



FACILITIES MANAGEMENT

OPEN CALL FOR BIDS

FOR

**EN-110-23: Engineering Building,
Renovations to EN-4033**

Request for Open Call Number: **TFM-017-25**

Issued: **April 3, 2025**

Submission Deadline: **Thursday, May 1, 2025 @ 3:00PM NDT**

REQUEST FOR OPEN CALL FOR BIDS INFORMATION SHEET

Request for Open Call			
Title:	EN-110-23: Engineering Building, Renovations to EN-4035		
Open Call #:	TFM-017-25	Issue Date:	April 3, 2025
Site Visit:	Location: Engineering Building, EN-4033		April 10, 2025 @ 9:00AM NDT
Questions Deadline:	Eight (8) days prior to closing time, at 3:00pm (NST).	Closing Date & Time: Thursday May 1, 2025 @ 3:00 pm NDT Bid Submission Format: opencalls@mun.ca Opening Date, Time & Location: Thursday, May 1, 2025 @ 3:30 pm NST Via Conference line: 1-416-915-6530 (toll free) Access Code: 2770 928 0292 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-017-25 EN-110-23: Engineering Building, Renovations to EN-4033			
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-017-25 EN-110-23: Engineering Building, Renovations to EN-4033** 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*.

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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 of Bids

Bidders may 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.

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 risk 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.ni.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 its 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 or gases.
- (f) Some University buildings contain asbestos and other hazardous materials. Do not alter or disturb any goods believed to contain asbestos (unless this is a duly authorized part of the project). Consult with University officials before proceeding with any work.
- (g) Safety Data Sheets shall be procured for any hazardous product used on campus. Such sheets shall be made readily available for consultation as required under the Workplace Hazardous Materials Information System (WHMIS).
- (h) Contractors are required to complete the online training module for Memorials Zero Energy Isolation Program (ZEIP) before mobilizing on site. Training can be accessed via the link: <https://ooc.citl.mun.ca/enrol/index.php?id=21>.
 - First time users must create an account. Click 'Create new account'. Enter required information and click 'Create my new account'.
 - A confirmation email will be sent to the email you entered when creating your account. Open that email and click the link it contains.
 - Click 'Zero energy isolation Program for Contractors'.
 - To enroll in the training, enter the enrollment key: 7653. Click 'Enroll me'.
 - Complete the training according to the instructions provided in the course.
 - Successful completion certificates shall be available during auditing by Environmental Health & Safety.

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

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

4.3.0 Contractor Safety Management

- 4.3.1** All Contractors and Subcontractors to be used by the Contractor in the execution of the Contract shall be required to submit confirmation of a current third party occupational health and safety program certification (Letter of Assurance). These may include, but not be limited to, Certificate of Recognition (COR), OHSAS 18001, and CSA Z.1000.
- 4.3.2** All Contractors and Subcontractors shall be required to review and follow all requirements of sections 4.4.5.2. below.

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

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

4.4.0 Contractor Safety Management Element

4.4.1 Purpose

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

4.4.2 Scope

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

4.4.3 Definitions

Act: Newfoundland & Labrador Occupational Health & Safety Act, latest edition.

Contract: A documented agreement between Memorial University and a contractor.

Contractor: The principal contractor, person, partnership, or corporation bound to execute the work under the contract and defined as such in the agreement is responsible for the supervision of the work so as to ensure the work is carried out in accordance with the contract.

Project Management Team: The group assigned by the University to act on behalf of the owner with respect to the execution of Contractor work.

Principal Contractor: The person primarily responsible for the carrying out of a contract.

Regulations: Newfoundland & Labrador Occupational Health & Safety Regulations, latest edition.

Subcontractor: A person, firm or corporation having a direct contract with the Contractor or subcontractor(s) to perform a part or parts of the work included in the contract, or to supply products worked to a special design according to the contract documents, but does not include one who merely supplies products not so worked.

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

Work: The services and job procedure completion that is described in the contract.

4.4.4 Roles and Responsibilities

4.4.4.1 Project Management Team, including Environmental Health & Safety

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

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

4.4.4.2 Contractors

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

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

4.4.5 Procedure

4.4.5.1 Considerations prior to signing of contract

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

4.4.5.2 Requirements

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

Contractors shall also provide the following:

- (a) health and safety policy statement;
- (b) safety program table of contents; and
- (c) site hazard assessment;

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

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

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

- (a) safety program and/or manual
- (b) applicable documented safe work practices;
- (c) inspection reports and schedules;
- (d) required employee safety training certifications and qualifications; and
- (e) updated list of OHS Committee and/or a worker health and safety representative, or workplace health and safety designate.

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

Memorial reserves the right to:

- (a) Reject any Contractor that fails to meet the requirements or schedules outlined herein;
- (b) The University reserves the right to stop any work or portion of work where the risk presents an immediate danger.

4.4.5.3 Schedule of Submissions

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

4.4.6 Post-Contract Evaluation

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

4.5 Access To Site

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

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

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

[End of Part 4]

PART 5– GENERAL CONDITIONS

- 5.1** I/We hereby authorize the Owner to release names of Subcontractors, Suppliers and Manufacturers used in my/our Bid including those as listed in Appendix "D", where such information is requested from the Owner.
- 5.2** I/We understand that Bids that do not list major Subcontractors and Suppliers and Manufacturers where required in Appendix "D" may be rejected.
- 5.3** I/We reserve the right to substitute other Subcontractors and/or Suppliers and/or Manufacturers for any Subcontractor or Suppliers or Manufacturer withdrawing their Bid or becoming bankrupt after the date hereof. Any such substitutes shall be subject to the approval of the Owner and contingent upon evidence of withdrawal or bankruptcy satisfactory to the Owner.
- 5.4** I/We agree that upon approval by the Engineer/Architect, the Owner shall have the right to take possession of any part of the work upon its completion, except for minor deficiency items, and that such possession shall not necessarily constitute acceptance of that part of the work.
- 5.5** I/We understand and agree that the Owner may order changes to the work in the form of additions or deletions in accordance with the General Conditions, Supplementary General Conditions and the intent of the Contract Documents.
- 5.6** I/We understand and agree that the Unit Price Table in Appendix "C2" must be completed where indicated and the total amount included in my/our stipulated price for the total performance of the work under Part 4 of the Bid and Acceptance form. I/We understand that the Unit Prices include all costs and charges of every kind, including overhead and profit, to perform the items of work listed in Appendix "A". I/We also understand that these same Unit Prices will be used for additions or deletions to the actual measured quantities.
- 5.7** When Appendix "E" is included in the Open Call, I/we understand that bids which do not list project references, where required in Appendix "E", will be rejected.

5.8 Corporations Act

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

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

[End of Part 5]

Part 6 – Supplementary Terms and Conditions

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

6.2 Surety

6.2.1 Bid Surety

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

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

6.2.2 Public Work's Surety

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

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

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

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

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

6.3 Site Visit

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

Questions will not be answered at the site visit.

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

6.4 Substitution of Materials

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

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

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

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

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

The decision on substitutions will be final.

6.5 Completion date

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

[End of Part 6]

APPENDIX A – SPECIFICATIONS AND DRAWINGS

**SPECIFICATIONS AND DRAWINGS
LOCATED AT THE END OF THIS DOCUMENT**

APPENDIX B – SUBMISSION FORM

1. Bidder Information

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

2. Offer

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

3. Rates

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

4. Addenda

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

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

TABLE 1.10: ADDENDA RECEIVED

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

5. No Prohibited Conduct

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

6. Disclosure of Information

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

7. Bid Irrevocable

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

8. Execution of Agreement

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

BIDDER SIGNATURE FORM:

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

(See Part 1 section 1.8 for Electronic Signature acceptance)

Signature of Witness

Signature of Bidder Representative

Name of Witness

Name of Bidder Representative

Title of Bidder Representative

Date

I have the authority to bind the bidder.

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

APPENDIX C1 – PRICING FORM

1. INSTRUCTIONS ON HOW TO COMPLETE THE PRICING FORM

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

	Contract Bid (HST Excluded)	
Price A: Subtotal		HST EXCLUDED
Price B: Sum of Allowances (Section 01 21 00)	\$4,347.82	HST EXCLUDED
Price C: Total: [(A+B)]		HST EXCLUDED

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

2. THE DELIVERABLES:

EN-110-23: Engineering Building, Renovations to EN-4033
as per specifications listed in Appendix A

3. MANDATORY SUBMISSION REQUIREMENTS

(a) Submission Form (Appendix B)

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

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

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

APPENDIX C2 – UNIT RATES

<PAGE INTENTIONALLY LEFT BLANK, APPENDIX NOT USED>

APPENDIX C3 - FURNITURE BIDDING TABLE

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APPENDIX D - LIST OF SUBCONTRACTORS

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

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

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

TRADE/DIVISION	SUBCONTRACTOR - SUPPLIER - MANUFACTURER
Hazardous Materials Abatement	
Demolition	
Masonry	
Metal Stud & Gypsum Board	
Doors & Frames	
Flooring	
Plaster & Paint	
Furnishings	
Electrical	
ADD TRADES AS REQUIRED	

APPENDIX E – PROJECT REFERENCE (ROOFING PROJECTS ONLY)

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APPENDIX F – MUNet Spec

MUNet Specification

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1. Overview

1.1 General

The objective of this document is to provide a framework for incorporating changes to the MUNet Cable Plant. These changes will include drop additions, drop removals and drop moves.

Changes to the MUNet Cable Plant must be incorporated in a controlled manner in order to maintain the integrity of the cable plant on an on-going basis. Items to be addressed include:

- conduit materials & installation
- raceway materials & installation
- cable tray materials & installation
- utility column materials & installation
- data cabling materials & installation
- data closet arrangements
- testing
- documentation
- labelling

New buildings and major renovations of telecommunications spaces and pathways are beyond the scope of this document but should conform to CAN/CSA T530. In cases of renovations in historic or otherwise restrictive buildings, where it is impossible to follow the aforementioned guidelines, the exceptions must not modify the maximum distances set forth in CAN/CSA T529 and must not in any way affect the performance of the cabling system. Modification to these issues require written approval from purchaser and certifying manufacturer.

1.2 Notice

The MUNet Data Network is an operational, campus wide, high performance computer network used by the entire Memorial University community - faculty, staff and students. The objective of this document is to address Moves, Adds and Changes to the Physical Cable Plant for the MUNet Data Network.

It is critical that all personnel involved with both the Design and Installation effort addressed by this document take the necessary care and attention to ensure that network operation is not impacted by any of their activities. All work must be coordinated with both the Computing & Communications and Facilities Management Departments of the University.

All work must be approved by the Computing & Communications Department of the University.

1.3 Description of Work

Work is defined on drawings and includes but is not limited to:

- Supply, installation, removal of data cabling conduit system.
- Supply, installation, removal, testing and documentation of NORDX/CDT IBDN Data Cabling for the MUNet Data Network at Memorial University of Newfoundland. This includes moves, adds and deletions of data drops.
- Products include cabling, faceplates, patch panels, interbay panels

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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.

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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.

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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

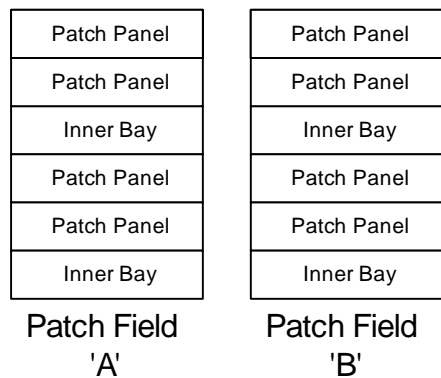
The riser closets are connected to the building entrance closets using 12 fiber multimode cable in a physical star arrangement. In addition the Engineering, CERR and Chemistry Physics buildings have computer rooms connected back to the entrance closet also with 12 fiber multimode cable.

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

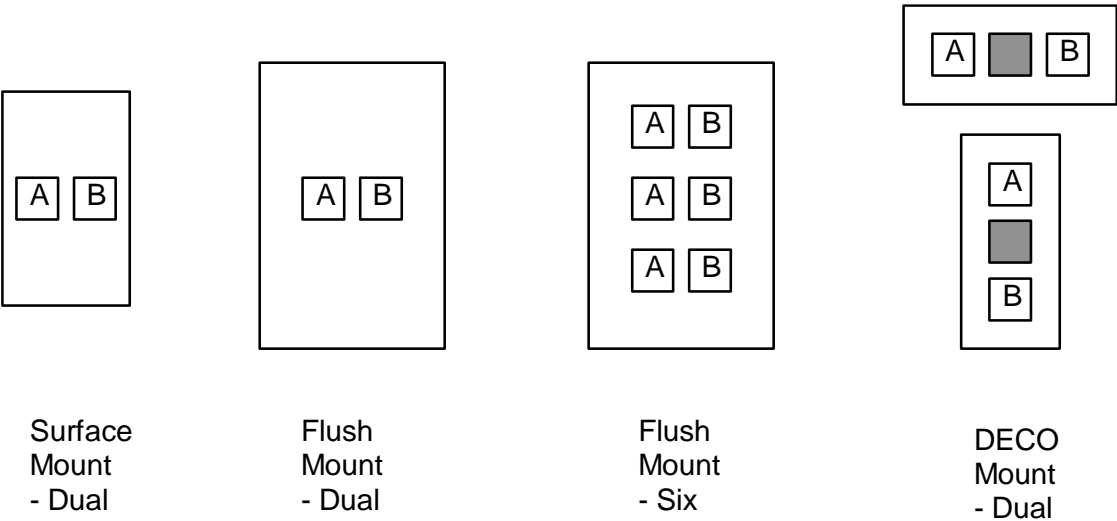


Vertical Configuration

Patch Panel
Patch Panel
Inner Bay
Patch Panel
Patch Panel
Inner Bay
Patch Panel
Patch Panel
Inner Bay
Patch Panel
Patch Panel

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:



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,

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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
	T-2.1	SC2022R	Entrance
	T-2.2	SC2014	Riser
Hatcher	H9-3.1	9-313A	Entrance
OSC OSC Annex	OS-4.1	OS4000A	Entrance
	AX-3.1	AX3003	Riser
St. John's Coll.	J-3.1	J3006	Entrance
T10	PA-1.1	PA1013B	Entrance

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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

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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

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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.

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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
---------	------------	------------------	-----------------

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Internal diameter				Wire OD	2 cables per drop
mm	in	mm	in	mm 5.2 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

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:

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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.

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- 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

<u>Condition</u>	<u>Minimum Separation</u>		
	<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.

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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	2 cables per drop
mm	in	mm	in	mm 5.2 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.

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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.

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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 3.3.2.1 and 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

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- 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.

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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

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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.

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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
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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.		

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.

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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 OSC Annex	OS-4.1	OS4000A	Entrance
	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

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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

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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.

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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.

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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:

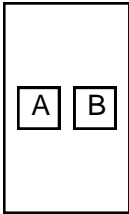
The labelling system used for all drops is a ten character alpha numeric string (10 for buildings with two character identifiers, 9 for buildings with one character identifiers). The label is formatted in the following manner, **L51-5001A**, and contains embedded information to allow easy identification 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

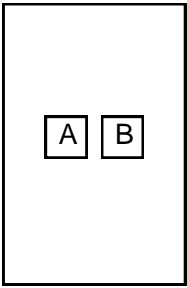
The drop labels consist of a two section white label with black lettering. The first section contains the Building and Closet information. The second section contains the Floor, Sequence and Field information. The total label size is approximately 1/2 x 1-1/2 inches (12 x 38 mm).

The following diagram illustrates the MUNet faceplate types and the typical label locations for each type.

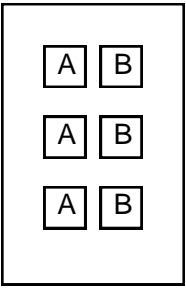
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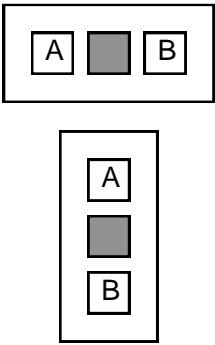
Surface Mount - Dual



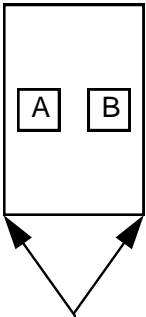
Flush Mount - Dual



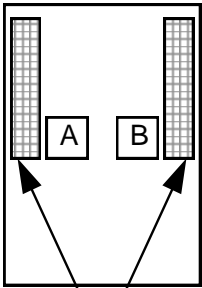
Flush Mount - Six



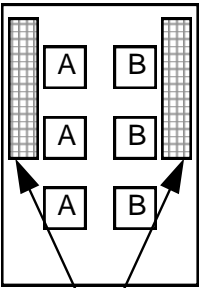
DECO Mount - Dual



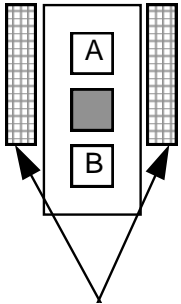
Label to be located on sides.



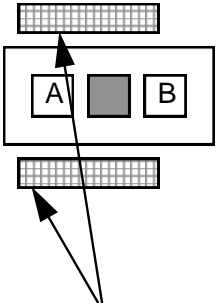
Label locations.



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 personnel 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



DEPARTMENT OF FACILITIES MANAGEMENT

GENERAL CONDITIONS

AND

AGREEMENT BETWEEN OWNER AND CONTRACTOR

FOR

THE STIPULATED PRICE CONTRACT

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

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1.0 GENERAL CONDITIONS

1.1.0 DEFINITIONS

1.1.1 Contract Documents

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

1.1.2 Owner, Engineer/Architect, Contractor

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

1.1.3 Subcontractors

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

1.1.4 The Project

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

1.1.5 The Work

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

1.1.6 Place of Work

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

1.1.7 Products/Materials/Equipment

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

1.1.8 Other Contractor

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

1.1.9 Time

- a) The Contract Time is the time stated in the Open Call for Bid and Acceptance Form for substantial performance of the Work.
- b) The date of substantial performance of the Work is the date certified by the Engineer/Architect.
- c) The term day, as used in the Contract Documents, shall mean the calendar day.
- d) The term working day means any day observed by the construction industry in the area of the place of the Work.

1.1.10 Substantial Performance of the Work

A Contract shall be deemed to be substantially performed:

- a) When the Work or a substantial part thereof is ready for use or is being used for the purpose intended; and
- b) When the Work to be done under the Contract is capable of completion or correction at a cost of not more than:
 - (i) 3% (Three per centum) of the first two hundred and fifty thousand dollars (\$250,000) of the Contract Price;
 - (ii) 2% (Two per centum) of the next two hundred and fifty thousand dollars (\$250,000) of the Contract Price; and
 - (iii) 1% (One per centum) of the balance of the Contract Price.
- c) When the Work or a substantial part thereof is ready for use or is being used for the purpose intended and where the Work cannot be completed expeditiously for

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

1.1.11 Total Performance of the Work

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

1.1.12 Changes in the Work

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

1.1.13 Extra Work

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

2.2.0 DOCUMENTS

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

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

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

- a) Documents of later date shall govern;
- b) Figured dimensions shown on the drawings shall govern even though they may differ from scaled dimensions on the same drawing;
- c) Drawings of larger scale shall govern over those of smaller scale of the same date;
- d) Specifications shall govern over drawings;
- e) Special Conditions shall govern over Specifications;
- f) The General Conditions of Contract shall govern over Specifications;
- g) Supplementary General Conditions shall govern over the General Conditions of the Contract;

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

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

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

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

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

2.3.0 ADDITIONAL INSTRUCTIONS AND SCHEDULE OF WORK

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

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

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

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

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

2.4.0 ENGINEER/ARCHITECT'S DECISIONS

- 2.4.1** The Engineer/Architect, in the first instance, shall decide on questions arising under the contract Documents and interpret the requirements therein. Such decisions shall be given in writing.
- 2.4.2** The Contractor shall notify the Engineer/Architect in writing within fourteen (14) days of receipt of a decision of the Engineer/Architect referred to in 2.4.1, should they hold that a decision by the Engineer/Architect is in error and/or at variance with the Contract Documents. Unless the Contractor fulfils this requirement, subsequent claims by them for extra compensation arising out of the decision will not be accepted.
- 2.4.3** If the question of error and/or variance is not resolved immediately, and the Engineer/Architect decides that the disputed work shall be carried out, the Contractor shall act according to the Engineer/Architect's written decision.

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

2.5.0 DELAYS

- 2.5.1** If it can be clearly shown that the Contractor is delayed in the performance of the Work by any act or fault of the Owner, Engineer/Architect, then the Contract Time shall be extended for such reasonable time as the Engineer/Architect may decide in consultation with the Owner and the Contractor. The Contractor shall be entitled to be reimbursed for any costs incurred by them as a result of such a delay occasioned by the act or fault, provided that it can be clearly shown that the Contractor's forces cannot work efficiently elsewhere on the project and that the incurred cost is limited to that which could not reasonably have been avoided.
- 2.5.2** If the Contractor is delayed in the performance of the Work by a Stop Work Order issued by any court or other public authority and providing that such order was not issued as the result of any act or fault of the Contractor or of anyone employed by them directly or indirectly then the Contract Time shall be extended for such reasonable time as the Engineer/Architect may decide in consultation with the Contractor.
- 2.5.3** If the Contractor is delayed in the performance of the Work by civil disorders, labour disputes, strikes, lockouts, (including lockouts decreed or recommended for its members by a recognized Contractor's Association, of which the Contractor is a member) fire, unusual delay by common carriers or unavoidable casualties, or without limit to any of the foregoing, by any cause of any kind whatsoever beyond the Contractor's control, then the Contract Time shall be extended for such reasonable time as may be decided by the Engineer/Architect in consultation with the Owner and the Contractor, but in no case shall the extension of time be less than the time lost as the result of the event causing the delay, unless such shorter extension of time be agreed to by the Contractor.

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

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

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

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

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

- a) Fails to proceed regularly and diligently with the Work; or
- b) Without reasonable cause wholly suspends the carrying out of the Work before the completion thereof; or
- c) Refuses or fails to supply sufficient, properly skilled workmen for proper workmanship, products or construction machinery and equipment for the scheduled performance of the Work within five (5) working days of receiving written notice from the Engineer/Architect except in those cases provided in **2.5.0 DELAYS**; or
- d) Fails to make payments due to their Subcontractors, their Suppliers for their workmen; or
- e) Persistently disregards laws or ordinances, or the Engineer/Architect's instructions; or
- f) Otherwise violates the provisions of their Contract to a substantial degree.

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

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

- a) Commence the correction of the default within the specified time; and
- b) Provide the Owner with an acceptable schedule for such correction; and
- c) Complete the correction in accordance with such schedule.

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

- a) Correct such default and deduct the cost thereof as certified by the Engineer/Architect from any payment due under the Contract; or
- b) Terminate the Contract by written notice to the Contractor. If a Performance Bond has been provided by the Contractor, the Owner will provide the Surety with a copy of such notice.

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

- a) Take possession of the premises and products and utilize the temporary buildings, plants, tools, construction machinery and equipment, goods and materials, intended for, delivered to and placed on or adjacent to the Work and may complete the Work by whatever method they may deem expedient but without undue delay or expense;
- b) Withhold any further payments to the Contractor until the Work is finished;
- c) Upon total performance of the Work, charge the Contractor the amount by which the full cost of finishing the Work as certified by the Engineer/Architect including compensation to the Engineer/Architect for their additional services and a reasonable allowance to cover the cost of any corrections required by **2.26.0 WARRANTY** exceeds the unpaid balance of the Contract Price; or if such cost of finishing the Work is less than the unpaid balance of the Contract Price, pay the Contractor the difference;
- d) On expiry of the warranty period, charge the Contractor the amount by which the cost of corrections under **2.26.0 WARRANTY** exceeds the allowance provided for such corrections, or if the cost of such corrections is less than the allowance, pay the Contractor the difference;

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

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

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

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

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

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

- a) The Engineer/Architect fails to issue a certificate in accordance with **2.16.0 CERTIFICATES AND PAYMENTS;**
- b) The Owner fails to pay the Contractor when due any amount certified by the Engineer/Architect and verified by the audit of the Owner;
- c) The Owner violates the provisions of the Contract to a substantial degree.

