shield, tinned copper drain wire. Outer PVC jacket. Non plenum rated. Standard of Acceptance: Belden 8760.

.3 .3 Twisted Shielded Cable (Plenum Rated): Single twisted pair 18/2 teflon insulated conductors, aluminum foil shield, tinned copper drain wire. Outer Teflon jacket. Classified for use in air plenums. Standard of Acceptance: Belden 88760.

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.

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 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

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.

.2 In underground ducts in accordance with Section 26 05 43.01- Installation of Cables in Ducts.

3.4 INSTALLATION OF TECK CABLE 0 -1000 V

.1 Install cables.

.1 Group cables wherever possible on channels.

.2 Install cable in areas only where specifically indicated on drawings or as approved otherwise by Owner's Representative.

.3 Terminate cables in accordance with Section 26 05 20- Wire and Box Connectors - 0 - 1000 V.

3.5 INSTALLATION OF ARMOURED CABLES (AC-90)

.1 Group cables wherever possible.

.2 Install cable in underground ducts in accordance with Section 26 05 43.01 - Installation of Cables in Ducts.

.3 Lay cable in cabletroughs in accordance with Section 26 05 43.01 - Installation of Cables in Ducts.

.4 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.

3.6 INSTALLATION OF CONTROL CABLES

.1 Install control cables in conduit, under floor raceways, cable troughs and underground ducts by direct burial as indicated.

.2 Ground control cable shield.

END OF SECTION

GENERAL

1.1 REFERENCE STANDARDS

.1 CSA C22.2 - General requirements — Canadian Electrical Code, Part II.

.2 IEEE 48 - IEEE Standard for Test Procedures and Requirements for Alternating-Current Cable Terminations Used on Shielded Cables Having Laminated Insulation Rated 2.5 kV through 765 kV or Extruded Insulation Rated 2.5 kV through 500 kV.

.3 IEEE 386 - IEEE Standard for Separable Insulated Connector Systems for Power Distribution Systems Rated 2.5 kV through 35 kV.

.4 IEEE 404 - IEEE Standard for Cable Joints for use with Extruded Dielectric Cable Rated 5,000 - 138,000 Volts and Cable Joints for use with Laminated Dielectric Cable Rated 2500 - 500,000 Volts.

1.2 INSTALLATION TOOLS

.1 Include with the material one complete set of installation tools. Tools to include all hydraulic pumps, fittings, compression dyes, cutting tools, measuring devices necessary to install all components.

PRODUCTS

2.1 TERMINATIONS (BOLTED)

.1 Exposed Conductor Terminal: IEEE 48 Class 1 termination, compatible with cable jacket, insulation level, and conductor type. Hydraulic crimp barrel. Insulation class shall be equivalent to that of cable. Include shield ground strap.

.1 Outdoor Modular Stress Relief: Furnished as a kit, with stress-relief tube; multiple, molded-silicone-rubber, insulator modules; and compression-type connector.

.2 Outdoor Heat Shrink Stress Relief: Heat-shrink type with heat-shrink inner stress control and outer non-tracking tubes; multiple, molded, non-tracking skirt modules; and compression-type connector.

.3 Indoor Heat Shrink Stress Relief: Heat shrink kit with stress-relief tube, non-tracking insulator tube, shield ground strap, compression-type connector, and end seal.

2.2 SEPERABLE INSULATED CONNECTORS

.1 Description: Modular system, complying with IEEE 386, with disconnecting, single-pole, cable terminators, stress relief, dead-front terminals designed for cable voltage and for sealing against moisture. Suitable for submersion in water.

.1 Copper or copper clad compression connectors with copper cable.

.2 Basic Impulse level (Distribution Class): 150kV

.3 Basic Impulse Level (Power Class): 200kV

.2 Loadbreak Cable Terminators: Elbow-type units with 200-A-load make/break and continuous-current rating; coordinated with insulation diameter, conductor size, and material of cable being terminated. Include test point on terminator body that is capacitance coupled.

.3 Deadbreak Cable Terminators: Elbow-type unit with 600-A continuous-current rating; designed for de-energized disconnecting and connecting; coordinated with insulation diameter, conductor size, and material of cable being terminated. Include test point on terminator body that is capacitance coupled.

.4 Terminations at Apparatus and Equipment: Elbow type unit constructed to match bushing or bushing well furnished with equipment. Refer to apparatus or equipment shop drawings.

.5 Splices: Modular type, consisting of terminators installed on cables and modular, dead-front, terminal junctions or plugs for interconnecting cables. In-Line, Tee, or multiple Tee connectors, dead break, with ampacity to match or exceed rating of cable overcurrent protective device.

.6 Dead-Front Terminal Junctions: Modular bracket-mounted groups of dead-front stationary terminals that mate and match with above cable terminators. Two-, three-, or four-terminal units as indicated, with fully rated, insulated, watertight conductor connection between terminals and complete with grounding lug, manufacturer's standard accessory stands, stainless-steel mounting brackets, and attaching hardware.

.1 Protective Cap: Insulating, electrostatic-shielding, water-sealing cap with drain wire.

.2 Portable Feed-Through Accessory: Two-terminal, dead-front junction arranged for removable mounting on accessory stand of stationary terminal junction.

.3 Grounding Kit: Jumpered elbows, portable feed-through accessory units, protective caps, test rods suitable for concurrently grounding three phases of feeders, and carrying case.

.4 Standoff Insulator: Portable, single dead-front terminal for removable mounting on accessory stand of stationary terminal junction. Insulators suitable for fully insulated isolation of energized cable-elbow terminator.

2.3 SPLICES

.1 Comply with IEEE 404; with components as recommended by cable or splicing kit manufacturer for the cable, location, and application. Include all components required for complete splice, with detailed instructions.

.2 Heat-shrink splicing kit of uniform, cross-section, polymeric construction with outer heat-shrink jacket.

.3 Premolded, cold-shrink-rubber, in-line splicing kit, with cast epoxy resin encasement or other waterproof, abrasion-resistant material.

2.4 TOOLS

.1 As required.

EXECUTION

3.1 INSTALLATION

.1 Install cold shrink terminations and splices in accordance with manufacturer's instructions.

.2 Bond and ground as required to CSA C22.2 No. 41.

END OF SECTION

GENERAL

1.1 REFERENCES

.1 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE).

.1 ANSI/IEEE 837, Qualifying Permanent Connections Used in Substation Grounding.

.2 Canadian Standards Association (CSA)

.1 CSA C22.2 No.0.4, Bonding and Grounding of Electrical Equipment (Protective Grounding).

1.2 SUBMITTALS

.1 Provided manufacturer's printed product literature, specifications, data sheet and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence and cleaning procedures.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

PRODUCTS

2.1 MATERIALS

.1 Rod electrodes: copper clad steel, 19 mm dia by 3 meter long.

.2 Conductors: bare, stranded, untinned soft annealed copper wire, size No 4/0 AWG and 2/0 AWG for ground bus, electrode interconnections, metal structures, gradient control mats, transformers, switchgear, motors, ground connections.

.3 Conductors: PVC insulated coloured green, stranded untinned soft annealed copper wire, size No. 4 AWG for grounding cable sheaths, raceways, pipe work, screen guards, switchboards, potential transformers.

.4 Conductors: PVC insulated coloured green, stranded untinned soft annealed copper wire No. 10 AWG for grounding meter and relay cases.

.5 Bolted removable test links.

.6 Accessories: non-corroding, necessary for complete grounding system, type, size material as indicated, including:

.1 Grounding and bonding bushings,

.2 Protective type clamps,

.3 Bolted type conductor connectors,

.4 Thermit welded type conductor connectors,

.5 Bonding jumpers, straps,

.6 Pressure wire connectors.

.7 Wire connectors and terminations: as indicated.

EXECUTION

3.1 GROUNDING INSTALLATION

.1 Install continuous grounding system including, electrodes, conductors, connectors and accessories in accordance with CSA C22.2 No.0.4 and requirements of local authority having jurisdiction.

.2 Install connectors in accordance with manufacturer's instructions.

.3 Protect exposed grounding conductors from mechanical injury.

.4 Make buried connections, and connections to electrodes, structural steel work, using copper welding by thermit process.

.5 Use mechanical connectors for grounding connections to equipment provided with lugs.

.6 Use tinned copper conductors for aluminum structures.

.7 Do not use bare copper conductors near un-jacketed lead sheath cables.

3.2 ELECTRODE INSTALLATION

.1 Install ground rod electrodes, as indicated. Make grounding connections to station equipment.

.2 Make special provision for installing electrodes that will give acceptable resistance to ground value, where rock or sand terrain prevails.

3.3 EQUIPMENT GROUNDING

.1 Install grounding connections as indicated to typical station equipment. Non current carrying parts of: transformers, motors, circuit breakers, current transformers, frames of switches and fuse cutout bases. Cable sheaths, raceways, pipe work, screen guards, switchboards, potential transformers. Meter and relay cases. Any exposed building metal, within or forming part of station enclosure.

.2 Ground hinged doors to main frame of electrical equipment enclosure with flexible jumper.

3.4 GROUNDING IN MANHOLES

.1 Install conveniently located grounding stud, electrode, size 3/0 stranded copper conductor in each manhole.

.2 Install ground rod with lug for grounding connection in each manhole so that top projects through bottom of manhole.

3.5 CABLE SHEATH GROUNDING

.1 Bond single conductor, metallic sheathed cables together at one end only. Break sheath continuity by inserting insulating sleeves in cables.

.2 Use No. 6 AWG flexible copper wire soldered, not clamped, to cable sheath.

.3 Connect bonded cables to ground with No. 2/0 AWG copper conductor.

3.6 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 – Common Work Results - Electrical and Section 01 91 13 – Commissioning (Cx) Requirements.

.2 Perform earth loop test and resistance tests using method appropriate to site conditions and to approval of Owner's Representative and local authority having jurisdiction.

.3 Perform test before energizing electrical system.

.4 Engage testing agent to inspect grounding and perform resistance test before backfill.

END OF SECTION

GENERAL

1.1 RELATED SECTIONS

.1 Grounding conductors for all distribution grounding to be insulated copper, uninsulated where in contact with earth.

1.2 REFERENCES

.1 Codes and standards referenced in this section refer to the latest edition thereof.

.2 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)

.1 ANSI/IEEE 837, Qualifying Permanent Connections Used in Substation Grounding.

.3 Canadian Standards Association, (CSA)

.1 CAN/CSA Z32, Electrical Safety and Essential Electrical Systems in Health Care Facilities, where applicable.

PRODUCTS

2.1 EQUIPMENT

.1 Rod electrodes: copper clad steel 21 mm dia by 3 meter long.

.2 Grounding conductors: bare stranded copper, soft annealed, size as indicated.

.3 Insulated grounding conductors: green, type TW.

.4 Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.

.5 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.

.7 Compression type connectors.

EXECUTION

3.1 INSTALLATION GENERAL

.1 Install complete permanent, continuous grounding and bonding system including, electrodes, conductors, connectors, accessories. Where EMT 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 Make buried connections using copper welding by thermit process or compression fitting.

.5 Use mechanical connectors for bonding connections to equipment provided with lugs.

.6 Soldered joints not permitted.

.7 Where not installed within the conduit, 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.

.8 Install separate bond conductor to outdoor lighting standards.

.9 Make bonding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.

.10 All conduits containing bonding or grounding conductors which terminate above the electrical room ground bus to be equipped with bonding jumpers.

3.2 ELECTRODES

.1 Install rod electrodes and make grounding connections.

.2 Bond separate, multiple electrodes together.

.3 Use size AWG copper conductors for connections to electrodes as required by code.

.4 Make special provision for installing electrodes that will give acceptable resistance to ground value where rock or sand terrain prevails. Ground as indicated.

3.3 SYSTEM AND CIRCUIT GROUNDING

.1 Install system and circuit grounding connections to neutral of secondary 600V and 208V systems.

3.4 EQUIPMENT BONDING

.1 Install bonding connections to typical equipment included in, but not necessarily limited to following list. transformers, frames of motors, starters, control panels, building steel work, distribution panels, outdoor lighting.

3.5 GROUNDING BUS

.1 Install copper grounding bus mounted on insulated supports on wall of electrical rooms.

.2 Ground items of electrical equipment in electrical room to ground bus with individual bare stranded copper connections size as required by code.

3.6 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 ground continuity and resistance 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 Disconnect ground fault indicator during tests.

END OF SECTION

GENERAL (NOT APPLICABLE)

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.

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 50 mm and smaller.
- .2 Two-hole steel straps for conduits and cables larger than 50 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 meter 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.

END OF SECTION

GENERAL

1.1 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 professional engineer registered or licensed in the Province of Newfoundland and Labrador, Canada.

PRODUCTS

2.1 SPLITTERS

.1 Sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.

.2 Main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.

.3 At least three spare terminals on each set of lugs in splitters less than 400A.

2.2 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.

.3 Sized in accordance with the CEC without use of extension sections.

2.3 CABINETS

.1 Type E: sheet steel, hinged door and return flange overlapping sides, handle, lock and catch, for surface mounting.

.2 Type T: sheet steel cabinet, with hinged door, latch, lock, 2 keys, containing 19 mm fir plywood backboard for surface flush mounting.

EXECUTION

3.1 SPLITTER INSTALLATION

.1 Install splitters and mount plumb, true and square to the building lines.

.2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Mount cabinets with top not higher than 2 meter above finished floor.

.3 Install terminal block as indicated in Type T cabinets.

.4 Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed 30 meter of conduit run between pull boxes.

3.3 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

GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CSA C22.1, Canadian Electrical Code, Part 1.

PRODUCTS

2.1 OUTLET AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with CSA C22.1-09.

.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 347V outlet boxes for 347V switching devices.

.6 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 SHEET 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 Electro-galvanized steel utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.

.3 102 mm square or octagonal outlet boxes for lighting fixture outlets.

.4 102 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 32 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.

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.

END OF SECTION

GENERAL

1.1 REFERENCES

.1 Codes and standards referenced in this section refer to the latest edition thereof.

.2 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 CSA C22.2 No. 211.2, Rigid PVC (Unplasticized) Conduit.

.6 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.

PRODUCTS

2.1 CONDUITS

.1 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.

.2 Rigid pvc conduit: to CSA C22.2 No. 211.2.

.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 50 mm and smaller. Two hole steel straps for conduits larger than 50 mm.

.2 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for two or more conduits at 1.5 meter 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 90o, 45 o or 22.5 o bends are required for 25 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 Connectors and couplings for EMT. Steel set-screw type, size as required.

.5 CSA Certified water tight connectors for all conduit entries into top of electrical equipment, panelboards, transformers and switchgear. Thomas & Betts Bullet Hub or equal.

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.

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 electrical service rooms and in unfinished areas.

.4 Do not install conduit within 100mm of the underside of roof decking in accordance with GCS Electrical Bulletin dated January 13, 2010.

.5 Use electrical metallic tubing (EMT) except in cast concrete and where subject to mechanical injury, as well as concealed work in masonry construction.

.6 Use rigid pvc conduit underground and buried in or under concrete slab on grade.

.7 Use flexible metal conduit for connection to vibrating equipment in dry areas.

.8 Use liquid tight flexible metal conduit for connection to vibrating equipment in damp, wet or corrosive locations.

.9 Use AC90 for individual vertical power supply drops to light fixtures only.

.10 Minimum conduit size for lighting and power circuits: 21mm. 16mm conduit is acceptable for switch leg drops only where one two-wire circuit and ground is required.

.11 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.12 Mechanically bend steel conduit over 19 mm dia.

.13 Install fish cord in empty conduits.

.14 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.

.15 Dry conduits out before installing wire.

.16 Install water tight bullet hubs on all conduits entering top of equipment.

3.3 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Run conduits in flanged portion of structural steel.

.3 Group conduits wherever possible on suspended channels.

.4 Do not pass conduits through structural members except as indicated.

.5 Do not locate conduits less than 75 mm parallel to hot water lines with minimum of 25 mm at crossovers.

.6 Do not install conduit within 100mm of the underside of roof decking in accordance with GCS Electrical Bulletin dated January 13, 2010. See drawings for acceptable methods of running conduit below roofing decks.

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 CONDUITS IN CAST-IN-PLACE CONCRETE

.1 Locate to suit reinforcing steel. Install in centre one third of slab. Use rigid PVC conduit.

.2 Protect conduits from damage where they stub out of concrete

.3 Install sleeves where conduits pass through slab or wall.

.4 Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed. Use cold mastic between sleeve and conduit.

.5 Do not place conduits is slabs in which slab thickness is less than 4 times conduit diameter.

.6 Encase conduits completely in concrete with minimum 25 mm concrete cover.

.7 Organize conduits in slab to minimize cross-overs.

3.6 CONDUITS IN CAST-IN-PLACE SLABS ON GRADE

.1 Run conduits 25 mm and larger below slab and encased in 75 mm concrete envelope. Provide 50 mm of sand over concrete envelope below floor slab.

3.7 CONDUITS UNDERGROUND

.1 Slope conduits to provide drainage.

.2 Waterproof joints (PVC excepted) with heavy coat of bituminous paint.

3.8 CLEANING

.1 Proceed in accordance with Section 01 74 11 – Cleaning.

.2 On Completion and verification of performance of installation, remove surplus materials, excess materials rubbish, tools and equipment.

END OF SECTION

GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 26 05 00 – Common Work Results - Electrical.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CAN/CSA C22.1 No. 126.1 – Metal Cable Tray Systems.

.2 National Electrical Manufacturers Association (NEMA).

.1 NEMA FG 1, Fibreglass and Cable Tray Systems.

.2 NEMA BI 50015, Metal Cable Tray Systems.

1.3 SUBMITTALS

.1 Product Data: submit manufacturer's product data sheets for cable tray indicating dimensions, materials, and finishes, including classifications and certifications.

.2 Shop Drawings: submit shop drawings showing materials, finish, dimensions, accessories, layout, and installation details.

.3 Identify types of cabletroughs used.

.4 Show actual cabletrough installation details and suspension system.

PRODUCTS

2.1 CABLETROUGH

.1 Cabletroughs and fittings: to NEMA FG 1 and VE 1 as referenced in Item 1.02(B) above.

.2 Ladder type, Class E as indicated in CAN/CSA C22.2 No.126.

.3 Side rail height: 100mm.

.4 Width: 610mm.

.5 Rung Spacing: 150mm.

.6 Trays: hot dipped galvanized steel after fabrication.

.7 Fittings: horizontal elbows, end plates, drop outs, vertical risers and drops, tees, wyes, expansion joints and reducers where required, manufactured accessories for cabletrough supplied.

.1 Radii on fittings: 900 mm minimum.

.8 Barriers where different voltage systems are in same cabletrough.

2.2 SUPPORTS

.1 Provide supports as required by manufacturer and CSA C22.2 No. 126 for the cable tray classification and loading.

EXECUTION

3.1 INSTALLATION

.1 Install complete cabletrough system.

.2 Support cabletrough on both sides.

.3 Remove sharp burrs or projections to prevent damage to cables or injury to personnel.

3.2 CABLES IN CABLETROUGH

.1 Install cables individually.

.2 Lay cables into cabletrough. Use rollers when necessary to pull cables.

.3 Secure cables in cabletrough at 6 meter centres, with galvanized ss steel one piece cobra clamps.

.4 Identify cables with cable markers in accordance with Section 26 05 00 – Common Work Results - Electrical.

END OF SECTION

GENERAL

1.1 REFERENCES

.1 Codes and standards referenced in this section refer to the latest edition thereof.

.2 Canadian Standards Association, (CSA)

.3 Insulated Cable Engineers Association, Inc. (ICEA)

PRODUCTS

EXECUTION

3.1 CABLE INSTALLATION IN DUCTS

.1 Immediately before pulling cables in new or existing duct banks, pull through each duct wooden mandrel not less than 300 mm long and of diameter 6 mm less than internal diameter of duct, followed by stiff bristle brush to remove sand, earth and other foreign matter. Avoid disturbing or damaging ducts where concrete has not set completely.

.2 Install cables as indicated in ducts.

.1 Do not pull spliced cables inside ducts.

.3 Install multiple cables in duct simultaneously.

.4 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.

.5 To facilitate matching of colour coded multiconductor control cables reel off in same direction during installation.

.6 Before pulling cable into ducts and until cables are properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.

.7 After installation of cables, seal duct ends with duct sealing compound.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical and Section 01 91 13 – Commissioning (Cx) Requirements.

.2 Perform tests using qualified personnel. Provide necessary instruments and equipment.

.3 Check phase rotation and identify each phase conductor of each feeder.

.4 Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 50 megohms.

.5 Pre-acceptance tests.

.1 After installing cable but before splicing and terminating, perform insulation resistance test with 1000 V megger on each phase conductor.

.2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.

.6 Acceptance Tests

.1 Ensure that terminations and accessory equipment are disconnected.

.2 Ground shields, ground wires, metallic armour and conductors not under test.

.3 High Potential (Hipot) Testing.

.1 Conduct hipot testing at 100 % of original factory test voltage in accordance with manufacturer's recommendations.

.4 Leakage Current Testing.

.1 Raise voltage in steps from zero to maximum values as specified by manufacturer for type of cable being tested.

.2 Hold maximum voltage for specified time period by manufacturer.

.3 Record leakage current at each step.

.7 Provide Owner’s Representative with list of test results showing location at which each test was made, circuit tested and result of each test. Include results in Commissioning Manual.

.8 Remove and replace entire length of cable if cable fails to meet any of test criteria.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 03 30 00 - Cast-in-Place Concrete

.2 Section 33 65 73 - Concrete Encased Duct Banks and Manholes

1.2 REFERENCE STANDARDS

.1 IEC 62271-200 - High-Voltage Switchgear and Controlgear – Part 200: AC Metal-Enclosed Switchgear and Controlgear for Rated Voltages Above 1 kV and up to and Including 52 kV.