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

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

2.8.0 OTHER CONTRACTORS

- 2.8.1** The Owner reserves the right to let separate contracts in connection with the project of which the Work is part or do certain work by their own forces.
- 2.8.2** The Owner shall, in such cases, coordinate the Work and insurance coverage of other Contractors as it affects the Work of this Contract.
- 2.8.3** The Contractor shall coordinate their work with that of other Contractors and connect as specified or shown in the Contract Documents. Any change in the costs incurred by the Contractor in the planning and performance of such work which was not shown or included in the Contract Documents as of the date of signing the Contract, shall be evaluated as provided under **2.14.0 VALUATION AND CERTIFICATION OF CHANGES IN THE WORK** and authorized as provided in **2.13.0 CHANGES IN THE WORK AND EXTRA WORK**.
- 2.8.4** The Contractor shall report to the Engineer/Architect any apparent deficiencies in other Contractor's work which would affect this Contract immediately as they come to their attention and shall confirm such report in writing. Failure by the Contractor to so report shall invalidate any claims against the Owner by reason of the deficiencies of other Contractor's work except as to those of which they were not reasonably aware.

2.9.0 ASSIGNMENT

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

2.10.0 SUBCONTRACTORS

- 2.10.1** The Contractor agrees to preserve and protect the rights of the Owner under the Contract with respect to any work to be performed under subcontract. The Contractor shall:
- a) Require their Subcontractors to perform their work in accordance with and subject to the terms and conditions of the Contract Documents; and
 - b) Be fully responsible to the Owner for acts and omissions of their Subcontractors and of persons directly or indirectly employed by them as for acts and omissions of persons directly employed by them.

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

- 2.10.2** The Contractor shall employ those Subcontractors proposed by them in writing and accepted by the Owner prior to the signing of the Contract for such portions of the Work as may be designated in the bidding requirements.
- 2.10.3** The Owner may, for reasonable cause, object to the use of a proposed Subcontractor and require the Contractor to employ one of the other Subcontractors.
- 2.10.4** In the event that the Owner requires a change from any proposed Subcontractor, the Contract price shall be adjusted by the difference in cost occasioned by such required change.
- 2.10.5** The Contractor shall not be required to employ as a Subcontractor any person or firm to whom they may reasonably object.
- 2.10.6** The Engineer/Architect may, upon reasonable request and at their discretion, provide to a Subcontractor information as to the percentage of the Subcontractor's work which has been certified for payment.
- 2.10.7** Nothing contained in the Contract Documents shall create any contractual relationship between any Subcontractor and the Owner.

2.11.0 DISPUTES

- 2.11.1** Differences between the parties to the Contract as to the interpretation, application or administration of this Contract or any failure to agree where agreement between the parties is called for, herein collectively called disputes, which are not resolved in the first instances by decision of the Engineer/Architect pursuant to the provisions of **2.4.0 ENGINEER/ARCHITECT'S DECISIONS** shall be settled in accordance with the requirement of the General Conditions.
- 2.11.2** The Claimant shall give written notice of such dispute to the other party no later than fourteen (14) days after the receipt of the Engineer/Architect's decisions given under **2.4.0 ENGINEER/ARCHITECT'S DECISIONS**. Such notice shall set forth particulars of the matters in dispute, the probable scope, extent and value of the dispute and relevant provisions of the Contract Documents. The other party shall reply to such notice no later than fourteen (14) days after they receive or are considered to have received it, setting out in such reply their grounds and other relevant provisions of the Contract Documents.
- 2.11.3** Pending settlement of the dispute, the Engineer/Architect will give such instructions as, in their opinion, are necessary for the proper performance of the Work or to prevent delays pending settlement of the dispute. The parties shall act immediately according to such instructions, it being understood that by so doing neither party will jeopardize any claim they may have. If it is subsequently determined that such instructions were in error or at variance with the Contract Documents, the Owner shall pay the Contractor cost incurred by the Contractor in carrying out such instructions which they were

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

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

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

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

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° F, (higher if required for special trades). Heating equipment not adequately protected or operated in conditions other than those intended by the manufacturer shall be regarded as temporary. Remove all such equipment and replace with new permanent equipment.

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

4.4.5 Water Supply

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

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

4.5.0 PLANT AND MACHINERY

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

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

4.6.0 PROTECTION OF PUBLIC AND WORKMEN

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

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

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

4.7.0 CONSTRUCTION SCHEDULE

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

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

Weekly schedule updates shall be provided.

Provide updated construction schedule demoting the original.

4.8.0 PROGRESS PHOTOGRAPHS

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

4.9.0 OPERATIONS AND MAINTENANCE DATA

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

- a) Bind data in vinyl hard covered, 3-ring, loose-leaf binder for 215 x 280 mm size paper.
- b) Enclose title sheet, labelled "Operation and Maintenance Data", project number, project name, date and list of contents.
- c) Organize contents into applicable sections of work to parallel project specifications breakdown. Mark each section by labelled tabs protected with celluloid covers fastened to hard paper dividing sheets.
- d) Provide electronic document in CD or DVD as original editable file format or, at the direction of the Owner, pdf format.

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

- a) Maintenance instruction for finished surface and materials.
- b) Copy of hardware schedules.
- c) Description, operation and maintenance instructions for equipment and systems, including complete list of equipment and parts list. Indicate nameplate information such as make, size capacity and serial number.
- d) Names, addresses, phone and fax numbers of Subcontractors and Suppliers.
- e) Guarantees, warranties and bonds showing:
 - (i) Name and address of project;
 - (ii) Guarantee commencement date (date of Final Certification of Completion).
 - (iii) Duration of guarantee.

- (iv) Clear indication of what is being guaranteed and what remedial action will be taken under guarantee.
- (v) Signature and Seal of Contractor.
- f) Additional materials used in project listed under various sections showing name of manufacturer and source of supply.

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

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

4.10.0 COORDINATION OF WORK

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

4.11.0 TRAFFIC MAINTENANCE

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

4.12.0 FIRE PROTECTION

4.12.1 Fire protection measures shall include:

- a) An adequate fire alarm signal, the use of fire resistant tarpaulins, the daily inspection of temporary heating system by competent staff and regular fire patrol;
- b) All temporary wiring shall be done by electricians qualified under the applicable local regulations;
- c) Supply and maintenance of fifteen (15) pounds dry chemicals and/or five (5) gallons soda-acid fire extinguishers in such locations that no working crew has to

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

4.13.0 JOB MEETINGS

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

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

4.14.0 AS-BUILT DRAWINGS

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

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

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

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

4.15.0 COMPLETION TIME

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

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

4.16.0 CLOSE DOWN OF WORK

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

4.17.0 BROKEN GLASS

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

4.18.0 HOARDING

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

4.19.0 COMMISSIONING

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

4.20.0 FINAL CLEAN-UP

- 4.20.1** At the end of the job, thoroughly clean the building of all rubbish and surplus materials.
- 4.20.2** Make good all damaged areas in the building caused as a result of the Work of this Contract.
- 4.20.3** Do final cleaning, waxing and polishing of resilient flooring.

5.0 CAMPUS SAFETY AND HEALTH REGULATIONS

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

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

5.1.0 REGULATIONS, CODES AND STANDARDS

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

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

5.2.0 GENERAL SAFETY REGULATIONS

- a) Contractors/service agencies shall ensure that members of the campus community are not endangered by any work or process in which they may be engaged. Work areas shall be adequately barricaded, and if dust or fumes are generated, suitable enclosures shall be installed to contain such emissions.
- b) No material shall be stored in such a way as to obstruct walkways or represent a danger to pedestrian traffic.
- c) Adequate protection shall be provided to prevent the possibility of materials falling from scaffolding or elevated areas. Areas where materials are being loaded or offloaded shall be barricaded or otherwise protected to prevent unauthorized entry. Where necessary, appropriate warning signs shall be posted.
- d) The work areas must be kept reasonably clean and free from debris which could constitute a fire hazard. Care must be taken to ensure that the work process does not activate fire alarm detection devices. (Generation of dust and fumes can activate smoke detectors causing a false alarm).
- e) Due consideration shall be given to fire safety in buildings. Flammable materials must be kept away from sources of ignition. No work involving the use of open flame devices must be undertaken around flammable solvents or gases.
- f) Do not alter or disturb any materials believed to contain asbestos materials (unless this is a duly authorized part of the project). Should suspect materials be encountered, consult with University officials before proceeding.

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

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

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

6.0 CONTRACTOR PERFORMANCE EVALUATION

- 6.1.0 The purpose of this process is to maintain an acceptable level of performance with external contractors carrying out work for the Department of Facilities Management.
- 6.2.0 A record of the performance of external contractors will be maintained to identify the following:
- a) Those contractors who by virtue of satisfactory performance will continue to be eligible to submit bids for work at the University;
 - b) Those contractors whose performance is considered unsatisfactory and will be advised of the need to improve performance to remain eligible to submit bids for work at the University;
 - c) Those contractors whose record of unsatisfactory performance will render them ineligible to submit bids for work at the University.
- 6.3.0 Contractors' performance will be evaluated on a points rating system relative to quality of work performed, timeliness in completing work and management/administration of contracts/work and safety parameters.

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Types of items described in this Section:
- B. Types of items described in this Section:
 - 1. Work Covered By the Contract Documents.
 - 2. Type of Contract.
 - 3. Work Phases.
 - 4. Work Under Other Contracts.
 - 5. Products Ordered In Advance.
 - 6. Owner-Furnished Products.
 - 7. Use of Premises.
 - 8. Owner's Occupancy Requirements.
 - 9. Work Restrictions.
 - 10. Interpretation Of Documents
 - 11. Specification Formats and Conventions.
 - 12. Project Management and Coordination.
 - 13. Construction Progress Documentation.
 - 14. Photographic Documentation.
 - 15. Substitution Procedures.
 - 16. Submittal Procedures.
 - 17. Environmental Procedures.
 - 18. Wildlife Protection.
 - 19. Quality Requirements.
 - 20. Regulatory Requirements.
 - 21. Temporary Facilities and Control.
 - 22. Temporary Barriers and Enclosures.
 - 23. Product Requirements.
 - 24. Execution.
 - 25. Construction Waste Management And Disposal.
 - 26. Closeout Procedures.
 - 27. List of Incomplete Items (Punch List)
 - 28. Operation and Maintenance Data.
 - 29. Project Record Documents.
 - 30. Demonstration and Training.
- C. Types of items you will not find described in this Section:
 - 1. Health and Safety Requirements

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification: EN-110-23: Engineering Building, Renovations to EN-4033
 - 1. Project Location: Main Campus, Memorial University, St. John's, NL

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

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

1.4 TYPE OF CONTRACT

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

1.5 WORK PHASES

- A. The Work shall be conducted in one (1) phase in the following order, with each phase substantially complete before beginning the next phase:
1. Work shall be substantially complete and ready for occupancy on August 4, 2025.
2. Before commencing Work of each phase, submit a schedule showing the sequence, commencement and completion dates, and move-out and -in dates of Owner's personnel for all phases of the Work.

1.6 WORK UNDER OTHER CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate the Work of this Contract with work performed under separate contracts.
- B. Preceding Work: Owner has awarded / will award separate contract(s) for the following construction operations at Project site. Those operations are scheduled to be substantially complete before work under this Contract begins.
1. No proceeding work planned
- C. Concurrent Work: Owner has awarded / will award separate contract(s) for the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.
1. Work associated with Facilities Management trade shop support and Information Technology Services.
- D. Future Work: Owner has awarded / will award separate contract(s) for the following additional work to be performed at site after Substantial Completion. Completion of that work will depend on successful completion of preparatory work under this Contract.
1. No future work planned.

1.7 PRODUCTS ORDERED IN ADVANCE

- A. General: Owner has negotiated Purchase Orders with suppliers of material and equipment to be incorporated into the Work. Owner will assign these Purchase Orders to Contractor. Costs for receiving, handling, storage if required, and installation of material and equipment are included in the Contract Sum.
1. Contractor's responsibilities are same as if Contractor had negotiated Purchase Orders, including responsibility to renegotiate purchase and to execute final Purchase-Order agreements.
- B. List of Products Ordered in Advance:
1. None.

1.8 OWNER-FURNISHED PRODUCTS

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

1.9 USE OF PREMISES

- A. General: Contractor shall have full use of premises for construction operations, including use of Project site, during construction period. Contractor's use of premises is limited only by Owner's right to perform work or to retain other contractors on portions of Project.
- B. General: Contractor shall have limited use of premises for construction operations as indicated on Drawings by the Contract limits.
- C. Use of Site: Limit use of premises to areas under construction. Do not disturb portions of Project site beyond areas in which the Work is indicated.
1. Owner Occupancy: Allow for Owner occupancy of Project site and use by the public.
 2. Driveways and Entrances: Keep driveways parking garage, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- D. Use of Existing Building: If the work involves construction in an existing building, maintain the existing building in a weather tight condition throughout construction period. Repair damage caused by construction operations. Protect building and its occupants during construction period.

1.10 OWNER'S OCCUPANCY REQUIREMENTS

- A. **Full Owner Occupancy:** Owner will occupy site and existing building during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits, unless otherwise indicated.
1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
 2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
- B. **Partial Owner Occupancy:** Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits, unless otherwise indicated.
1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
 2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
- C. **Owner Occupancy of Completed Areas of Construction:** Owner reserves the right to occupy and to place and install equipment in completed areas of building, before Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.
1. Obtain a Certificate of Occupancy from authorities having jurisdiction before Owner occupancy.
 2. Before partial Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of building.
 3. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of building.

1.11 WORK RESTRICTIONS

- A. **On-Site Work Hours:** Work shall be generally performed inside the existing building during normal business working hours, Monday through Friday, except otherwise indicated.
1. Weekend Hours: **Contractor to notify Owner's representative 48hrs prior to scheduling.**
 2. Early Morning Hours: **Contractor to notify Owner's representative 48hrs prior to scheduling.**
 3. Hours for Utility Shutdowns: **Dependant on Scope of shutdown. Contractor to notify Owner's representative 2 weeks prior to scheduling.**
 4. Hours for Core Drilling and other noise generating activities: **To be scheduled after regular work hours. Contractor to notify Owner's representative 48hrs prior to scheduling.**
- B. **Existing Utility Interruptions:** Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
1. Notify Owner's Representative not less than two days in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without Owner's Representative's written permission.
- C. No smoking is permitted on MUN Campus.

1.12 INTERPRETATION OF DOCUMENTS

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

2. General Conditions take precedence over drawings and specifications.
 3. Division 1 Sections take precedence over technical specification sections in other Divisions;
 4. Legends and schedules take precedence over drawings and Specifications, whether they are bound with the specifications or integral with the drawings;
 5. Specifications take precedence over all other drawings;
- B. Plans (drawings) and Specifications are complementary. When work is shown or mentioned on the drawings but is not indicated in the Specifications, or when work is indicated in the Specifications but is not shown or mentioned on the Drawings, it shall nevertheless be included in the Contract.

1.13 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 50-division format and CSI/CSC's *MasterFormat* numbering system.
1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
 2. Division 01: Sections in Division 01 govern the execution of the Work of all Sections in the Specifications.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
- C. The words *shall*, *shall be*, or *shall comply with*, depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.14 PROJECT MANAGEMENT AND COORDINATION

- A. Coordination
1. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
- B. Administrative and supervisory personnel
1. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.
 2. Maintain same superintendent on Project for duration of Project. Immediately notify Owner's Representative if superintendent should become unavailable to work and immediately replace with an alternate person acceptable to the Owner's Representative.
- C. Project meetings
1. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
 2. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Owner's Representative, within three days of the meeting.

3. Progress Meetings: Conduct progress meetings at monthly intervals. Coordinate dates of meetings with preparation of payment requests.
- 1.15 Requests For Interpretation (RFIs)
1. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.
 - a. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
 2. Allow seven working days for Owner's Representative's response for each RFI.
 3. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Owner's Representative in writing within 10 days of receipt of the RFI response.
- 1.16 CONSTRUCTION PROGRESS DOCUMENTATION
- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's Construction Schedule within 30 days of date established for the Notice of Award.
1. Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
 2. At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
- B. Reports
1. Daily Construction Reports: Prepare a daily construction report and submit to Owner's Representative each week recording the following information concerning events at Project site:
 - a. List of subcontractors at Project site.
 - b. List of separate contractors at Project site.
 - c. Approximate count of personnel at Project site.
 - d. Equipment at Project site.
 - e. Material deliveries.
 - f. High and low temperatures and general weather conditions.
 - g. Accidents.
 - h. Meetings and significant decisions.
 - i. Unusual events.
 - j. Stoppages, delays, shortages, and losses.
 - k. Meter readings and similar recordings.
 - l. Emergency procedures.
 - m. Orders and requests of authorities having jurisdiction.
 - n. Change Orders received and implemented.
 - o. Construction Change Directives received and implemented.
 - p. Services connected and disconnected.
 - q. Equipment or system tests and start-ups.
 - r. Partial Completions and occupancies.
 - s. Substantial Completions authorized.
 2. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for interpretation. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.
- 1.17 PHOTOGRAPHIC DOCUMENTATION
- A. Preconstruction Photographs: Before starting construction take, digital photographs of Project site and surrounding areas, including existing items to remain during construction, from different vantage points.

- B. Periodic Construction Photographs: Take digital photographs weekly, with timing each month adjusted to coincide with the cut-off date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.
- C. E-mail or otherwise submit photos to Owner's representative on monthly basis to coincide with the each Application for Payment.

1.18 SUBSTITUTION PROCEDURES

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

- B. Substitutions for Cause: Submit requests for substitution immediately upon discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
1. Conditions: Owner's Representative will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Owner's Representative will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Substitution request is fully documented and properly submitted.
 - c. Requested substitution will not adversely affect Contractor's construction schedule.
 - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - e. Requested substitution is compatible with other portions of the Work.
 - f. Requested substitution has been coordinated with other portions of the Work.
 - g. Requested substitution provides specified warranty.
 - h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- C. Substitutions for Convenience: Owner's Representative will consider requests for substitution if received within 60 days after the Notice of Award. Requests received after that time may be considered or rejected at discretion of Owner's Representative.
1. Conditions: Owner's Representative will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Owner's Representative will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume.
 - b. Requested substitution does not require extensive revisions to the Contract Documents.
 - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - d. Substitution request is fully documented and properly submitted.
 - e. Requested substitution will not adversely affect Contractor's construction schedule.
 - f. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - g. Requested substitution is compatible with other portions of the Work.
 - h. Requested substitution has been coordinated with other portions of the Work.
 - i. Requested substitution provides specified warranty.

1.19 SUBMITTAL PROCEDURES

- A. Contractor's Review
1. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. **Mark with approval stamp before submitting to Owner's Representative.**
- B. Preferred Size for Paper Submittals
1. Provide paper submittals on sheets no less than 8 ½ x 11" Whenever practical, provide paper submittals on sheet size not greater than 11 x 17". In all cases ease of readability of submittal content by Engineer shall take precedent over providing information on preferred sheet size.
- C. Submittal Procedures
1. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
 - a. Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and

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

1.20 ENVIRONMENTAL PROCEDURES

- A. Definitions
 1. Hazardous Material: Product, substance, or organism that is used for its original purpose; and that is either dangerous goods or a material that may cause adverse impact to the environment or adversely affect health of persons, animals, or plant life when released into the environment.
- B. Fires and burning of rubbish on site not permitted.
- C. Store, handle, and dispose of hazardous materials in accordance with applicable federal and provincial laws, regulations, codes and guidelines. Store in location that will prevent spillage into the environment
- D. Provide temporary drainage and pumping as necessary to keep excavations and site free from water.
 1. Do not pump water containing suspended materials into waterways, sewer or drainage systems.
- E. Protect any trees and plants on site and adjacent properties that are in immediate area of construction.
 1. Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.
 2. Restrict tree removal to areas indicated or designated by Owner's Representative.
- F. Minimize stripping of topsoil and vegetation.

1.21 WILDLIFE PROTECTION

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

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

1.22 QUALITY REQUIREMENTS

A. Conflicting Requirements

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

B. Quality Control

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

1.23 REGULATORY REQUIREMENTS

- A. Perform Work in accordance with National Building Code of Canada (NBC) including all amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- B. Meet or exceed requirements of:
 1. Contract documents.
 2. Specified standards, codes, and referenced documents.

1.24 TEMPORARY FACILITIES AND CONTROLS

A. Temporary Utility Installation

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

- wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
3. Water Service: If the Owner has existing water service it may be used as long as it does not impact on the Owner's need. Otherwise install water service and distribution piping in sizes and pressures adequate for construction.
 4. Sewers and Drainage: Provide temporary utilities as required to remove effluent lawfully.
 5. Heating: Provide temporary heating as required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
 6. Ventilation and Humidity Control: Provide temporary ventilation as required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
 7. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
 - a. Install electric power service overhead, unless otherwise indicated.
 - b. If the Owner has an existing power source, the contractor may access it for temporary power provided it does not impact the Owner's needs.
 8. Lighting: Provide temporary lighting with local switching as required to provide adequate illumination for construction operations, observations, inspections, and traffic conditions.
 9. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
 10. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weather tight enclosure for building exterior.
 11. Tree and Plant Protection: Install temporary fencing as required to protect trees and plants intended to remain. Install protection outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
 12. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner as required to prevent people and animals from easily entering site except by entrance gates.
- B. Operation, Termination, and Removal
1. Maintain facilities in good operating condition until removal.
 2. Remove each temporary facility when need for its service has ended.
- 1.25 TEMPORARY BARRIERS AND ENCLOSURES
- A. Hoarding
1. For work involving the excavation for new foundations or the erection of new structures outside of an enclosure, provide hoarding.
- B. Weather Enclosures
1. Provide weather tight closures to unfinished door and window openings, tops of shafts and other openings in floors and roofs.
- C. Dust Tight Screens
1. Provide dust tight screens or insulated partitions to localize dust generating activities, and for protection of workers, finished areas of Work and public.
- D. Protection Of Building Finishes

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

1.26 PRODUCT REQUIREMENTS

A. Manufacturer's Instructions

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

B. Quality

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

C. Product Warranties

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

D. Product Selection Procedures

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

1.27 EXECUTION

A. Materials

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

B. Construction Layout

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

C. Installation

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

D. Cutting And Patching

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

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

F. Progress Cleaning

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

G. Correction Of The Work

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

H. Protection Of Installed Construction

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

1.28 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

A. Waste Reduction

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

- a. Use of a central cutting area to allow for easy access to off-cuts;
 - b. Use of off-cuts for blocking and bridging elsewhere.
 - c. Use of effective and strategically placed facilities on site for storage and staging of left-over or partially cut materials (such as gypsum board, plywood, ceiling tiles, insulation etc...) to allow for easy incorporation into
 - B. Material Source Separation Process
 - 1. Perform demolition and removal of existing building components and equipment following a systematic deconstruction process.
 - 2. Separate materials and equipment at source, carefully dismantling, labelling and stockpiling alike items for the following purposes:
 - a. Reinstallation into the work where indicated.
 - b. Salvaging reusable items not needed in project which Contractor may sell to other parties. Sale of such items not permitted on site.
 - c. Sending as many items as possible to locally available recycling facility.
 - d. Segregating remaining waste and debris into various individual waste categories for disposal in a *non-mixed state* as recommended by waste processing/landfill sites.
 - C. Disposal Requirements
 - 1. Dispose of waste only at approved waste processing facility or landfill sites approved by authority having jurisdiction.
- 1.29 CLOSEOUT PROCEDURES
- A. Substantial Completion
 - 1. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
 - a. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 - b. Advise Owner of pending insurance changeover requirements.
 - c. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - d. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - e. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
 - f. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
 - g. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - h. Complete start-up testing of systems.
 - i. Submit test/adjust/balance records.
 - j. Terminate and remove temporary facilities from Project site, along with mock-ups, construction tools, and similar elements.
 - k. Advise Owner of changeover in heat and other utilities.
 - l. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
 - m. Complete final cleaning requirements, including touch-up painting.
 - n. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
 - 2. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Owner's Representative will either proceed with inspection or notify Contractor of unfulfilled requirements. Owner's Representative will prepare the Certificate of Substantial Completion after inspection or will notify

- Contractor of items, either on Contractor's list or additional items identified by Owner's Representative, that must be completed or corrected before certificate will be issued.
3. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
- B. Final Completion
1. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
 - a. Submit a final Application for Payment according to the General Conditions.
 - b. Submit certified copy of Owner's Representative's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Owner's Representative. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 - c. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 - d. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
 2. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Owner's Representative will either proceed with inspection or notify Contractor of unfulfilled requirements. Owner's Representative will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
 - a. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
- C. Final Cleaning
1. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
 2. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
- 1.30 LIST OF INCOMPLETE ITEMS (PUNCH LIST)
- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Owner's Representative.
 - d. Name of Contractor.
 - e. Page number.
 4. Submit list of incomplete items in the following format:
 - a. Three paper copies of product schedule or list, unless otherwise indicated.
- 1.31 WARRANTIES
- A. Submittal Time: Submit written warranties on request of Owner's Representative for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

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

1.32 OPERATION AND MAINTENANCE DATA

- A. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
- B. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
- C. Manual Contents: Operations and maintenance manual content is specified in individual specification sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Where applicable, clarify and update reviewed manual content to correspond to modifications and field conditions.
- D. **Format: Submit operations and maintenance manuals in the following format:**
 - 1. **PDF electronic file. Assemble each manual into a composite electronically-indexed file. Submit on digital media acceptable to Owner's Representative.**
 - a. **Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically-linked operation and maintenance directory.**
 - b. **Enable inserted reviewer comments on draft submittals.**

1.33 PROJECT RECORD DOCUMENTS

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

- g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Change Directive.
 - k. Changes made following Owner's Representative's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
- 5. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
 - 6. Mark record sets with erasable, red-coloured pencil. Use other colours to distinguish between changes for different categories of the Work at same location.
 - 7. Mark important additional information that was either shown schematically or omitted from original Drawings.
 - 8. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
 - 9. Submit record drawings to Owner's Representative prior to requesting Substantial Completion inspection.

1.34 DEMONSTRATION AND TRAINING

- A. Demonstrate start-up, operation, control, adjustment, troubleshooting, servicing, and maintenance of each item of maintenance of each item of equipment.
- B. Instruct personnel in all phases of operation and maintenance using operation and maintenance manuals as the basis of instruction.
- C. Review contents of manual in detail to explain all aspects of operation and maintenance.
- D. Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent during instructions.
- E. The GC shall be responsible for training coordination and scheduling and ultimately for ensuring that training is completed.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- .1 Types of items described in this Section:
 - .1 Administrative and procedural requirements governing allowances.
 - .1 Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to the Contractor. If necessary, additional requirements will be issued by Change Order.
 - .2 Types of allowances include the following:
 - .1 Revise list below to suit Project.
 - .2 Lump-sum allowances.
 - .3 Unit-cost allowances.
 - .4 Quantity allowances.
 - .5 Contingency allowances.
 - .6 Testing and inspecting allowances.
- .2 Types of items you will not find described in this Section:
 - .1 Procedures for using unit prices.
 - .2 Procedures governing the use of allowances for testing and inspecting.
 - .3 Divisions 02 through 49 Sections for items of Work covered by allowances.

1.3 SELECTION AND PURCHASE

- .1 At the earliest practical date after award of the Contract, advise Owner's Representative of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.
- .2 At Owner's Representative's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
- .3 Purchase products and systems selected by Owner's Representative from the designated supplier.

1.4 SUBMITTALS

- .1 Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.
- .2 Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- .3 Submit time sheets and other documentation to show labour time and cost for installation of allowance items that include installation as part of the allowance.
- .4 Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.5 COORDINATION

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

1.6 QUANTITY ALLOWANCES

- .1 Allowance shall include cost to Contractor of specific products and materials selected by Owner's Representative under allowance and shall include freight, and delivery to Project site.
- .2 Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labour, installation, overhead and profit, and similar costs related to products and materials selected by Owner's Representative under allowance shall be included as part of the Contract Sum and not part of the allowance.
- .3 Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
 - .1 If requested by Owner's Representative, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.7 CONTINGENCY ALLOWANCES

- .1 Use the contingency allowance only as directed by Owner's Representative for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.
- .2 Contractor's overhead, profit, and related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, insurance, equipment rental, and similar costs.
- .3 Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit margins.
- .4 At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.
- .5 The cash allowance shall not include HST.

1.8 TESTING AND INSPECTING ALLOWANCES

- .1 Testing and inspecting allowances include the cost of engaging testing agencies, actual tests and inspections, and reporting results.
- .2 The allowance does not include incidental labour required to assist the testing agency or costs for retesting if previous tests and inspections result in failure. The cost for incidental labour to assist the testing agency shall be included in the Contract Sum.
- .3 At Project closeout, credit unused amounts remaining in the testing and inspecting allowance to Owner by Change Order.

1.9 ADJUSTMENT OF ALLOWANCES

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

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

- .1 Include installation costs in purchase amount only where indicated as part of the allowance.
 - .2 If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
 - .3 Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
-
- .2 Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labour, installation, overhead, and profit.
 - .1 Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
 - .2 No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 SCHEDULE OF ALLOWANCES

- .1 Control Integration Allowance:
 - .1 Include a control integration allowance of \$2,173.91 for use according to Owner's instructions.
- .2 Lump-Sum Allowance:
 - .1 No Lump Sum Allowances apply to this Work.
- .3 Unit-Cost Allowance:
 - .1 No Unit Cost Allowances apply to this Work.
- .4 Contingency Allowance:
 - .1 Include a contingency allowance of \$2,173.91 for use according to Owner's instructions.
- .5 Testing and Inspection Allowance:
 - .1 No testing and Inspection Allowance apply to this Work.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Types of items described in this Section:
 - 1. Health and safety requirements for projects located in Newfoundland and Labrador.

1.3 REFERENCES

- A. Code and standards referenced in this section refer to the latest edition thereof.
- B. Canadian Standards Association (CSA)
 - 1. CSA S269.1 Falsework for Construction Purposes.
 - 2. CAN/CSA-Z259.1 Safety Belts and Lanyards.
 - 3. CAN/CSA-Z259.10 Full body Harnesses.
 - 4. CAN/CSA-Z259.11 Shock Absorbers for Personal Fall Arrest Systems.
 - 5. CAN/CSA-Z259.2, Fall Arresting Devices, Personnel Lowering Devices and Lifelines.
 - 6. FCC No. 301 Standard for Construction Operations.
 - 7. CSA Z275.2 Occupational Safety Code for Diving Operations.
 - 8. CSA Z275.4 Competency Standard for Divers Operations.
- C. FCC No. 302 Standard for Welding and Cutting.
- D. Transportation of Dangerous Goods Act Regulations.
- E. Newfoundland Occupational Health and Safety Act, Amended
- F. Consolidated Newfoundland and Regulations 1149 WMIS Regulations Under the Occupational Health and Safety Act
- G. Consolidated Newfoundland and Regulations 1165 Occupational Health and Safety Regulations under the Occupational Health and Safety Act.
- H. Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations.
- I. National Building Code of Canada.

1.4 SUBMITTALS

- A. At least 10 (ten) working days prior to commencing any site work: submit to Owner's Representative copies of:
 - 1. A complete Site Specific Hazard Assessment and Safety Program Table of Contents.
 - 2. **Including requirements as outlined by the Department of Environmental Health & Safety, See APPENDIX A.**
- B. Acceptance of the Project Health and Safety Hazard Assessment and Management Plan and other submitted documents by the Owner's Representative shall only be viewed as acknowledgement that the contractor has submitted the required documentation under this specification section.
- C. Owner's Representative makes no representation and provides no warranty for the accuracy, completeness and legislative compliance of the Project Health and Safety Hazard Management Plan and other submitted documents by this acceptance.
- D. Responsibility for errors and omissions in the Project Health and Safety Hazard Assessment and Management Plan and other submitted documents is not relieved by acceptance by Owner's Representative.

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

- A. Conduct operations in accordance with latest edition of the Newfoundland Occupational Health and Safety (OH&S) Act and Regulations.
- B. Prepare a detailed Project Health and Safety Hazard Assessment and Management Plan for the Owner. Assessment shall identify, evaluate and control job specific hazards and the necessary control measures to be implemented for managing hazards.
- C. Provide a copy of the Project Health and Safety Hazard Assessment and Management Plan upon request to Occupational Health and Safety Branch, Department of Labour, Province of Newfoundland and Labrador and the Owner.
- D. The written Health and Safety Hazard Assessment and Management Plan shall incorporate the following:
 - 1. A site-specific health and safety plan, refer to clause 1.6 Site-Specific Health and Safety Hazard Assessment and Management Plan of this section for requirements.
 - 2. An organizational structure which shall establish the specific chain of command and specify the overall responsibilities of contractor's employees at the work site.
 - 3. A comprehensive work plan which shall:
 - a. define work tasks and objectives of site activities/operations and the logistics and resources required to reach these tasks and objectives
 - b. establish personnel requirements for implementing the plan, and
 - c. establish site specific training and notification requirements and schedules.
 - 4. A personal protected equipment (PPE) Program which shall detail PPE:
 - a. Selection criteria based on site hazards.
 - b. Use, maintenance, inspection and storage requirements and procedures.

- c. Decontamination and disposal procedures.
 - d. Inspection procedures prior to during and after use, and other appropriate medical considerations.
 - e. Limitations during temperature extremes, heat stress and other appropriate medical consideration.
- 5. An emergency response procedure, refer to Clause 1.7 Supervision and Emergency Response Procedure of this section for requirements.
- 6. A hazard communication program for informing workers, visitors and individuals outside of the work area as required.
- 7. A diving program which shall contain standard operating procedures to be followed in the diving operation.
- 8. A health and safety training program.
- 9. General safety rules.
- E. Periodically review and modify as required each component of the Project Health and Safety Hazard Assessment and Management Plan when a new hazard is identified during completion of work and when an error or omission is identified in any part of the Project Health and Safety Hazard Assessment and Management Plan.
- F. Implement all requirements of the Project Health and Safety Hazard Assessment and Management Plan.
 - 1. Ensure that every person entering the project site is informed of requirements under the Project Health and Safety Hazard Assessment and Management Plan.
 - 2. Take all necessary measures to immediately implement any engineering controls, administrative controls, personal protective equipment required or termination of work procedures to ensure compliance with the Project Health and Safety Hazard Assessment and Management Plan.

1.6 SITE SPECIFIC HEALTH AND SAFETY PLAN

- A. Prepare a detailed site Specific Project Health and Safety Plan which shall:
 - 1. Contain certain hazard assessment results.
 - 2. Identify engineering and administrative demonstrative controls (work-practices and procedures) to be implemented for managing identified and potential hazards, and comply with applicable federal and provincial legislation and more stringent requirements that have been specified in these specifications.
- B. Review for completeness the hazard assessment results immediately prior to commencing work, when a new hazard is identified during completion of work and when an error or omission is identified.
 - 1. Be solely responsible for investigating, evaluation and managing any report of actual or potential hazards.
 - 2. Retain copies of all completed hazard assessments at the project site and make available to the Owner's Representative immediately upon request.

1.7 SUPERVISION AND EMERGENCY RESCUE PROCEDURE

- A. Carry out work under the direct supervision of competent persons responsible for safety by ensuring the work complies with the appropriate section of OH&S Act and Regulations
- B. Assign a sufficient number of supervisory personnel to the work site.
- C. Provide a suitable means of communications for workers required to work alone.

- D. Develop an emergency rescue plan for the job site and ensure that supervisors and workers are trained in the emergency rescue plan.
- E. The emergency response plan shall address, as a minimum:
 - 1. Pre-emergency planning.
 - 2. Personnel roles, lines of authority and communication.
 - 3. Emergency recognition and prevention.
 - 4. Safe distances and places of refuge.
 - 5. Site security and control
 - 6. Evacuation routes and procedures
 - 7. Decontamination procedures which are not covered by the site specific safety and health plan.
 - 8. Emergency medical treatment and first aid.
 - 9. Emergency alarm, notification and response procedures including procedures for reporting incidents to local, provincial and federal government departments.
 - 10. PPE and emergency equipment.
 - 11. Procedures for handling emergency incidents.
 - 12. Site specific emergency response training requirements and schedules.
 - 13. For diving operation, include procedures for:
 - a. Managing deteriorating environmental conditions.
 - b. Managing unexpected weather or sea-state condition.
 - c. Evacuation of diver(s) under pressures greater than atmospheric pressure.
 - d. In-water emergency transfers.
 - e. Managing failing of equipment below the surface that impairs the ability of a diver to complete a dive.
 - f. Managing failure of any major component of diving plant or equipment.
 - g. Emergency signalling between divers involved in the diving program and between the diver(s) and the attendants using umbilical, tethers or other suitable methods.
 - h. Mobilizing stand-by divers.
 - i. Mobilizing crafts, stand-by boats and any other devices to be used for rescue.
 - j. Contacting evacuation, rescue, treatment facilities and medical services that will be used in the diving program.
 - k. Operation of emergency power and lighting facilities.
- F. The emergency response procedures shall be rehearsed regularly as part of the overall training program.
- G. Provide adequate first aid facilities for the jobsite and ensure that a minimum number of workers are trained in first aid in accordance with the First Aid Regulations.

1.8 CONTRACTORS SAFETY OFFICER

- A. The contractor's Safety Officer will be solely responsible for the implementation and monitoring of the Project Health and Safety Hazard Assessment and Management Plan, and will have the authority to implement health and safety changes as directed by the Owner's Representative. The Safety Officer shall have as a minimum:
 - 1. Completed training in hazardous occurrence management and response/protocols.
 - 2. Completed training in the use, maintenance of fall protection systems.
 - 3. Completed training in the design and construction of scaffolding.
 - 4. Completed training in confined space entry protocols and techniques.
 - 5. Completed training in First Aid.

6. Have working knowledge of occupational safety and health regulations.
7. Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
8. Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
9. Be on site during execution of Work and report directly to and be under direction of site supervisor.

1.9 HEALTH AND SAFETY COMMITTEE

- A. Establish an Occupational Health and Safety Committee where ten or more workers are employed on the job site as per the OH&S Act and Regulations. Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- C. Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.10 RESPONSIBILITY

- A. Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- B. Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.11 UNFORESEEN HAZARDS

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

1.12 INSTRUCTION AND TRAINING

- A. Workers shall not participate in or supervise any activity on the work site until they have been trained to a level required by this job function and responsibility. Training shall as a minimum thoroughly cover the following:
 1. Federal and Provincial Health and Safety Legislation requirements including roles and responsibilities of workers and person(s) responsible for implementing, monitoring and enforcing health and safety requirements.
 2. Safety and health hazards associated with working on a contaminated site including recognition of symptoms and signs which might indicate over exposure to hazards.
 3. Limitations, use, maintenance and disinfection-decontamination of personal protective equipment associated with completing work.
 4. Limitations, use, maintenance and care of engineering controls and equipment.

5. Limitations and use of emergency notifications and response equipment including emergency response protocol.
 6. Work practices and procedures to minimize the risk of an accident and hazardous occurrence from exposure to a hazard.
- B. Provide and maintain training of workers, as required, by Federal and Provincial legislation.
- C. Provide copies of all safety training certificates, upon request, to Owner's Representative for review, and to be maintained on the worker when they enter the work site.
- D. Authorized visitors shall not access the work site until they have been:
1. Notified of the names of persons responsible for implementing, monitoring and enforcing the Health and Safety Hazard Assessment and Management Plan.
 2. Briefed on safety and health hazards present on the site.
 3. Instructed in the proper use and limitations of personal protective equipment.
 4. Briefed as the emergency response protocol including notification and evacuation process.
 5. Informed of practices and procedures to minimize risks from hazards and applicable to activities performed by visitors.

1.13 CONSTRUCTION SAFETY MEASURES

- A. Observe construction safety measures of National Building Code, latest edition, Provincial Government, OH&S Act and Regulations, Workplace Health and Safety and Compensation Commission and Municipal Authority provided that in any case of conflict or discrepancy more stringent requirements shall apply.
- B. Administer the project in a manner that will ensure, at all times, full compliance with Federal and Provincial Acts, regulations and applicable safety codes and the site Health and Safety Hazard Assessment and Management Plan.
- C. Provide Owner's Representative with copies of all orders, directions and any other documentation, issued by the Provincial Department of Government Services, Occupational Health and Safety branch immediately after receipt.

1.14 POSTING OF DOCUMENTS

- A. Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province and authority having jurisdiction, and in consultation with Owner's Representative.

1.15 HEALTH AND SAFETY MONITORING

- A. Periodic inspections of the contractor's work may be carried out by the Owner's Representative to maintain compliance with the Health and Safety Program. Inspections will include visual inspections as well as testing and sampling as required.
- B. The contractor shall be responsible for any and all costs associated with delays as a result of contractor's failure to comply with the requirements outlined in this section.

1.16 CORRECTION OF NON-COMPLIANCE

- A. Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Owner's Representative.
- B. Provide Owner's Representative with written report of action taken to correct non-compliance of health and safety issues identified.
- C. Owner's Representative may stop work if non-compliance of health and safety regulations is not corrected.

1.17 WHMIS

- A. Ensure that all controlled products are in accordance with the Workplace Hazardous Materials Information System (WHMIS) Regulations and Chemical Substances of the OH&S Act and Regulations regarding use, handling, labelling, storage, and disposal of hazardous materials.
- B. Deliver copies of relevant (Material) Safety Data Sheets (SDS) to job site and the Owner's Representative. The SDS must be acceptable to Labour Canada and Health and Welfare Canada for all controlled products that will be used in the performance of this work.
- C. Train workers required to use or work in close proximity to controlled products as per OH&S Act and Regulations.
- D. Label controlled products at jobsite as per OH&S and Regulations.
- E. Provide appropriate emergency facilities as specified in the SDS where workers might be exposed to contact with chemicals, e.g. eye-wash facilities, emergency shower.
 - 1. Workers to be trained in use of such emergency equipment.
- F. Contractor shall provide appropriate personal protective equipment as specified in the SDS where workers are required to use controlled products.
 - 1. Properly fit workers for personal protective equipment
 - 2. Train workers in care, use and maintenance of personal protective equipment.
- G. No controlled products are to be brought on-site without prior approved SDS.
- H. The SDS are to remain on site at all times.

1.18 OVERLOADING

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

1.19 FALSEWORK

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

1.20 SCAFFOLDING

- A. Design, erect and maintain scaffolding in accordance with CSA S269.2 and Sections 91-97 of the OH&S Act and Regulations.
- B. Ensure that fall-restraint or fall-arrest devices are used by all workers working at elevations greater than 3.05 metres above grade or floor level in accordance with CSA Z259.

1.21 PERSONAL PROTECTIVE EQUIPMENT

- A. Ensure workers on the jobsite use personal protective equipment appropriate to the hazards identified in the Hazard Assessment and Management Plan and those workers are trained in the proper care, use, and maintenance of such equipment.
- B. PPE selections shall be based on an evaluation of the performance characteristics of the PPE relative to the requirements and limitations of the site, task-specific conditions, duration and hazards and potential hazards identified on site.
- C. Provide workers and visitors to the site with proper respiratory protection equipment.
 - 1. No work shall be performed in an area where an airborne contaminant exceeds one half ($\frac{1}{2}$) the IDLH concentration.
 - 2. Respiratory protection shall be provided in accordance with the requirements of the Occupational Health and Safety Branch, Department of Labour of the Province of Newfoundland and Labrador and these specifications.
 - 3. Establish, implement and maintain a respirator inspection and maintenance program.
 - 4. Copies of all respirator owners' maintenance manuals shall be kept at all times at the contractor's site office.
- D. Provide and maintain a supply of dermal protection equipment to allow visitors and all workers proper dermal protection.
 - 1. Dermal protection shall be sufficient to act as a protective barrier between the skin and an airborne contaminant or hazardous material. Dermal protection shall also be provided for all physical hazards.
 - 2. Dermal protection equipment shall not be used after exceeding 75% of the break through time. The break through time shall be based on the contaminant which requires the least amount of time to break through the protective equipment
 - 3. Copies of all dermal protection user specifications, owners and maintenance manuals shall be kept at all times at the contractor's site office.
 - 4. Establish, implement and maintain air inspection program to ensure proper dermal protection in accordance with CSA, NIOSH, U.S. EPA and manufacturer's requirements.
- E. Provide all workers and up to two (2) visitors to the site with proper hearing protection. Workers and visitors shall not be exposed to noise levels greater than 85 dB (A) over an eight hour shift without proper hearing protection.
- F. Provide all workers and up to two (2) visitors to the site with CSA approved eye protection sufficient to act as a protective barrier between the eye and airborne contaminants, hazardous materials and physical hazard.
- G. Provide workers and up to two (2) visitors to the site with CSA approved hard hats.

1.22 EXCAVATION SAFETY

- A. Protect excavations more than 1.25 metres deep against cave-ins or wall collapse by side wall sloping to the appropriate angle of repose, an engineered shoring/sheathing system or an approved trench box.
 - 1. Provide a ladder which can extend from the bottom of the excavation to at least 0.91 metres above the top of the excavation.
- B. Ensure that all excavations less than 1.25 metres deep are effectively protected when hazardous ground movement may be expected.
- C. Design trench boxes, certified by a registered Professional Engineer, and fabricated by a reputable manufacturer. Provide the manufacturer's Depth Certificate Statement permanently affixed. Use trench boxes in strict accordance with manufacturer's instructions and depth certification data.
- D. For excavations deeper than six (6) metres, provide a certificate from a registered Professional Engineer stating that the protection methods proposed have been properly designed in accordance with accepted engineering practice. The engineer's certificate shall verify that the trench boxes, if used, are properly designed and constructed to suit the depth and soil conditions.
 - 1. Ensure that the superintendent and every crew chief, foreperson and lead hand engaged in trenching operations or working in trenches have in his/her possession a copy of the Department of Labour's "Trench Excavation Safety Guide".

1.23 CONFINED SPACE WORK

- A. Comply with requirements of Canada Occupational Safety and Health Regulations, Part XI and Consolidated Regulations Newfoundland and Labrador (CRNL) OH&S 1165/96.
- B. Provide approved air monitoring equipment where workers are working in confined spaces and ensure any test equipment to be used is calibrated, in good working order and used by trained persons.
- C. Develop a confined space entry program specific to the nature of work performed and in accordance with OH&S Act and Regulations and ensure supervisors and workers are trained in the confined space entry program.
 - 1. Ensure that personal protective equipment and emergency rescue equipment appropriate to the nature of the work being performed is provided and used.
- D. Provide and maintain training of workers, as required by the Federal and Provincial Legislation.
- E. Provide Owner's Representative with a copy of an "Entry Permit" for each entry into the confined space to ensure compliance with Federal and Provincial Legislation.