.2 IEEE 386 - IEEE Standard for Separable Insulated Connector Systems for Power Distribution Systems Rated 2.5 kV through 35 kV.

.3 IEEE C37 - Guides and Standards for Circuit Breakers, Switchgear, Relays, Substations, and Fuses.

1.3 SUBMITTALS

.1 Action Submittals

.2 Informational Submittals

.3 Operation and Maintenance Materials

.4 Record Documents

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver and offload materials at the Owner’s Representative designated location in accordance with the manufacturer’s written instructions.

1.5 SOURCE QUALITY CONTROL

.1 Submit to Owner's Representative standard factory test certificates of each equipment and type test of each equipment with accessories.

1.6 FIELD SERVICE CAPABILITY

.1 Manufacturer shall have local field service personnel capable of mobilizing to site within 72 hours of a request for service from the Owner's Representative.

1.7 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate:

.1 Anchoring method and dimensioned foundation template.

.2 Dimensioned cable entry locations.

.3 Dimensioned cable termination height.

.4 Identified internal and external component layout on assembly drawing.

.5 Catalog data on all devices including switches, interlocks, fuses, fuse mounting methods, bushing wells, bushing inserts, spades, separable connectors, etc.

.3 Submit fuse time-current characteristics.

.4 Factory Tests: Furnish manufacturer's certified standard test reports for equipment.

.5 Certification of Ratings:

.1 The manufacturer of the switchgear shall be completely and solely responsible for the performance of the fault interrupter and fault interrupter as well as the complete integrated assembly as rated.

.2 The manufacturer shall furnish, upon request, certification of ratings of the fault interrupter and the integrated switchgear assembly consisting of switches and fault interrupters in combination with the gas-tight tank.

.6 Instruction Manuals: Furnish manufacturer's installation and maintenance manuals on the equipment and accessories.

1.8 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance data for equipment for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

PART 2 PRODUCTS

2.1 PADMOUNTED SF6 SWITCHGEAR

.1 General Description

.1 The switchgear shall consist of a gas-tight tank containing SF_6 insulating gas, four resettable fault interrupter ways, with visible open gaps and integral visible grounds, and a microprocessor-based overcurrent control. Fault-interrupter terminals shall be equipped with bushing wells rated 600 amperes continuous for elbow connection. Manual operating mechanisms and viewing windows shall be located on the opposite side of the tank from the bushing and bushing wells, so operating personnel shall not be required to perform any routine operations in close proximity to high-voltage elbows and cables.

.2 Basic Components

.1 External current transformers rated at 600:5 to be used for measurement and protection functions.

.2 An adequate elbow connected voltage transformer needs to be installed inside the high voltage enclosure (HVE) to supply power to the low voltage enclosure (LVE).

.3 SEL 751 protection relays (no alternates), must be used inside the low voltage enclosure to provide monitoring, protection, and operation of the devices

.3 The ratings for the integrated switchgear shall be as designated below:

.1 Frequency: 60Hz

.2 Short-Circuit Current, Amperes, RMS, Symmetrical: 25kA

.3 Voltage Class, kV: 15.5kV

.1 Maximum Voltage, 15.5 kV

.2 BIL Voltage, 95 kV

.4 Main Bus Continuous Current, Amperes: 600A

.5 Three-Pole Load-Interrupter Switches

.1 Continuous Current, Amperes: 600A

.2 Load Dropping Current, Amperes: 600A

.3 Fault Closing Current, Duty-Cycle

.1 Three-Time, Amperes, RMS, Symmetrical: 16kA

.2 Three-Time, Amperes, Peak: 65kA

.3 Ten-Time, Amperes, RMS, Symmetrical: 16kA

.4 Ten-Time, Amperes, Peak: 41.6kA

.6 Fault Interrupters

.1 Continuous Current, Amperes: 600A

.2 Load Dropping Current, Amperes: 600A

.3 Fault Interrupting Current, Duty-Cycle

.1 Three-Time, Amperes, RMS, Symmetrical: 25kA

.2 Ten-Time, Amperes, RMS, Symmetrical: 25kA

.4 Fault Closing Current, Duty-Cycle

.1 Three-Time, Amperes, RMS, Symmetrical: 25kA

.2 Three-Time, Amperes, Peak: 65kA

.3 Ten-Time, Amperes, RMS, Symmetrical: 16kA

.4 Ten-Time, Amperes, Peak: 41.6kA

.4 SF6 GAS INSULATION

.1 The SF_6 gas shall conform to ASTM D2472

.2 The switchgear shall be filled with SF6 gas to a pressure of 48.26 kPa at 20°C.

.3 The gas-tight tank shall be evacuated prior to filling with SF6 gas to minimize moisture in the tank.

.4 The switchgear shall withstand system voltage at a gas pressure of 0.00 kPa at 20ºC.

.5 A gas-fill valve shall be provided.

.6 A temperature-compensated pressure gauge shall be provided that is color coded to show the operating range. The gauge shall be mounted inside the gas-tight tank (visible through a large viewing window) to provide consistent

pressure readings regardless of the temperature or altitude at the installation site.

.5 SF6 GAS TANK

.1 The tank shall be submersible and able to withstand up to 304.8 cm of water over the base.

.2 The tank shall be of welded construction and shall be made of Type 304L stainless steel

.3 A means of lifting the tank shall be provided.

.6 HIGH-VOLTAGE BUS

.1 Bus and interconnections shall withstand the stresses associated with short-circuit currents up through the maximum rating of the switchgear.

.2 Before installation of aluminum bus, all electrical contact surfaces shall first be pre-pared by machine-abrading to remove any oxide film. Immediately after this operation, the electrical contact surfaces shall be coated with a uniform coating of an oxide inhibitor and sealant.

.7 PROVISIONS FOR GROUNDING

.1 One ground-connection pad shall be provided on the gas-tight tank of the switchgear.

.2 The ground-connection pad shall be constructed of stainless steel and welded to the gas-tight tank, and shall have a short-circuit rating equal to that of the switchgear.

.3 When an enclosure is provided, no less than one enclosure ground pad shall be provided.

.8 CONNECTIONS

.1 Bushings and bushing wells shall be located on one side of the gear to reduce the required operating clearance.

.2 Fault interrupters shall be equipped with 600-ampere bushings.

.3 Unless indicated otherwise, bushings and bushing wells shall be provided with threaded studs and located on one side of the gear to reduce the required operating clearance.

.9 BUSHINGS AND BUSHING WELLS

.1 Bushings and bushing wells shall conform to ANSI/IEEE Standard 386.

.2 Bushings and bushing wells shall include a semi-conductive coating.

.3 Bushings and bushing wells shall be mounted in such a way that the semi-conductive coating is solidly grounded to the gas-tight tank.

.10 VIEWING WINDOWS

.1 Each load-interrupter switch shall be provided with a large viewing window at least 152.4 mm by 304.8 mm to allow visual verification of the switch-blade position (closed, open, and grounded) while shining a flashlight on the blades.

.2 Viewing windows shall be located on the opposite side of the gear from the bushings and bushing wells so that operating personnel shall not be required to perform any routine operations in close proximity to high-voltage elbows and cables.

.3 A cover shall be provided for each viewing window to prevent operating personnel from viewing the flash which may occur during switching operations.

.11 LOAD-INTERRUPTER SWITCHES

.1 The three-phase, group-operated load-interrupter switches shall have a three-time and ten-time duty-cycle fault-closing rating. This rating defines the ability to close the switch the designated number of times against a three-phase fault with asymmetrical (peak) current in at least one phase equal to the rated value, with the switch remaining operable and able to carry and interrupt rated current.

.2 The switch shall be provided with an integral ground position that is readily visible through the viewing window to eliminate the need for cable handling and exposure to high voltage to ground the equipment.

.3 The ground position shall have a three-time and ten-time duty-cycle fault-closing rating.

.4 The switch shall be provided with an open position that is readily visible through the viewing window to eliminate the need for cable handling and exposure to high voltage to establish a visible gap.

.5 The open gaps of the switch shall be sized to allow cable testing through a feed thru bushing or the back of the elbow.

.12 FAULT INTERRUPTERS

.1 Fault interrupters shall have a three-time and ten-time duty-cycle fault-closing and fault interrupting rating as specified under "Ratings." This rating defines the fault interrupter's ability to close the designated number of times against a three-phase fault with asymmetrical (peak) current in at least one phase equal to the rated value and clear the resulting fault current, with the interrupter remaining operable and able to carry and interrupt rated current.

.2 The fault interrupter shall be provided with a disconnect with an integral ground position that is readily visible through the viewing window to eliminate the need for cable handling and exposure to high voltage to ground the equipment.

.3 The ground position shall have a three-time and ten-time duty-cycle fault-closing rating.

.4 The disconnect shall be provided with an open position that is readily visible through the viewing window, eliminating the need for cable handling and exposure to high voltage to establish a visible gap.

.5 The fault interrupter, including its three-position disconnect, shall be a single integrated design so that operation between the closed and open positions or the open and grounded positions is accomplished with a single, intuitive movement.

.6 The open gaps of the disconnect shall be sized to allow cable testing through a feed through bushing or the back of the elbow.

.7 An internal indicator shall be provided for each fault interrupter to show when it is in the tripped condition. The indicator shall be clearly visible through the viewing window.

.13 OPERATING MECHANISMS

.1 Load-interrupter switches and fault interrupters shall be operated by means of a quick-make, quick-break mechanism.

.2 The manual handle shall charge the operating mechanism for closing, opening, and grounding of the switches and fault interrupters.

.3 A single, integrated operating mechanism shall fully operate each fault interrupter or load interrupter switch in a continuous movement, so that additional operations are not required to establish open or grounded positions.

.4 Operating mechanisms shall be equipped with an operation selector to prevent inadvertent operation from the closed position directly to the grounded position, or from the grounded position directly to the closed position. The operation selector shall require physical movement to the proper position to permit the next operation.

.5 Operating shafts shall be pad lockable in any position to prevent operation.

.6 The operation selector shall be pad lockable to prevent operation to the grounded position.

.7 The operating mechanism shall indicate switch position which shall be clearly visible from the normal operating position.

.14 BACKUP OVERCURRENT CONTROL

.1 A microprocessor-based overcurrent control shall be provided to initiate fault interruption as a back-up device to primary protection devices.

.2 Control settings shall be field-programmable using a personal computer connected via a USB port to the control. The USB port shall be accessible from the exterior of the enclosure. All programming software is resident on the control and can be accessed via personal computer using the Microsoft Edge or Firefox web browser. Energization of the gear shall not be required to set or alter control settings.

.3 Power and sensing for the control shall be supplied by integral current transformers.

.4 The control shall provide time-current characteristic (TCC) curves, including standard E-speed, K-speed, T-speed, coordinating-speed tap, coordinating-speed main, and relay curves per IEEE C37.112-2018 and IEC 60255-

151:2009. Coordinating-speed tap curves shall optimizer coordination with load-side weak-link/backup current-limiting fuse combinations, and coordinating-speed main curves shall optimize coordination with tap-interrupter curves and upstream feeder breakers.

.5 The standard E-speed curve shall have Phase Overcurrent settings ranging from 7E through 400E. The standard K-speed curve shall have Phase Overcurrent settings ranging from 8K through 200K. The standard T-speed curve shall have Phase Overcurrent settings ranging from 8T through 200T. The coordinating-tap curve shall have Phase Overcurrent and independent Ground Overcurrent settings ranging from 15 amperes through 400 amperes. The coordinating-main curve shall have Phase Overcurrent and independent Ground Overcurrent settings ranging from 25 amperes through 800 amperes.

.6 Time-current characteristic curves shall conform to the following IEEE C37.112-2018 IEEE and IEC 60255-151:2009 Standard Inverse-Time Characteristic Equations for Overcurrent Relays: U.S. Moderately Inverse Curve U1, U.S. Inverse Curve U2, U.S. Very Inverse Curve U3,U.S. Extremely Inverse Curve U4, U.S. Short-Time Inverse Curve U5, I.E.C. Class A Curve (Standard Inverse) C1, I.E.C. Class B Curve (Very Inverse) C2, I.E.C. Class C Curve (Extremely Inverse) C3, I.E.C. Long-Time Inverse Curve C4, and I.E.C. Short-Time Inverse Curve C5.

.7 The control shall have two independently settable and field-adjustable definite-time delay settings. (A definite-time delay setting can be configured to be an instantaneous trip setting if the definite-time delay is set to 0 milliseconds.)

.8 The minimum trip current shall be 14 amperes for Vista switchgear with 660:1 ratio current transformers, and 28 amperes for models with 1320:1 ratio current transformers.

.9 Event records shall be easily viewable from the control using a personal computer connected to the USB port. The event log shall capture the last 64 events recorded by the overcurrent control.

.10 The control shall store sufficient energy to operate the fault interrupters without affecting the accuracy or coordination under fault conditions.

.15 SWITCHGEAR STYLE – PAD-MOUNTED STYLE

.1 The gas-tight tank shall be made of Type 304L stainless steel.

.2 Switchgear shall conform to or exceed the requirements of applicable portions of IEC 62271-200, covering arc resistance through 25 kA for 15 cycles.

.3 Enclosure

.1 The switchgear shall be provided with a pad-mounted enclosure suitable for installation of the gear on a concrete pad.

.2 The pad-mounted enclosure shall be separable from the switchgear to allow clear access to the bushings and bushing wells for cable termination.

.3 The basic material shall be 14-gauge hot-rolled, pickled and oiled steel sheet.

.4 The enclosure shall be provided with removable front and back panels, and hinged lift-up roof sections for access to the operating and termination compartments. Each roof section shall have a retainer to hold it in the open position.

.5 Lift-up roof sections shall overlap the panels and shall have provisions for pad-locking that incorporate a means to protect the padlock shackle from tampering.

.6 The base shall consist of continuous 90-degree flanges, turned inward and welded at the corners, for bolting to the concrete pad.

.7 Panel openings shall have 90-degree flanges, facing outward, that shall provide strength and rigidity as well as deep overlapping between panels and panel openings to guard against water entry.

.8 For bushings rated 600 amperes continuous, the termination compartment shall be of an adequate depth to accommodate encapsulated surge arresters mounted on 600 ampere elbows having 200-ampere interfaces.

.9 For bushing wells rated 600 amperes continuous, the termination compartment shall be of an adequate depth to accommodate 600-ampere elbows mounted on feed through inserts.

.10 An instruction manual holder shall be provided.

.11 Non-removable lifting tabs shall be provided.

.4 Enclosure Finish

.1 All exterior welded seams shall be filled and sanded smooth for neat appearance.

.2 To remove oils and dirt, to form a chemically and anodically neutral conversion coating to improve the finish-to-metal bond, and to retard under film propagation of corrosion, all surfaces shall undergo a thorough pretreatment process comprised of a fully automated system of cleaning, rinsing, phosphatizing, sealing, drying, and cooling, before any protective coatings are applied. By utilizing an automated pretreatment process, the enclosure shall receive a highly consistent thorough treatment, eliminating fluctuations in reaction time, reaction temperature, and chemical concentrations.

.3 After pretreatment, protective coatings shall be applied that shall help resist corrosion and protect the steel enclosure. To establish the capability to resist corrosion and protect the enclosure, representative test specimens coated by the manufacturer's finishing system shall satisfactorily pass the following tests:

.1 4000 hours of exposure to salt-spray testing per ASTM B117 with:

.1 Under film corrosion not to extend more than 0.79 mm. from the scribe, as evaluated per ASTM D 1645, Procedure A, Method 2 (scraping); and

.2 Loss of adhesion from bare metal not to extend more than 3.18 mm. from the scribe.

.2 1000 hours of humidity testing per ASTM D 4585 using the Cleveland Condensing Type Humidity Cabinet, with no blistering as evaluated per ASTM D714.

.3 500 hours of accelerated weathering testing per ASTM G 53 using lamp UVB-313, with no chalking as evaluated per ASTM D 659, and no more than 10% reduction of gloss as evaluated per ASTM D523.

.4 Crosshatch-adhesion testing per ASTM D 3359 Method B, with no loss of finish.

.5 160-inch-pound impact, followed by adhesion testing per ASTM D2794, with no chipping or cracking.

.6 3000 cycles of abrasion testing per ASTM 4060, with no penetration to the substrate. Certified test abstracts substantiating the above capabilities shall be furnished upon request.

.4 The finish shall be inspected for scuffs and scratches. Blemishes shall be touched up by hand to restore the protective integrity of the finish.

.5 The finish shall be olive green, Munsell 7GY3.29/1.5.

.16 Low-Voltage Compartment/Enclosure and Components

.1 The low-voltage compartment/enclosure shall be a separate, grounded structure, and shall allow complete accessibility for test and/or maintenance without exposure to medium voltage. The low-voltage compartment shall be mounted on the outside of the pad-mounted enclosure for pad-mounted style switchgear.

.2 All low-voltage components, including the batteries, shall operate over the temperature range of -40C to +65C.

.3 To guard against unauthorized or inadvertent entry, the low-voltage compartment/enclosure shall not have any externally accessible hardware.

.4 The low-voltage compartment/enclosure shall include appropriate vents to prevent gas and moisture buildup. Vents shall be screened and filtered to prevent entry of insects and shall be mounted to prevent rain entry and to minimize entry of dust into the enclosure.

.5 Low-voltage wiring, except for short lengths, such as connections to terminal blocks, shall be shielded for isolation from medium voltage.

.6 The low-voltage compartment/enclosure shall be made of 14-gauge mild steel.

.7 Control cabling between the tank and low-voltage enclosure 457.2 cm or greater in length shall be furnished with a braided shield to protect electronic components from damage under surge and transient conditions.

.8 Single-point grounding methods shall be used on cabling between the tank and low- voltage enclosure to protect electronic components from damage under surge and transient conditions.

.9 To guard against corrosion due to extremely harsh environmental conditions, the exterior of the compartment/enclosure shall be fabricated from Type 304 stainless steel.

.17 Motor Operators and Controls

.1 Motor operators for local and remote supervisory control shall be available for source load-interrupter ways and three-pole fault-interrupter ways.

.2 The control board shall have pushbuttons for locally operating the switches between the Closed and Open positions and, optionally, between the Open and Grounded positions.

.3 Each motor operator control board shall have a connection for a portable remote control device, which will allow the user to activate the motor operator at a maximum distance of 1524 cm from the gear.

.4 d) No decoupling or any adjustments shall be required to manually operate a way equipped with a motor operator.

.5 Removing the motor operator for decoupling shall be a simple, quick process requiring only standard tools.

.6 Motor operators and controls shall be interchangeable between fault-interrupter switch ways by simply moving the operator. No modifications to any low-voltage compartment/enclosure control components shall be required.

.7 Motor operators and controls shall be interchangeable between three-pole fault-interrupter ways by simply moving the operator. No modifications to any low-voltage compartment/enclosure control components shall be required.

.8 The motor operators shall take no more than three seconds to change state from the time a local or remote control signal is received.

.9 The motor operator shall be watertight. Each unit shall be submersion-tested to verify water under pressure does not enter the operator housing.

.10 It shall not be possible for the motor operator to be changed from the Closed position directly to the Ground position using local pushbutton or remote control. The Ground position shall be directly accessible only from the Open position.

.11 A mechanical interlock shall be provided to prevent a decoupled motor operator from being incorrectly recoupled.

.12 An integral means shall be provided for testing the position indicating lamps on the motor controls.

.13 Controls shall be easy to operate with or without 25-kV high-voltage rubber gloves and protectors.

.14 The gear shall include batteries to power the motor operators and controls in the event the external ac power is lost.

.15 The motor operator controls shall be capable of interfacing with a remote terminal unit.

.18 Voltage Indication

.1 Voltage indication with provisions for low-voltage phasing shall be provided for each load-interrupter switch and fault interrupter by means of capacitive taps on the bushings, eliminating the need for cable handling and exposure to high voltage to test the cables for voltage and phasing. This feature shall include a flashing liquid-crystal display to indicate the presence of voltage for each phase and a solar panel to supply power for testing of the complete voltage-indication circuit and phasing circuit. Routine operations in close proximity to high-voltage elbows and cables.

.2 The voltage-indication feature shall be mounted on the covers for the viewing windows, on the opposite side of the gear from the bushings and bushing wells, so that operating personnel shall not be required to perform any routine operations in close proximity to high-voltage elbows and cables.

.19 LABELING

.1 Hazard-Alerting Signs

.1 The exterior of the pad-mounted enclosure (if furnished) shall be provided with "Warning-Keep Out-Hazardous Voltage Inside-Can Shock, Burn, or Cause Death" signs.

.2 Each unit of switchgear shall be provided with a "Danger-Hazardous Voltage-Failure to Follow These Instructions Will Likely Cause Shock, Burns, or Death" sign. The text shall further indicate that operating personnel must know and obey the employer's work rules, know the hazards involved, and use proper protective equipment and tools to work on this equipment.

.3 Each unit of switchgear shall be provided with a "Danger-Keep Away-Hazardous Voltage-Will Shock, Burn, or Cause Death" sign.

.2 Nameplates, Ratings Labels, and Connection Diagrams

.1 Each unit of switchgear shall be provided with a nameplate indicating the manufacturer's name, catalog number, model number, date of manufacture, and serial number.

.2 Each unit of switchgear shall be provided with a ratings label indicating the following: voltage rating; main bus continuous current rating; short-circuit rating; fault-interrupter ratings including interrupting and duty-

cycle fault-closing; and load-interrupter switch ratings including duty-cycle fault-closing and short-time.

.20 ACCESSORIES

.1 A USB cable kit shall be provided for connecting an overcurrent control to a user-furnished personal computer.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 260500 - Electrical General Requirements.