1.24 HAZARDOUS MATERIALS

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

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

1.25 HEAVY EQUIPMENT

- A. Ensure mobile equipment used on jobsite is of the type specified in OH&S Act and Regulations fitted with a Roll Over Protective (ROP) Structure.
- B. Provide certificate of training in Power Line Hazards for operators of heavy equipment.
- C. Obtain written clearance from the power utility where equipment is used in close proximity to (within 5.5 metres) overhead or underground power lines.
- D. Equip cranes with:
 - 1. A mechanism which will effectively prevent the hook assembly from running into the top boom pulley.
 - 2. A legible load chart.
 - 3. A maintenance log book.

1.26 WORK STOPPAGE

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

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- .1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- .2 OPR and BoD documentation are included by reference for information only.

1.2 SUMMARY

- .1 Types of items described in this Section:
 - .1 General requirements that apply to implementation of commissioning without regard to specific systems, assemblies, or components.
- .2 Types of items you will not find described in this Section:
 - .1 Commissioning process activities for building exterior enclosure, roof, and foundation systems, assemblies, equipment, and components.
 - .2 Commissioning process activities for building interiors construction, stairways, and finish systems and assemblies.
 - .3 Commissioning process activities for conveying systems, assemblies, equipment, and components.
 - .4 Commissioning process activities for fire-suppression systems, assemblies, equipment, and components.
 - .5 Commissioning process activities for plumbing systems, assemblies, equipment, and components.
 - .6 Commissioning process activities for HVAC systems, assemblies, equipment, and components.
 - .7 Commissioning process activities for integrated automation systems, assemblies, equipment, and components.
 - .8 Commissioning process activities for electrical systems, assemblies, equipment, and components.
 - .9 Commissioning process activities for communications systems, assemblies, equipment, and components.
 - .10 Commissioning process activities for electronic safety and security systems, assemblies, equipment, and components.

1.3 DEFINITIONS

- .1 BoD: Basis of Design. A document that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.
- .2 Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.
- .3 CxA: Commissioning Authority.
- .4 OPR: Owner's Project Requirements. A document that details the functional requirements of a project and the expectations of how it will be used and operated. These include Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.
- .5 Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean *as-built* systems, subsystems, equipment, and components.

1.4 COMMISSIONING TEAM

- .1 Members Appointed by Contractor(s): Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated action. The commissioning team shall consist of, but not be limited to, representatives of Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.
 - .2 Members Appointed by Owner:
 - .1 CxA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.
 - .2 Representatives of the facility user and operation and maintenance personnel.
 - .3 Owner's Representative and engineering design professionals.
- 1.5 OWNER'S RESPONSIBILITIES
- .1 Provide the OPR documentation to the CxA and Contractor for information and use.
 - .2 Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.
 - .3 Provide the BoD documentation, prepared by Owner's Representative and approved by Owner, to the CxA and Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.
- 1.6 CONTRACTOR'S RESPONSIBILITIES
- .1 Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:
 - .1 Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
 - .2 Cooperate with the CxA for resolution of issues recorded in the Issues Log.
 - .3 Attend commissioning team meetings held on a variable basis.
 - .4 Integrate and coordinate commissioning process activities with construction schedule.
 - .5 Review and accept construction checklists provided by the CxA.
 - .6 Complete paper construction checklists as Work is completed and provide to the Commissioning Authority on a weekly basis.
 - .7 Review and accept commissioning process test procedures provided by the Commissioning Authority.
 - .8 Complete commissioning process test procedures.
- 1.7 CxA'S RESPONSIBILITIES
- .1 Organize and lead the commissioning team.
 - .2 Provide commissioning plan.
 - .3 Convene commissioning team meetings.
 - .4 Provide Project-specific construction checklists and commissioning process test procedures.
 - .5 Verify the execution of commissioning process activities using random sampling. The sampling rate may vary from 1 to 100 percent. Verification will include, but is not limited to, equipment submittals, construction checklists, training, operating and maintenance data, tests, and test reports to verify compliance with the OPR. When a random sample does not meet the requirement, the CxA will report the failure in the Issues Log.

- .6 Prepare and maintain the Issues Log.
- .7 Prepare and maintain completed construction checklist log.
- .8 Witness systems, assemblies, equipment, and component startup.
- .9 Compile test data, inspection reports, and certificates; include them in the systems manual and commissioning process report.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

.1 Section Includes a copy of:

.1 Asbestos and Lead Paint Building Materials Survey for: Engineering Building Memorial University of Newfoundland dated June 19, 2013

- .2 This report was prepared primarily for the use of the Owner and the Design Team. The recommendations shall not be construed as a requirement of this Contract, unless also contained elsewhere in the Contract Documents.
- .3 The report, by its nature, cannot reveal all conditions that exist or occur on the site. Undertake whatever precautionary measures as required by authorities having jurisdiction and whatever measures as you see prudent and appropriate to protect workers, building occupants, and the environment from hazardous materials.
- .4 Should conditions be found to vary substantially from the report, changes in the design and construction of the Work may be made, with resulting credits or expenditures to the Contract Price accruing to the Owner.

PART 2 - PRODUCTS (Not used)

PART 3 - EXECUTION (Not used)

END OF SECTION



**ASBESTOS AND LEAD PAINT BUILDING MATERIALS SURVEY FOR:
ENGINEERING BUILDING
MEMORIAL UNIVERSITY OF NEWFOUNDLAND**



Prepared for:
Memorial University of Newfoundland
St. John's, NL

Pinchin LeBlanc Environmental Ltd
Project No. 02-02-00900

June 19, 201

EXECUTIVE SUMMARY

Pinchin LeBlanc Environmental Limited. (Pinchin) was retained by Memorial University of Newfoundland to perform asbestos and lead paint surveys in selected buildings on the Memorial University of Newfoundland's St. John's, NL campus. A total of twenty-seven (27) buildings were surveyed for asbestos containing materials (ACM) and lead based paints (LBP). This report will provide the findings for the following location;

BUILDING DESCRIPTION: ENGINEERING BUILDING

BUILDING ADDRESS: MEMORIAL UNIVERSITY OF NL, ST. JOHN'S CAMPUS, NL

A summary of the findings for the Engineering Building (hereafter referred to as "Site Building") is provided. For specific recommendations regarding any hazardous materials listed the reader will refer to Sections 3 and 4 of this report:

1. Friable asbestos containing building materials were identified in the Site Building, specifically parging cement,
2. Non-friable materials with the potential to become friable during renovation and demolition activities were identified inside the Site Building, specifically drywall joint compound.
3. Non-friable asbestos-containing building materials were identified in the Site Building, specifically vinyl floor tiles, transite, incandescent heat shields, and tar mastic;
4. Paints containing greater than 600 mg/kg of lead were identified in the Site Building, specifically the cream paint as observed in EN1250, the green paint as observed in EN1035, and the green paint in EN 4013.

This Executive Summary is subject to the same standard limitations as contained in the report and must be read in conjunction with the entire report.

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APPENDIX I ASBESTOS ANALYTICAL REPORT

APPENDIX II LEAD PAINT ANALYTICAL REPORT

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1.0 INTRODUCTION

Pinchin LeBlanc Environmental Ltd. (Pinchin) was retained by Memorial University of Newfoundland to perform asbestos and lead paint surveys in selected buildings on the Memorial University of Newfoundland's St. John's, NL campus. A total of twenty-seven (27) buildings were surveyed for asbestos containing materials (ACM) and lead based paints (LBP). This report will provide the findings for the following location;

BUILDING DESCRIPTION: ENGINEERING BUILDING

BUILDING ADDRESS: MEMORIAL UNIVERSITY OF NL, ST. JOHN'S CAMPUS, NL

The report presents a detailed investigation of condition, quantity, location, access, and type of ACM and LBP present in the building. The Overview Report, provided under separate cover, provides detailed information regarding the survey methodology, sampling procedure, evaluation criteria, suspect materials and regulatory information.

Provincial regulations and guidelines distinguish between friable¹ and non-friable² materials. The asbestos building materials survey performed by Pinchin included a search for both friable and common non-friable ACM.

For reporting purposes, the survey will be divided into sections. The report is presented in this manner to accommodate ease in reading and to allow access to report information for specific areas or materials within the building. The report also addresses specific systems and products likely present in the building. The sections of the report are as follows:

- 2.0 Survey Information
- 3.0 ACM Survey Findings
- 4.0 LBP Survey Findings
- 5.0 Recommendations

¹ The term friable is applied to a material that can be readily reduced to dust or powder by hand or moderate pressure. Friable ACM has a much greater potential to release airborne asbestos fibres when disturbed. The most common friable ACM used in the past are sprayed or trowelled materials (for fireproofing or thermal insulation), texture plaster (decorative or acoustic), and mechanical insulations.

² Common non-friable ACM include vinyl floor tiles, ceiling tiles, gasket materials, asbestos cement pipe or board (transite), and asbestos textiles. Although a product may be considered non-friable when new, if the product releases fine dust due to deterioration or during removal, the free dust is considered friable. For example, most lay-in or glued on acoustic ceiling tiles release significant dust during removal of large quantities of these tiles.

2.0 SURVEY INFORMATION

The survey was conducted between July 27th and August 1st, 2012. The survey, collection of representative bulk samples, and recording of information was performed by Mr. Trent Hardy and Mr. Philip Lowery of Pinchin. All accessible areas of the building were inspected for the presence of asbestos containing materials (ACM) and lead based paints (LBP).

A total of eighty-three (83) representative bulk samples were collected for analysis for asbestos content and thirteen (13) bulk samples were collected for analysis of lead content.

3.0 ACM SURVEY FINDINGS

The ACM found during this survey are detailed in the location & data excel document provided to the client. The excel document serves as the clients active asbestos management plan. Quantities of materials identified, locations and friable or non-friable are also present in this excel file. Laboratory certificates for asbestos samples collected are presented in Appendix I and lead samples are presented in Appendix II. Sample location drawings are provided in Appendix III. A photographic record of the samples collected during the survey of the building is presented in Appendix IV. The following is summary of the findings for this building.

3.1 Sprayed or Trowelled Fireproofing and Thermal Insulation

Two (2) samples of spray applied fireproofing material were collected from above the ceiling in rooms EN 3034, and EN 1052. Analysis of the samples did not identify the presence of asbestos (reference samples 02-02-900-S080 and 02-02-900-S004).

3.2 Mechanical Insulation

Insulating cement, also referred to as “parging cement”, present on pipe elbows for and fittings was sampled in site building. Results from two (2) of the three (3) samples contain 25- 30% Chrysotile asbestos in (reference sample 02-02-900-S082 and 02-02-900-S008). For locations and conditions of this material at the time of the building survey refer to location & data excel document.

The sample of tar mastic and paper sampled above ceiling in room EN 1053 contains 10% chrysotile asbestos (reference sample 02-02-900-S005). For locations and conditions of this material at the time of the building survey refer to location & data excel document.

One (1) sample of the tar paper used on fibreglass insulation was collected from EN 1053. Analysis of the samples did not identify the presence of asbestos (reference sample 02-02-900-S038).

3.3 Acoustic Ceiling Tiles

Seven (7) samples were collected of acoustic ceiling tiles were observed in the site building. Analysis of the samples did not identify the presence of asbestos. A summary of the acoustic ceiling tiles samples collected are as follows:

- The 2"x2" acoustic ceiling tile distinguished with a pinhole and fleck pattern located in EN 2077 (reference sample 02-02-900-S048);
- The 2"x2" acoustic ceiling tile distinguished with a pinhole fleck pattern located in EN-1051A (reference sample 02-02-900-S007);
- The 2"x2" acoustic ceiling tile distinguished with a pinhole pattern located in EN 1056 (reference sample 02-02-900-S012);
- The 2"x2" acoustic ceiling tile distinguished with a plain pattern located in EN 1037 (reference sample 02-02-900-S040);
- The 2"x2" acoustic ceiling tile distinguished with a pinhole pattern located in EN 1052 (reference sample 02-02-900-S003);
- The 2"x2" acoustic ceiling tile distinguished with a pinhole and fleck pattern located in EN 1053 (reference sample 02-02-900-S010);and
- The 2"x2" acoustic ceiling tile distinguished with a pinhole and fissure pattern located in EN 1034B (reference sample 02-02-900-S029);

3.4 Drywall, Plaster, and Texture Finishes

Drywall was used as a wall and ceiling finish throughout the building. Until the early to mid-1980s, drywall joint compound may have contained chrysotile asbestos. Drywall joint compound is considered a non-friable material. Most buildings of this type undergo constant renovation, including the removal and replacement of drywall partitions. Therefore extensive sampling of drywall compound is necessary to come to a reasonable conclusion regarding the extent of asbestos. Furthermore, any attempt to distinguish and delineate all asbestos-containing drywall compounds from new non-asbestos drywall compound is often unachievable. Therefore, drywall joint compound was sampled at walls, which were believed to be original to try to define the presence of asbestos content in the original drywall compound.

Twenty (20) samples, in total, of drywall joint compound were collected in the site building. Results from ten (10) samples collected were determined to contain asbestos (reference samples 02-02-900-S024, 02-02-900-S043 02-02-900-S057 02-02-900-S058 02-02-900-S060 02-02-900-S068 02-02-900-S070 02-02-900-S072 02-02-900-S073 and 02-02-900-S074).

Plaster was used as a wall and ceiling finish in various locations in the Site Building. Until the early to mid-1980s, plaster may have contained chrysotile asbestos. Plaster is considered a potentially friable material. Most buildings of this type undergo constant renovation, including the removal and replacement of plaster. Moreover, the addition of asbestos to plaster compound was done at the site by the individual plasterer on an as needs basis. Therefore extensive sampling of plaster is necessary to come to a reasonable conclusion regarding the extent of asbestos. Furthermore, any attempt to distinguish and delineate all asbestos-containing plaster from new non-asbestos plaster is often unachievable. Therefore, plaster was sampled at walls which were believed to be original to try to define the presence of asbestos content in the original plaster.

Six (6) samples of plaster were collected throughout the site building. Analysis of the samples did not identify the presence of asbestos (reference samples 02-02-900-S079, 02-02-900-S078, 02-02-900-S05, 02-02-900-S075, 02-02-900-S076 and 02-02-900-S077).

Friable textured ceiling stucco was also observed on the ceilings of the stairwells of the site building. Samples of this material were collected from EN 2000 and EN 2001 and analysis of the samples did not identify the presence of asbestos (reference sample 02-02-900-S052 and 02-02-900-S054).

3.5 Vinyl Flooring Materials

3.5.1 Vinyl Floor Tiles Thirty (30) types of vinyl floor tiles were observed in the site building. Results from eleven (11) of the thirty (30) samples collected contain asbestos. For locations and conditions of this material at the time of the building survey refer to location & data excel document. A list of the visually different asbestos and non-asbestos vinyl floor tiles is provided below:

3.5.1.1 Asbestos Containing Vinyl Floor Tiles

Asbestos Floor Tile Summary Engineering Building			
Reference Sample	Description	Location	Asbestos (%)
02-02-900-S021	12"x12" vinyl floor tiles brown with abundant grey flecks	EN 1019A	3%
02-02-900-S035	12"x12" vinyl floor tiles brown with white and dark brown streaks	EN 1023F	3%
02-02-900-S033	12"x12" vinyl floor tiles green with brown and white streaks	EN 1026A	3%
02-02-900-S018	12"x12" vinyl floor tiles green with thick green streak	EN 1C01	3%
02-02-900-S050	12"x12" vinyl floor tiles grey with brown streaks	EN 2006	2%
02-02-900-S034	12"x12" vinyl floor tiles grey with dark grey streaks	EN 1023A	3%
02-02-900-S041	12"x12" vinyl floor tiles grey with dark grey streaks	EN 2024	3%
02-02-900-S023	12"x12" vinyl floor tiles light brown with brick red streak	EN 1019A	3%
02-02-900-S011	12"x12" vinyl floor tiles light brown with large white streaks	EN 1056	3%
02-02-900-S055	12"x12" vinyl floor tiles red with abundant white streaks	EN 2C01	3%
02-02-900-S013	12"x12" vinyl floor tiles very light brown with large brown streaks	EN 1061	3%
For additional locations of these materials at the time of the building survey refer to location & data excel document.			

3.5.1.2 Non Asbestos-Containing Vinyl Floor Tiles

Non-Asbestos Floor Tile Summary Engineering Building		
Reference Sample	Description	Location
02-02-900-S001	12"x12" Vinyl floor tiles greenish blue with large green and white streak	EN 1052
02-02-900-S042	12"x12" vinyl floor tiles grey with abundant white and dark grey flecks	EN 2020
02-02-900-S019	12"x12" vinyl floor tiles green with large white streaks	EN 1C01
02-02-900-S026	12"x12" vinyl floor tiles large brown and cream streaks	EN 1038F
02-02-900-S044	12"x12" vinyl floor tiles light yellow with dark yellow and white specks	EN 2048
02-02-900-S064	12"x12" vinyl floor tiles pale yellow with abundant yellow and white streak	EN 3000A
02-02-900-S036	12"x12" vinyl floor tiles white	EN 1023F
02-02-900-S022	12"x12" vinyl floor tiles white mottled brown	EN 1019A
02-02-900-S020	12"x12" vinyl floor tiles white with abundant grey flecks	EN 1015B
02-02-900-S006	12"x12" vinyl floor tiles white with black streaks	EN 1051A
02-02-900-S059	12"x12" vinyl floor tiles white with brown streak	EN 3057
02-02-900-S028	12"x12" vinyl floor tiles white with large brown flecks	EN 1010
02-02-900-S031	12"x12" vinyl floor tiles white with light blue streaks	EN 1035E
02-02-900-S046	12"x12" vinyl floor tiles, white with abundant grey flecks	EN 205C
02-02-900-S045	12"x12" vinyl floor tiles, white with yellow streak	EN 2050

Non-Asbestos Floor Tile Summary Engineering Building		
Reference Sample	Description	Location
02-02-900-S009	12"x12" vinyl; floor tiles blue with white streak	EN 1053
02-02-900-S017	12"x12" vinyl floor tiles aqua with white and green fleck	EN 1C01
02-02-900-S081	12"x12" vinyl floor tiles pebble stone pattern	
02-02-900-S083	12"x12" vinyl floor tiles orange with brown	EN2042
For additional locations of these materials at the time of the building survey refer to location & data excel document.		

3.5.2 Vinyl Sheet Flooring

Six (6) types of vinyl sheet flooring were observed in the site building. Analysis of the samples did not identify the presence of asbestos. A summary of the visually different asbestos containing vinyl sheet flooring is provided in the tables below:

3.5.2.1 Non-Asbestos Containing Vinyl Sheet Flooring

Non-Asbestos Containing Vinyl Sheet Flooring Engineering Building		
Sample Number	Description	Location
02-02-900-S069	Vinyl Sheet Flooring white with grey and brown mottles	EN 4029B
02-02-900-S039	Vinyl sheet flooring blue wave pattern	EN
02-02-900-S071	Vinyl sheet flooring brown stone pattern	EN 4004
02-02-900-S061	Vinyl sheet flooring dark blue	EN 3038
02-02-900-S066	Vinyl sheet flooring pale yellow with brown flecks	EN 2030

Non-Asbestos Containing Vinyl Sheet Flooring Engineering Building		
Sample Number	Description	Location
02-02-900-S065	Vinyl Sheet Flooring, dark grey flecks	EN 4028
For additional locations of these materials at the time of the building survey refer to location & data excel document.		

3.6 Asbestos Cement Products

One (1) sample of transite sheeting was collected inside the fume hood from EN 1020B and contains 20% chrysotile asbestos (reference sample 02-02-900-S025). For locations and conditions of this material at the time of the building survey refer to location & data excel document.

The black phenolic lab bench also referred as “transite counter” was sampled in room EN 1001 and contains 15% amosite and 5% chrysotile asbestos (reference sample 02-02-900-S016). For locations and conditions of this material at the time of the building survey refer to location & data excel document.

3.7 Vermiculite Insulation

No vermiculite containing products were observed. Visual observations were made above the ceiling and through any hatches.

3.8 Other Asbestos Containing Building Materials

One (1) sample of foil paper in the incandescent light fixture was collected from EN 4027 and contains 40% chrysotile asbestos (reference sample 02-02-900-S053). For locations and conditions of this material at the time of the building survey refer to location & data excel document.

One (1) sample of leveling compound on the ducts was collected from room EN 1049. Analysis of the sample did not identify the presence of asbestos (reference sample 02-02-900-S015).

One (1) sample of mastic compound on the ducts was collected from EN 3000A. Analysis of the samples did not identify the presence of asbestos (reference sample 02-02-900-S063).

4.0 LBP SURVEY FINDINGS

Analytical results indicate that three (3) of the samples collected of painted surfaces would be considered a risk to worker exposure during construction or renovation activities (with lead concentrations exceeding 0.06%). The cream paint as observed in EN 1250 (reference sample 02-02-900-L002) contains 0.26%, the green paint as observed in EN 10350 (reference sample 02-02-900-L013) contains 0.067% and the green paint in EN 4013 (reference sample 02-02-900-L012) contains 0.11% and the same paint colours located elsewhere, should be managed as lead-containing.

Results indicate that were detected, all other paint samples containing less than 0.06% lead.

All paints observed inside the Site Building were observed in GOOD condition.

5.0 RECOMMENDATIONS

Asbestos containing materials and lead based paints have been identified in the Site Building. Listed below are a series of general recommendations for the Site Building. Recommendations provided in the Overview Report may also be reviewed and applied to this building.

Friable ACMs

Friable asbestos containing materials identified inside the Site Building include: parging cement.

1. Type III (high risk) asbestos abatement procedures should be carried out for the scheduled removal of greater than 1 ft² of friable asbestos containing materials. Alternatively, Type II (moderate risk) glove bag abatement procedures may be applied where practical;
2. Type II (moderate risk) asbestos abatement procedures should be carried out for the scheduled repair or enclosure of friable ACMs or for the removal of less than 1 ft² of material;

Potentially Friable Materials

Non-friable materials with the potential to become friable during renovation and demolition activities were identified inside the Site Building, specifically drywall joint compound

1. Under the NL guidance documents for moderate and low risk asbestos abatement procedures, quantities of these materials within an enclosure exceeding 100 ft² should be removed using Type III (high risk) asbestos abatement procedures. Quantities less than 100 ft² but exceeding 10 ft² should be removed using Type II (moderate risk) asbestos abatement procedures, while

quantities less than 10 ft² should be removed using Type I (low risk) asbestos abatement procedures.

Non-Friable Materials

Non-friable asbestos containing materials identified inside the Site Building include: transite, tar mastic, and vinyl floor products.

1. Type I (low risk) asbestos abatement procedures should be carried out for the scheduled disturbance of any non-friable materials provided the materials can be removed intact, and without the use of powered hand tools.
2. Should the use of powered hand tools or excessive breakage of the materials become necessary, Type II (moderate risk) asbestos abatement procedures should be adopted.

Lead Based Paints

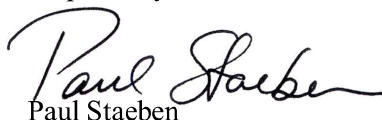
Do not grind, sand, torch or cut lead materials without using proper procedures, as material poses a health hazard if disturbed by these methods.

Any painted surfaces visually matching the identified paint colors should be managed as lead containing and necessary precautions (i.e.: worker protection) should be employed prior to the disturbance to these materials. Do not grind, sand, torch or cut lead materials without using proper procedures, as material poses a health hazard if disturbed by these methods.

Should there be any questions pertaining to the contents of this report, please do not hesitate to contact the undersigned at our office.

PINCHIN LEBLANC ENVIRONMENTAL LIMITED

Prepared by;



Paul Staeben

NL Vice President

pstaeben@pinchinleblanc.com

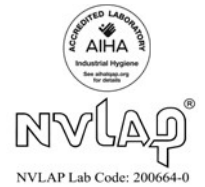
APPENDIX I

ASBESTOS ANALYTICAL REPORT



Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020



Customer: Pinchin LeBlanc Environmental
27 Austin St
2nd Flr
St Johns, NL A1B 4C3

Attn: Nicole Power

Lab Order ID: 1214573

Analysis ID: 1214573PLM

Date Received: 9/4/2012

Date Reported: 9/10/2012

Project: 02-02-900

Sample ID	Description	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes
Lab Sample ID	Lab Notes				Treatment
02-02-900-S001 - A	12x12 VFT, greenish blue with large green and white streaks	None Detected		100% Other	Blue Non Fibrous Heterogeneous
1214573PLM_1	tile				Dissolved
02-02-900-S001 - B	12x12 VFT, greenish blue with large green and white streaks	None Detected	3% Cellulose	97% Other	Black Non Fibrous Heterogeneous
1214573PLM_83	mastic				Dissolved
02-02-900-S002	Drywall joint compound	None Detected		100% Other	Tan Non Fibrous Homogeneous
1214573PLM_2					Crushed
02-02-900-S003	2x4 Acoustic ceiling tile pinhole pattern 2x4 Acoustic ceiling tile	None Detected	50% Cellulose 30% Fiber Glass	10% Perlite 10% Other	Tan, White Fibrous Heterogeneous
1214573PLM_3					Crushed
02-02-900-S004	Spray insulation above ceiling	None Detected	60% Mineral Wool	40% Other	Gray Fibrous Heterogeneous
1214573PLM_4					Crushed
02-02-900-S005 - A	Tar paper and mastic	None Detected	95% Cellulose	5% Other	Brown Fibrous Heterogeneous
1214573PLM_5	tar paper				Teased
02-02-900-S005 - B	Tar paper and mastic	10% Chrysotile		90% Other	Black Non Fibrous Heterogeneous
1214573PLM_84	mastic				Dissolved
02-02-900-S006 - A	12x12 Vinyl floor tiles white with black streaks	None Detected		100% Other	White Non Fibrous Heterogeneous
1214573PLM_6	tile				Dissolved

Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommended that analysis of floor tiles, vermiculite, and/or heterogeneous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by NVLAP or any other agency

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Analyst

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Nathaniel Durham, MS or Approved Signatory

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Bulk Asbestos Analysis

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Lab Order ID: 1214573

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Date Received: 9/4/2012

Date Reported: 9/10/2012

Project: 02-02-900

Sample ID	Description	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes
Lab Sample ID	Lab Notes				Treatment
02-02-900-S006 - B	12x12 Vinyl floor tiles white with black streaks	None Detected	2% Cellulose	98% Other	Black Non Fibrous Heterogeneous
1214573PLM_85	mastic				Dissolved
02-02-900-S007	2x2 Acoustic ceiling tile pinhole with fleck pattern	None Detected	40% Cellulose 40% Fiber Glass	10% Perlite 10% Other	Tan, White Fibrous Heterogeneous
1214573PLM_7					Crushed
02-02-900-S008	Pipe elbow parging	30% Chrysotile		70% Other	Gray Fibrous Heterogeneous
1214573PLM_8					Teased
02-02-900-S009 - A	12x12 Vinyl; floor tiles blue with white streaks	None Detected		100% Other	Blue Non Fibrous Heterogeneous
1214573PLM_9	tile				Dissolved
02-02-900-S009 - B	12x12 Vinyl; floor tiles blue with white streaks	None Detected	5% Cellulose	95% Other	Black Non Fibrous Heterogeneous
1214573PLM_86	mastic				Dissolved
02-02-900-S010	2x4 Acoustic ceiling tile pinhole with fleck pattern	None Detected	50% Cellulose 30% Fiber Glass	10% Perlite 10% Other	Tan, White Fibrous Heterogeneous
1214573PLM_10					Crushed
02-02-900-S011 - A	12x12 Vinyl floor tiles light brown with large white streaks	3% Chrysotile		97% Other	Brown Non Fibrous Heterogeneous
1214573PLM_11	tile				Dissolved
02-02-900-S011 - B	12x12 Vinyl floor tiles light brown with large white streaks	None Detected	2% Cellulose	98% Other	Black Non Fibrous Heterogeneous
1214573PLM_87	mastic				Dissolved

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Date Reported: 9/10/2012

Project: 02-02-900

Sample ID	Description	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes
Lab Sample ID	Lab Notes				Treatment
02-02-900-S012	2x2 Acoustic ceiling tiles pinhole pattern	None Detected	40% Cellulose 40% Fiber Glass	10% Perlite 10% Other	Tan, White Fibrous Heterogeneous
1214573PLM_12					Crushed
02-02-900-S013 - A	12x12 Vinyl floor tiles very light brown with large brown streaks	3% Chrysotile		97% Other	Tan Non Fibrous Heterogeneous
1214573PLM_13	tile				Dissolved
02-02-900-S013 - B	12x12 Vinyl floor tiles very light brown with large brown streaks	None Detected	3% Cellulose	97% Other	Black Non Fibrous Heterogeneous
1214573PLM_88	mastic				Dissolved
02-02-900-S014	Drywall joint compound	None Detected		100% Other	White Non Fibrous Homogeneous
1214573PLM_14					Crushed
02-02-900-S015	Leveling compound above ceiling ductwork	None Detected	5% Cellulose	95% Other	White Non Fibrous Heterogeneous
1214573PLM_15					Crushed
02-02-900-S016	Counter top	15% Chrysotile 5% Amosite		80% Other	Black Fibrous Heterogeneous
1214573PLM_16					Crushed
02-02-900-S017 - A	12x12 Vinyl floor tiles aqua with white and green fleck	None Detected		100% Other	Blue Non Fibrous Heterogeneous
1214573PLM_17	tile				Dissolved
02-02-900-S017 - B	12x12 Vinyl floor tiles aqua with white and green fleck	None Detected	3% Cellulose	97% Other	Black Non Fibrous Heterogeneous
1214573PLM_89	mastic				Dissolved

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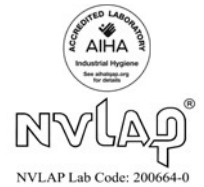
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Bulk Asbestos Analysis

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EPA Method: 600/R-93/116 and 600/M4-82-020



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Attn: Nicole Power

Lab Order ID: 1214573

Analysis ID: 1214573PLM

Date Received: 9/4/2012

Date Reported: 9/10/2012

Project: 02-02-900

Sample ID	Description	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes
Lab Sample ID	Lab Notes				Treatment
02-02-900-S018 - A	12x12 Vinyl floor tiles green with thick green streak	3% Chrysotile		97% Other	Red Non Fibrous Heterogeneous
1214573PLM_18	tile				Dissolved
02-02-900-S018 - B	12x12 Vinyl floor tiles green with thick green streak	None Detected	4% Cellulose	96% Other	White, Black Non Fibrous Heterogeneous
1214573PLM_90	mastic/leveling compound				Dissolved
02-02-900-S019 - A	12x12 Vinyl floor tiles green with large white streaks	None Detected		100% Other	Green Non Fibrous Heterogeneous
1214573PLM_19	tile				Dissolved
02-02-900-S019 - B	12x12 Vinyl floor tiles green with large white streaks	None Detected	3% Cellulose	97% Other	Black Non Fibrous Heterogeneous
1214573PLM_91	mastic				Dissolved
02-02-900-S020 - A	12x12 Vinyl floor tiles white with abundant grey flecks	None Detected		100% Other	White Non Fibrous Heterogeneous
1214573PLM_20	tile				Dissolved
02-02-900-S020 - B	12x12 Vinyl floor tiles white with abundant grey flecks	None Detected	3% Cellulose	97% Other	Black Non Fibrous Heterogeneous
1214573PLM_92	mastic				Dissolved
02-02-900-S021 - A	12x12 Vinyl floor tiles brown with abundant grey flecks	3% Chrysotile		97% Other	Brown Non Fibrous Heterogeneous
1214573PLM_21	tile				Dissolved
02-02-900-S021 - B	12x12 Vinyl floor tiles brown with abundant grey flecks	None Detected	2% Cellulose	98% Other	Black Non Fibrous Heterogeneous
1214573PLM_93	mastic				Dissolved

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Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020



Customer: Pinchin LeBlanc Environmental
27 Austin St
2nd Flr
St Johns, NL A1B 4C3

Attn: Nicole Power

Lab Order ID: 1214573

Analysis ID: 1214573PLM

Date Received: 9/4/2012

Date Reported: 9/10/2012

Project: 02-02-900

Sample ID	Description	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes
Lab Sample ID	Lab Notes				Treatment
02-02-900-S022 - A	12x12 Vinyl floor tiles white mottled brown	None Detected		100% Other	White Non Fibrous Heterogeneous
1214573PLM_22	tile				Dissolved
02-02-900-S022 - B	12x12 Vinyl floor tiles white mottled brown	None Detected	3% Cellulose	97% Other	Black Non Fibrous Heterogeneous
1214573PLM_94	mastic				Dissolved
02-02-900-S023 - A	12x12 Vinyl floor tiles light brown with brick red streak	3% Chrysotile		97% Other	Tan Non Fibrous Heterogeneous
1214573PLM_23	tile				Dissolved
02-02-900-S023 - B	12x12 Vinyl floor tiles light brown with brick red streak	None Detected	2% Cellulose	98% Other	Black Non Fibrous Heterogeneous
1214573PLM_95	mastic				Dissolved
02-02-900-S024	Drywall joint compound	3% Chrysotile		97% Other	Tan Non Fibrous Homogeneous
1214573PLM_24					Crushed
02-02-900-S025	Transite sheeting in fume hood	20% Chrysotile		80% Other	Gray Fibrous Heterogeneous
1214573PLM_25					Crushed
02-02-900-S026 - A	12x12 Vinyl floor tiles large brown and cream streaks	None Detected	3% Cellulose	97% Other	Cream Non Fibrous Heterogeneous
1214573PLM_26	tile				Dissolved
02-02-900-S026 - B	12x12 Vinyl floor tiles large brown and cream streaks	None Detected	3% Cellulose	97% Other	Black Non Fibrous Heterogeneous
1214573PLM_96	mastic				Dissolved

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Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020



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Attn: Nicole Power

Lab Order ID: 1214573

Analysis ID: 1214573PLM

Date Received: 9/4/2012

Date Reported: 9/10/2012

Project: 02-02-900

Sample ID	Description	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes
Lab Sample ID	Lab Notes				Treatment
02-02-900-S027	Drywall joint compound	None Detected		100% Other	Tan Non Fibrous Homogeneous
1214573PLM_27					Crushed
02-02-900-S028 - A	12x12 Vinyl floor tiles white with large brown flecks	None Detected		100% Other	White Non Fibrous Heterogeneous
1214573PLM_28	tile				Dissolved
02-02-900-S028 - B	12x12 Vinyl floor tiles white with large brown flecks	None Detected	2% Cellulose	98% Other	Black Non Fibrous Heterogeneous
1214573PLM_97	mastic				Dissolved
02-02-900-S029	2x4 Acoustic ceiling tiles pinhole and fissure pattern	None Detected	50% Cellulose 30% Fiber Glass	10% Perlite 10% Other	Tan, White Fibrous Heterogeneous
1214573PLM_29					Crushed
02-02-900-S030	Pipe elbow parging on furnace exhaust	None Detected	25% Mineral Wool 10% Cellulose	65% Other	Gray Fibrous Heterogeneous
1214573PLM_30					Crushed
02-02-900-S031 - A	12x12 Vinyl floor tiles white with light blue streaks	None Detected		100% Other	White Non Fibrous Heterogeneous
1214573PLM_31	tile				Dissolved
02-02-900-S031 - B	12x12 Vinyl floor tiles white with light blue streaks	None Detected	3% Cellulose	97% Other	Black Non Fibrous Heterogeneous
1214573PLM_98	mastic				Dissolved
02-02-900-S032	Drywall joint compound	None Detected		100% Other	White Non Fibrous Homogeneous
1214573PLM_32					Crushed

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Bulk Asbestos Analysis

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EPA Method: 600/R-93/116 and 600/M4-82-020



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Attn: Nicole Power

Lab Order ID: 1214573

Analysis ID: 1214573PLM

Date Received: 9/4/2012

Date Reported: 9/10/2012

Project: 02-02-900

Sample ID	Description	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes
Lab Sample ID	Lab Notes				Treatment
02-02-900-S033 - A	12x12 Vinyl floor tiles green with brown and white streaks	3% Chrysotile		97% Other	Green Non Fibrous Heterogeneous
1214573PLM_33	tile				Dissolved
02-02-900-S033 - B	12x12 Vinyl floor tiles green with brown and white streaks	None Detected	2% Cellulose	98% Other	Black Non Fibrous Heterogeneous
1214573PLM_99	mastic				Dissolved
02-02-900-S034 - A	12x12 Vinyl floor tiles grey with dark grey streaks	3% Chrysotile		97% Other	Gray Non Fibrous Heterogeneous
1214573PLM_34	tile				Dissolved
02-02-900-S034 - B	12x12 Vinyl floor tiles grey with dark grey streaks	None Detected	3% Cellulose	97% Other	Black Non Fibrous Heterogeneous
1214573PLM_100	mastic				Dissolved
02-02-900-S035 - A	12x12 Vinyl floor tiles brown with white and dark brown streaks	3% Chrysotile		97% Other	Brown Non Fibrous Heterogeneous
1214573PLM_35	tile				Dissolved
02-02-900-S035 - B	12x12 Vinyl floor tiles brown with white and dark brown streaks	None Detected	2% Cellulose	98% Other	Black Non Fibrous Heterogeneous
1214573PLM_101	mastic				Dissolved
02-02-900-S036 - A	12x12 Vinyl floor tiles white	None Detected		100% Other	Tan Non Fibrous Heterogeneous
1214573PLM_36	tile				Dissolved
02-02-900-S036 - B	12x12 Vinyl floor tiles white	None Detected	3% Cellulose	97% Other	Black Non Fibrous Heterogeneous
1214573PLM_102	mastic				Dissolved

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Attn: Nicole Power

Lab Order ID: 1214573

Analysis ID: 1214573PLM

Date Received: 9/4/2012

Date Reported: 9/10/2012

Project: 02-02-900

Sample ID	Description	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes
Lab Sample ID	Lab Notes				Treatment
02-02-900-S037	Drywall joint compound	None Detected		100% Other	White Non Fibrous Homogeneous
1214573PLM_37					Crushed
02-02-900-S038	Tar paper wrap on straight fiberglass insulation	None Detected	80% Cellulose	20% Other	Brown, Black Fibrous Heterogeneous
1214573PLM_38					Dissolved
02-02-900-S039	Vinyl sheet flooring blue wave pattern	None Detected	15% Cellulose	85% Other	Blue Fibrous Heterogeneous
1214573PLM_39	vinyl only				Dissolved
02-02-900-S040	2x4 Acoustic ceiling tile	None Detected	40% Cellulose 40% Fiber Glass	10% Perlite 10% Other	Tan, White Fibrous Heterogeneous
1214573PLM_40					Crushed
02-02-900-S041 - A	12x12 Vinyl floor tiles grey with dark grey streaks	3% Chrysotile		97% Other	Black Non Fibrous Heterogeneous
1214573PLM_41	tile				Dissolved
02-02-900-S041 - B	12x12 Vinyl floor tiles grey with dark grey streaks	None Detected	3% Cellulose	97% Other	Black Non Fibrous Heterogeneous
1214573PLM_103	mastic				Dissolved
02-02-900-S042 - A	12x12 Vinyl floor tiles grey with abundant white and dark grey flecks	None Detected		100% Other	Tan Non Fibrous Heterogeneous
1214573PLM_42	tile				Dissolved
02-02-900-S042 - B	12x12 Vinyl floor tiles grey with abundant white and dark grey flecks	None Detected	2% Cellulose	98% Other	Black Non Fibrous Heterogeneous
1214573PLM_104	mastic				Dissolved

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Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020



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Lab Order ID: 1214573

Analysis ID: 1214573PLM

Date Received: 9/4/2012

Date Reported: 9/10/2012

Project: 02-02-900

Sample ID	Description	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes
Lab Sample ID	Lab Notes				Treatment
02-02-900-S043	Drywall joint compound	3% Chrysotile		97% Other	Tan, White Non Fibrous Homogeneous
1214573PLM_43					Crushed
02-02-900-S044 - A	12x12 Vinyl floor tiles light yellow with dark yellow and white specks	None Detected		100% Other	Yellow Non Fibrous Heterogeneous
1214573PLM_44	tile				Dissolved
02-02-900-S044 - B	12x12 Vinyl floor tiles light yellow with dark yellow and white specks	None Detected	2% Cellulose	98% Other	Yellow, Black Non Fibrous Heterogeneous
1214573PLM_105	mixed mastics				Dissolved
02-02-900-S045 - A	12x12 Vinyl floor tiles white and yellow streaks	None Detected		100% Other	Tan Non Fibrous Heterogeneous
1214573PLM_45	tile				Dissolved
02-02-900-S045 - B	12x12 Vinyl floor tiles white and yellow streaks	None Detected	4% Cellulose	96% Other	Black Non Fibrous Heterogeneous
1214573PLM_106	mastic				Dissolved
02-02-900-S046 - A	12x12 Vinyl floor tiles white with abundant grey flecks	None Detected		100% Other	White Non Fibrous Heterogeneous
1214573PLM_46	tile				Dissolved
02-02-900-S046 - B	12x12 Vinyl floor tiles white with abundant grey flecks	None Detected	3% Cellulose	97% Other	Black Non Fibrous Heterogeneous
1214573PLM_107	mastic				Dissolved
02-02-900-S047	Drywall joint compound	None Detected		100% Other	Tan Non Fibrous Homogeneous
1214573PLM_47					Crushed

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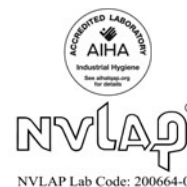
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Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020



Customer: Pinchin LeBlanc Environmental
27 Austin St
2nd Flr
St Johns, NL A1B 4C3

Attn: Nicole Power

Lab Order ID: 1214573

Analysis ID: 1214573PLM

Date Received: 9/4/2012

Date Reported: 9/10/2012

Project: 02-02-900

Sample ID	Description	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes
Lab Sample ID	Lab Notes				Treatment
02-02-900-S048	2x2 Acoustic ceiling tile pinhole and fleck pattern	None Detected	50% Cellulose 30% Fiber Glass	10% Perlite 10% Other	Tan, White Fibrous Heterogeneous
1214573PLM_48					Crushed
02-02-900-S049	Drywall joint compound	None Detected		100% Other	Tan Non Fibrous Homogeneous
1214573PLM_49					Crushed
02-02-900-S050 - A	12x12 Vinyl floor tiles grey with brown streaks	2% Chrysotile		98% Other	Gray Non Fibrous Heterogeneous
1214573PLM_50	tile				Dissolved
02-02-900-S050 - B	12x12 Vinyl floor tiles grey with brown streaks	None Detected	3% Cellulose	97% Other	Black Non Fibrous Heterogeneous
1214573PLM_108	mastic				Dissolved
02-02-900-S051	Ceiling plaster	None Detected		100% Other	White Non Fibrous Heterogeneous
1214573PLM_51					Crushed
02-02-900-S052	Textured ceiling coat	None Detected		100% Other	White Non Fibrous Heterogeneous
1214573PLM_52					Crushed
02-02-900-S053	Foil backed heatsheild for incandescent fixture	40% Chrysotile	40% Cellulose	20% Other	Silver, Tan Fibrous Heterogeneous
1214573PLM_53					Teased
02-02-900-S054	Textured ceiling coat	None Detected		100% Other	White Non Fibrous Heterogeneous
1214573PLM_54					Crushed

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Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020



Customer: Pinchin LeBlanc Environmental
27 Austin St
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St Johns, NL A1B 4C3

Attn: Nicole Power

Lab Order ID: 1214573

Analysis ID: 1214573PLM

Date Received: 9/4/2012

Date Reported: 9/10/2012

Project: 02-02-900

Sample ID	Description	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes
Lab Sample ID	Lab Notes				Treatment
02-02-900-S055 - A	12x12 Vinyl floor tiles red with abundant white streaks	3% Chrysotile		97% Other	Red Non Fibrous Heterogeneous
1214573PLM_55	tile				Dissolved
02-02-900-S055 - B	12x12 Vinyl floor tiles red with abundant white streaks	None Detected	2% Cellulose	98% Other	Black Non Fibrous Heterogeneous
1214573PLM_109	mastic				Dissolved
02-02-900-S056	Drywall joint compound	None Detected		100% Other	White Non Fibrous Homogeneous
1214573PLM_56					Crushed
02-02-900-S057	Drywall joint compound	3% Chrysotile		97% Other	Tan Non Fibrous Homogeneous
1214573PLM_57					Crushed
02-02-900-S058	Drywall joint compound	3% Chrysotile		97% Other	Tan Non Fibrous Homogeneous
1214573PLM_58					Crushed
02-02-900-S059 - A	12x12 Vinyl floor tiles white with brown streaks	None Detected		100% Other	White Non Fibrous Heterogeneous
1214573PLM_59	tile				Dissolved
02-02-900-S059 - B	12x12 Vinyl floor tiles white with brown streaks	None Detected	3% Cellulose	97% Other	Black Non Fibrous Heterogeneous
1214573PLM_110	mastic				Dissolved
02-02-900-S060	Drywall joint compound	3% Chrysotile		97% Other	Tan Non Fibrous Homogeneous
1214573PLM_60					Crushed

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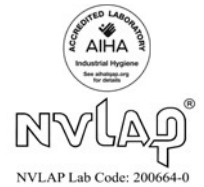
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Project: 02-02-900

Sample ID	Description	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes
Lab Sample ID	Lab Notes				Treatment
02-02-900-S061	Vinyl sheet flooring dark blue	None Detected		100% Other	Blue Non Fibrous Homogeneous
1214573PLM_61	vinyl only				Ashed
02-02-900-S062	Drywall joint compound	None Detected		100% Other	Tan Non Fibrous Homogeneous
1214573PLM_62					Crushed
02-02-900-S063	Mastic on furnace ductwork	None Detected	2% Synthetic Fibers	98% Other	Gray Non Fibrous Heterogeneous
1214573PLM_63					Dissolved
02-02-900-S064 - A	12x12 Vinyl floor tiles pale yellow with abundant yellow and white flecks	None Detected		100% Other	Yellow Non Fibrous Heterogeneous
1214573PLM_64	tile				Dissolved
02-02-900-S064 - B	12x12 Vinyl floor tiles pale yellow with abundant yellow and white flecks	None Detected	3% Cellulose	97% Other	Black Non Fibrous Heterogeneous
1214573PLM_111	mastic				Dissolved
02-02-900-S065 - A	Vinyl sheet flooring, dark grey flecks	None Detected	15% Cellulose	85% Other	Brown Fibrous Heterogeneous
1214573PLM_65	vinyl				Dissolved
02-02-900-S065 - B	Vinyl sheet flooring, dark grey flecks	None Detected		100% Other	Yellow Non Fibrous Heterogeneous
1214573PLM_112	mastic				Dissolved
02-02-900-S066 - A	Vinyl sheet flooring pale yellow with brown flecks	None Detected	15% Cellulose	85% Other	Yellow Fibrous Heterogeneous
1214573PLM_66	vinyl				Dissolved