.2 Include permanent nameplates including manufacturer’s name, catalog number, model number, date of manufacture, and serial number, and main electrical ratings.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Ensure precast concrete foundation is properly installed, or concrete pad is fully cured before equipment is installed.

.2 Install all equipment in accordance with manufacturer's recommendations.

.3 Remove and dispose of packing and shipping materials.

.4 Set and secure equipment unit in place, rigid, plumb and square. Bolt to concrete pad in accordance with manufacturer's requirements.

.5 Motor operators and current sensors are shipped separate from the switchgear. Contractor shall assemble components in the field in accordance with manufacturer's installation instructions.

.6 Mount and install fault indicators.

.7 Install current sensors and connect to wiring harnesses in equipment in accordance with manufacturer's requirements. Secure to cables.

.8 Make all cable connections.

.9 Connect equipment tank ground pad and enclosure ground pad to system ground.

.10 Provide and instal insulated protective caps on all unused bushing wells.

.11 Interconnect wiring and grounds between low voltage compartment and pad mounted enclosure. Once all interconnecting cabling is installed, bundle neatly with nylon cable ties.

.12 Caulk around base of enclosure at concrete pad with a waterproof, silicon vulcanizing sealant.

.13 Seal all gaps between conduit and cables with waterproof silicon sealant and cap all empty conduits to prevent water and rodent entry.

.14 Provide and install weatherproof industrial padlock in each hasp and turn keys over to Owner's Representative.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Requirements.

.2 Before energizing switchgear, replace all shipping covers on all bushings and bushing wells with elbows. Provide and instal insulated protective caps on all unused bushing wells.

.3 Provide strain relief on all cable connections to minimize the load on the equipment bushings.

.4 Engage and pay costs for Authorized Manufacturer's Agent to complete equipment inspection, Site Acceptance Testing, startup and commissioning. Manufacturer's testing, startup and commissioning report to be submitted to Owner's Representative and included in Closeout Submittals.

.5 Inspect all connections for tightness and for signs of overheating.

.6 Inspect and clean insulators and enclosure.

.7 Check trip unit settings for correctness of type and size.

3.3 ADJUSTING

.1 Program relays in accordance with the recommendations of the Arc Flash, Short Circuit and Coordination studies completed by the Owner's Representative.

3.4 CLEANING

.1 Wipe down exterior of enclosure with a clean, damp cloth.

.2 Refinish any scratches or abrasions with manufacturer's touch-up primer and finish coat.

3.5 DEMONSTRATION

.1 Engage and pay costs for Authorized Manufacturer's Agent to provide training on equipment operation and maintenance to Owner's Representative staff. Training session to be recorded and video to be submitted to Owner's Representative and included in Closeout Submittals.

END OF SECTION

GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 91 13 - Commissioning (Cx) Requirements.

.3 Section 26 05 00 - Common Work Requirements – Electrical.

1.2 SUBMITTALS

.1 Include time-current characteristic curves for breakers with ampacity of 100 A and over or with interrupting capacity of 22,000 A symmetrical (rms) and over at system voltage.

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 of 10,000 A symmetrical rms interrupting capacity rating.

2.2 THERMAL MAGNETIC BREAKERS DESIGN A

.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.

2.3 FUSED THERMAL MAGNETIC BREAKERS DESIGN B

.1 Fused thermal magnetic breakers with current limiting fuses internally mounted. Time current limiting characteristics of fuses coordinated with time current tripping characteristics of circuit breaker. Coordination to result in interruption by breaker of fault-level currents up to interrupting capacity of breaker. Fuses individually removable and interlocked with breaker. Removal of fuse cover, blowing of a fuse or removal of a fuse, to trip breaker.

2.4 SOLID STATE TRIP BREAKERS DESIGN C

.1 Moulded case circuit breaker to operate by means of a solid-state trip unit with associated current monitors and self-powered shunt trip to provide inverse time current trip under overload condition, and long time short time, instantaneous tripping for phase and ground fault short circuit protection.

2.5 OPTIONAL FEATURES

.1 Include as noted:

- .1 Shunt trip.
- .2 Auxiliary switch.
- .3 Motor-operated mechanism c/w time delay unit.
- .4 Under-voltage release.
- .5 On-off locking device.
- .6 Handle mechanism.

2.6 ENCLOSURE

.1 Mounted in NEMA 1 type enclosure, sprinkler proof as indicated.

EXECUTION

3.1 INSTALLATION

.1 Install circuit breakers as indicated.

END OF SECTION

GENERAL

1.1 SYSTEM DESCRIPTION

.1 Data system includes data outlets and wiring for building applications.

.2 Data system equipment consists of:

.1 Data outlets.

.2 UTP cabling.

.3 Patch Cords.

.4 Line Cords.

.5 Conduit System.

1.2 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.

1.3 REFERENCES

.1 Codes and standards referenced in the section refer to the latest edition thereof and include all addenda.

.2 ANSI/TIA-568-C.0, Generic Telecommunications Cabling for Customer Premises

.3 ANSI/TIA-568-C.1, Commercial Building Telecommunications Cabling Standard

.4 ANSI/TIA-568-C.2, Balanced Twisted-Pair Telecommunications Cabling and Components Standard

.5 ANSI/TIA-568-C.3, Optical Fiber Cabling Components Standards

.6 ANSI/TIA-606, Administration Standard for Commercial Telecommunications Infrastructure

.7 ANSI/TIA-1152, Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling

.8 ANSI/TIA-942, Telecommunications Infrastructure Standard for Data Centers

.9 ANSI/TIA-1005, Telecommunications Infrastructure Standard for Industrial Premises

.10 TIA TSB-162, Telecommunications Cabling Guidelines for Wireless Access Points

.11 ANSI/NECA/BICSI 568, Standard for Installing Commercial Building Telecommunications Cabling.

1.4 SUBMITTALS

.1 Shop drawings to include the following items as minimum:

.1 Outlets.

.2 Labels.

.3 UTP Wire.

.4 Line Cords.

.5 Cable Management Equipment.

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.

PRODUCTS

2.1 OUTLETS

.1 Provide single or dual data outlet as indicated.

.2 Dual flush mounted data outlet.

.1 Two 8 position RJ45 jacks with T568A (ISDN) wiring.

.2 Two (2) blank inserts.

.3 Colour: blue.

.4 Acceptable product: Belden RVAMJKUXX-S1, CAT-6A.

.3 Single flush mounted data outlets:

.1 One (1) 8 position RJ45 jack with T586A (ISDN) wiring.

.2 Three (3) blank inserts.

.3 Color: blue

.4 Acceptable product: Belden RVAMJKUXX-S1, CAT-6A.

.4 Acceptable alternate manufacturers: Panduit, AMP, Lucent, Hubbel, Ortronics. (must have transmission performance equal to or better than specified product).

2.2 COVER PLATES

.1 Provide flush mount type to accept four (4) modular data outlets.

.2 Indicate outlet number of “Data” cover plate. Provide labeling as indicated and to Owner’s requirement.

.3 Color: grey.

.4 Construction: Themo – plastic.

.5 Acceptable product: Belden AX101435.

2.3 CABLE MANAGEMENT

.1 Cable management in accessible ceiling spaces:

.1 Cable bundle support mounted to steel structure with beam clamps as required. Support to be 50 mm diameter bridal ring or cable.

.2 Provide quantity as required to support all loose cables at 1000 mm spacings up to point of entry into cable management system.

.3 Provide support for individual cables using caddy clip at 1000 mm spacings.

2.4 PATCH AND LINE CORDS

.1 Provide patch and line cords for connection of individual room equipment and for connection of Owner's equipment in data racks.

.2 Provide 3 meter long line cords. 24 gauge, solid conductor, CAT-6A T586A ISDN wired. Acceptable Product: Belden CA21106010.

.3 Quantity: one per data outlet.

.4 Cords must be from same manufacturer as connectivity components.

2.5 LABELING

.1 All communication cables (Voice, Data) terminating at the same location shall have the same cable number designation:

.1 BA - Building prefix (BL – Blackall, DO – Doyle, etc.)

.2 2 - Data room floor level

.3 .1 - Data room number

.4 -1 - Data outlet floor level

.5 01 - Data outlet number

.6 A - Data port side designation

.2 The closet tag (BA2.1) will always be the same as there is only one data closet. The data port side designation (A) will always be the same as there is only on system in the facility. The labeling system shall be represented on the workstation face plate and on the appropriate patch panel port.

.3 Sample outlet designations:

.1 BA2.1-4, 16A – Data outlet 16 located on Level 4, Barnes House

.2 DO2.1-1, 132A – Data outlet 132 located on Level 1, Doyle House

.4 Coordinate labeling scheme with MUN C & C prior to installation.

.5 The labeling system shall be represented on the workstation face plate and on the appropriate patch panel port.

2.6 UTP WIRING

.1 4 pair, 24 gauge, solid conductor, unshielded twisted pairs, CMP rated, Category 6A.

.2 Provide one cable from each single outlet back to patch panel (two cables from each dual data outlet back to patch panel).

2.7 CONDUIT SYSTEMS

.1 Install conduit systems and pull boxes for data wiring as indicated on the drawings.

EXECUTION

3.1 INSTALLATION

.1 Install data system wiring and components.

.2 Terminate UTP 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.

.3 Ensure that manufacturer's bending radius limitations are adhered to.

.4 Protect cables from damage during installation.

.5 Turn over UTP line cords to Owner' Representative.

.6 Coordinate the entire installation with the Owner's Representative.

.7 Entire installation to be completed in accordance with MUNet Standards. Coordinate with MUN C & C for specific requirements. Entire installation to be inspected by MUN C & C staff prior to enclosure. Deficiencies identified from this inspection to be corrected at no additional cost to the contract. Where discrepancy between MUNet Specification and Division 27 Specifications shall arise, consult Owner's Representative for clarification. Refer to Appendix 1 for current MUNet Specifications.

3.2 CONDUIT SYSTEM RESTRICTIONS

.1 Do not provide conduit raceways that exceed 30 meter or contain more than two 900 bends (or equivalent) between pull points or pull boxes. Advise the owner in advance of any such potential installations. The owner will then provide clarification.

.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 50 mm and smaller. For larger conduits provide inside radius bends to a minimum of 10 times the internal diameter of the conduit.

.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 5 years experience in data cabling industry. Experience to be acceptable to the Owner's Representative.

3.4 TESTING UTP CABLING

.1 System to meet continuity and attenuation tests outlined in IBDN Testing Note: IBDN-TESTS-9104.

.2 Category 6A cable to meet acceptable ANSI standard for data transmission.

.3 Perform system and channel tests after UTP cable installation o ensure that installation meets standard indicated above. 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.

.4 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.

.5 Provide written copy of the testing sequence to be performed, testing equipment to be used, and standards to which cable is being tested.

.6 Provide a written report to the Owner’s Representative indicating each cable tested and the results of the testing. Provide printout from the Level IV tester for each cable.

.7 Replace cable and/or connection equipment that fails tests.

END OF SECTION

PART 1- GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

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

.3 Section 01 35 43 - Environmental Procedures.

.4 Section 02 41 16 - Structure Demolition.

.5 Section 31 23 13 - Rough Grading.

.6 Section 31 23 17 - Rock Removal.

.7 Section 33 11 17 - Site Water Utility Distribution Piping.

.8 Section 33 31 13 - Public Sanitary Utility Sewerage Piping.

.9 Section 33 46 20 - Foundation and Underslab Drainage.

.10 Section 33 44 00 - Storm Utility Drains

.11 Section 31 05 17 - Aggregate Materials.

1.2 REFERENCES

.1 Codes and standards referenced in this section refers to the latest edition thereof.

.2 American Society for Testing and Materials (ASTM).

.1 ASTM C117, Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.

.2 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

.3 ASTM D698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3) (600 kN-m/m^3).

.4 ASTM D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3) (2,700 kN-m/m^3).

.3 Canadian General Standards Board (CGSB).

.1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.

.2 CA/CGSB-8.2, Sieves, Testing, Woven Wire, Metric

.4 Canadian General Standards Association (CSA)

.1 CAN/CSA-A23.1, Concrete Materials and Methods of Concrete Construction.

1.3 DEFINITIONS

.1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.

.1 Rock excavation: excavation of material from solid masses of igneous, sedimentary or metamorphic rock which, prior to its removal, was integral with its parent mass, and boulders or rock fragments having individual volume in excess of 1 m3. Frozen material not classified as rock.

.2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.

.2 Unclassified excavation: excavation of deposits of whatever character encountered in work.

.3 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

.4 Waste material: excavated material unsuitable for use in work or surplus to requirements.

.5 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of work.

.6 Unsuitable materials:

.1 Weak and compressible materials under excavated areas.

.2 Frost susceptible materials under excavated areas.

.3 Frost susceptible materials:

.1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422 and ASTM C136: Sieve sizes to CAN/CGSB-8.1.

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45-100
0.02 mm	10-80
0.005 mm	0-45

.2 Coarse grained soils containing more than 20% by mass passing 0.075 mm sieve.

1.4 SUBMITTALS

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

.2 Inform Engineer/Architect at least 4 weeks prior to commencing work, of proposed source of fill materials and provide access for sampling.

.3 Submit 70 kg samples of type of fill specified including representative samples of excavated material.

.4 Ship samples as directed by Engineer/Architect in tightly closed containers to prevent contamination.

1.5 QUALITY ASSURANCE

.1 Submit design and supporting data at least 2 weeks prior to commencing work.

.2 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in the province of Newfoundland and Labrador.

.3 Keep design and supporting data on site.

.4 Engage services of qualified professional engineer who is registered or licensed in Province of Newfoundland and Labrador to design and inspect cofferdams, shoring, bracing and underpinning required for work.

1.6 PROTECTION OF EXISTING FEATURES

.1 Protect existing features in accordance with Section 01 56 00 - Temporary Barriers and Enclosures and applicable local regulations.

.2 Existing buried utilities and structures:

.1 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are

.2 Prior to commencing excavation work, notify applicable Owner or authorities having jurisdiction, establish location and state of use of buried utilities and structures.
Owners or authorities having jurisdiction to clearly mark such locations to

.3 Confirm locations of buried utilities by careful test excavations.

.4 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered as indicated.

.5 Where utility lines or structures exist in area of excavation, obtain direction of Engineer/Architect before removing or re-routing.

.6 Record location of maintained, re-routed and abandoned underground

.7 Confirm locations of recent excavations adjacent to area of excavation.

.3 Existing buildings and surface features:

.1 Conduct, with Engineer/Architect condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by

.2 Protect existing buildings and surface features from damage while work is in progress. In event of damage, immediately make repair to approval of Engineer/Architect.

.3 Where required for excavation, cut roots or branches as approved by Engineer/Architect.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 .1 Backfill Type 1 and Type 2 fill: properties to Section 31 05 17 - Aggregate Materials and the following requirements:

.1 Crushed, pit run or screened stone, gravel or sand.

.2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.1.

Sieve Designation	%Passing	
	Type1	Type
75 mm	-	100
50 mm	-	-
37.5 mm	-	-
25 mm	100	-
19 mm	75-100	-
12.5 mm	-	-
9.5 mm	50-100	-
4.75 mm	30-70	22-85
2.00 mm	20-45	-
0.425 mm	10-25	5-30
0.180 mm	-	-
0.075 mm	3-8	0-10

.2 .2 Type 3 fill: selected material from excavation or other sources, approved by Engineer/Architect for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.

PART 3 - EXECUTION

3.1 SITE PREPARATION

.1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

3.2 STRIPPING OF TOPSOIL

.1 Commence topsoil stripping of areas as indicated by Engineer/Architect after area has been cleared of brush, weeds and grasses and removed from site.

.2 Strip topsoil to depths as indicated by Engineer/Architect. Do not mix topsoil with

subsoil.

.3 Stockpile in locations as directed by Engineer/Architect. Stockpile height not to exceed 2 m.

.4 Dispose of unused topsoil as directed by Engineer/Architect.

3.3 STOCKPILING

.1 Stockpile fill materials in areas designated by Engineer/Architect. Stockpile granular materials in manner to prevent segregation.

.2 Protect fill materials from contamination.

3.4 COFFERDAMS, SHORING, BRACING AND UNDERPINNING

.1 Obtain permit from authority having jurisdiction for temporary diversion of water course.

.2 Construct temporary works to depths, heights and locations as indicated or approved by Engineer/Architect.

.3 During backfill operation:

.1 Unless otherwise as indicated or as directed by Engineer/Architect remove sheeting and shoring from excavations.

.2 Do not remove bracing until backfilling has reached respective levels of such bracing.

.3 Pull sheeting in increments that will ensure compacted backfill is maintained at an elevation at least 500 mm above toe of sheeting.

.4 When sheeting is required to remain in place, cut off tops at elevations as indicated.

.5 Upon completion of substructure construction:

.1 Remove cofferdams, shoring and bracing.

.2 Remove excess materials from site and restore water courses as indicated and as directed by Engineer/Architect.

3.5 DEWATERING AND HEAVE PREVENTION

.1 Keep excavations free of water while work is in progress.

.2 Submit for Engineer/Architect's review details of proposed dewatering or heave prevention methods, such as dikes, well points, and sheet pile cut-offs.

.3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.

Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.

.4 Protect open excavations against flooding and damage due to surface run-off.

.5 Dispose of water in accordance with Section 01 35 43 - Environmental Procedures and in manner not detrimental to public and private property, or any portion of work completed or under construction.

.6 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, water courses or drainage areas.

3.6 EXCAVATION

.1 Excavate to lines, grades, elevations and dimensions as indicated by Engineer/Architect.

.2 Remove concrete, masonry, paving, walks, demolished foundations and rubble and other obstructions encountered during excavation in accordance with Section 02 41 23 – Selective Site Demolition and Removal.

.3 Excavation must not interfere with bearing capacity of adjacent foundations.

.4 Do not disturb soil within branch spread of trees or shrubs that are to remain. If excavating through roots, excavate by hand and cut roots with sharp axe or saw.

.5 For trench excavation, unless otherwise authorized by Engineer/Architect in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.

.6 Keep excavated and stockpiled materials a safe distance away from edge of trench as directed by Engineer/Architect.

.7 Restrict vehicle operations directly adjacent to open trenches.

.8 Dispose of surplus and unsuitable excavated material off site.

.9 Do not obstruct flow of surface drainage or natural watercourses.

.10 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.

.11 Notify Engineer/Architect when bottom of excavation is reached.

.12 Obtain Engineer/Architect approval of completed excavation.

.13 Remove unsuitable material from trench bottom to extent and depth as directed by Engineer/Architect.

.14 Correct unauthorized over-excavation as follows:

.1 Fill under bearing surfaces and footings with concrete specified for footings.

.2 Fill under other areas with Type 2 fill compacted to not less than 95% of corrected maximum dry density.

.15 Hand trim, make firm and remove loose material and debris from excavations. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil. Clean out rock seams and fill with concrete mortar or grout to approval of Engineer/Architect.

3.7 FILL TYPES AND COMPACTION

.1 Use fill of types as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTM D698 corrected maximum dry density.

.1 Exterior side of perimeter walls: use Type 3 fill to subgrade level. Compact to 95%.

.2 Within building area: use Type 2 to underside of base course for floor slabs. Compact to 98%.

.3 Under concrete slabs: provide 150 mm compacted thickness base course of Type 1 fill to underside of slab. Compact base course to 100%.

.4 Retaining walls: use Type 2 fill to subgrade level on high side for minimum 95%.

.5 To correct over excavation in trenches: use Type 2 fill to underside of sand bedding compacted to 95%.

3.8 BEDDING AND SURROUND OF UNDERGROUND SERVICES

.1 Place and compact granular material for bedding and surround of underground services as indicated.

.2 Place bedding and surround material in unfrozen condition.

3.9 BACKFILLING

.1 Vibratory compaction equipment: approved by Engineer/Architect.

.2 Do not proceed with backfilling operations until Engineer/Architect has inspected and approved installations.

.3 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.

.4 Do not use backfill material which is frozen or contains ice, snow or debris.

.5 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.

.6 Backfill around installations.

.1 Place bedding and surround material as specified elsewhere.

.2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.

.3 Place layers simultaneously on both sides of installed work to equalize loading.

.4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures.

.1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure, and approval obtained from Engineer/Architect, or

.2 If approved by Engineer/Architect, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Engineer/Architect.

3.10 RESTORATION

.1 Upon completion of work, remove waste materials and debris, trim slopes, and correct defects as directed by Engineer/Architect.

.2 Replace topsoil as indicated by Engineer/Architect.

.3 Reinstate lawns to elevation which existed before excavation.

.4 Reinstate pavement and sidewalks distributed by excavation to thickness, structure, and elevation which existed before excavation.

.5 Clean and reinstate areas affected by work as directed by Engineer/Architect.

.6 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 h.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 Concrete filled metal bollards for site protection and traffic control.

.2 Bolt down style bollards for site protection and traffic control.

1.2 RELATED REQUIREMENTS

.1 Division 01 - General Requirements.

.2 Division 03 - Concrete.

1.3 REFERENCE STANDARDS

1.4 SUBMITTALS

.1 See Division 01 or submittal procedures.

.2 Product Data:

.1 Bollard pipe and concrete fill for concrete filled bollards.

.2 Shop drawings showing dimensions, installation details, and finish.

.3 Paint system specifications, and compatibility statement with galvanized substrates, from paint manufacturer.

.4 Concrete mix design.

1.5 QUALITY ASSURANCE

.1 Installer qualifications: Minimum 3 years experience in similar installations

.2 Welding to be performed by certified personnel per AWS standards.

PART 2 PRODUCTS

2.1 CONCRETE FILLED METAL BOLLARDS

.1 Steel pipe bollards

.1 Material: ASTM A53 Grade B or ASTM A500 Grade B

.2 Size: 219mm diameter, Schedule 80

.3 Height: 1000 mm above finished grade

.4 Finish: Galvanized (ASTM A123) with two coats of polyester powder coated yellow paint.