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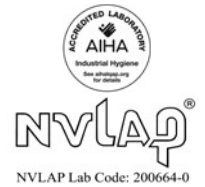
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Bulk Asbestos Analysis

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EPA Method: 600/R-93/116 and 600/M4-82-020



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Analysis ID: 1214573PLM

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Project: 02-02-900

Sample ID	Description	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes
Lab Sample ID	Lab Notes				Treatment
02-02-900-S066 - B	Vinyl sheet flooring pale yellow with brown flecks	None Detected		100% Other	Yellow Non Fibrous Heterogeneous
1214573PLM_113	mastic				Dissolved
02-02-900-S067	Drywall joint compound	None Detected		100% Other	White Non Fibrous Homogeneous
1214573PLM_67					Crushed
02-02-900-S068	Drywall joint compound	3% Chrysotile		97% Other	Tan Non Fibrous Homogeneous
1214573PLM_68					Crushed
02-02-900-S069	Vinyl sheet flooring white with grey and brown mottles	None Detected		100% Other	White Non Fibrous Heterogeneous
1214573PLM_69					Dissolved
02-02-900-S070	Drywall joint compound	2% Chrysotile		98% Other	White Non Fibrous Homogeneous
1214573PLM_70					Crushed
02-02-900-S071 - A	Vinyl sheet flooring brown stone pattern	None Detected	15% Cellulose	85% Other	Brown Fibrous Heterogeneous
1214573PLM_71	vinyl				Dissolved
02-02-900-S071 - B	Vinyl sheet flooring brown stone pattern	None Detected		100% Other	Yellow Non Fibrous Heterogeneous
1214573PLM_114	mastic				Dissolved
02-02-900-S072	Drywall joint compound	3% Chrysotile		97% Other	Tan, White Non Fibrous Homogeneous
1214573PLM_72					Crushed

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Analysis ID: 1214573PLM

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Project: 02-02-900

Sample ID	Description	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes
Lab Sample ID	Lab Notes				Treatment
02-02-900-S073	Drywall joint compound	3% Chrysotile		97% Other	Tan Non Fibrous Homogeneous
1214573PLM_73					Crushed
02-02-900-S074	Drywall joint compound	3% Chrysotile		97% Other	Tan Non Fibrous Homogeneous
1214573PLM_74					Crushed
02-02-900-S075	Ceiling plaster	None Detected		100% Other	White Non Fibrous Heterogeneous
1214573PLM_75					Crushed
02-02-900-S076 - A	Ceiling plaster	None Detected		100% Other	White Non Fibrous Heterogeneous
1214573PLM_76	finish				Crushed
02-02-900-S076 - B	Ceiling plaster	None Detected		100% Other	Gray Non Fibrous Heterogeneous
1214573PLM_115	base				Crushed
02-02-900-S077	Window sil plaster	None Detected		100% Other	White Non Fibrous Homogeneous
1214573PLM_77					Crushed
02-02-900-S078	2nd floor ceiling plaster	None Detected		100% Other	White Non Fibrous Homogeneous
1214573PLM_78					Crushed
02-02-900-S079	1st floor ceiling plaster	None Detected		100% Other	White Non Fibrous Homogeneous
1214573PLM_79					Crushed

Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommended that analysis of floor tiles, vermiculite, and/or heterogeneous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by NVLAP or any other agency

Dorlos Ammerman (116)

Analyst

Scientific Analytical Institute, Inc. 4604 Dundas Dr. Greensboro, NC 27407 (336) 292-3888

Nathaniel Durham, MS or Approved Signatory

Page 14 of 15



Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020



Customer: Pinchin LeBlanc Environmental
27 Austin St
2nd Flr
St Johns, NL A1B 4C3

Attn: Nicole Power

Lab Order ID: 1214573

Analysis ID: 1214573PLM

Date Received: 9/4/2012

Date Reported: 9/10/2012

Project: 02-02-900

Sample ID	Description	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes
Lab Sample ID	Lab Notes				Treatment
02-02-900-S080	Fire proofing	None Detected	65% Mineral Wool	35% Other	Gray Fibrous Heterogeneous
1214573PLM_80					Crushed
02-02-900-S081 - A	Pebble stone 12x12 vinyl floor tiles	None Detected		100% Other	Brown Non Fibrous Heterogeneous
1214573PLM_81	tile				Dissolved
02-02-900-S081 - B	Pebble stone 12x12 vinyl floor tiles	None Detected	2% Cellulose	98% Other	Black Non Fibrous Heterogeneous
1214573PLM_116	mastic				Dissolved
02-02-900-S082	Parging cement on water tanks and elbow pipes	25% Chrysotile		75% Other	White Fibrous Heterogeneous
1214573PLM_82					Teased

Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommended that analysis of floor tiles, vermiculite, and/or heterogeneous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by NVLAP or any other agency.

Dorlos Ammerman (116)

Analyst

Scientific Analytical Institute, Inc. 4604 Dundas Dr. Greensboro, NC 27407 (336) 292-3888

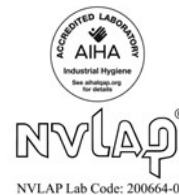
Nathaniel Durham, MS or Approved Signatory

Page 15 of 15



Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 600/M4-82-020



Customer: Pinchin LeBlanc Environmental
27 Austin St
2nd Flr
St Johns NL A1B 4C3

Attn: Dawn Benteau
Paul Staeben

Lab Order ID: 1308169

Analysis ID: 1308169_PLM

Date Received: 5/2/2013

Date Reported: 5/7/2013

Project: 02-02-00900; Engineering Building

Sample ID	Description	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes
Lab Sample ID	Lab Notes				Treatment
02-02-900-S083 - A	12x12 Vinyl Floor Tiles - Orange With Brown Flecks	None Detected		100% Other	Orange Non Fibrous Heterogeneous
1308169PLM_1	tile				Dissolved
02-02-900-S083 - B	12x12 Vinyl Floor Tiles - Orange With Brown Flecks	None Detected	3% Cellulose	97% Other	Yellow Non Fibrous Heterogeneous
1308169PLM_2	mastic				Dissolved

Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommended that analysis of floor tiles, vermiculite, and/or heterogeneous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. government. Estimated MDL is 0.1%.

Ired Gulley (2)

Analyst

Approved Signatory

APPENDIX II

LEAD PAINT ANALYTICAL REPORT



Analysis for Lead Concentration in Paint Chips

by Flame Atomic Absorption Spectroscopy
EPA SW-846 3rd Ed. Method No. 3050B/Method No. 7420



Customer: Pinchin LeBlanc Environmental
27 Austin St
2nd Flr
St Johns NL A1B 4C3

Attn: Dawn Benteau

Lab Order ID: 1214516

Analysis ID: 1214516_PBP

Date Received: 9/4/2012

Date Reported: 9/11/2012

Project: 02-02-900

Sample ID	Description	Mass	Analytical Sensitivity	Concentration
Lab Sample ID	Lab Notes	(g)	(% by weight)	(% by weight)
02-02-900-L001	White wall paint (engineering bld.)	0.0421	0.003%	0.025%
1214516PBP_1				
02-02-900-L002		0.0519	0.003%	0.26%
1214516PBP_2	cream wall paint			
02-02-900-L003		0.0274	0.005%	0.067%
1214516PBP_3	green wall paint			
02-02-900-L004		0.0624	0.002%	< 0.006%
1214516PBP_4	very light grey paint			
02-02-900-L005		0.0636	0.002%	0.041%
1214516PBP_5	dark blue wall paint			
02-02-900-L006		0.0367	0.004%	0.022%
1214516PBP_6	blue wall paint			
02-02-900-L007		0.0464	0.003%	< 0.009%
1214516PBP_7	navy blue wall paint			
02-02-900-L008		0.0415	0.003%	< 0.01%
1214516PBP_8	aqua green wall paint			
02-02-900-L009		0.0628	0.002%	< 0.006%
1214516PBP_9	red wall paint			
02-02-900-L010		0.0687	0.002%	< 0.006%
1214516PBP_10	light grey wall paint			

The quality control samples run with the samples in this report have passed all AIHA required specifications unless otherwise noted. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by AIHA or any other agency of the U.S. government.

Melissa Sharps (13)

Analyst

Laboratory Director



Analysis for Lead Concentration in Paint Chips

by Flame Atomic Absorption Spectroscopy
EPA SW-846 3rd Ed. Method No. 3050B/Method No. 7420



Customer: Pinchin LeBlanc Environmental
27 Austin St
2nd Flr
St Johns NL A1B 4C3

Attn: Dawn Benteau

Lab Order ID: 1214516

Analysis ID: 1214516_PBP

Date Received: 9/4/2012

Date Reported: 9/11/2012

Project: 02-02-900

Sample ID	Description	Mass (g)	Analytical Sensitivity (% by weight)	Concentration (% by weight)
Lab Sample ID	Lab Notes			
02-02-900-L011		0.0572	0.002%	< 0.007%
1214516PBP_11	pink wall paint			
02-02-900-L012		0.0532	0.003%	0.11%
1214516PBP_12	light green wall paint			
02-02-900-L013	(Yellow wall paint) engineering bld.	0.0494	0.003%	< 0.008%
1214516PBP_13				

The quality control samples run with the samples in this report have passed all AIHA required specifications unless otherwise noted. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by AIHA or any other agency of the U.S. government.

Melissa Sharps (13)

Analyst

Laboratory Director

APPENDIX III

SITE DRAWINGS



LEGEND:

- XXX PINCHIN LOCATION NUMBER
◎ ASBESTOS SAMPLE ID NUMBER
△ LEAD SAMPLE ID NUMBER
N/A NOT ACCESSIBLE



CLIENT:

MEMORIAL UNIVERSITY OF
NEWFOUNDLAND

PROJECT:

ASBESTOS AND LEAD PAINT BUILDING
MATERIALS SURVEY

SITE ADDRESS:

ENGINEERING BUILDING,
ST. JOHN'S CAMPUS,
NEWFOUNDLAND AND LABRADOR

DRAWING NAME:

SAMPLE LOCATIONS
LEVEL 1

REFERENCE:

PLEL SITE SURVEY

DATE:

OCTOBER 2012

PROJECT #:

02 - 02 - 00900

SCALE:

N.T.S.

FIGURE #:

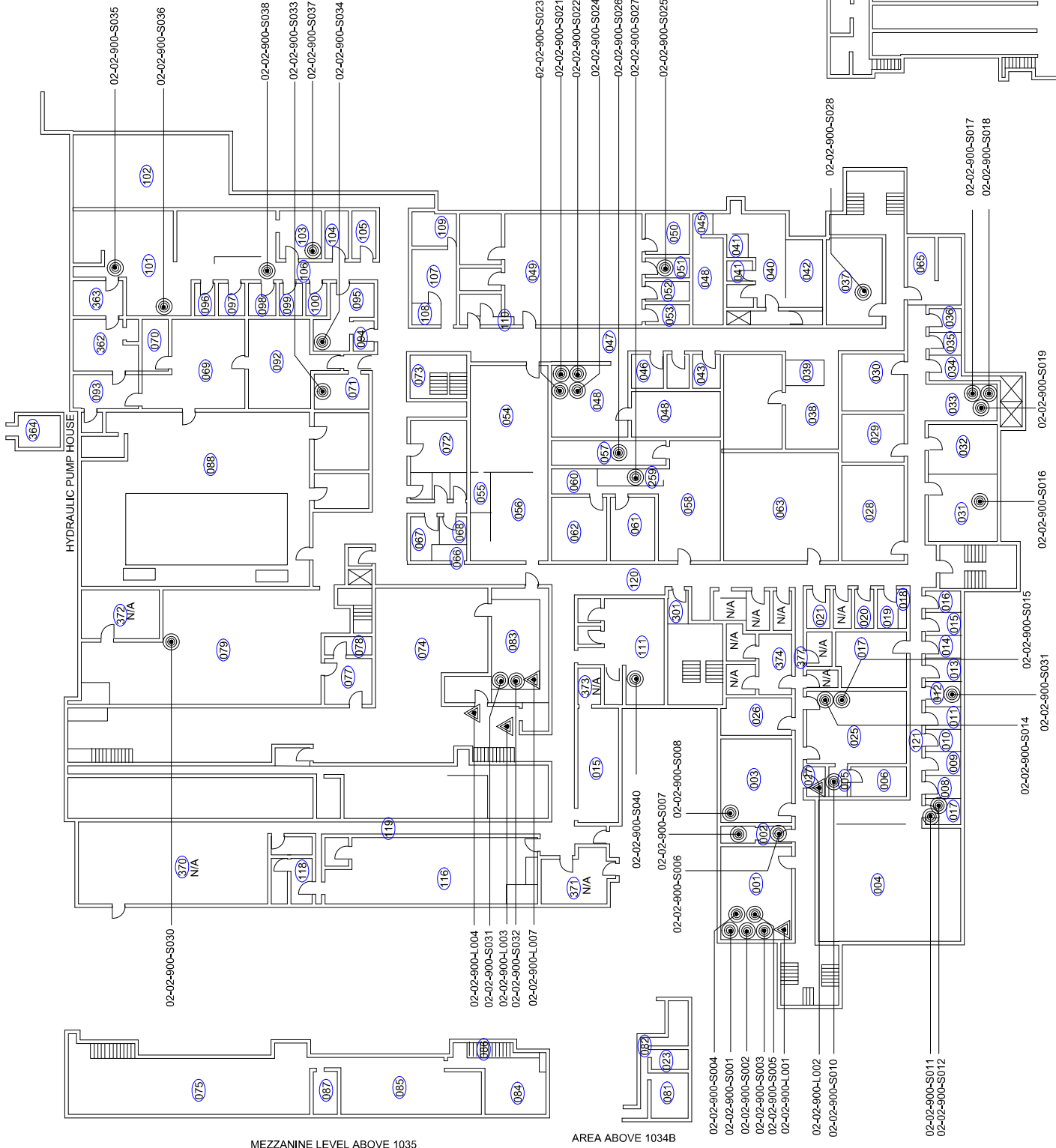
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DRAWN BY:

A. ANISCIKLI

CHECKED BY:

T. HARDY





LEGEND:

- xxx PINCHIN LOCATION NUMBER
◎ ASBESTOS SAMPLE ID NUMBER
△ LEAD SAMPLE ID NUMBER
N/A NOT ACCESSIBLE



CLIENT:

MEMORIAL UNIVERSITY OF
NEWFOUNDLAND

PROJECT:

ASBESTOS AND LEAD PAINT BUILDING
MATERIALS SURVEY

SITE ADDRESS:

ENGINEERING BUILDING,
ST. JOHN'S CAMPUS,
NEWFOUNDLAND AND LABRADOR

DRAWING NAME:

SAMPLE LOCATIONS
LEVEL 2

REFERENCE:

PLEL SITE SURVEY

DATE: OCTOBER 2012

PROJECT #:
02 - 02 - 00900

SCALE: N.T.S.

FIGURE #:

DRAWN BY:
A. ANISCIKLI

CHECKED BY:
T. HARDY

2





LEGEND:

- xxx PINCHIN LOCATION NUMBER
◎ ASBESTOS SAMPLE ID NUMBER
▲ LEAD SAMPLE ID NUMBER
N/A NOT ACCESSIBLE



CLIENT:

MEMORIAL UNIVERSITY OF
NEWFOUNDLAND

PROJECT:

ASBESTOS AND LEAD PAINT BUILDING
MATERIALS SURVEY

SITE ADDRESS:

ENGINEERING BUILDING,
ST. JOHN'S CAMPUS,
NEWFOUNDLAND AND LABRADOR

DRAWING NAME:

SAMPLE LOCATIONS
LEVEL 3

REFERENCE:

PLEL SITE SURVEY

DATE:

OCTOBER 2012

PROJECT #:

02 - 02 - 00900

SCALE:

N.T.S.

FIGURE #:

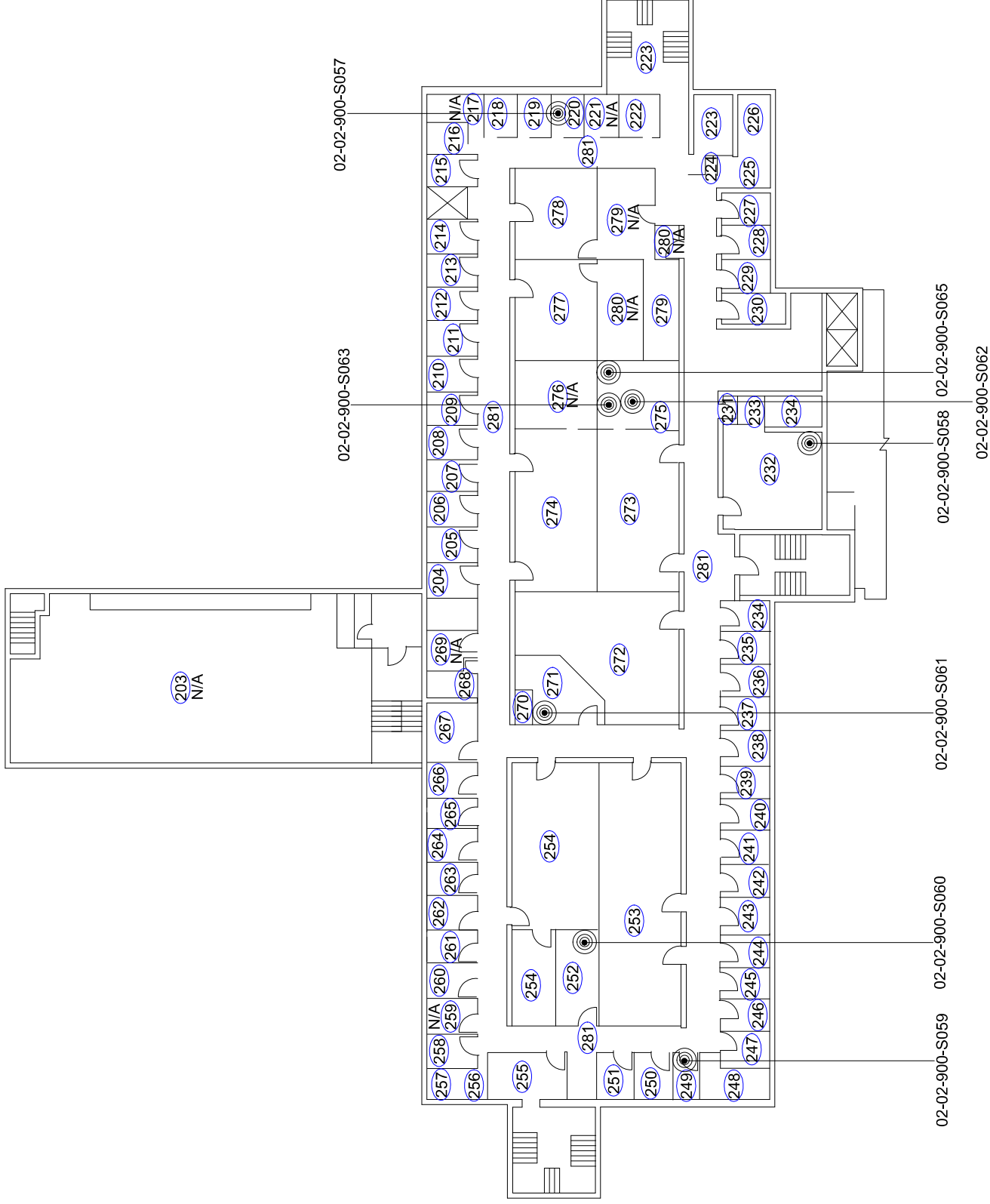
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DRAWN BY:

A. ANISCIKLI

CHECKED BY:

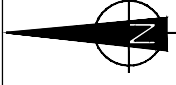
T. HARDY





LEGEND:

- xxx PINCHIN LOCATION NUMBER
◎ ASBESTOS SAMPLE ID NUMBER
▲ LEAD SAMPLE ID NUMBER
N/A NOT ACCESSIBLE



CLIENT:

MEMORIAL UNIVERSITY OF
NEWFOUNDLAND

PROJECT:

ASBESTOS AND LEAD PAINT BUILDING
MATERIALS SURVEY

SITE ADDRESS:

ENGINEERING BUILDING,
ST. JOHN'S CAMPUS,
NEWFOUNDLAND AND LABRADOR

DRAWING NAME:

SAMPLE LOCATIONS
LEVEL 4

REFERENCE:

PLEL SITE SURVEY

DATE:

OCTOBER 2012

PROJECT #:

02 - 02 - 00900

SCALE:

N.T.S.