.2 Concrete Fill

.1 Concrete: 20 MPa at 28 days, air-entrained to Division 03 requirements.

.3 Base Footing

.1 Concrete footing: Minimum 450 mm diameter x 1200 mm deep.

.4 Accessories

.1 PVC reflective cap.

2.2 BOLT DOWN METAL BOLLARDS

.1 Steel pipe bollards

.1 Material: ASTM A53 Grade B or ASTM A500 Grade B

.2 Size: 219mm diameter, Schedule 80

.3 Height: 1000 mm above finished grade

.4 Finish: Galvanized (ASTM A123) with two coats of polyester powder coated yellow paint.

.2 Base Footing

.1 Schedule 80 base plate

.2 Bolt to concrete pad using galvanized 21mm diameter x 155mm long concrete expansion anchor bolts, nuts and washers.

.3 Accessories

.1 PVC reflective cap.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install in accordance with manufacturer's written instructions.

.2 Mark bollard locations on site and notify Owner's Representative. Adjust locations if so directed by Owner's Representative. Proceed with excavation only after obtaining necessary dig permit.

.3 Take precautions to minimize impact of excavation and placement of concrete on adjacent surfaces. Protect finished surfaces with plywood or similar materials.

.4 Excavate hole to depth of 1200 mm or to rock-bearing, whichever is lesser. Maintain sides of hole straight and plumb walls whenever possible. Excavate hole 150 mm wider than bollard all around.

.5 Place pipe in hole in correct position, plumb, level. Adjust height of pipe as may be required to maintain correct height. Fill hole with concrete to within 100 mm of finish grade and allow to set. Fill pipe full with concrete.

.6 Reinstate finish grade with materials to match adjacent grade finish

.7 Ensure bollards are plumb and aligned. All bollards to be free standing plumb and to the same height.

.8 Clean and touch up finish as required.

3.2 PROTECTION AND CLEANING

.1 Protect bollards from damage during construction

.2 Clean exposed surfaces and remove debris

3.3 FIELD QUALITY CONTROL

.1 Inspect footing and reinforcement prior to concrete placement

.2 Verify alignment and finish of installed bollards

END OF SECTION

GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA),

.1 CAN/CSA-A3000, Cementitious Materials Compendium. Includes:

.1 CAN/CSA-A5, Portland Cement

.2 CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.

.3 CSA G30.3, Cold-Drawn Steel Wire for Concrete Reinforcement.

.4 CSA G30.5, Welded Steel Wire Fabric for Concrete Reinforcement.

.5 CSA-G30.18, Billet-Steel Bars for Concrete Reinforcement.

.2 American Society for Testing and Materials (ASTM),

.1 ASTM D1056, Specification for Flexible Cellular Materials – Sponge or Expanded Rubber.

1.2 SUBMITTALS

.1 Submit manufacturer's test data and certification at least 2 weeks prior to commencing work.

.2 Submit manufacturer's information data sheets and instructions.

.3 Product Data: For the following:

.1 Duct-bank materials, including separators and miscellaneous components.

.1 Ducts and conduits and their accessories, including elbows, end bells, bends, fittings, and solvent cement.

.2 Accessories for manholes, handholes, and boxes.

.4 Frame and cover design and manhole frame support rings.

.1 Ladder details.

.2 Grounding details.

.3 Dimensioned locations of cable rack inserts.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements.

1.4 COORDINATION

.1 Coordinate layout and installation of ducts with final arrangement of other utilities, site grading, and surface features as determined in the field.

.2 Coordinate elevations of ducts and duct bank entrances into manholes, handholes and boxes with final locations and profiles of ducts and duct banks as determined by coordination with other utilities, underground obstructions, and surface features.

Revise locations and elevations from those indicated as required to suit field conditions and to ensure that duct runs drain to manholes and handholes, and as approved by Owner's Representative.

.3 Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

.1 Notify Owner's Representative in advance of proposed interruption of electrical service.

.2 Submit Method of Procedure (MOP) documents for all proposed outages in accordance with Section 26 05 00 - Common Work Requirements - Electrical.

.3 Do not proceed with interruption of electrical service without Owner Representative’s written permission.

1.5 RECORD DRAWINGS

.1 Provide record drawings, including details of pipe and duct bank materials, maintenance and operating instructions in accordance with Section 01 78 00 – Closeout Submittals.

PRODUCTS

2.1 PVC DUCTS AND FITTINGS

.1 Rigid PVC Schedule 80 duct and conduit for exterior underground duct banks and wiring below interior concrete floor slabs, size as indicated to CSA C22.2, with moulded fittings and minimum wall thickness at any point of 2.8 mm. Nominal length: 3 meter plus or minus 12 mm.

.2 Rigid PVC split ducts as required.

.3 Rigid PVC Schedule 80 bends, couplings, reducers, bell end fittings, plugs, caps, adaptors same product material as duct, to make complete installation.

.4 Rigid PVC Schedule 80 90° and 45° bends.

.5 Rigid PVC Schedule 80 5° angle couplings.

.6 Expansion joints as required.

.7 Preformed, interlocking intermediate duct spacers for duct size as indicated.

.8 Use epoxy coated galvanized steel conduit for sections extending above finished grade.

2.2 SOLVENT WELD COMPOUND

.1 Solvent cement for PVC duct joints.

2.3 RIGID EPOXY COATED CONDUIT

.1 Rigid epoxy coated galvanized steel conduit with zinc coating and corrosion resistant epoxy finish inside and outside. Use for sections extending above finished grade as indicated on drawings.

.2 Factory “ells” where 90° bends are required for 27 mm and larger conduits.

.3 Fittings: Manufactured for use with conduit specified. Coating same as conduit.

2.4 GROUNDING

.1 Ground rods in accordance with Section 26 05 27 - Grounding - Primary.

.2 All reinforcing steel in electrical manholes, tunnels, pull pits and other concrete slabs and structures to be bonded to ground using a #3/0 bare copper ground wire.

2.5 CABLE RACKS

.1 Manhole Hardware

.1 Cables shall be well supported on walls by heavy duty nonmetallic cable racks.

.2 The cable racks shall consist of a stanchion that shall be attached to the manhole wall in accordance with the manufacturer’s recommendations and adjustable arms that lock into the stanchion.

.3 Unless otherwise specified:

.1 At least two stanchions shall be installed on each manhole wall.

2.6 MANHOLE NECKS

.1 Concrete brick and mortar.

.1 Cable rack arm lengths shall be appropriate for the manhole size and amount of cable being installed.

.2 At least two spare arms shall be installed at each stanchion position.

2.7 MANHOLE FRAMES AND COVERS

.1 Heavy duty (H25).

.2 Cable Rack

.1 Stanchions and arms shall be made from 50% glass reinforced nylon or a nonmetallic material having equal mechanical strength, thermal resistance, chemical resistance, dielectric strength and physical properties.

.3 Fatigue life– 2 million cycles at 16,000 lb of load.

.4 Wear and abrasion resistance per ASTM D4060-14.

.1 The stanchion shall be of an appropriate length to accommodate the required number of arms to be installed, shall incorporate multiple arm mounting holes that are 100mm apart and recessed bolt mounting holes.

.2 Slots shall be provided in the arms for cable wire ties.

.5 Cover dampener and frame dampener.

.6 Color: black.

.1 The cable racks shall meet or exceed the following load capacities: Rated Working Load (lbs) - 250; Deflection at Rated Working Load (mm) - 6.

.7 Cable Rack Mounting Hardware

.8 Pick bar made of 316 stainless steel.

.9 Quarter turn paddle lock with penta head made of 316 stainless steel.

.1 Drop-in anchors (UDI Catalog No. FSRM-12) shall have a 1/2-13 thread, a rated pullout working capacity of 2100 lbs. and shall be made from either 316 stainless steel. A 316 stainless steel 1/2-13 hex head cap screw (UDI Catalog No. FHC316-16-044) and a 316 stainless steel .562 ID x 1.250 OD x .078 THK. fat washer (UDI Catalog No. FFW316-18-40) shall be used with each drop-in anchor.

.10 Standard of Acceptance: Underground Devices CR Series complete with RA20 mounting arms. Refer to drawings for quantity and lengths.

.11 UV resistant— tested to ASTM G154-16 testing standard Cycle 1 for 1600 hours.

.12 Five year limited warranty.

2.8 CABLE PULLING EQUIPMENT

.1 Pull rope: 6 mm stranded nylon polypropylene, tensile strength 5 kN, continuous throughout each duct run with 3 meter spare rope at each end.

.2 Permanently stamped lettering reading " High Voltage - Do Not Enter".

.3 36" clear opening.

2.9 DUCT SPACERS

.1 As required for installation at 900 mm center – center.

.2 Standard of Acceptance: Ejco Durostreet COM3800 Series.

.3 Factory-fabricated rigid PVC interlocking spacers, sized for type and sizes of ducts with which used, and selected to provide minimum duct spacings indicated while supporting ducts during concreting or backfilling.

2.10 MANHOLE LADDERS

.1 All new ladders to be coated in epoxy protective coating - PPG Amerlock 2/400 or approved equivalent.

2.11 CONCRETE & REINFORCEMENT

.1 Refer to Division 3- Concrete.

EXECUTION

3.1 INSTALLATION GENERAL

3.2 MARKERS

.1 Concrete type cable markers: 600 x 600 x 100 mm, with words: "Cable", "Joint", "Conduit" impressed in top surface, with arrows to indicate change in direction of duct runs.

.2 Slope: Pitch ducts a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes to drain in both directions.

.3 Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 1200mm, both horizontally and vertically, at other locations, unless otherwise indicated.

.4 Provide 150 mm wide, 4 mil, polyethylene marker tape in all trenches. Use red colored tape. Install at depth as per drawings.

.5 Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.

.6 Duct Entrances to Manholes and Handholes: Use end bells, spaced approximately 250 mm o.c. for 125 mm ducts, and vary proportionately for other duct sizes.

.1 Begin change from regular spacing to end-bell spacing 3000 mm from the end bell without reducing duct line slope and without forming a trap in the line.

.2 Grout end bells into structure walls from both sides to provide watertight entrances.

.7 Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig hydrostatic pressure.

.8 Pulling Cord: Install 100-lbf- test nylon cord in ducts, including spares.

.9 Concrete-Encased Ducts: Support ducts on duct separators.

.1 Separator Installation: Space separators close enough to prevent sagging and deforming of ducts, with not less than 5 spacers per 6 meters of duct. Secure separators to earth and to ducts to prevent floating during concreting. Stagger separators approximately 150 mm between tiers. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.

.2 Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.

.1 Start at one end and finish at the other, allowing for expansion and contraction of ducts as their temperature changes during and after the pour. Use expansion fittings installed according to manufacturer's

written recommendations, or use other specific measures to prevent expansion-contraction damage.

.2 If more than one pour is necessary, terminate each pour in a vertical plane and install 21 mm reinforcing rod dowels extending 450 mm into concrete on both sides of joint near corners of envelope.

.3 Pouring Concrete: Spade concrete carefully during pours to prevent voids under and between conduits and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto ducts. Use a plank to direct concrete down sides of bank assembly to trench bottom. Allow concrete to flow to center of bank and rise up in middle, uniformly filling all open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-bank application.

.4 Reinforcement: Reinforce concrete-encased duct banks where they cross disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.

.5 Forms: Use forms for side walls of duct bank.

.6 Minimum Space between Ducts: 75 mm between ducts and exterior envelope wall, 90 mm between ducts for like services, and 100 mm between power and signal ducts.

.7 Depth: Install top of duct bank at depths as indicated on electrical drawings.

.8 Warning Tape: Bury warning tape approximately 300 mm above all concrete-encased ducts and duct banks. Align tape parallel to and within 75 mm of the centerline of duct bank. Provide an additional warning tape for each 300 mm increment of duct-bank width over a nominal 450 mm. Space additional tapes 300 mm apart, horizontally.

.10 Build duct bank on undisturbed soil or on well compacted granular fill not less than 150 mm thick, compacted to 95% of maximum proctor dry density.

.11 Open trench completely between to be connected before ducts are laid and ensure that no obstructions will necessitate change in grade of ducts.

.12 Prior to laying ducts, construct "mud slab" not less than 75 mm thick.

.13 Install concrete in accordance with Division 03 requirements. Allow concrete to attain 50% of its specified strength before backfilling.

.14 Use anchors, ties and trench jacks as required to secure ducts and prevent moving during placing of concrete. Tie ducts to spacers with twine or other non-metallic material. Remove weights or wood braces before concrete has set and fill voids.

.15 Clean ducts before laying. Cap ends of ducts during construction and after installation to prevent entrance of foreign materials.

.16 Install four 3 meter lengths of 15M reinforcing rods, one in each corner of duct bank when connecting duct to manholes or buildings. Wire rods to 10M dowels at manhole or building and support from duct spacers. Protect existing cables and equipment when breaking into existing manholes. Place concrete down sides of

duct bank filling space under and around ducts. Rod concrete with flat bar between vertical rows filling voids.

.17 To verify the integrity, cleanliness, alignment, and obstruction-free condition of underground electrical duct banks prior to cable installation.

.18 In each duct install pull rope continuous throughout each duct run with 3 meter spare rope at each end.

.19 Camera Inspection of Underground Electrical Ducts:

.1 Equipment Requirements

.1 High-resolution, self-propelled or push-type camera suitable for duct diameters ranging from 50 mm to 150 mm.

.20 Label cables in manholes and vaults in accordance with Section 26 05 00 - Common Work Requirements – Electrical.

.1 Pan-and-tilt capability for detailed inspection.

.21 Manhole Access: Circular opening in manhole roof; sized to match cover size.

.1 Manholes with Fixed Ladders: Offset access opening from manhole centerlines to align with ladder.

.1 Integrated lighting system for clear visibility.

.2 Install chimney, constructed of precast concrete collars and rings to support frame and cover and to connect cover with manhole roof opening. Provide moisture-tight masonry joints and waterproof grouting for cast-iron frame to chimney.

.1 Distance counter and location tracking.

.2 Recording capability (video and still images).

3.3 INSPECTIONS

.1 Inspection of duct will be carried out by Owner's Representative prior to placing. Placement of concrete and duct cleanout to be done when Owner's Representative present.

.1 Waterproof and dustproof (IP68 rating or better).

.2 Inspection Procedure

.1 Pre-Inspection:

.1 Confirm duct installation is complete and access points (manholes, handholes, pull boxes) are available.

.2 Ensure ducts are free of standing water or debris.

.3 Verify duct identification and routing per as-built drawings.

.2 Camera Insertion:

.1 Insert camera from one end of the duct run and inspect continuously to the other end.

.2 Record the entire inspection with time and distance stamps.

.3 Inspection Criteria:

.1 Check for:

.1 Cracks, breaks, or deformation.

.2 Obstructions (e.g., concrete intrusion, debris, mud).

.3 Water accumulation or infiltration.

.4 Joint integrity and alignment.

.5 Presence of mandrel or pull string.

.2 Document duct bends and junctions.

.3 Documentation

.1 Provide a report including:

.1 Duct identification and location.

.2 Summary of findings.

.3 Annotated video footage and still images.

.4 Recommendations for corrective actions (if needed).

.4 Acceptance Criteria

.1 Ducts must be:

.1 Free of obstructions and damage.

.2 Properly aligned and continuous.

.3 Dry or appropriately drained.

.4 Ready for cable pulling without additional cleaning or repair.

END OF SECTION

APPENDIX 1

MUNET SPECIFICATIONS

MUNet Specification

Table of Contents

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

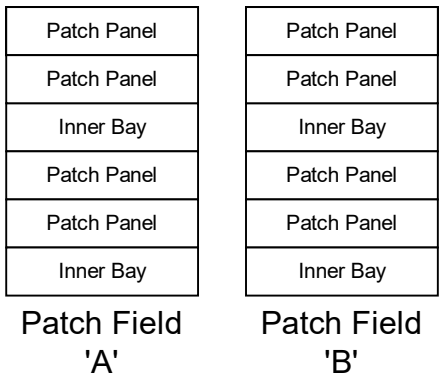
The riser closets are connected to the building entrance closets using 12 fiber multimode cable in a physical star arrangement. In addition the Engineering, CERR and Chemistry Physics buildings have computer rooms connected back to the entrance closet also with 12 fiber multimode cable.

2.2.3 Horizontal Distribution

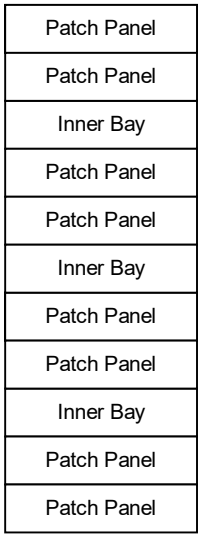
The horizontal cable distribution consists of two four pair Unshielded Twisted Pair (UTP) Category 5 cables, terminated in accordance with CSA T529 and EIA/TIA 568A using the preferred 'A' pin out only.

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

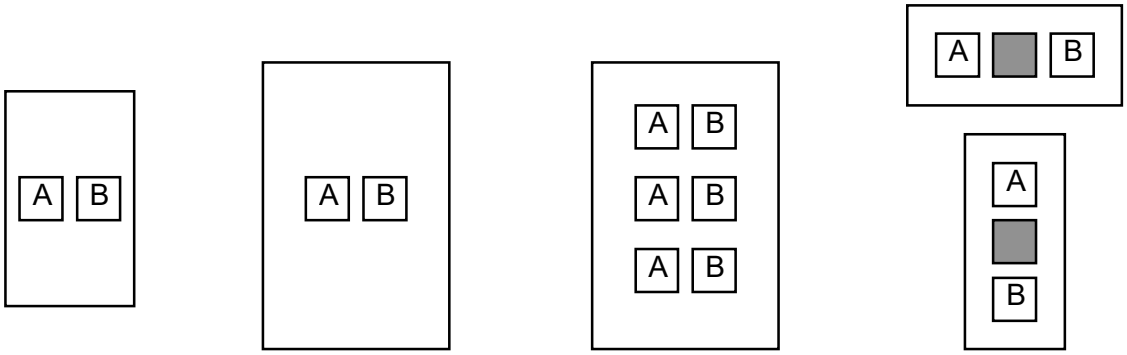


Vertical Configuration



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.

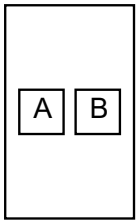
3.11.2 Implementation:

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:

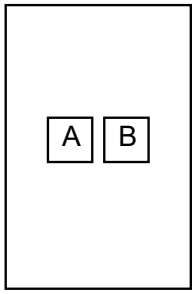
Building	**L**	this may consist of one or two characters and conforms to the MUNet Building identification plan.
Closet	**51**	closets are identified by their own floor and sequence number.
Field Separator	**-**	
Floor	**5**	floor on which drop is located
Sequence	**001**	three digit sequence number
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).

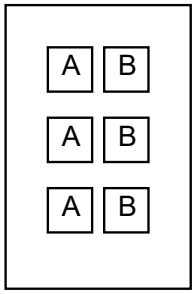
The following diagram illustrates the MUNet faceplate types and the typical label locations for each type.



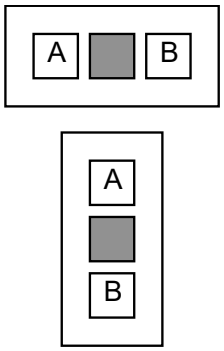
Surface Mount - Dual



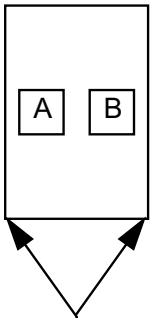
Flush Mount - Dual



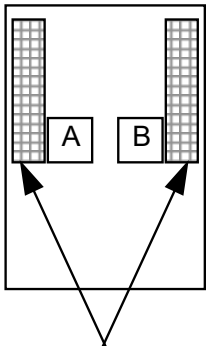
Flush Mount - Six



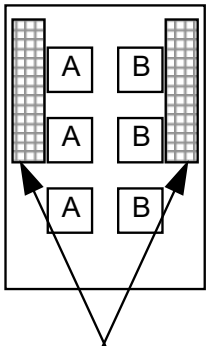
DECO Mount - Dual



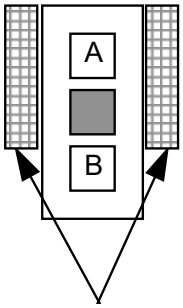
Label to be located on sides.



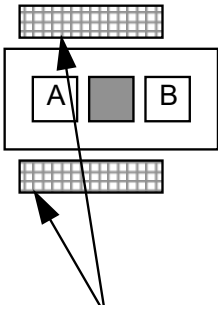
Label locations.



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:

Derek Greenland RCDD
Computing and Communications
dgreenla@mun.ca

APPENDIX 2

MUN ELECTRICAL PANEL COLOURS

Company Name:

Job Name: HARRIS CROMWELL

Job Address: MUN ELECTRICAL COLOR CODE PANELS

Contact Name:

Page Number

JUNE 13/19

120-240V NORMAL POWER

Dulux Paints 8655
57 Old Pennywell Road
6/13/2019

St. Johns, NL A1E 6A8
709 738 2230

CUSTOMER
D.C. D.C.

JOB INFO
Electrical Panel

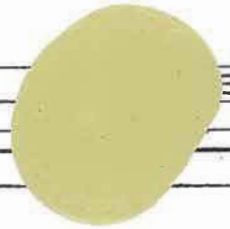
COLOR
PANTONE 14-0425 TPG Beachnut

PRODUCT
22010 ALKYD EMULSION MELAMINE

BASE
22010 WHITE

CAN SIZE
1 Quart

COLORANTS
BX 10¼
CX 13
DX 4½
FX 1⅛
GX 1Y + 2¼
WX 36



DRAWDOWN

120-240V ESSENTIAL POWER

Dulux Paints 8655
57 Old Pennywell Road
6/13/2019

St. Johns, NL A1E 6A8
709 738 2230

CUSTOMER
D.C. D.C.

JOB INFO
Electrical Panel

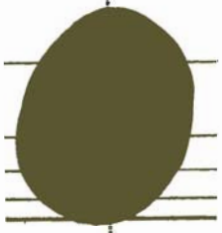
COLOR
18-0430 TPG Avocado

PRODUCT
22010 ALKYD EMULSION MELAMINE

BASE
22016 ULTRA DEEP BASE

CAN SIZE
1 Quart

COLORANTS
BX 33
CX 1Y + 39¾
DX 5½
WX 17¾



BATCH NUMBER

DRAWDOWN

480-600V NORMAL POWER

Dulux Paints 8655
57 Old Pennywell Road
6/13/2019

St. Johns, NL A1E 6A8
709 738 2230

CUSTOMER
D.C. D.C.

JOB INFO
Electrical Panel

COLOR
13-5410 TPG Iced Aqua

PRODUCT
22010 ALKYD EMULSION MELAMINE

BASE
22010 WHITE

CAN SIZE
1 Quart

COLORANTS
BX 1½
DX 3
EX 2¾

Colour Sample

DRAWDOWN

12,500-15,000V NORMAL POWER

Dulux Paints 8655
57 Old Pennywell Road
6/13/2019

St. Johns, NL A1E 6A8
709 738 2230

CUSTOMER
D.C. D.C.

JOB INFO
Electrical Panel

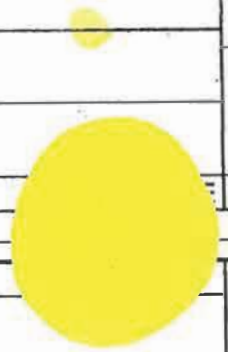
COLOR
PANTONE 12-0752 TPG Buttercup

PRODUCT
22010 ALKYD EMULSION MELAMINE

BASE
22016 ULTRA DEEP BASE

CAN SIZE
1 Quart

COLORANTS
GX 1Y + 28¾
LX ¾
WX 2Y + 14¾



DRAWDOWN

4,160V ESSENTIAL POWER

Dulux Paints 8655
57 Old Pennywell Road
6/13/2019

St. Johns, NL A1E 6A8
709 738 2230

CUSTOMER
D.C. D.C.

JOB INFO
Electrical Panel

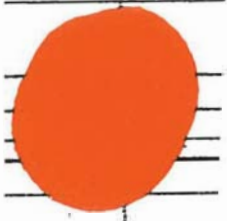
COLOR
17-1461 Orangeade

PRODUCT
22010 ALKYD EMULSION MELAMINE

BASE
22016 ULTRA DEEP BASE

CAN SIZE
1 Quart

COLORANTS
CX 9¼
FX 4¼
OX 1Y + 46½
WX 36¼



480-600V ESSENTIAL POWER

Dulux Paints 8655
57 Old Pennywell Road
6/13/2019

St. Johns, NL A1E 6A8
709 738 2230

CUSTOMER
D.C. D.C.

JOB INFO
Electrical Panel

COLOR
17-4530 TPG Barrier Reef

PRODUCT
22010 ALKYD EMULSION MELAMINE

BASE
22016 ULTRA DEEP BASE

CAN SIZE
1 Quart

COLORANTS
BX 6¼
DX 24¾
EX 40¾
WX 1Y + 24¼

Colour Sample

APPENDIX 3

METHOD OF PROCEDURE SAMPLE FORM

1.0 Executive Summary

2.0 Location

Health Sciences Centre
300 Prince Philip Drive
St. John's, NL
Canada

OR

HSC Central Utilities Annex
Sands Pit Road
St. John's, NL
Canada

3.0 Schedule

This work will start on _____at _____**AM/PM**
This work will end on _____at _____**AM/PM**

Toolbox meeting/Hazard Assessment to be held in _____ at _____AM/PM sharp prior to start of work.

4.0 Roles & Responsibilities

Name	**Role/Responsibility**	**Contact Number**
	MUN/EH Site Contact	
	Project Manager – MUN	
	Project Manager – Eastern Health	
	Design Consultant - Elec	
	Design Consultant - Mech	
	MUN Electrical	
	Contractor Foreman	
	Contractor Superintendent	
	Contractor Project Manager	

5.0 Work Procedure

5.1
5.2

6.0 Reason/Benefit

6.1

7.0 Customer/User Impact Description

7.1

8.0 Test Planning

8.1 Name of System/Application to be tested:

8.2 Assigned Testers:

8.3 Test Plan:

9.0 Backout plan

9.1

Back out is expected to take _____ minutes/hours.

END OF M.O.P

MUN-09 FEEDER CABLE REPLACEMENT & PAD MOUNTED SWITCHGEAR

STANTEC CONSULTING LTD.
141 Kelsey Dr.
St. John's, NL A1B 0L2
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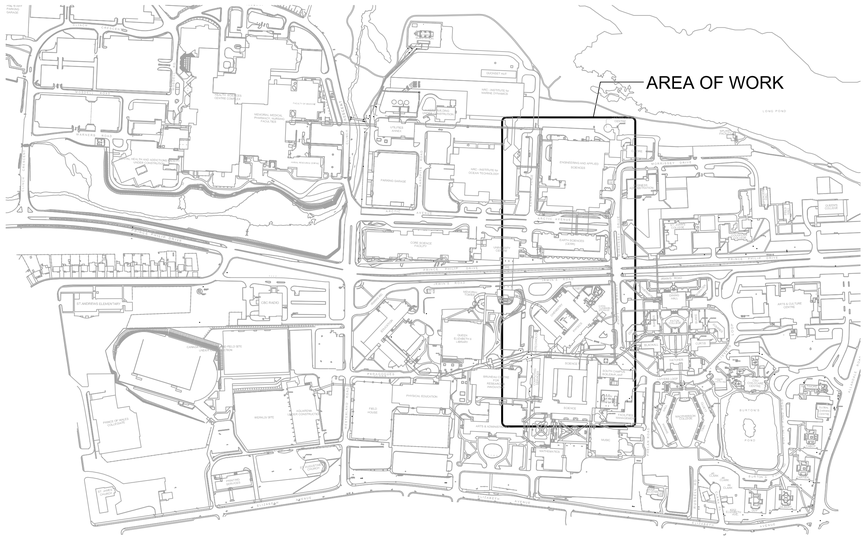
www.stantec.com

Memorial University
St. John's, Newfoundland and Labrador

Issued for Tender: October 23, 2025
Stantec Project #: 133412009
MUN Project #: TU-509-23

LIST OF DRAWINGS



1 E100 KEY PLAN
N.T.S.

GENERAL SITE CONSTRUCTION NOTES:

1. ALL SURPLUS MATERIAL FROM TRENCHING OR FROM REMOVAL OF HARD SURFACES SHALL BE REMOVED FROM SITE. STOCK PILING ON SITE IS NOT PERMITTED UNLESS OTHERWISE APPROVED BY OWNERS REPRESENTATIVES.
2. ALL SPARE DUCTS TO BE CAPPED AT BOTH ENDS AND COMPLETE WITH PULL WIRES.
3. ALL PAVEMENT, LANDSCAPING, FENCING AND CONCRETE WALKWAYS TO BE REINSTATED TO ORIGINAL CONDITIONS.
4. ALL CONDUITS ARE REQUIRED TO BE CAMERA INSPECTED WITH OWNER PRIOR TO POURING CONCRETE TO ENSURE NO BREAKS OR ROUGH EDGES. CONTRACTOR RESPONSIBLE FOR COMPLETION OF CAMERA INSPECTIONS.
5. ALL MEASUREMENTS ARE HORIZONTAL GROUND DISTANCES IN METRES.
6. CONTRACTOR RESPONSIBLE TO SECURE SITE DURING CONSTRUCTION FOR PUBLIC SAFETY.
7. PRIOR TO COMMENCEMENT OF CONSTRUCTION CONTRACTOR SHALL LAYOUT THE ROUTE FOR THE CONDUIT FOR REVIEW BY THE CONSULTANT AND MEMORIAL UNIVERSITY (MUN). MINOR CHANGES TO THE ROUTING MAY OCCUR AS A RESULT OF THIS REVIEW. NO EXTRA PAYMENT WILL BE MADE AS A RESULT OF THESE MINOR CHANGES.
8. MEMORIAL UNIVERSITY (MUN) SHALL HAVE THE RIGHT TO SET PRIORITY OVER AREAS OF WORK TO BE COMPLETED FIRST TO MINIMIZE DISRUPTION TO THE CAMPUS AND TO ENSURE HARD SURFACE AREAS ARE REINSTATED IN A TIMELY MANNER.
9. CONTRACTOR RESPONSIBLE FOR LOCATING ALL EXISTING UNDERGROUND INFRASTRUCTURE (IE. TELEPHONE, CABLE, POWER LINES, WATERMAINS, SEWERS, ETC) BEFORE PROCEEDING WITH THIS WORK. CONTRACTOR SHALL TAKE EXTREME CARE WHILE EXCAVATING TO PREVENT DAMAGE TO EXISTING INFRASTRUCTURE. HAND DIGGING MAY BE REQUIRED AS NOTED ON PLANS OR AS DIRECTED BY MUN. CONTRACTOR TO AQUIRE MUN DIG PERMIT THROUGH OPERATIONS AND MAINTENANCE PRIOR TO START OF ANY WORK. CONFIRM ALL DIMENSIONS, PIPE SIZES AND EXISTING INVERT ELEVATIONS PRIOR TO CONSTRUCTION AND ADVISE OWNER'S REPRESENTATIVE OF ANY DISCREPANCIES. LOCATION & ELEVATION OF UNDERGROUND INFRASTRUCTURE SHOWN ON PLANS IS APPROXIMATE ONLY.
10. ANY AND ALL DAMAGE TO EXISTING ON-SITE INFRASTRUCTURE SHALL BE CORRECTED AT THE CONTRACTORS EXPENSE.
11. ALL DISTURBED AREAS BEYOND LIMITS OF WORK TO BE RESTORED TO ORIGINAL CONDITIONS OR BETTER.
12. CONTRACTOR SHALL TAKE ALL NECESSARY STEPS TO PREVENT DAMAGE TO TREES AND SHRUBBERY. WHERE POSSIBLE ALL EXCAVATION SHALL OCCUR OUTSIDE THE DRIP LINE OF TREES. ONCE THE ROUTE FOR THE CONDUIT IS ESTABLISHED, MUN WILL IDENTIFY AND/OR REMOVE VEGETATION THEY WOULD LIKE TO PRESERVE.
13. CONTRACTOR SHALL REMOVE & REPLACE CURB, CURB & GUTTER, SIDEWALK, WALKWAYS, ASPHALT, ETC. AS REQUIRED TO COMPLETE THIS WORK. CONTRACTOR SHALL VISIT SITE TO CONFIRM ALL POSSIBLE REINSTATEMENT WORK THAT MAY NOT BE NOTED ON DRAWINGS.
14. ALL HARD SURFACES (I.E. SIDEWALKS, WALKWAYS, CURBS, ASPHALT, ETC) SHALL BE SAW CUT TO MINIMIZE DISTURBANCE AND REINSTATEMENT. MINIMUM REINSTATEMENT WIDTH SHALL BE 3.0 METRES UNLESS NOTED OTHERWISE. REINSTATEMENT TO BE IN ACCORDANCE WITH THE DRAWINGS AND SPECIFICATIONS.
15. IN LANDSCAPED AREAS SOD SHALL BE PROPERLY REMOVED AND STORED ON SITE FOR REUSE AND TOPSOIL SHALL BE STOCKPILED FOR REUSE. ALL EXCAVATIONS SHALL BE KEPT TO MINIMUM WIDTH AS REQUIRED. DAMAGED SOD SHALL BE REPLACED BY THE CONTRACTOR.
16. DUE TO UNDERGROUND INFRASTRUCTURE & MINOR ROUTE ADJUSTMENTS, CONTRACTOR SHALL CORRECT DEFLECTION ANGLES AS NEEDED TO SUIT FIELD CONDITIONS. MINIMUM COVER TO BE MAINTAINED OVER CONDUIT SHALL BE AS ILLUSTRATED ON TRENCH SECTIONS.
17. FIELD BENDING OF SUPERDUCT CONDUIT SHALL NOT EXCEED MANUFACTURER`S ALLOWABLE OFFSETS. MINOR ADJUSTMENTS TO STATIONS / DEFLECTION ANGLES MAY BE REQUIRED.
18. CONTRACTOR SHALL PROVIDE NECESSARY MEANS TO SUPPORT UNDERGROUND INFRASTRUCTURE EXPOSED DURING PLACEMENT OF DUCT-BANK.
19. CONTRACTOR TO INSTALL NYLON PULL ROPE IN ALL CONDUITS. SEE SPECIFICATION FOR DETAILS.
20. AN ELECTRICAL PERMIT FROM SERVICE NL IS REQUIRED TO BE OBTAINED PRIOR TO CONSTRUCTION WORK COMMENCING. THE COST FOR THIS PERMIT IS TO BE INCLUDED IN THE TENDER PRICE
21. CONTRACTOR TO PUMP WATER AND VACUUM FROM EXISTING MANHOLES, IF REQUIRED. PUMPING TO BE COMPLETED JUST PRIOR TO WORKING IN MANHOLES AND MAY BE REQUIRED TO BE CONTINUOUS WHILE WORKING TO KEEP WATER DOWN. ANY REQUIRED SHUTDOWNS FOR WORKING IN MANHOLES IS TO BE COORDINATED WITH MUN REPRESENTATIVES.

ELECTRICAL LEGEND

POWER DISTRIBUTION

- [J] – JUNCTION BOX.
- [ ] – OUTLET BOX.
- [ ]^{J} – SAFETY DISCONNECT SWITCH SIZED TO SUIT. NEMA RATED
- △ – DATA OUTLET.

LIST OF SUBSCRIPTS

- WP – INDICATES WEATHERPROOF.
- GFCI – INDICATES GROUND FAULT CIRCUIT INTERRUPTER

Stantec

Stantec Consulting Ltd.
141 Kelsey Drive
St. John's NL
Tel. 709.576.1458
www.stantec.com

Legend

Notes

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BERNIE ROSSON
SIGNATURE
2025-10-23
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NEWFOUNDLAND & LABRADOR

Client/Project

MEMORIAL UNIVERSITY
Department of Facilities Management

MUN-09 FEEDER CABLE REPLACEMENT
& PAD MOUNT SWITCHGEAR
(TU-509-23)
St. John's, NL Canada

Title
KEY PLAN, NOTES AND LEGEND

Project No.	Scale	Revision
133412009	AS SHOWN	0

Drawing No.
E100

ORIGINAL SHEET - ISO B1

NRC - INSTITUTE for OCEAN TECHNOLOGY

ENGINEERING AND APPLIED SCIENCES

BUSINESS ADMINISTRATION

UNIVERSITY CENTRE

EARTH SCIENCES (CERR)

Food

MOTORCYCLE PARKING LOT

TRANSFORMER

KERWIN PLACE

MORRISSEY DRIVE

ARCTIC AVENUE

IRWIN'S ROAD

EXISTING UTILITY TUNNEL TO NRC BUILDING

EXISTING FEEDER MUN-09E FROM NRC SWITCHGEAR TO ENGINEERING BUILDING SWITCHGEAR TO PARTIALLY REMAIN. (PORTION OF CABLE FROM ENGINEERING ELECTRICAL ROOM 1037H TO AREA OF NEW SWITCHGEAR TO BE REMOVED). SEE REVISED RISER DIAGRAM AND REVISED PARTIAL SITE PLAN.

1 E106

EXISTING ELECTRICAL ROOM 1037H (SUBSTATION NO. 1)

EXISTING POWER AND COMMS MANHOLE

1 E108

3 E108

EXISTING MUN-09 FEEDERS ENTERING ENGINEERING ELECTRICAL ROOM 1037H (SUBSTATION NO. 1), TO BE REMOVED: REFER TO RISER DIAGRAM FOR CABLE DETAILS:
- MUN-09E FEEDER FROM MANHOLE TO ENGINEERING BUILDING SWITCHGEAR.
- MUN-09A FEEDER FROM EARTH SCIENCES SWITCHGEAR TO ENGINEERING BUILDING SWITCHGEAR.

EXISTING FEEDER MUN-09A TO BE REMOVED

3 E108

EXISTING UTILITY TUNNEL

EXISTING UTILITY TUNNEL

EXISTING PORTION OF MUN-09 FEEDER TO BE REMOVED

EXISTING FEEDER MUN-09A TO BE REMOVED

EXISTING ELECTRICAL ROOM 1000B

EXISTING FEEDER MUN-09D TO REMAIN

EXISTING FEEDER MUN-09C TO REMAIN

2 E106

NORTH CAMPUS SWITCHING STATION (NCSS)

EXISTING PORTION OF MUN-09 FEEDER TO BE REMOVED

3 E108

EXISTING UTILITY TUNNEL

SEE PLAN E102 FOR CONTINUATION

NOTES:

1. NOT ALL MEDIUM / LOW VOLTAGE CABLING SHOWN FOR CLARITY.
2. EXISTING CABLING SHOWN AS SINGLE RUNS FOR CLARITY, REFER TO RISER DIAGRAM FOR CABLE SIZING AND # OF RUNS).
3. VERTICAL SPACING BETWEEN CABLE TRAYS VARIES ENTIRE LENGTH OF TUNNEL. CONTRACTOR TO ADJUST CABLE TRAY HEIGHTS AS REQUIRED TO DEMOLISH AND INSTALL NEW CABLES.

Stantec

Stantec Consulting Ltd.
141 Kelsey Drive
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Notes

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PEGNL
BERNIE ROBSON
SIGNATURE
2025-10-23
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NEWFOUNDLAND & LABRADOR

Client/Project

MEMORIAL UNIVERSITY
Department of Facilities Management

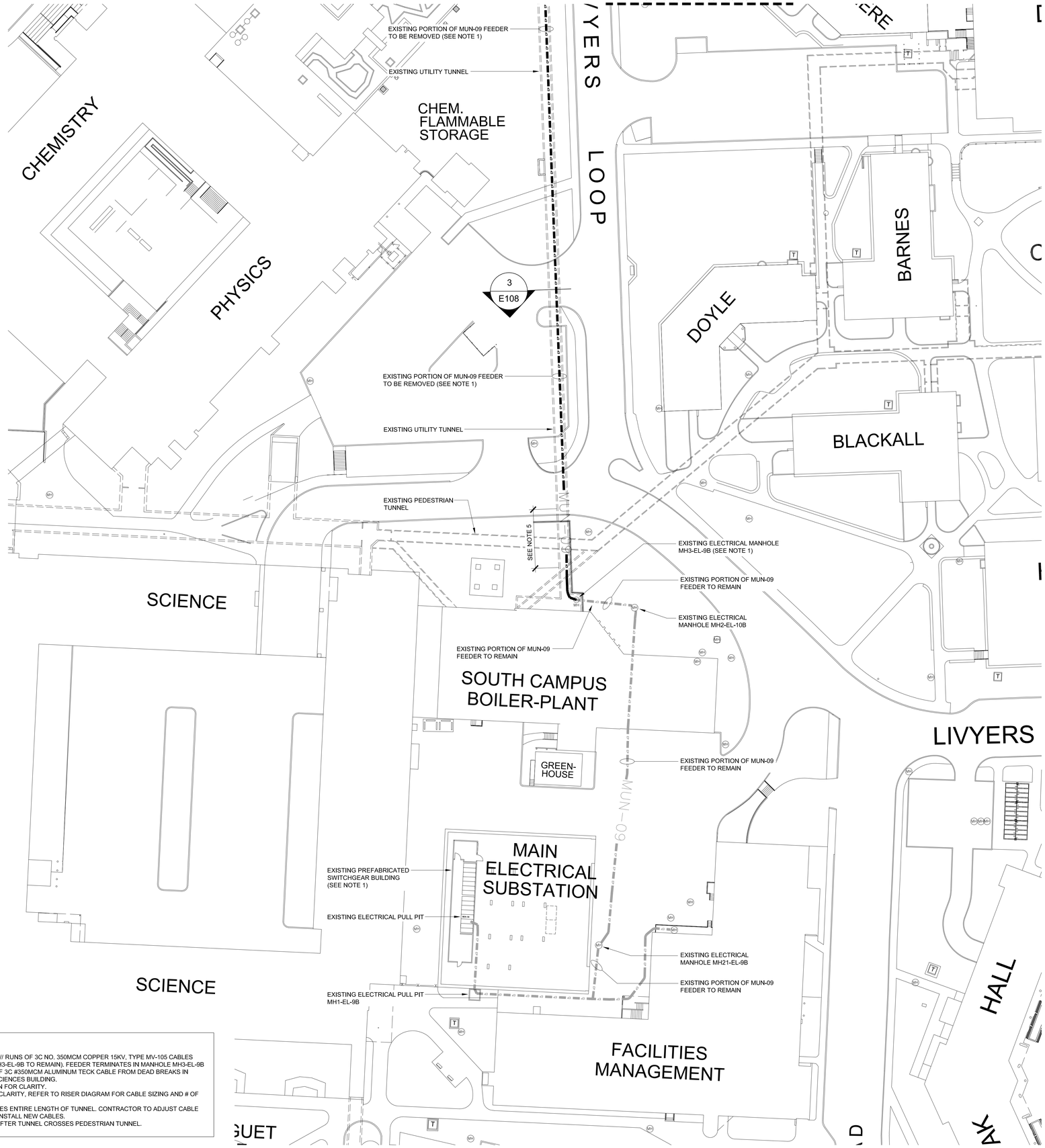
MUN-09 FEEDER CABLE REPLACEMENT & PAD MOUNT SWITCHGEAR (TU-509-23)
St. John's, NL Canada

Title

PARTIAL SITE PLAN - DEMOLITION NORTH

Project No.	Scale
133412009	1:350

Drawing No.	Revision
E101	0



NOTES:

1. EXISTING SOUTH PORTION OF MUN-09 FEEDER (2 // RUNS OF 3C NO. 350MCM COPPER 15KV, TYPE MV-105 CABLES BETWEEN MAIN ELECTRICAL SUBSTATION AND MH3-EL-9B TO REMAIN). FEEDER TERMINATES IN MANHOLE MH3-EL-9B ON DEAD BREAKS. REMOVE EXISTING 2 // RUNS OF 3C #350/0MCM ALUMINUM TECK CABLE FROM DEAD BREAKS IN MANHOLE TO SWITCHGEAR LOCATED IN EARTH SCIENCES BUILDING.
2. NOT ALL MEDIUM / LOW VOLTAGE CABLING SHOWN FOR CLARITY.
3. EXISTING CABLING SHOWN AS SINGLE RUNS FOR CLARITY, REFER TO RISER DIAGRAM FOR CABLE SIZING AND # OF RUNS).
4. VERTICAL SPACING BETWEEN CABLE TRAYS VARIES ENTIRE LENGTH OF TUNNEL. CONTRACTOR TO ADJUST CABLE TRAY HEIGHTS AS REQUIRED TO DEMOLISH AND INSTALL NEW CABLES.
5. CABLE TRAY (AND CABLES) DROP IN ELEVATION AFTER TUNNEL CROSSES PEDESTRIAN TUNNEL.