FIGURE #:

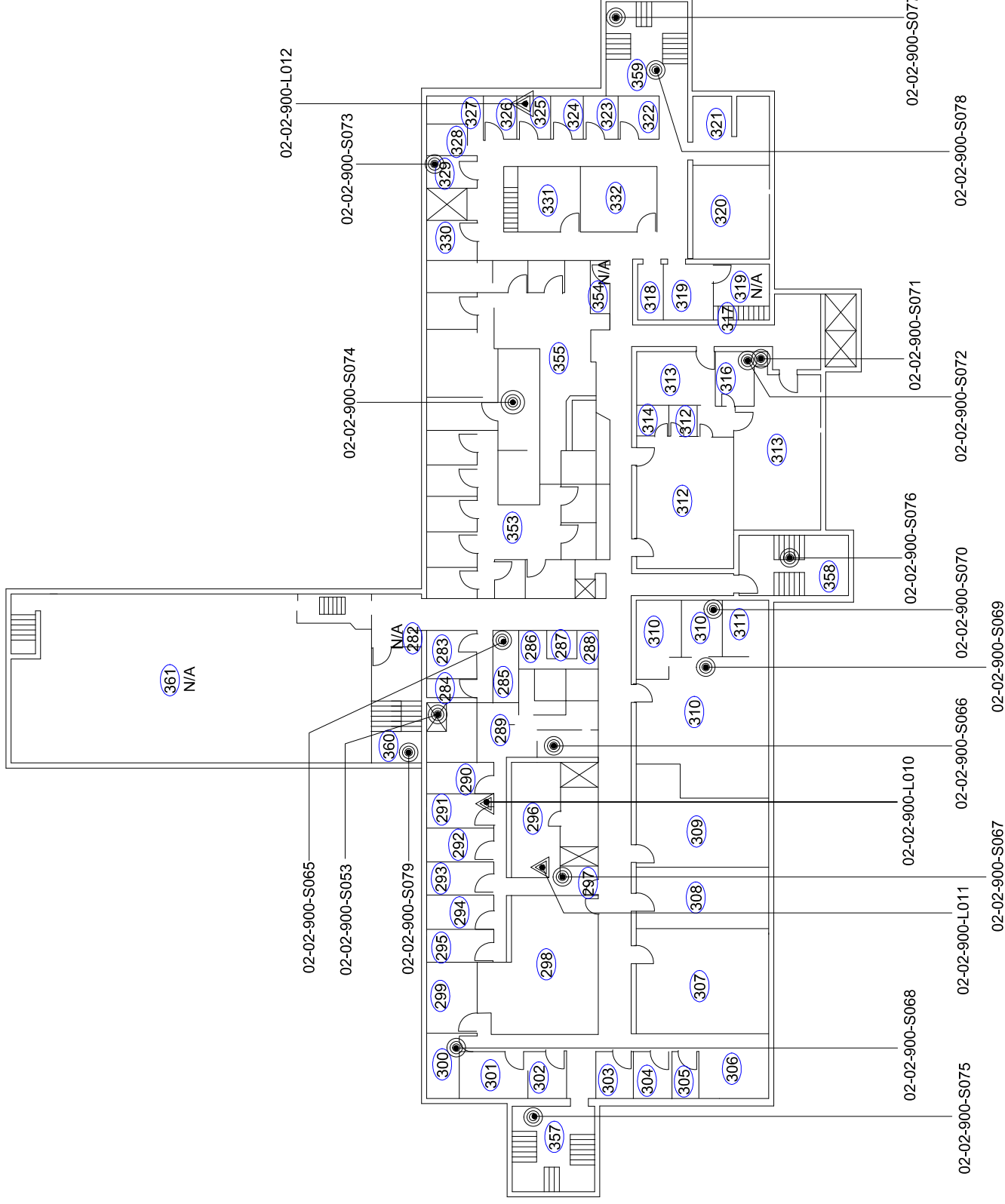
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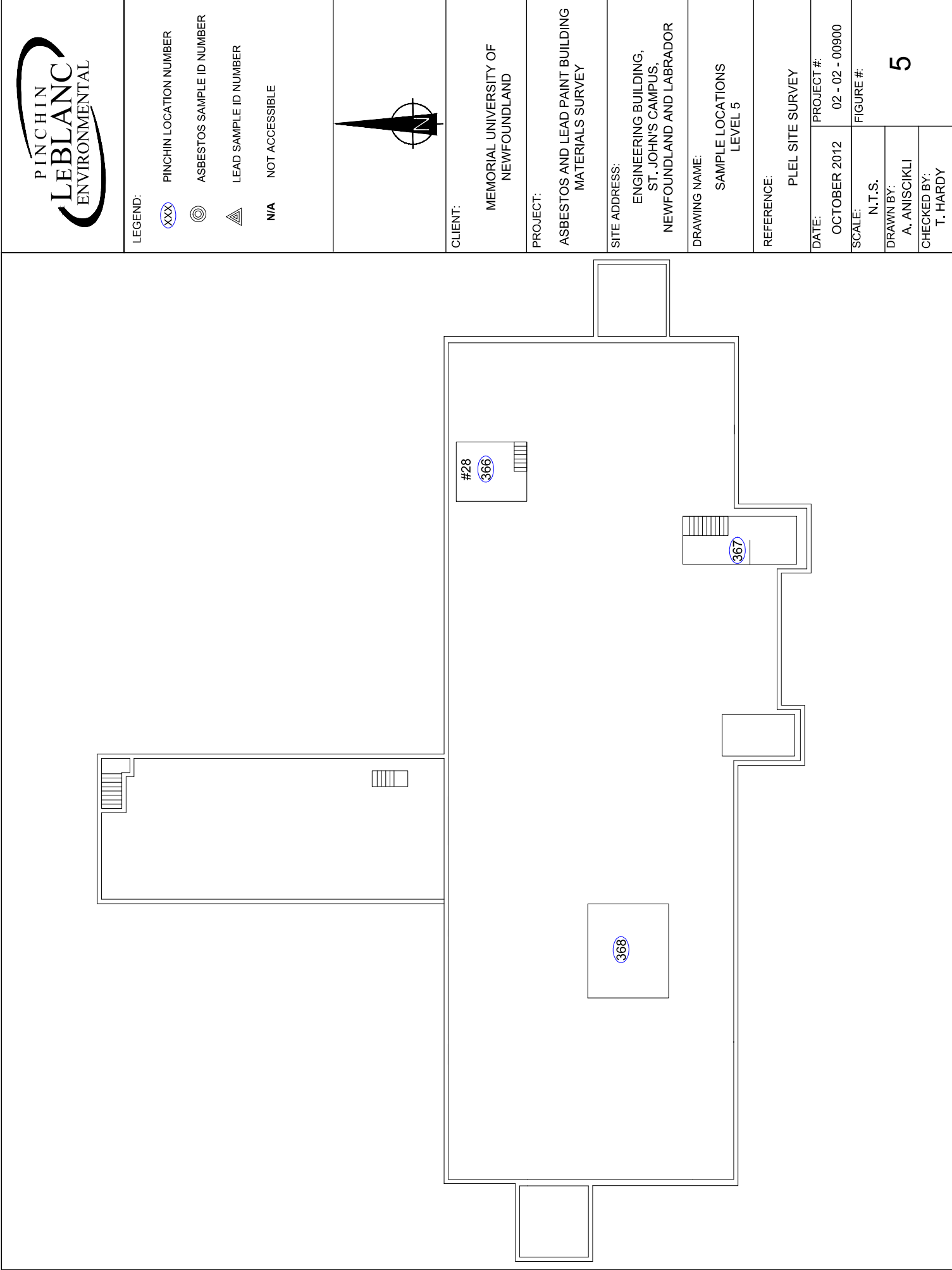
A. ANISCIKLI

CHECKED BY:

T. HARDY

4





APPENDIX IV

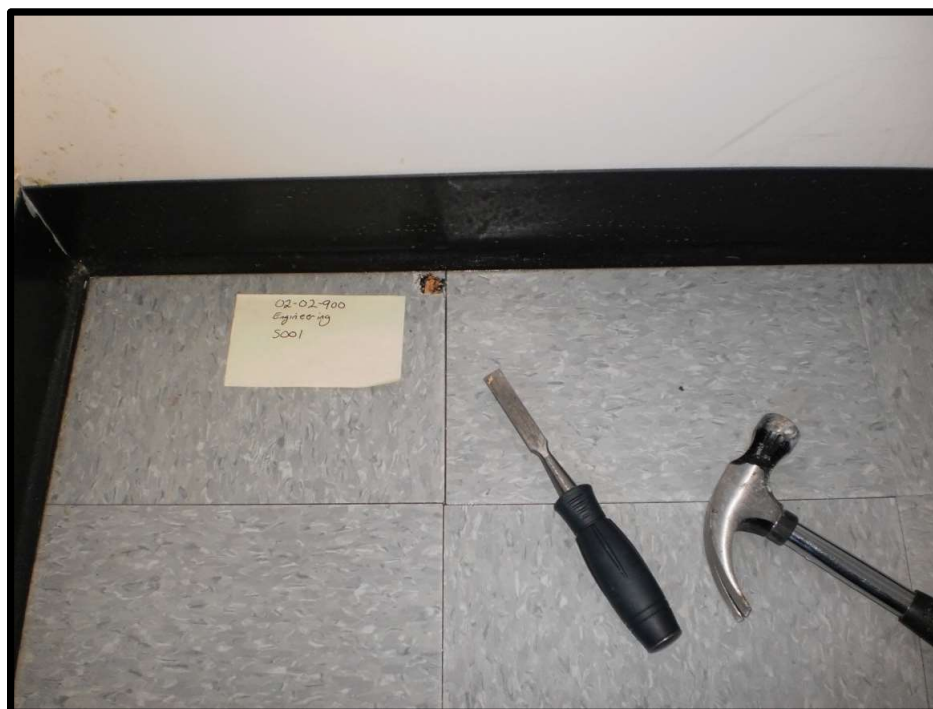
SAMPLE LOG



ASBESTOS BULK SAMPLING FORM

Sample #:	S001	Date Sampled:	July 25, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room EN1052	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	X12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	X Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: <u>Greenish blue with large white and green specks</u>	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		





ASBESTOS BULK SAMPLING FORM

Sample #:	S002	Date Sampled:	July 25, 2012	
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy	
Location:	Room EN1052	Analysis:	SAI - PLM	
MUN Project #:	02-02-900	Work Order #:		
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation <input type="checkbox"/> Elbow <input type="checkbox"/> Fitting <input type="checkbox"/> Transite Pipe <input type="checkbox"/> Gasket <input type="checkbox"/> Tank Insulation <input type="checkbox"/> Pipe Wrap HVAC <input type="checkbox"/> Insulation <input type="checkbox"/> Tape <input type="checkbox"/> Paper Wrap	<input type="checkbox"/> 12'x12' Tile <input type="checkbox"/> 9'x9'Tile <input type="checkbox"/> Vinyl Sheet <input type="checkbox"/> Mastic Wall <input type="checkbox"/> Transite Panel <input type="checkbox"/> Textured Wall <input type="checkbox"/> Plaster <input type="checkbox"/> DWJC	<input type="checkbox"/> Textured <input type="checkbox"/> Stucco <input type="checkbox"/> Popcorn <input type="checkbox"/> DWJC <input type="checkbox"/> Plaster <input type="checkbox"/> Acoustic Tile (Dropped) <input type="checkbox"/> Acoustic Tile (Glued-on) <input type="checkbox"/> Mastic Structural <input type="checkbox"/> Steel F. P. ing <input type="checkbox"/> Deck F. P. ing	<input type="checkbox"/> Shingle <input type="checkbox"/> Rolled <input type="checkbox"/> Felt <input type="checkbox"/> Tar Miscellaneous: _____ No. of Phases: _____ Colour: _____	<input type="checkbox"/> Floor <input type="checkbox"/> X Wall Orientation <input type="checkbox"/> Ceiling <input type="checkbox"/> Above Ceiling <input type="checkbox"/> Other

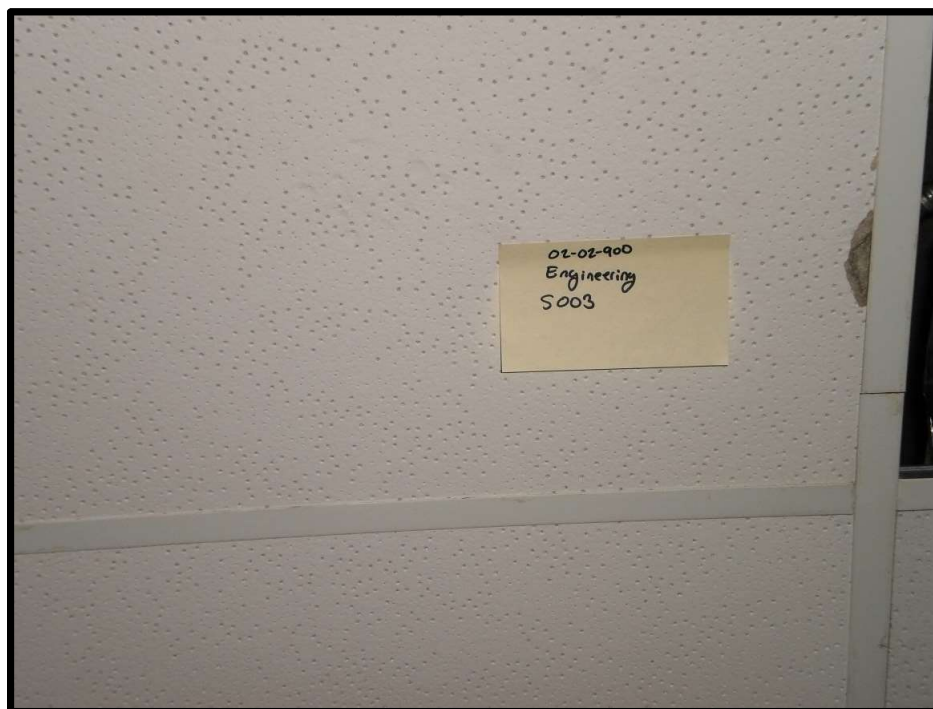




ASBESTOS BULK SAMPLING FORM

Sample #:	S003	Date Sampled:	July 25, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room EN1052	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

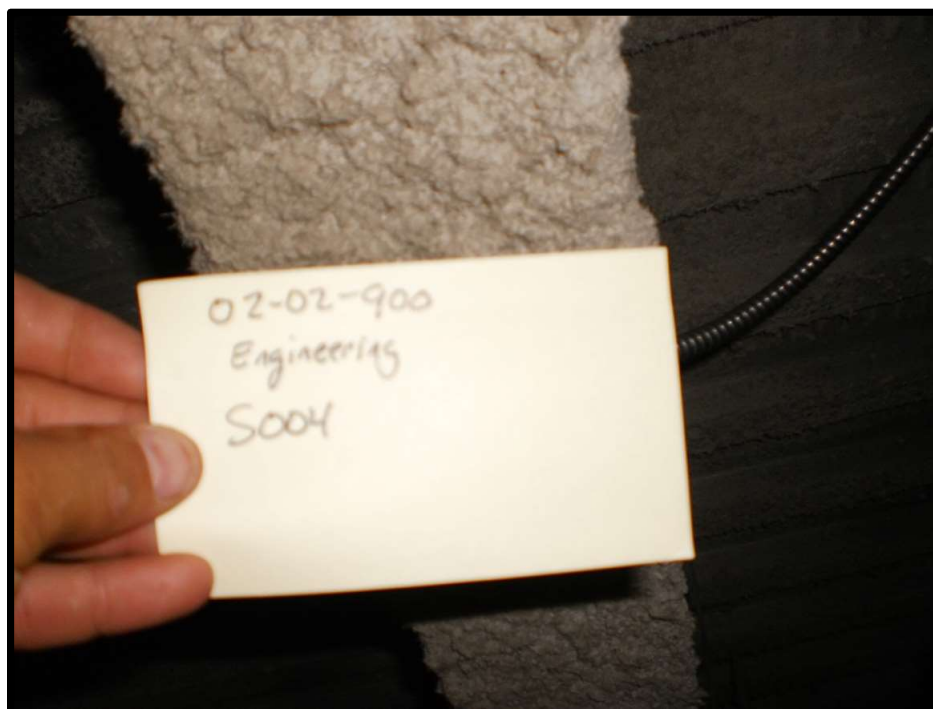
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
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<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	X Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	X Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: <u>2' x 4' pinhole</u>	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: _____	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		





ASBESTOS BULK SAMPLING FORM

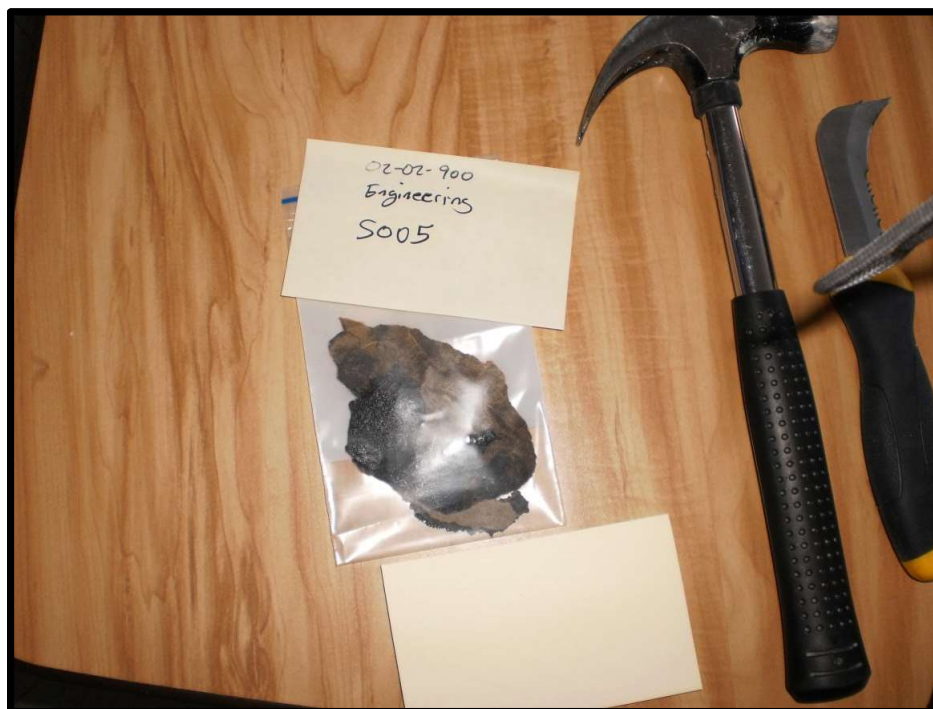
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Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy	
Location:	Room EN1052	Analysis:	SAI - PLM	
MUN Project #:	02-02-900	Work Order #:		
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation <input type="checkbox"/> Elbow <input type="checkbox"/> Fitting <input type="checkbox"/> Transite Pipe <input type="checkbox"/> Gasket <input type="checkbox"/> Tank Insulation <input type="checkbox"/> Pipe Wrap HVAC <input type="checkbox"/> Insulation <input type="checkbox"/> Tape <input type="checkbox"/> Paper Wrap	<input type="checkbox"/> 12'x12' Tile <input type="checkbox"/> 9'x9'Tile <input type="checkbox"/> Vinyl Sheet <input type="checkbox"/> Mastic Wall <input type="checkbox"/> Transite Panel <input type="checkbox"/> Textured Wall <input type="checkbox"/> Plaster <input type="checkbox"/> DWJC	<input type="checkbox"/> Textured <input type="checkbox"/> Stucco <input type="checkbox"/> Popcorn <input type="checkbox"/> DWJC <input type="checkbox"/> Plaster <input type="checkbox"/> Acoustic Tile (Dropped) <input type="checkbox"/> Acoustic Tile (Glued-on) <input type="checkbox"/> Mastic Structural <input checked="" type="checkbox"/> Steel F. P. ing <input checked="" type="checkbox"/> Deck F. P. ing	<input type="checkbox"/> Shingle <input type="checkbox"/> Rolled <input type="checkbox"/> Felt <input type="checkbox"/> Tar Miscellaneous: _____ No. of Phases: _____ Colour: _____	<input type="checkbox"/> Floor <input type="checkbox"/> Wall Orientation <input type="checkbox"/> Ceiling <input checked="" type="checkbox"/> Above Ceiling <input type="checkbox"/> Other





ASBESTOS BULK SAMPLING FORM

Sample #:	S005	Date Sampled:	July 25, 2012	
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy	
Location:	Room EN1052	Analysis:	SAI - PLM	
MUN Project #:	02-02-900	Work Order #:		
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation <input type="checkbox"/> Elbow <input type="checkbox"/> Fitting <input type="checkbox"/> Transite Pipe <input type="checkbox"/> Gasket <input type="checkbox"/> Tank Insulation <input type="checkbox"/> Pipe Wrap HVAC <input type="checkbox"/> Insulation <input type="checkbox"/> Tape <input type="checkbox"/> Paper Wrap	<input type="checkbox"/> 12'x12' Tile <input type="checkbox"/> 9'x9'Tile <input type="checkbox"/> Vinyl Sheet <input type="checkbox"/> Mastic Wall <input type="checkbox"/> Transite Panel <input type="checkbox"/> Textured Wall <input type="checkbox"/> Plaster <input type="checkbox"/> DWJC	<input type="checkbox"/> Textured <input type="checkbox"/> Stucco <input type="checkbox"/> Popcorn <input type="checkbox"/> DWJC <input type="checkbox"/> Plaster <input type="checkbox"/> Acoustic Tile (Dropped) <input type="checkbox"/> Acoustic Tile (Glued-on) <input checked="" type="checkbox"/> Mastic Structural <input type="checkbox"/> Steel F. P. ing <input type="checkbox"/> Deck F. P. ing	<input type="checkbox"/> Shingle <input type="checkbox"/> Rolled <input type="checkbox"/> Felt <input type="checkbox"/> Tar Miscellaneous: _____ No. of Phases: _____ Colour: _____	<input type="checkbox"/> Floor <input type="checkbox"/> Wall Orientation <input type="checkbox"/> Ceiling <input checked="" type="checkbox"/> Above Ceiling <input type="checkbox"/> Other





ASBESTOS BULK SAMPLING FORM

Sample #:	S006	Date Sampled:	July 25, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room EN1051A	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	X12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	X Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: <u>White with blue streaks</u>	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		

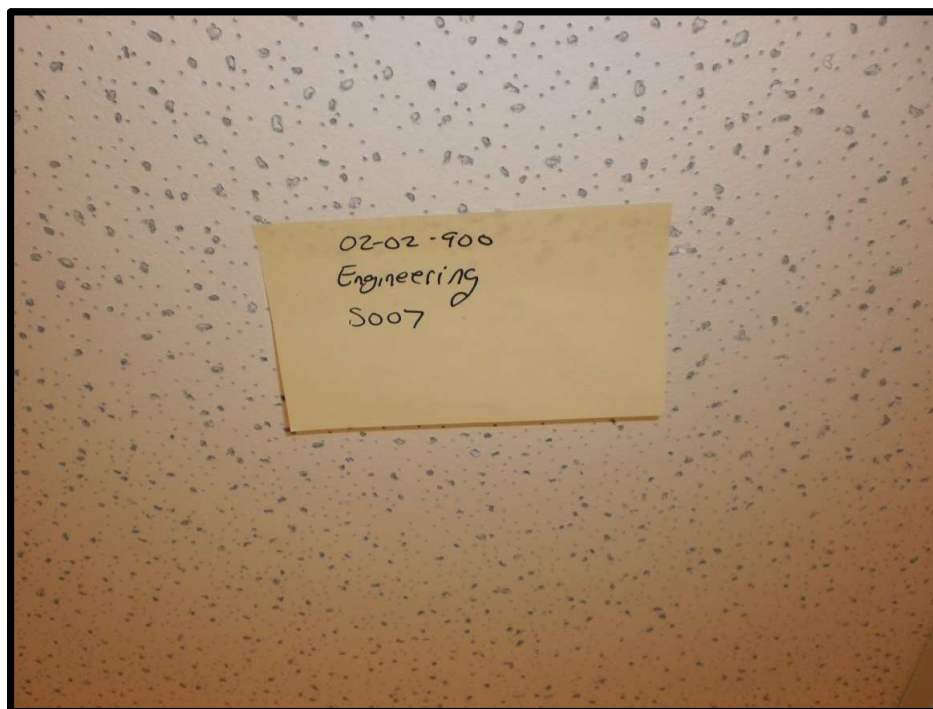





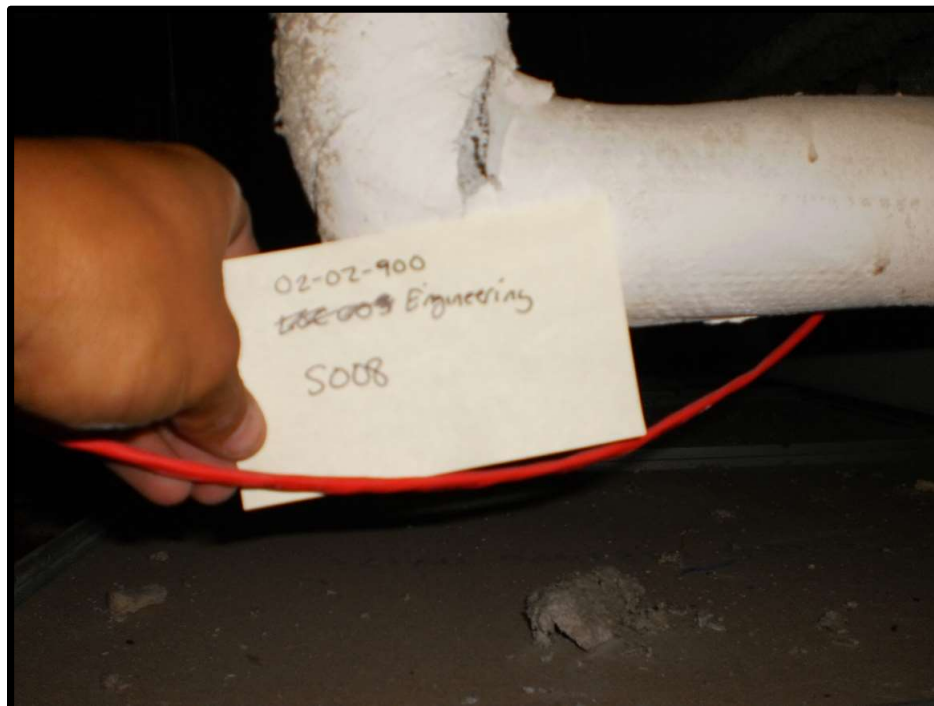
ASBESTOS BULK SAMPLING FORM

Sample #:	S007	Date Sampled:	July 25, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room EN1051A	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	<input type="checkbox"/> 12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	<input type="checkbox"/> Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	X Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	X Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: <u>2' x 2' pinhole fleck</u>	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: _____	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		