ORIGINAL SHEET - ISO B1

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St. John's NL
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PEGNL
Provincial Licensing
BERNIE ROBSON
SIGNATURE
2025-10-23
DATE
NEWFOUNDLAND & LABRADOR

Client/Project

MEMORIAL UNIVERSITY
Department of Facilities Management

MUN-09 FEEDER CABLE REPLACEMENT
& PAD MOUNT SWITCHGEAR
(TU-509-23)
St. John's, NL Canada

Title

PARTIAL SITE PLAN - DEMOLITION SOUTH

Project No.	Scale
133412009	1:350

Drawing No.	Revision
E102	0

EXISTING UTILITY TUNNEL TO NRC BUILDING

1-09E

EXISTING FEEDER MUN-09E

EXISTING U/G DUCTBANK

1-09F

EXISTING ELECTRICAL ROOM 1037H (SUBSTATION NO. 1)

NEW EXTERIOR SWITCHGEAR #1 (NORTH)

EXISTING POWER AND COMMS MANHOLE

NEW EXTERIOR SWITCHGEAR #2 (SOUTH)

NRC - INSTITUTE for OCEAN TECHNOLOGY

KERWIN PLACE

1
E105

NEW FEEDER MUN-09A INSTALLED IN EXISTING CABLETRAY (EXTERIOR SWITCHGEAR TO SWITCHGEAR IN EARTH SCIENCES). REFER TO UTILITY TUNNEL SECTIONS

NEW FEEDER MUN-09 FEEDER, ROUTED IN EXISTING CABLETRAY (DEAD BREAKS IN MANHOLE MH3-EL-9B TO EXTERIOR SWITCHGEAR IN AREA OF ENGINEERING BUILDING). REFER TO UTILITY TUNNEL SECTIONS.

3
E108

ENGINEERING AND APPLIED SCIENCES

MOTORCYCLE PARKING LOT

BUSINESS ADMINISTRATION

1-05A

1-05B

TRANSFORMER

NEW FEEDER MUN-09 FEEDER, ROUTED IN EXISTING CABLETRAY (DEAD BREAKS IN MANHOLE MH3-EL-9B TO EXTERIOR SWITCHGEAR IN AREA OF ENGINEERING BUILDING). REFER TO UTILITY TUNNEL SECTIONS.

APPROXIMATE LOCATION OF MUN-09 CABLE SPLICE. (SEE NOTE 4)

1-09A

MUN-09

EXISTING UTILITY TUNNEL

EXISTING UTILITY TUNNEL

NORTH CAMPUS SWITCHING STATION (NCSS)

1-05C

ARCTIC AVENUE

EXISTING ELECTRICAL ROOM 1000B

NEW FEEDER MUN-09A INSTALLED IN EXISTING CABLETRAY (EXTERIOR SWITCHGEAR TO SWITCHGEAR IN EARTH SCIENCES). REFER TO UTILITY TUNNEL SECTIONS

2
E106

EARTH SCIENCES (CERR)

1-05E

MUN-09

MORRISSEY DRIVE

UNIVERSITY CENTRE

NEW FEEDER MUN-09 FEEDER, ROUTED IN EXISTING CABLETRAY (DEAD BREAKS IN MANHOLE MH3-EL-9B TO EXTERIOR SWITCHGEAR IN AREA OF ENGINEERING BUILDING). REFER TO UTILITY TUNNEL SECTIONS

3
E108

EXISTING UTILITY TUNNEL

Food Court

APPROXIMATE LOCATION OF MUN-09 CABLE SPLICE. (SEE NOTE 4)

IRWIN'S ROAD

SEE PLAN E104 FOR CONTINUATION

NOTES:

1. NOT ALL MEDIUM / LOW VOLTAGE CABLING SHOWN FOR CLARITY.
2. EXISTING CABLING SHOWN AS SINGLE RUNS FOR CLARITY, REFER TO RISER DIAGRAM FOR CABLE SIZING AND # OF RUNS).
3. VERTICAL SPACING BETWEEN CABLE TRAYS VARIES ENTIRE LENGTH OF TUNNEL. CONTRACTOR TO ADJUST CABLE TRAY HEIGHTS AS REQUIRED TO DEMOLISH AND INSTALL NEW CABLES.
4. NEW MUN-09 CABLE TO BE SPLICED (MAXIMUM TWO SPLICES IN CABLE RUN), APPROXIMATE LOCATIONS AS INDICATED. CABLE SPLICES TO BE LOCATED SO OVERALL CABLE RUN = 3 EQUAL LENGTHS. ADJUST LOCATIONS AS REQUIRED.

ORIGINAL SHEET - ISO B1

Stantec

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Legend

Notes

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PEGNL Newfoundland and Labrador
BERNIE ROBSON
SIGNATURE
2025-10-23
DATE

Client/Project

MEMORIAL UNIVERSITY
Department of Facilities Management

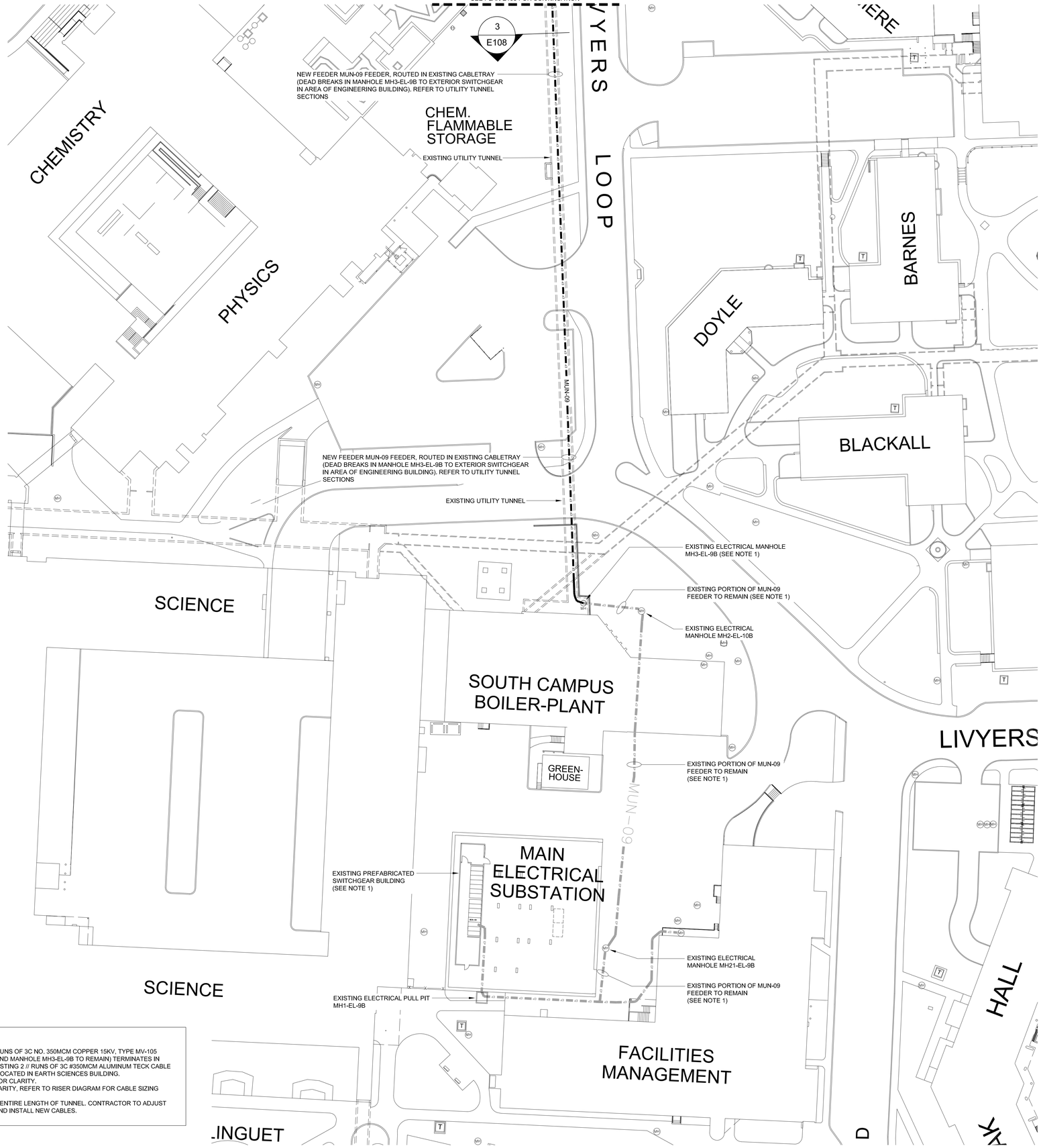
MUN-09 FEEDER CABLE REPLACEMENT & PAD MOUNT SWITCHGEAR (TU-509-23)
St. John's, NL Canada

Title

PARTIAL SITE PLAN - REVISED NORTH

Project No.	Scale
133412009	1:350

Drawing No.	Revision
E103	0



NOTES:

1. EXISTING SOUTH PORTION OF MUN-09 FEEDER (2 // RUNS OF 3C NO. 350MCM COPPER 15KV, TYPE MV-105 CABLES, BETWEEN MAIN ELECTRICAL SUBSTATION AND MANHOLE MH3-EL-9B TO REMAIN) TERMINATES IN MANHOLE MH3-EL-9B ON DEAD BREAKS. REMOVE EXISTING 2 // RUNS OF 3C #350MCM ALUMINUM TECK CABLE FROM DEAD BREAKS IN MANHOLE TO SWITCHGEAR LOCATED IN EARTH SCIENCES BUILDING.
2. NOT ALL MEDIUM / LOW VOLTAGE CABLING SHOWN FOR CLARITY.
3. EXISTING CABLING SHOWN AS SINGLE RUNS FOR CLARITY, REFER TO RISER DIAGRAM FOR CABLE SIZING AND # OF RUNS).
4. VERTICAL SPACING BETWEEN CABLE TRAYS VARIES ENTIRE LENGTH OF TUNNEL. CONTRACTOR TO ADJUST CABLE TRAY HEIGHTS AS REQUIRED TO DEMOLISH AND INSTALL NEW CABLES.

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File Name: E-104 Partial Site Plan - REVISED SOUTH.dwg
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PEGNL Newfoundland and Labrador
BERNIE ROBSON
SIGNATURE
2025-10-23
DATE
NEWFOUNDLAND & LABRADOR

Client/Project

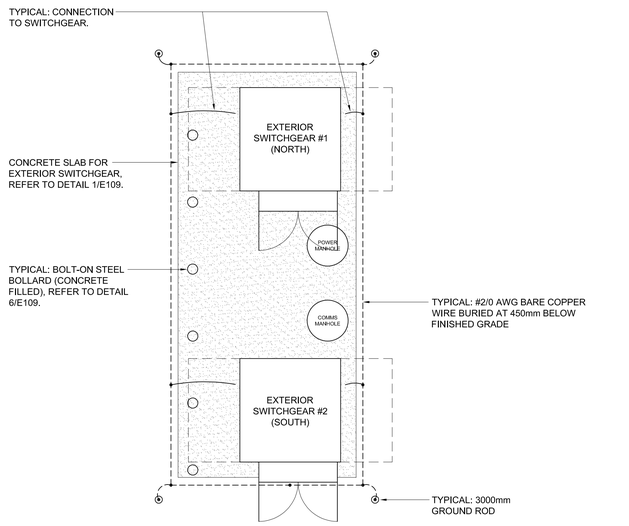
MEMORIAL UNIVERSITY
Department of Facilities Management

MUN-09 FEEDER CABLE REPLACEMENT & PAD MOUNT SWITCHGEAR (TU-509-23)
St. John's, NL Canada

Title
PARTIAL SITE PLAN - REVISED SOUTH

Project No.	Scale	Revision
133412009	1:350	0

Drawing No.
E104

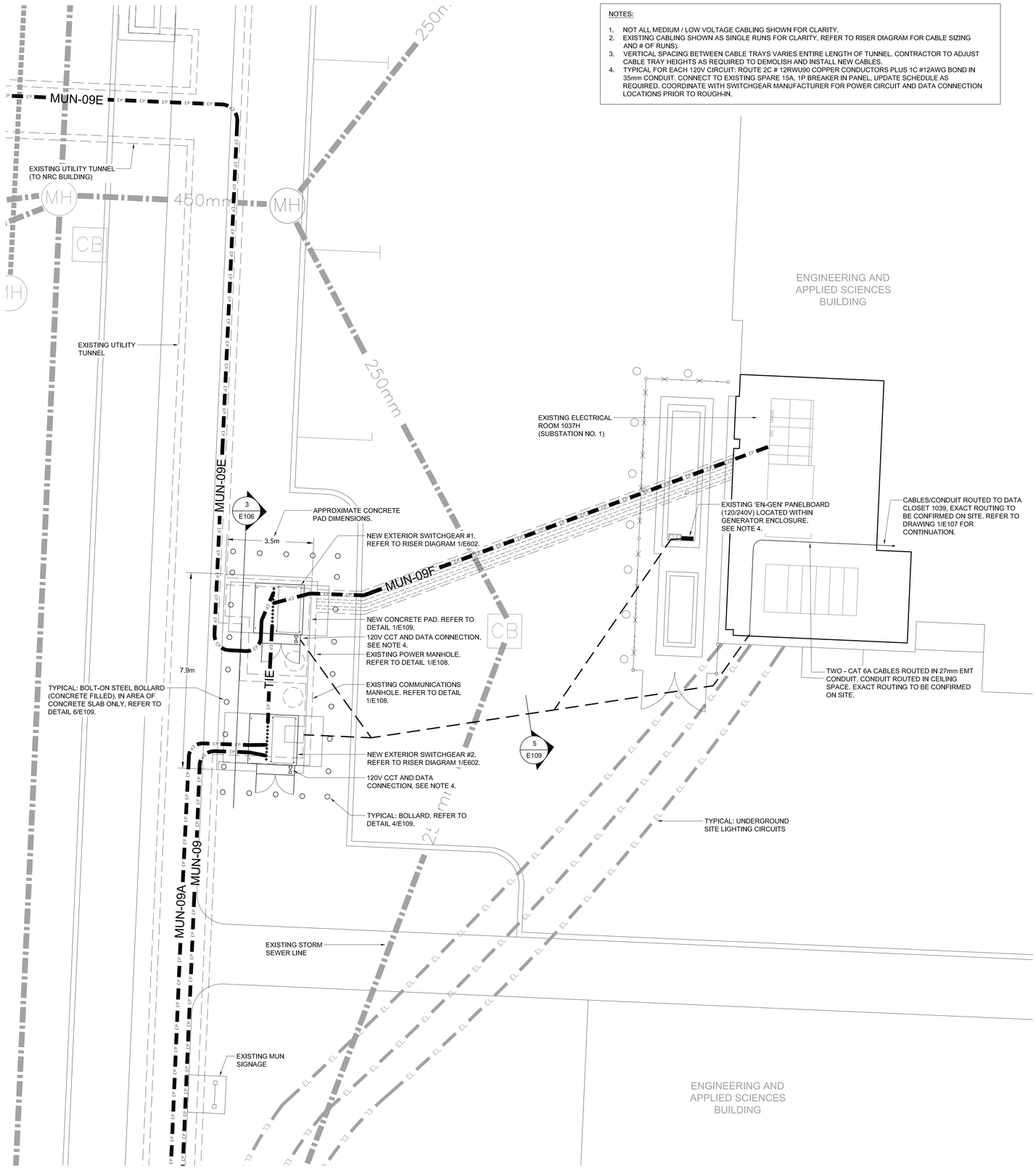


2 E105 PAD MOUNTED SWITCHGEAR - GROUNDING PLAN 1:50

0 0.5m 1.0m 1.5m 2.0m 2.5m
1 : 50

NOTES:

1. NOT ALL MEDIUM / LOW VOLTAGE CABLING SHOWN FOR CLARITY.
2. EXISTING CABLING SHOWN AS SINGLE RUNS FOR CLARITY, REFER TO RISER DIAGRAM FOR CABLE SIZING AND # OF RUNS).
3. VERTICAL SPACING BETWEEN CABLE TRAYS VARIES ENTIRE LENGTH OF TUNNEL. CONTRACTOR TO ADJUST CABLE TRAY HEIGHTS AS REQUIRED TO DEMOLISH AND INSTALL NEW CABLES.
4. TYPICAL FOR EACH 120V CIRCUIT: ROUTE 2C # 12RWU90 COPPER CONDUCTORS PLUS 1C #12AWG BOND IN 35mm CONDUIT. CONNECT TO EXISTING SPARE 15A, 1P BREAKER IN PANEL. UPDATE SCHEDULE AS REQUIRED. COORDINATE WITH SWITCHGEAR MANUFACTURER FOR POWER CIRCUIT AND DATA CONNECTION LOCATIONS PRIOR TO ROUGH-IN.



1 E105 PARTIAL SITE PLAN - EXTERIOR SWITCHGEAR (AT ENGINEERING BUILDING) SCALE 1:75

0 0.75m 1.5m 2.25m 3m 3.75m
1 : 75

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Notes

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BERNIE ROBSON
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2025-10-23
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NEWFOUNDLAND & LABRADOR

Client/Project

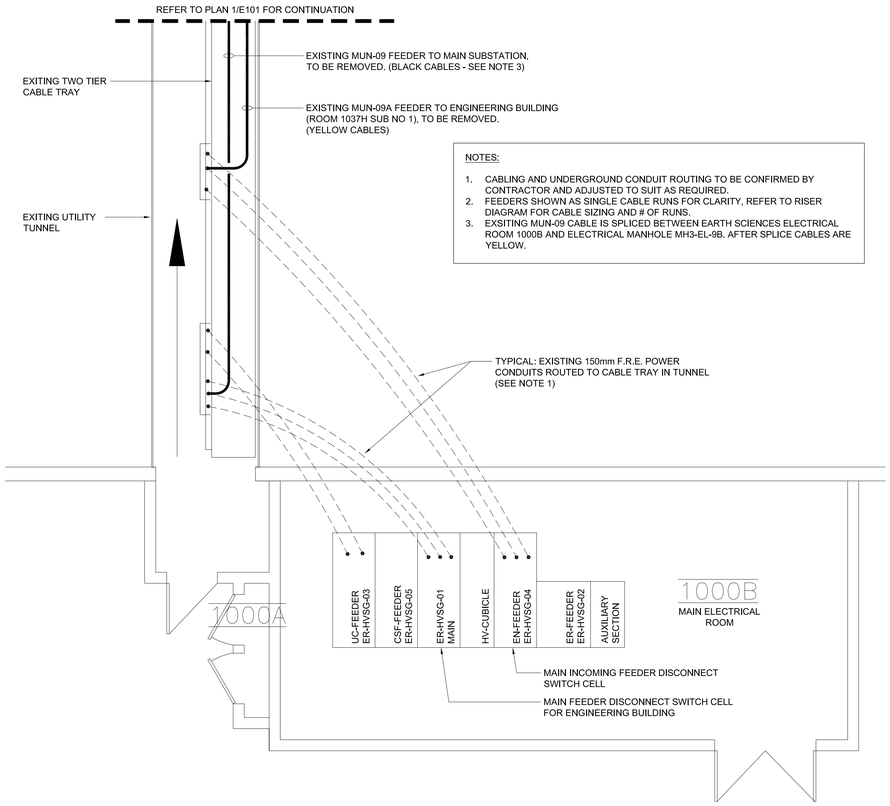
MEMORIAL UNIVERSITY
Department of Facilities Management

MUN-09 FEEDER CABLE REPLACEMENT & PAD MOUNT SWITCHGEAR (TU-509-23)
St. John's, NL Canada

Title
PARTIAL SITE PLANS - NEW SWITCHGEAR

Project No.	Scale
133412009	AS SHOWN

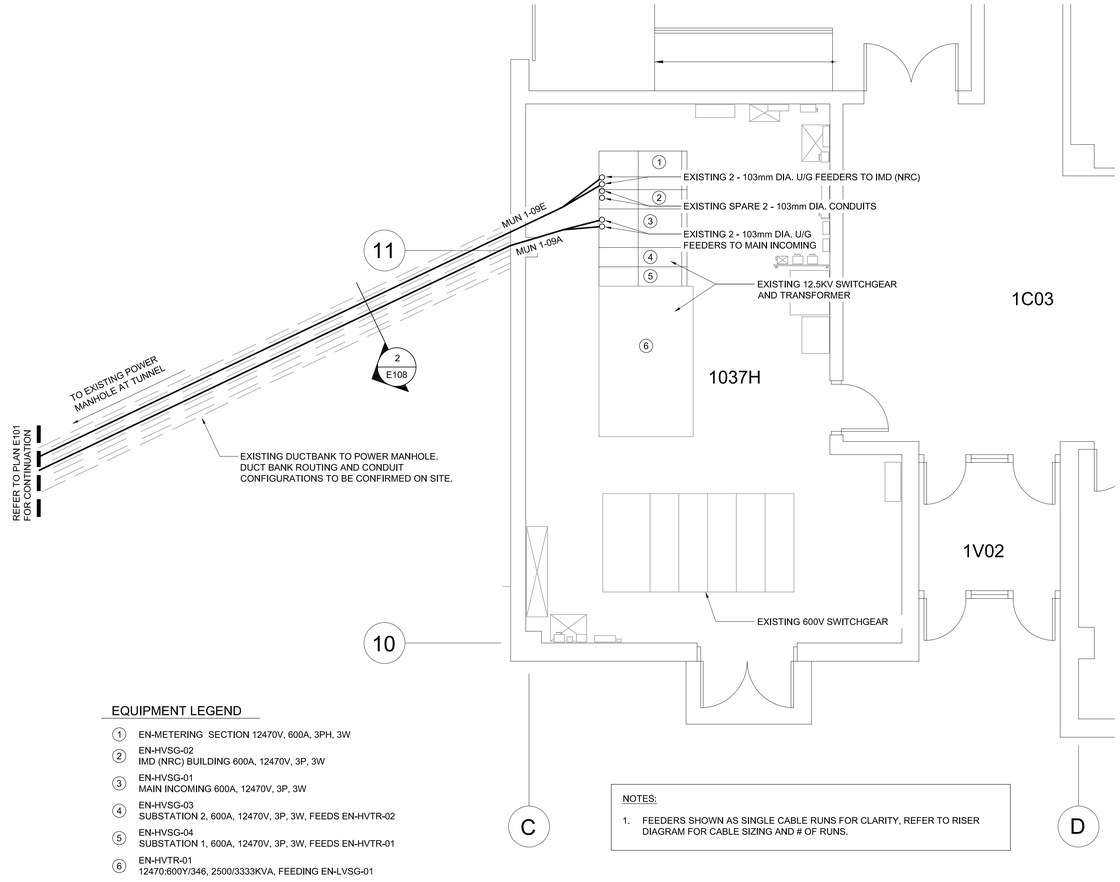
Drawing No.	Revision
E105	0



2 PARTIAL FLOOR PLAN - EXISTING (EARTH SCIENCES BUILDING - LEVEL 1)

2 / E106 SCALE 1:50

0 0.5m 1.0m 1.5m 2.0m 2.5m
1 : 50



EQUIPMENT LEGEND

1. EN-METERING SECTION 12470V, 600A, 3PH, 3W
2. EN-HVSG-02 IMD (NRC) BUILDING 600A, 12470V, 3P, 3W
3. EN-HVSG-01 MAIN INCOMING 600A, 12470V, 3P, 3W
4. EN-HVSG-03 SUBSTATION 2, 600A, 12470V, 3P, 3W, FEEDS EN-HVTR-02
5. EN-HVSG-04 SUBSTATION 1, 600A, 12470V, 3P, 3W, FEEDS EN-HVTR-01
6. EN-HVTR-01 12470:600Y/346, 2500/3333KVA, FEEDING EN-LVSG-01

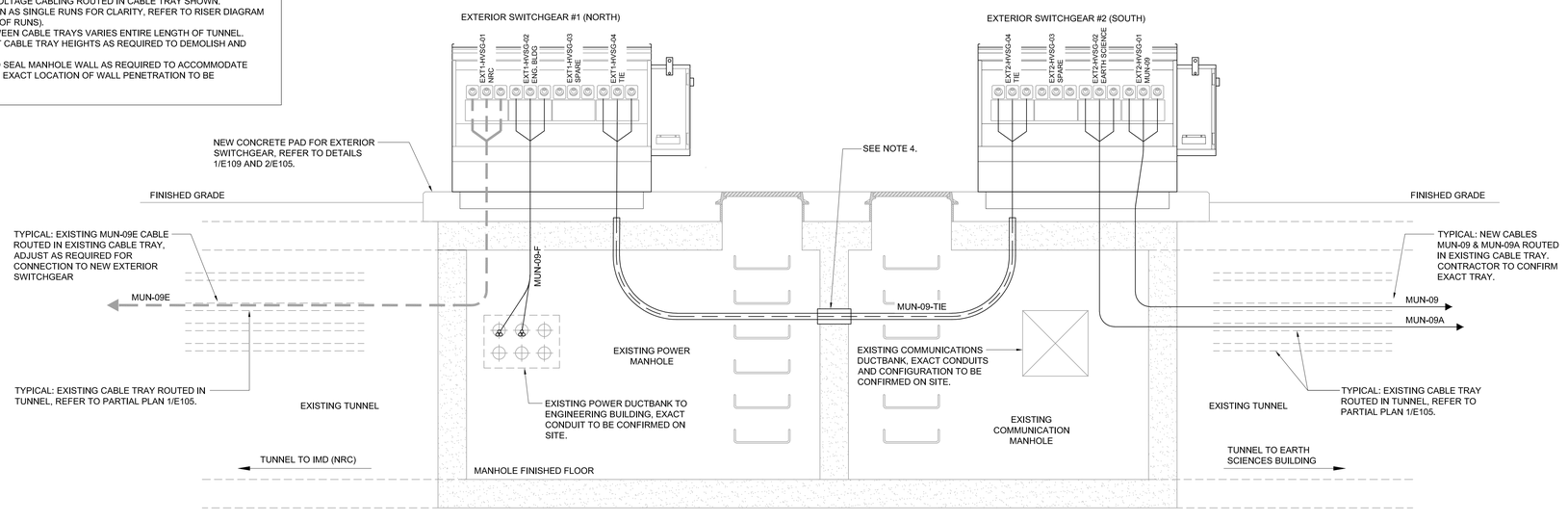
NOTES:
1. FEEDERS SHOWN AS SINGLE CABLE RUNS FOR CLARITY, REFER TO RISER DIAGRAM FOR CABLE SIZING AND # OF RUNS.

1 PARTIAL FLOOR PLAN - EXISTING ENGINEERING BUILDING (SUBSTATION NO .1, ROOM 1037H)

1 / E106 SCALE 1:50

0 0.5m 1.0m 1.5m 2.0m 2.5m
1 : 50

NOTES:
1. NOT ALL MEDIUM / LOW VOLTAGE CABLING ROUTED IN CABLE TRAY SHOWN.
2. EXISTING CABLING SHOWN AS SINGLE RUNS FOR CLARITY, REFER TO RISER DIAGRAM FOR CABLE SIZING AND # OF RUNS).
3. VERTICAL SPACING BETWEEN CABLE TRAYS VARIES ENTIRE LENGTH OF TUNNEL. CONTRACTOR TO ADJUST CABLE TRAY HEIGHTS AS REQUIRED TO DEMOLISH AND INSTALL NEW CABLES.
4. CORE DRILL, SLEEVE AND SEAL MANHOLE WALL AS REQUIRED TO ACCOMMODATE CONDUIT PENETRATIONS. EXACT LOCATION OF WALL PENETRATION TO BE CONFIRMED ON SITE.



3 SECTION AT POWER/COMMUNICATION MANHOLE - REVISED (OUTSIDE ENGINEERING BUILDING)

3 / E106 SCALE 1:25

0 0.25m 0.5m 0.75m 1.0m 1.25m
1 : 25

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BERNIE ROBSON
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2025-10-23
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Client/Project

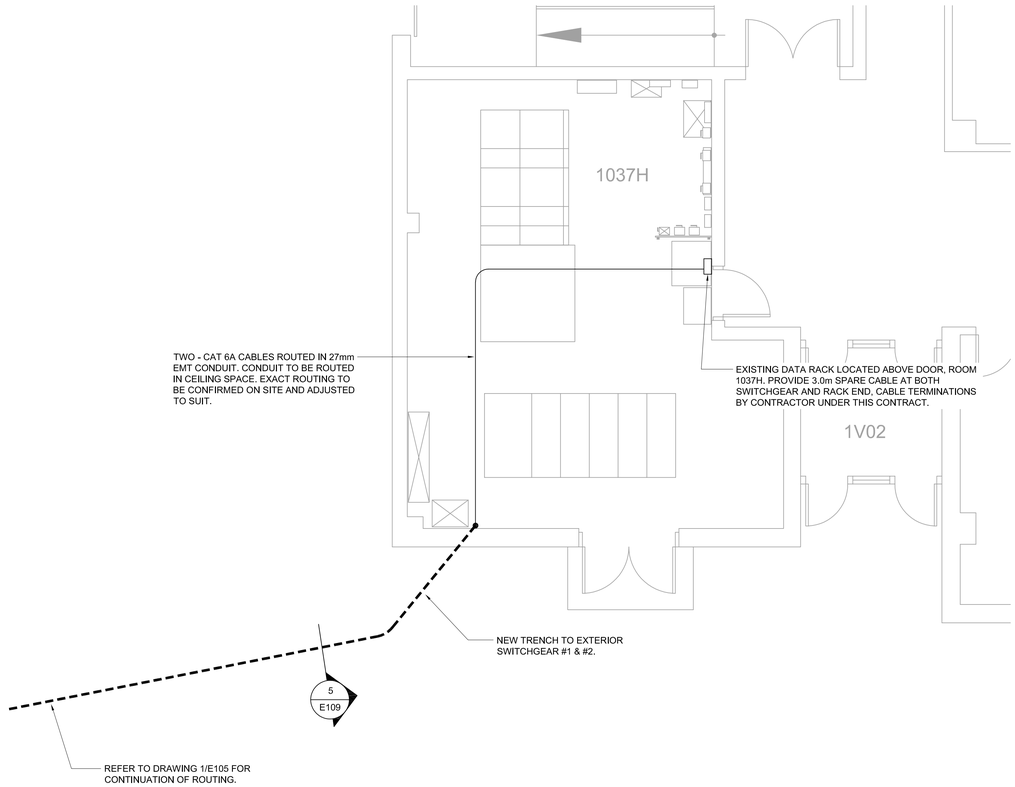
MEMORIAL UNIVERSITY
Department of Facilities Management

MUN-09 FEEDER CABLE REPLACEMENT & PAD MOUNT SWITCHGEAR (TU-509-23)
St. John's, NL Canada

Title
PARTIAL FLOOR PLANS AND SECTION

Project No.	Scale
133412009	AS SHOWN

Drawing No.	Revision
E106	0



1 / E107 PARTIAL FLOOR PLAN ENGINEERING BUILDING - LEVEL 1

SCALE 1:100

0 0.5m 1.0m 1.5m 2.0m 2.5m

1 : 50

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MEMORIAL UNIVERSITY
Department of Facilities Management

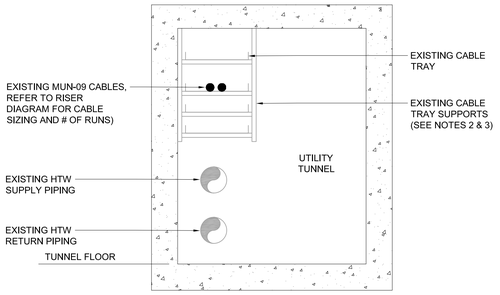
MUN-09 FEEDER CABLE REPLACEMENT
& PAD MOUNT SWITCHGEAR
(TU-509-23)
St. John's, NL Canada

Title
PARTIAL FLOOR PLAN

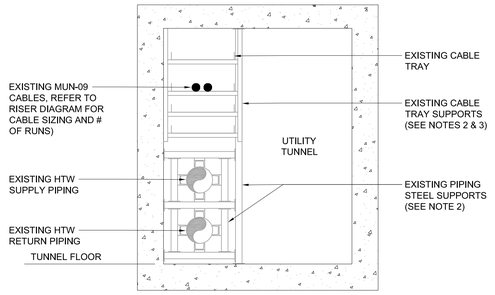
Project No.	Scale	
133412009	AS SHOWN	
Drawing No.		Revision
E107		0

NOTES:

1. NOT ALL MEDIUM / LOW VOLTAGE CABLING SHOWN FOR CLARITY.
2. CABLE TRAY SUPPORT / PIPING SUPPORTS ALTERNATE ALONG ENTIRE ROUTING IN TUNNEL.
3. VERTICAL SPACING BETWEEN CABLE TRAYS VARIES ENTIRE LENGTH OF TUNNEL. CONTRACTOR TO ADJUST CABLE TRAY HEIGHTS AS REQUIRED TO DEMOLISH AND INSTALL NEW CABLES.



SECTION AT CABLE TRAY SUPPORTS



SECTION CABLE TRAY SUPPORTS/PIPING SUPPORTS

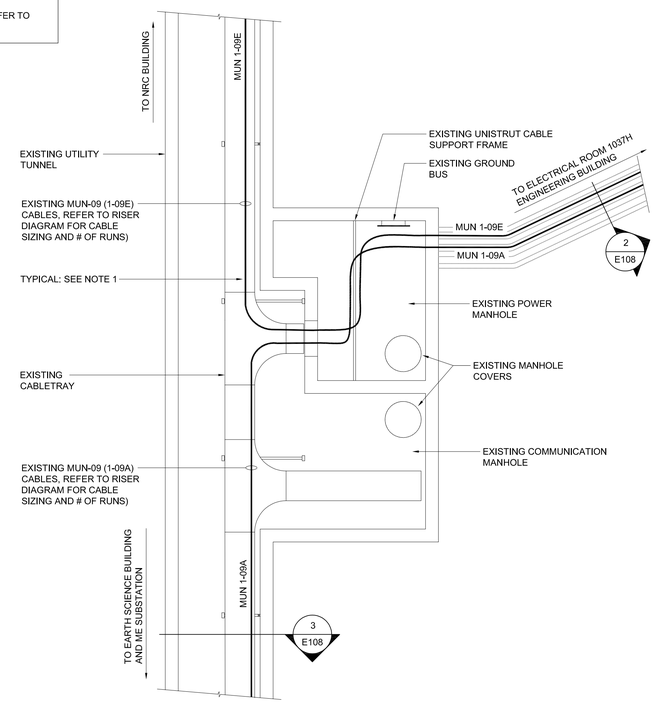
3 / E108 EXISTING TUNNEL SECTIONS - AT TRAY SUPPORT AND PIPING SUPPORT

SCALE 1:25

0 0.25m 0.5m 0.75m 1.0m 1.25m
1 : 25

NOTES:

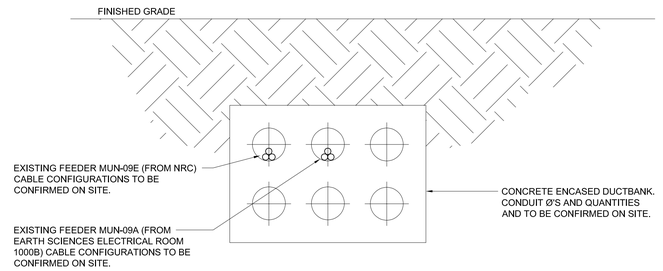
1. NOT ALL MEDIUM / LOW VOLTAGE CABLING SHOWN FOR CLARITY.
2. VERTICAL SPACING BETWEEN CABLE TRAYS VARIES ENTIRE LENGTH OF TUNNEL. CONTRACTOR TO ADJUST CABLE TRAY HEIGHTS AS REQUIRED TO DEMOLISH AND INSTALL NEW CABLES.
3. FEEDERS SHOWN AS SINGLE CABLE RUNS FOR CLARITY, REFER TO RISER DIAGRAM FOR CABLE SIZING AND # OF RUNS.



1 / E108 EXISTING PARTIAL PLAN (MANHOLE AT ENGINEERING BUILDING)

SCALE 1:50

0 0.5m 1.0m 1.5m 2.0m 2.5m
1 : 50



2 / E108 EXISTING TRENCH SECTION - MANHOLE TO ENGINEERING BUILDING (REFERENCE ONLY)

SCALE 1:10

0 100mm 300mm 500mm
1 : 10

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2025-10-23
DATE
NEWFOUNDLAND & LABRADOR

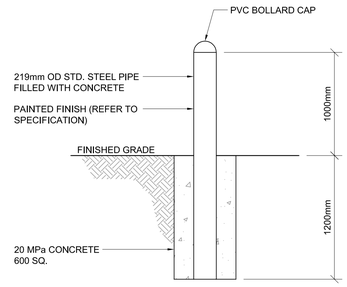
Client/Project

MEMORIAL UNIVERSITY
Department of Facilities Management

MUN-09 FEEDER CABLE REPLACEMENT & PAD MOUNT SWITCHGEAR (TU-509-23)
St. John's, NL Canada

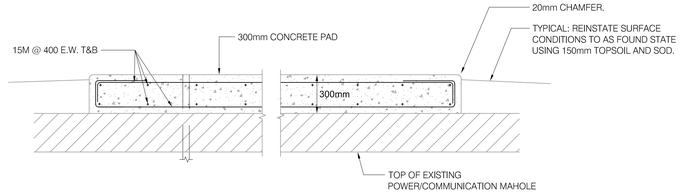
Title
PARTIAL PLAN AND SECTIONS

Project No. 133412009
Scale AS SHOWN
Drawing No. E108
Revision 0



4 E109 BOLLARD DETAIL AT NEW EXTERIOR SWITCHGEAR

SCALE 1:25

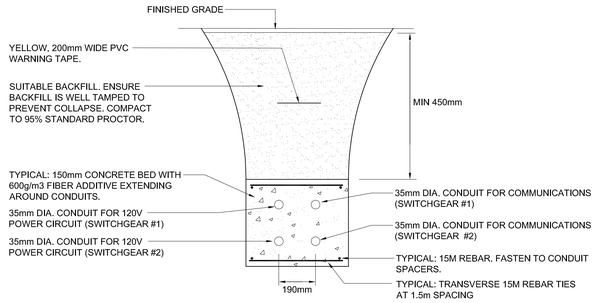


NOTES:

1. COORDINATE CONDUIT AND ANCHORAGE EMBEDMENTS WITH SWITCHGEAR MANUFACTURER.
2. CONTRACTOR TO COMPLETE UNDERGROUND SCANNING FOR EXISTING BURIED UTILITIES TO CONFIRM HORIZONTAL LOCATIONS AND BURIAL DEPTHS. SUBMIT SITE PLAN SKETCH ILLUSTRATING ALL KNOWN BURIED UTILITIES FOR APPROVAL BY OWNERPS REPRESENTATIVE PRIOR TO STARTING EXCAVATION WORK. UTILIZE SERVICES OF AN INDEPENDENT UNDERGROUND SURVEYOR WHERE REQUIRED.
3. SITE CONDITIONS MAY REQUIRE HAND DIGGING AROUND UNDERGROUND SERVICES.

1 E109 SECTION THROUGH EXTERIOR SWITCHGEAR SLAB

N.T.S.

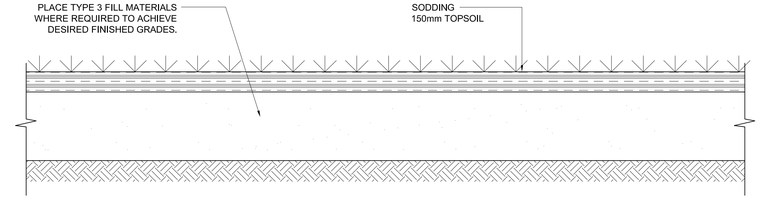


NOTE:

1. PROVIDE CONDUIT SUPPORT SPACERS/CRADLES AT MAXIMUM 2M SPACING.

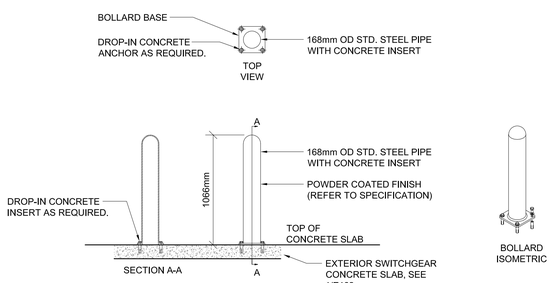
5 E109 TRENCH SECTION - POWER/COMMUNICATIONS TO SWITCHGEARS

N.T.S.



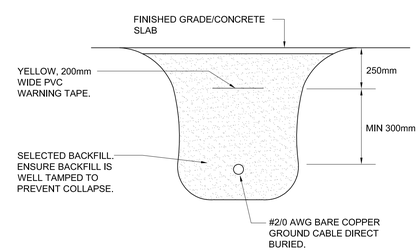
2 E109 LANDSCAPING DETAIL

N.T.S.



6 E109 BOLLARD DETAIL AT NEW EXTERIOR SWITCHGEAR (BOLT-ON TYPE)

SCALE 1:25



3 E109 TRENCH SECTION - GROUNDING

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Client/Project

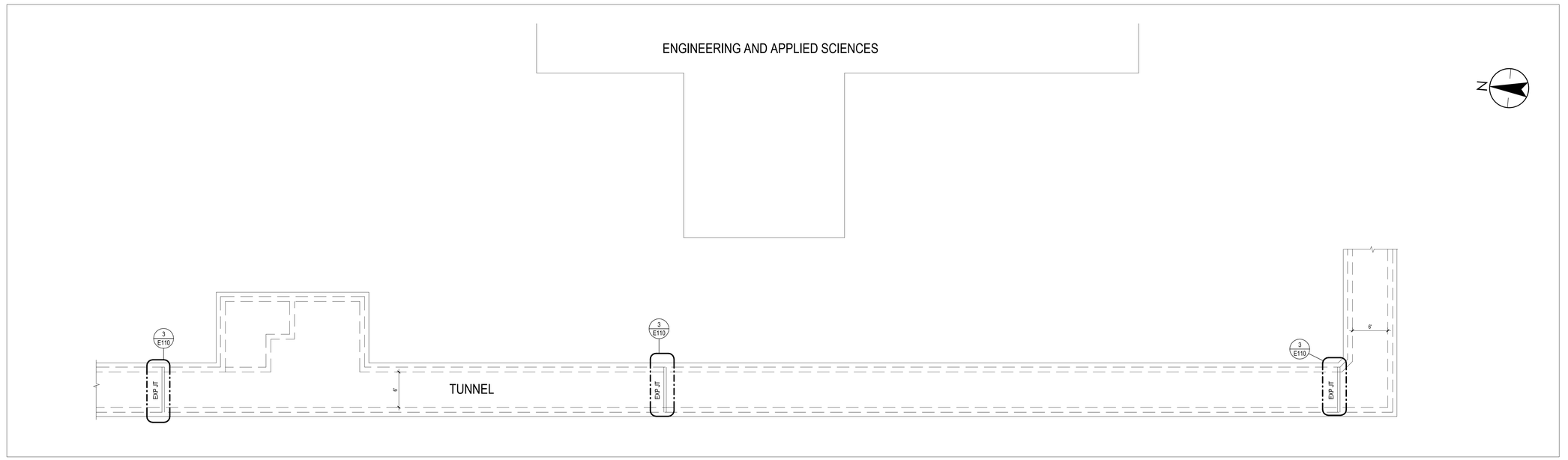
MEMORIAL UNIVERSITY
Department of Facilities Management

MUN-09 FEEDER CABLE REPLACEMENT & PAD MOUNT SWITCHGEAR (TU-509-23)
St. John's, NL Canada

Title
DETAILS AND SECTIONS

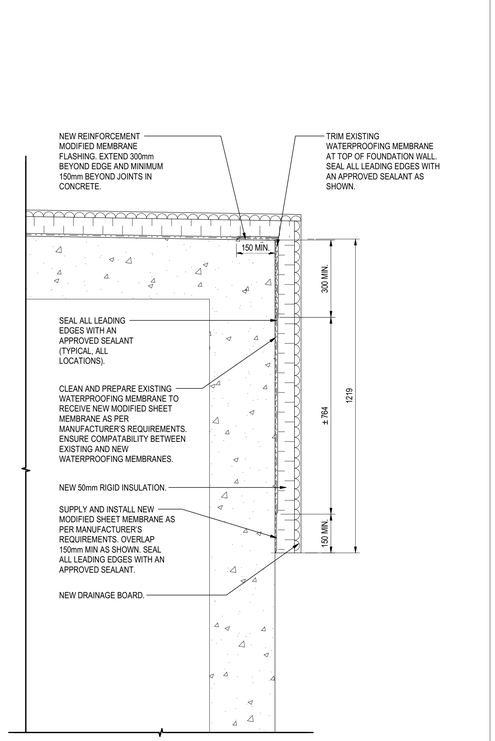
Project No.	Scale
133412009	AS SHOWN

Drawing No.	Revision
E109	0



1 E110 PARTIAL SITE PLAN

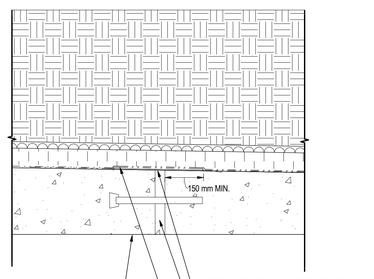
1 : 100



5 E110 NEW WATERPROOFING MEMBRANE- TYPICAL ROOF/WALL DETAIL

1 : 10

*APPLY AT ALL CONTROL JOINTS AND COLD JOINTS

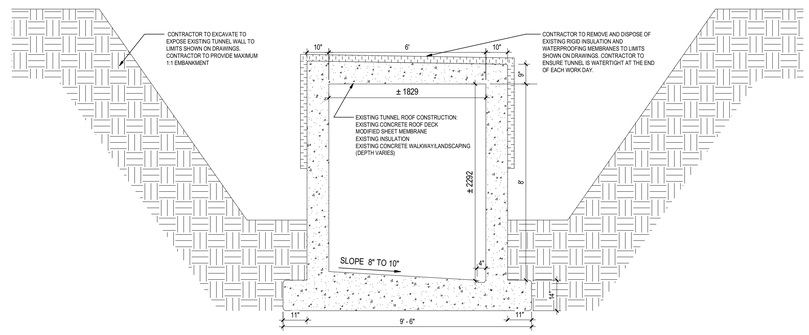


TUNNEL ROOF/WATERPROOFING CONSTRUCTION:

- EXISTING CONCRETE ROOF DECK
- SELF ADHERED SHEET WATERPROOFING MEMBRANE
- NEW 2 LAYERS RIGID BOARD INSULATION:
  - NEW 38mm RIGID BOARD INSULATION
  - NEW 2% SLOPED RIGID BOARD INSULATION
- NEW DRAINAGE BOARD
- NEW APPROVED BACK-FILL SOIL

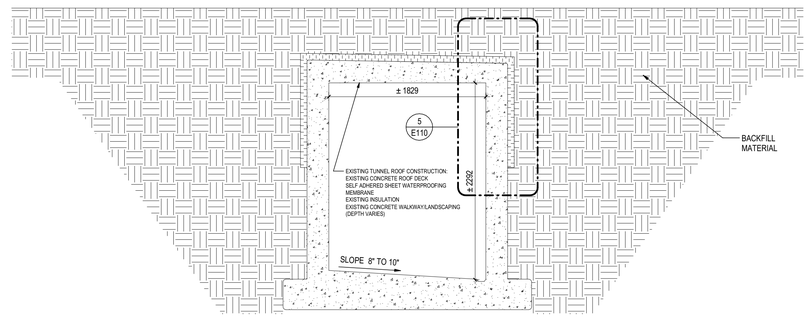
4 E110 CONTROL/ COLD JOINT DETAIL

1 : 10



2 E110 DEMOLITION TUNNEL SECTION

1 : 30



3 E110 NEW TUNNEL SECTION

1 : 30

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2025-10-23

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MUN-09 FEEDER CABLE REPLACEMENT & PAD MOUNTED SWITCHGEAR (TU-509-23)

ST. JOHN'S, NL

Title

PARTIAL SITE PLAN-DEMO/NEW TUNNEL AND DETAILS

Project No.	Scale
133412009	As indicated

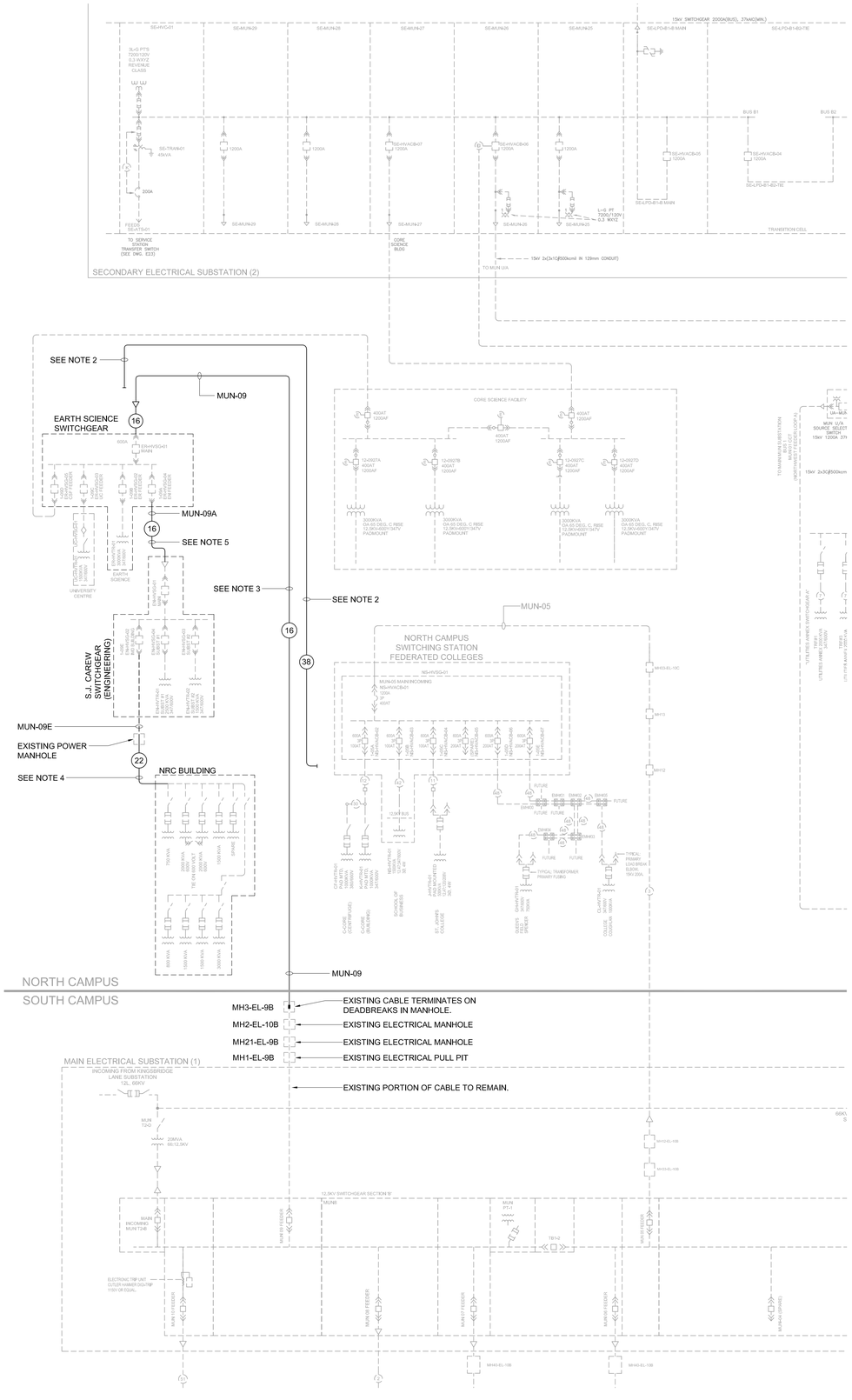
Drawing No. **E110** Revision **0**

EXISTING FEEDER SCHEDULE

TAG	No.	SIZE AND TYPE	RACEWAY	ROUTING	GROUND	AMPS
MUN 09	16	2 x 3C 350 kcmil AL TECK CABLE	CABLE TRAY/CONDUIT	MANHOLE MH3-EL-9B TO EARTH SCIENCE SWITCHGEAR	#3/0 CU CONDUCTOR	520
MUN 09-A	16	2 x 3C 350 kcmil AL TECK CABLE	CABLE TRAY/CONDUIT	EARTH SCIENCE SWITCHGEAR TO ENGINEERING BUILDING	#3/0 CU CONDUCTOR	520
MUN 09-E	22	3 NO. 500kcmil 15KV NU-AL TECK CABLE	CABLE TRAY/CONDUIT	ENGINEERING BUILDING TO NRC	---	
MUN-TEMP	38	2 RUNS OF 3C 350kcmil ALUMINUM TECK CABLE	TRAY	CONDUITS IN TUNNEL TO EARTH SCIENCES BUILDING	---	---

NOTES:

1. SHADING INDICATES EXISTING TO REMAIN UNLESS OTHERWISE INDICATED.
2. EXISTING SPARE // RUNS OF TECK CABLE ROUTED IN TUNNEL CABLE TRAY, TO BE REMOVED.
3. EXISTING // RUNS OF TECK CABLE ROUTED IN TUNNEL FROM DEADBREAKS IN MANHOLE MH3-EL-9B TO EARTH SCIENCES MAIN ELECTRICAL ROOM TO BE REMOVED.
4. EXISTING POWER FEED FROM ENGINEERING BUILDING TO NRC BUILDING TO BE PARTIALLY REMOVED. DISCONNECT CABLE FROM ENGINEERING BUILDING SWITCHGEAR, PULL CABLES BACK THROUGH U/G DUCTBANK TO EXISTING POWER MANHOLE ADJACENT TO BUILDING. COIL CABLES FOR CONNECTION NEW EXTERIOR SWITCHGEAR, REFER TO REVISED RISER. PORTION OF CABLE FROM EXISTING POWER MANHOLE TO NRC SWITCHGEAR TO REMAIN IN PLACE.
5. EXISTING POWER FEED FROM EARTH SCIENCES SWITCHGEAR TO ENGINEERING BUILDING SWITCHGEAR TO BE REMOVED.



1 E601 PARTIAL ELECTRICAL RISER DIAGRAM - DEMOLITION
N.T.S.

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Legend

Notes

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Permit-Seal

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ENGINEERING PERMIT J0291
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04642
Signature or Member Number (Member-in-Responsible Charge)

REGISTERED PROFESSIONAL ENGINEER
PEGNL Newfoundland and Labrador
BERNIE ROISON
SIGNATURE
2025-10-23
DATE
NEWFOUNDLAND & LABRADOR

Client/Project

MEMORIAL UNIVERSITY
Department of Facilities Management

MUN-09 FEEDER CABLE REPLACEMENT & PAD MOUNT SWITCHGEAR (TU-509-23)
St. John's, NL Canada

Title

PARTIAL ELECTRICAL RISER DIAGRAM - DEMOLITION

Project No.	Scale
133412009	N.T.S.

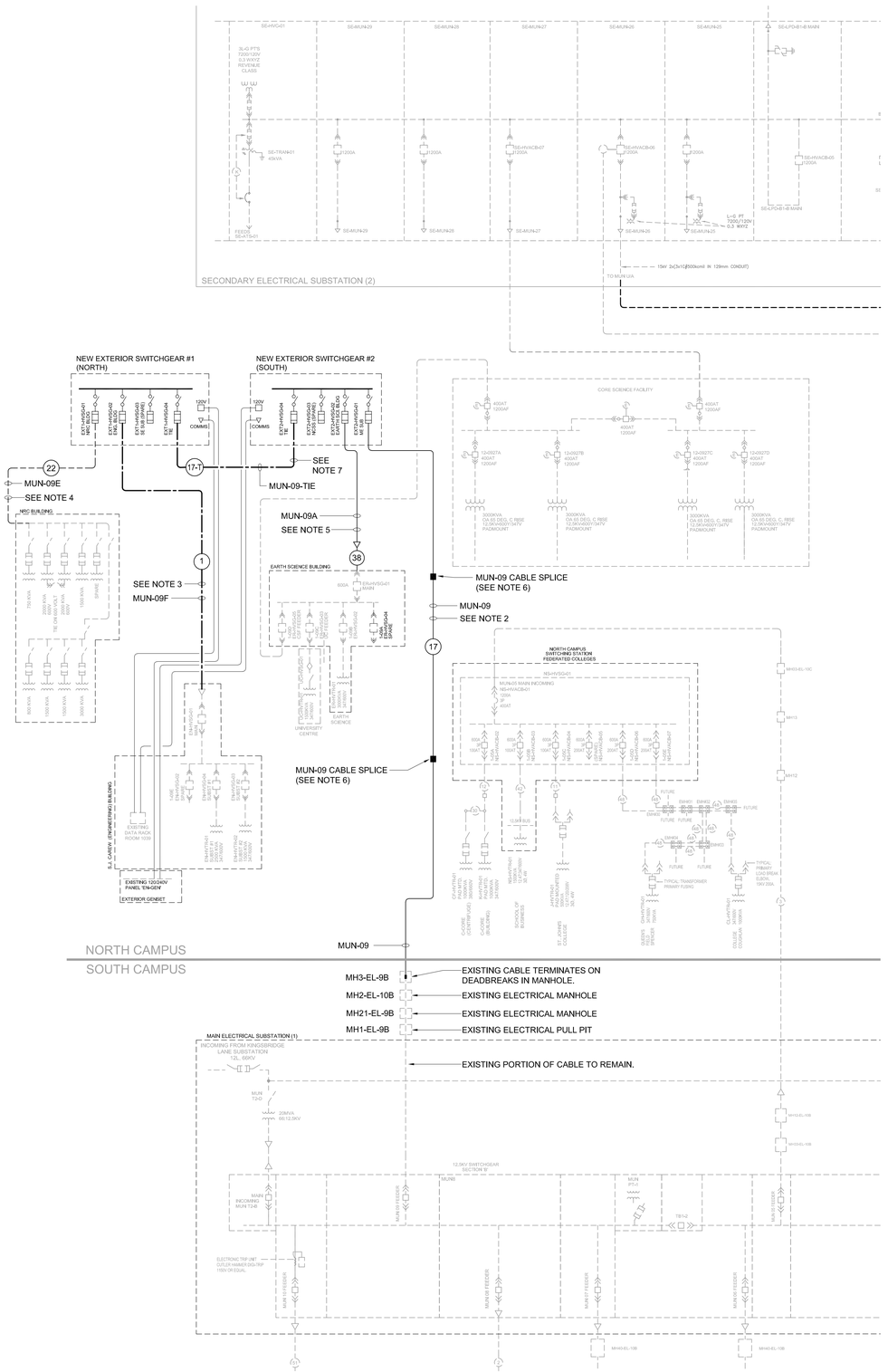
Drawing No.	Revision
E601	0

REVISED FEEDER SCHEDULE

TAG	No.	SIZE AND TYPE	RACEWAY	ROUTING	GROUND	AMPS
MUN 09	17	2// RUNS OF 3C 350 kcmil Cu TECK CABLE	CABLE TRAY	MANHOLE MH3-EL-9B TO EXTERIOR SWITCHGEAR #2 (SOUTH)	#3/0 CU CONDUCTOR	632
MUN 09-A	38	2// RUNS OF 3C 350 kcmil Cu TECK CABLE	CABLE TRAY/CONDUIT	EXTERIOR SWITCHGEAR #2 (SOUTH) TO EARTH SCIENCES BUILDING SWITCHGEAR	#3/0 CU CONDUCTOR	632
MUN 09-TIE	17-T	2 // RUNS OF 3 RUNS OF 1C #350 kcmil 15KV, 133% MV-105 CABLE IN 63mm CONDUIT. (CABLES ONLY SUPPLIED BY MUN)	CONDUIT	EXTERIOR SWITCHGEAR #2 (SOUTH) TO EXTERIOR SWITCHGEAR #1 (NORTH)	#3 CU CONDUCTOR	620
MUN 09-E	22	EXISTING 3 NO. 500kcmil 15KV NU-AL TECK CABLE	CABLE TRAY/CONDUIT	EXTERIOR SWITCHGEAR #1 (NORTH) TO NRC	---	---
MUN 09-F	1	2 // RUNS OF 3 RUNS OF 1C #350 kcmil 15KV, 133% MV-105 CABLE IN EXISTING CONDUIT.	CONDUIT	EXTERIOR SWITCHGEAR #1 (NORTH) TO ENGINEERING BUILDING SWITCHGEAR		632

NOTES:

1. SHADING INDICATES EXISTING TO REMAIN UNLESS OTHERWISE INDICATED.
2. NEW POWER FEED FROM MANHOLE MH3-EL-9B TO NEW EXTERIOR SWITCHGEAR, CABLES SUPPLIED AND INSTALLED BY CONTRACTOR UNDER THIS CONTRACT. CABLES ROUTED IN EXISTING CABLE TRAY IN TUNNEL
3. NEW POWER FEED ROUTED FROM EXTERIOR SWITCHGEAR TO ENGINEERING BUILDING SUBSTATION, CABLES SUPPLIED BY MUN AND INSTALLED BY CONTRACTOR UNDER THIS CONTRACT. CABLES ROUTED IN EXISTING U/G CONDUITS.
4. EXISTING POWER FEED PULLED FROM ENGINEERING BUILDING TO NEW EXTERIOR SWITCHGEAR AND TERMINATED UNDER THIS CONTRACT. EXISTING PORTION OF CABLE FROM NEW EXTERIOR SWITCHGEAR TO NRC ELECTRICAL ROOM IS EXISTING TO REMAIN.
5. NEW POWER FEED FROM EXTERIOR SWITCHGEAR TO EARTH SCIENCES BUILDING , CABLES SUPPLIED AND INSTALLED BY CONTRACTOR UNDER THIS CONTRACT. CABLES ROUTED IN EXISTING CABLE TRAY IN TUNNEL AND U/G CONDUITS.
6. NEW MUN-09 CABLE TO BE SPLICED (MAXIMUM TWO SPLICES IN CABLE RUN). SEE REVISED SITE PLAN FOR APPROXIMATE LOCATIONS. CABLE SPLICES TO BE LOCATED SO OVERALL CABLE RUN = 3 EQUAL LENGTHS. ADJUST LOCATIONS AS REQUIRED.
7. NEW POWER FEED BETWEEN EXTERIOR SWITCHGEAR #1 & #2, CABLES SUPPLIED BY MUN AND INSTALLED BY CONTRACTOR UNDER THIS CONTRACT.



1 E602 PARTIAL ELECTRICAL RISER DIAGRAM - REVISED
N.T.S.

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Notes

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REGISTERED PROFESSIONAL ENGINEER NEWFOUNDLAND & LABRADOR
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BERNIE ROBSON
SIGNATURE
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MUN-09 FEEDER CABLE REPLACEMENT & PAD MOUNT SWITCHGEAR (TU-509-23)
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Project No.	Scale
133412009	N.T.S.
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E602	0