		ASBESTOS BULK SAMPLING FORM		
Sample #:	S008	Date Sampled:	July 25, 2012	
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy	
Location:	Room EN1051	Analysis:	SAI - PLM	
MUN Project #:	02-02-900	Work Order #:		
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation X Elbow <input type="checkbox"/> Fitting <input type="checkbox"/> Transite Pipe <input type="checkbox"/> Gasket <input type="checkbox"/> Tank Insulation <input type="checkbox"/> Pipe Wrap HVAC <input type="checkbox"/> Insulation <input type="checkbox"/> Tape <input type="checkbox"/> Paper Wrap	<input type="checkbox"/> 12'x12' Tile <input type="checkbox"/> 9'x9'Tile <input type="checkbox"/> Vinyl Sheet <input type="checkbox"/> Mastic Wall <input type="checkbox"/> Transite Panel <input type="checkbox"/> Textured Wall <input type="checkbox"/> Plaster <input type="checkbox"/> DWJC	<input type="checkbox"/> Textured <input type="checkbox"/> Stucco <input type="checkbox"/> Popcorn <input type="checkbox"/> DWJC <input type="checkbox"/> Plaster <input type="checkbox"/> Acoustic Tile (Dropped) <input type="checkbox"/> Acoustic Tile (Glued-on) <input type="checkbox"/> Mastic Structural <input type="checkbox"/> Steel F. P. ing <input type="checkbox"/> Deck F. P. ing	<input type="checkbox"/> Shingle <input type="checkbox"/> Rolled <input type="checkbox"/> Felt <input type="checkbox"/> Tar Miscellaneous: _____ No. of Phases: _____ Colour: _____	<input type="checkbox"/> Floor <input type="checkbox"/> Wall Orientation <input type="checkbox"/> Ceiling X Above Ceiling <input type="checkbox"/> Other

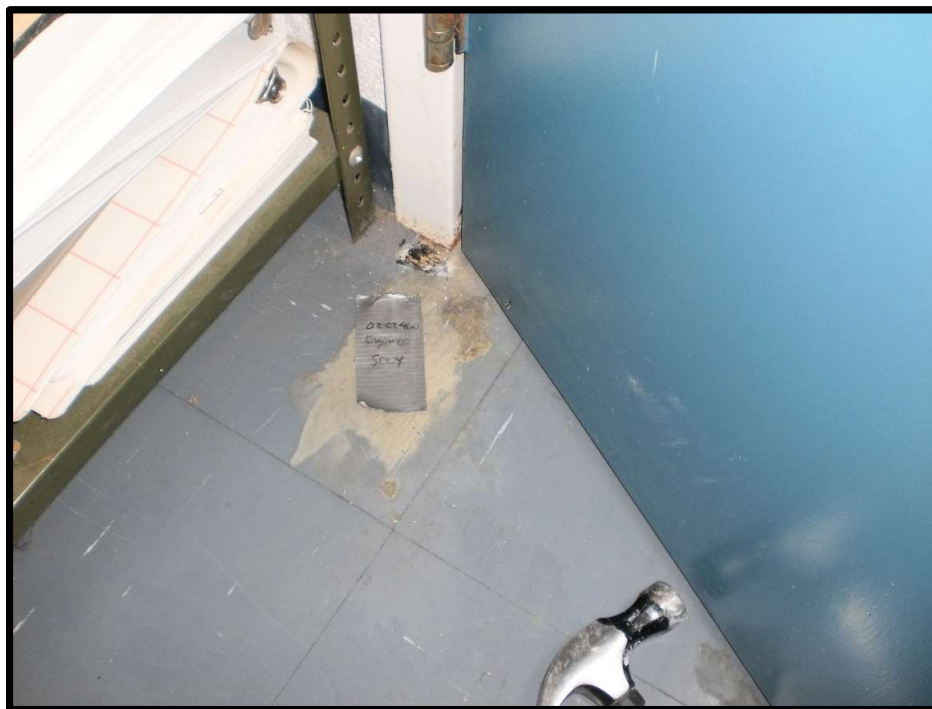




ASBESTOS BULK SAMPLING FORM

Sample #:	S009	Date Sampled:	July 25, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room EN1053	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	X12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	X Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: <u>Blue with white streaks</u>	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		





ASBESTOS BULK SAMPLING FORM

Sample #:	S010	Date Sampled:	July 25, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room EN1053	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	<input type="checkbox"/> 12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	<input type="checkbox"/> Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	X Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	X Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: 2' x 4' pinhole fleck	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural		
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	No. of Phases: _____	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing	Colour: _____	





ASBESTOS BULK SAMPLING FORM

Sample #:	S011	Date Sampled:	July 25, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room EN1056	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

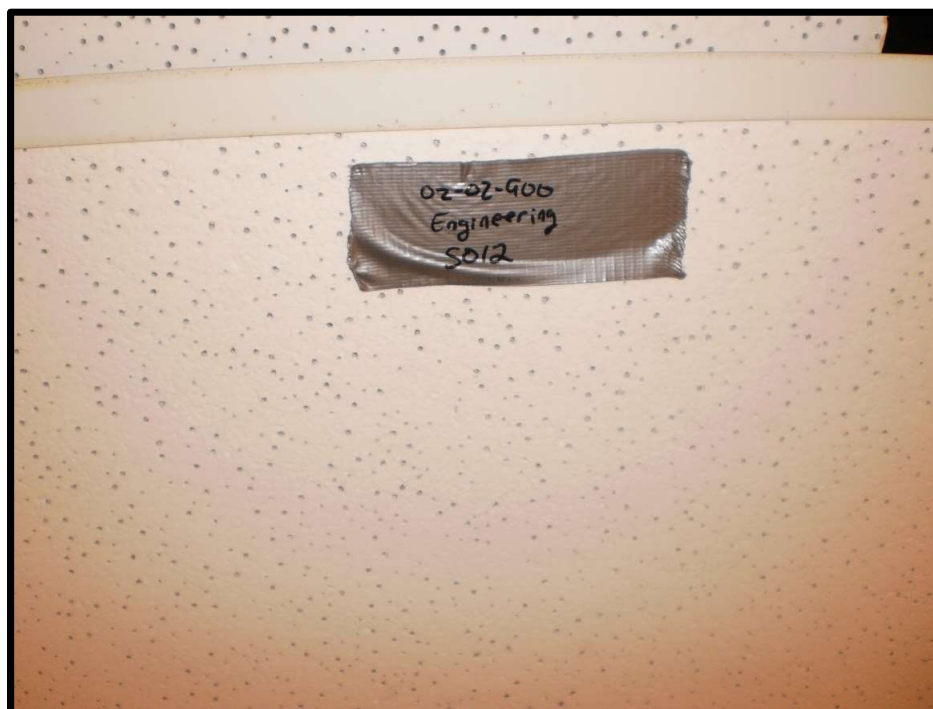
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	X12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	X Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: <u>Light brown with large white streaks</u>	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		





ASBESTOS BULK SAMPLING FORM

Sample #:	S012	Date Sampled:	July 25, 2012	
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy	
Location:	Room EN1056	Analysis:	SAI - PLM	
MUN Project #:	02-02-900	Work Order #:		
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation <input type="checkbox"/> Elbow <input type="checkbox"/> Fitting <input type="checkbox"/> Transite Pipe <input type="checkbox"/> Gasket <input type="checkbox"/> Tank Insulation <input type="checkbox"/> Pipe Wrap HVAC <input type="checkbox"/> Insulation <input type="checkbox"/> Tape <input type="checkbox"/> Paper Wrap	<input type="checkbox"/> 12'x12' Tile <input type="checkbox"/> 9'x9'Tile <input type="checkbox"/> Vinyl Sheet <input type="checkbox"/> Mastic Wall <input type="checkbox"/> Transite Panel <input type="checkbox"/> Textured Wall <input type="checkbox"/> Plaster <input type="checkbox"/> DWJC	<input type="checkbox"/> Textured <input type="checkbox"/> Stucco <input type="checkbox"/> Popcorn <input type="checkbox"/> DWJC <input type="checkbox"/> Plaster <input checked="" type="checkbox"/> Acoustic Tile (Dropped) <input type="checkbox"/> Acoustic Tile (Glued-on) <input type="checkbox"/> Mastic Structural <input type="checkbox"/> Steel F. P. ing <input type="checkbox"/> Deck F. P. ing	<input type="checkbox"/> Shingle <input type="checkbox"/> Rolled <input type="checkbox"/> Felt <input type="checkbox"/> Tar Miscellaneous: <u>2' x 2' pinhole</u> No. of Phases: _____ Colour: _____	<input type="checkbox"/> Floor <input type="checkbox"/> Wall Orientation <input checked="" type="checkbox"/> Ceiling <input type="checkbox"/> Above Ceiling <input type="checkbox"/> Other





ASBESTOS BULK SAMPLING FORM

Sample #:	S013	Date Sampled:	July 25, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room EN 1061	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	X12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	X Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: <u>Very light brown with large brown streaks</u>	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		





ASBESTOS BULK SAMPLING FORM

Sample #:	S014	Date Sampled:	July 25, 2012	
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy	
Location:	Room EN1049	Analysis:	SAI - PLM	
MUN Project #:	02-02-900	Work Order #:		
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation <input type="checkbox"/> Elbow <input type="checkbox"/> Fitting <input type="checkbox"/> Transite Pipe <input type="checkbox"/> Gasket <input type="checkbox"/> Tank Insulation <input type="checkbox"/> Pipe Wrap HVAC <input type="checkbox"/> Insulation <input type="checkbox"/> Tape <input type="checkbox"/> Paper Wrap	<input type="checkbox"/> 12'x12' Tile <input type="checkbox"/> 9'x9'Tile <input type="checkbox"/> Vinyl Sheet <input type="checkbox"/> Mastic Wall <input type="checkbox"/> Transite Panel <input type="checkbox"/> Textured Wall <input type="checkbox"/> Plaster <input type="checkbox"/> DWJC	<input type="checkbox"/> Textured <input type="checkbox"/> Stucco <input type="checkbox"/> Popcorn <input type="checkbox"/> DWJC <input type="checkbox"/> Plaster <input type="checkbox"/> Acoustic Tile (Dropped) <input type="checkbox"/> Acoustic Tile (Glued-on) <input type="checkbox"/> Mastic Structural <input type="checkbox"/> Steel F. P. ing <input type="checkbox"/> Deck F. P. ing	<input type="checkbox"/> Shingle <input type="checkbox"/> Rolled <input type="checkbox"/> Felt <input type="checkbox"/> Tar Miscellaneous: _____ No. of Phases: _____ Colour: _____	<input type="checkbox"/> Floor <input type="checkbox"/> X Wall Orientation <input type="checkbox"/> Ceiling <input type="checkbox"/> Above Ceiling <input type="checkbox"/> Other





ASBESTOS BULK SAMPLING FORM

Sample #:	S015	Date Sampled:	July 25, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room EN1049	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	<input type="checkbox"/> 12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	<input type="checkbox"/> Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	X Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: <u>Levelling compound on ductwork</u>	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: _____	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		

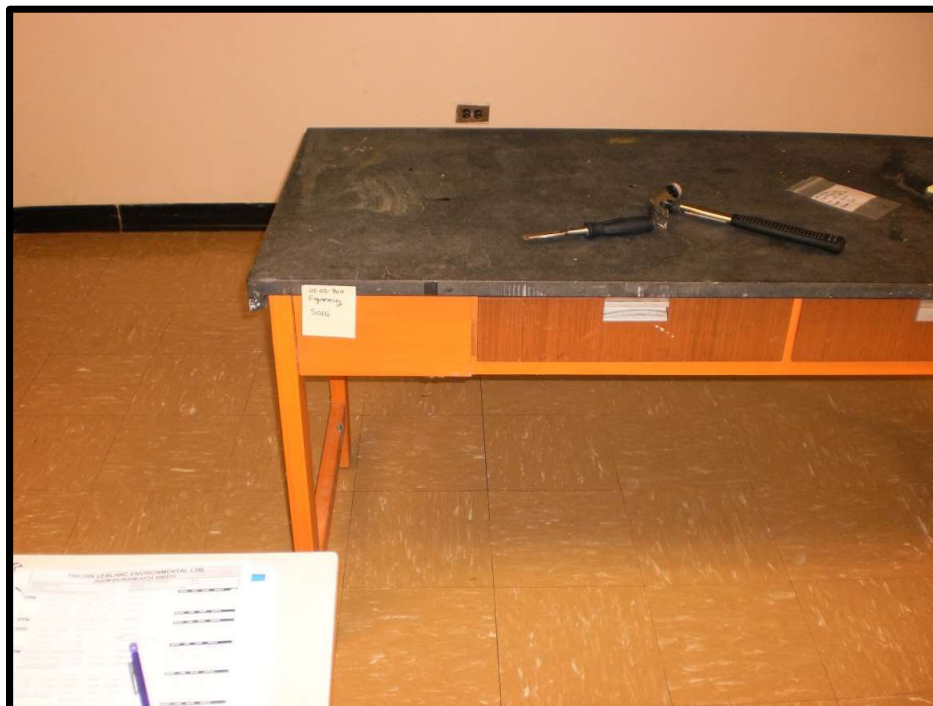




ASBESTOS BULK SAMPLING FORM

Sample #:	S016	Date Sampled:	July 26, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room EN1001	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	<input type="checkbox"/> 12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	<input type="checkbox"/> Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		X Other (counter)
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: <u>Black</u>	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		





ASBESTOS BULK SAMPLING FORM

Sample #:	S017	Date Sampled:	July 26, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room EN1001	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	X12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	X Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: <u>Aqua colour with white and green flecks</u>	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		





ASBESTOS BULK SAMPLING FORM

Sample #:	S018	Date Sampled:	July 26, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room EN1C01	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	X12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	X Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: <u>Green with thick green streaks</u>	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		

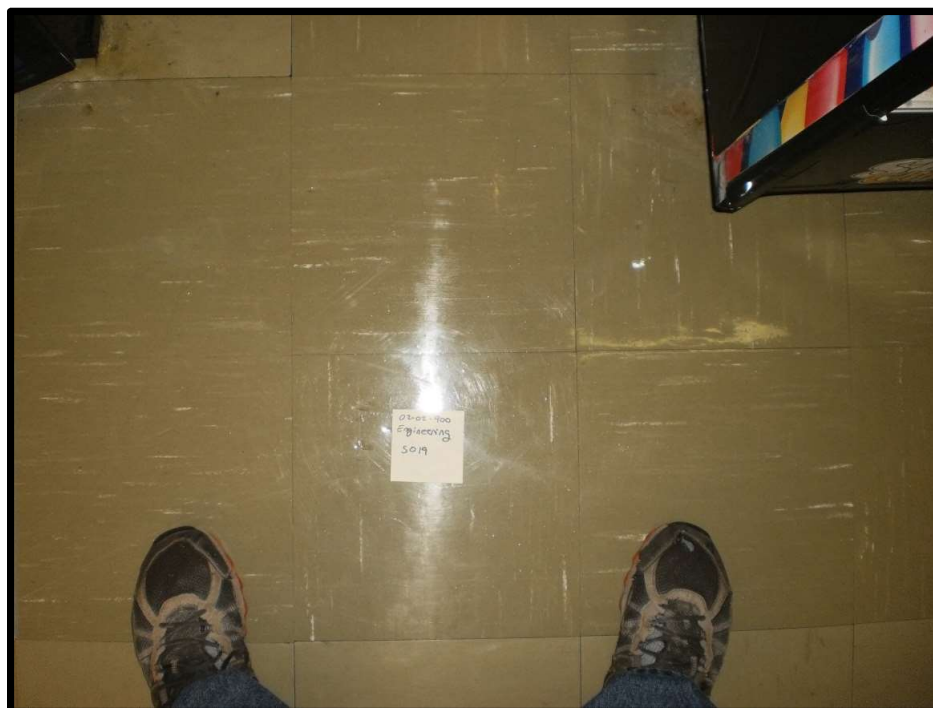




ASBESTOS BULK SAMPLING FORM

Sample #:	S019	Date Sampled:	July 26, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room EN1C01	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	X 12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	X Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: <u>Green with thick white streaks</u>	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		





ASBESTOS BULK SAMPLING FORM

Sample #:	S020	Date Sampled:	July 26, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room 1015B	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	X12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	X Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: <u>White with abundant grey</u>	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing	<u>flecks</u>	





ASBESTOS BULK SAMPLING FORM

Sample #:	S021	Date Sampled:	July 26, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room 1017A	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	X12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	X Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: <u>Brown with abundant grey specks</u>	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		

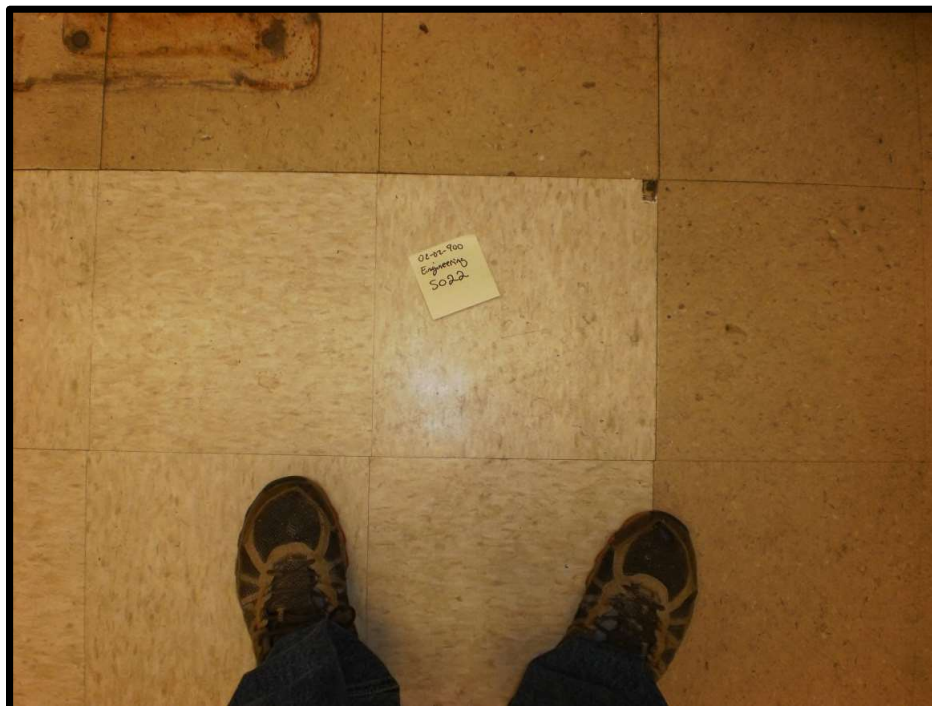




ASBESTOS BULK SAMPLING FORM

Sample #:	S022	Date Sampled:	July 26, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room 1019A	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	X12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	X Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: <u>White mottled brown</u>	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		

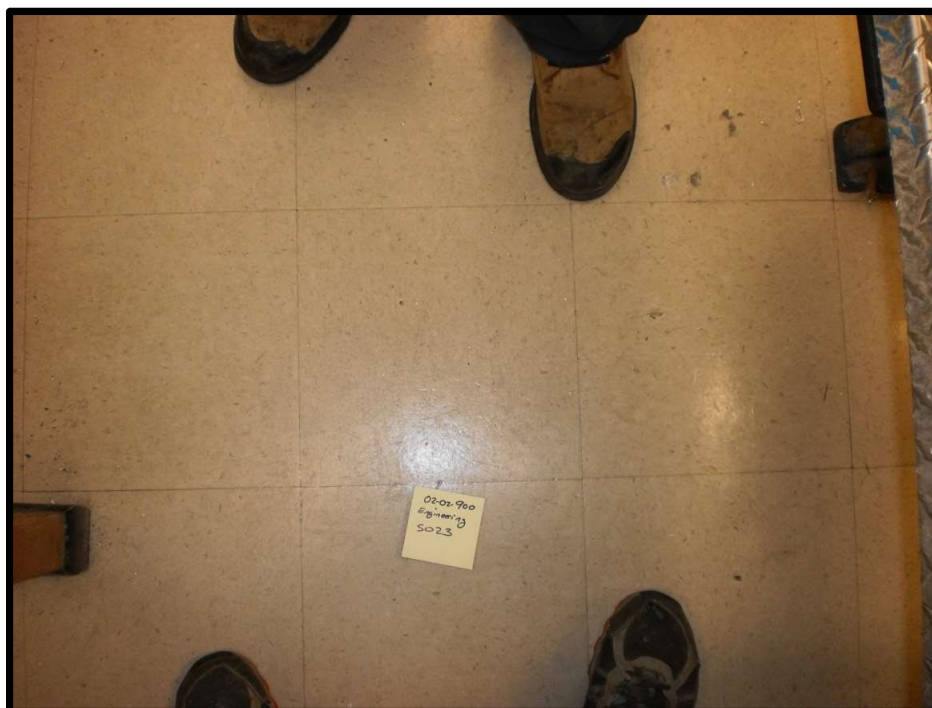




ASBESTOS BULK SAMPLING FORM

Sample #:	S023	Date Sampled:	July 26, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room EN1019A	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	X12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	X Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: <u>Light brown with red streaks</u>	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		

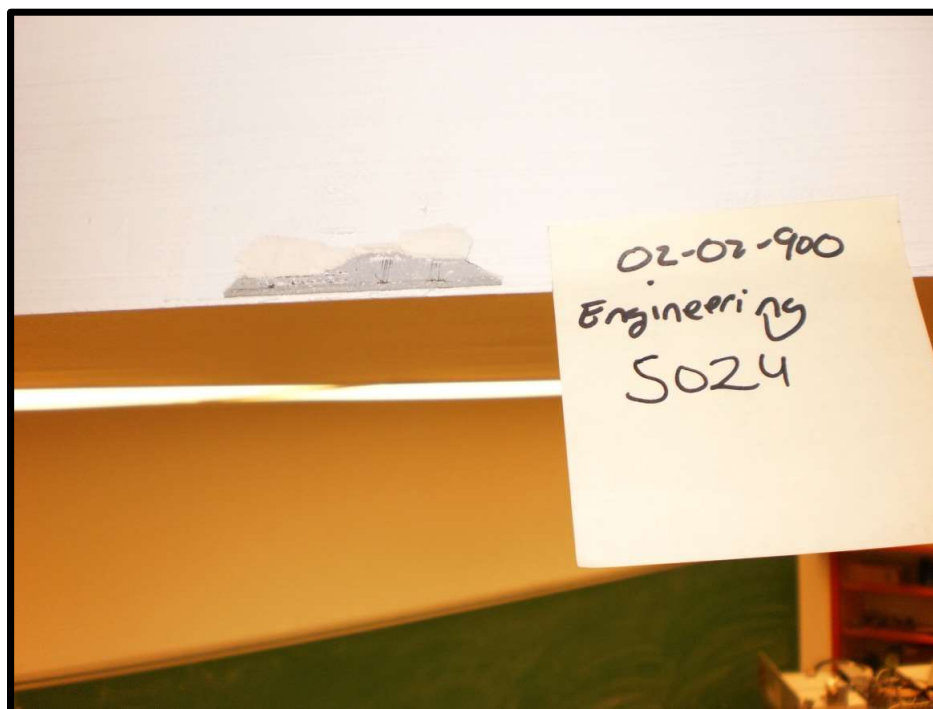




ASBESTOS BULK SAMPLING FORM

Sample #:	S024	Date Sampled:	July 26, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room EN1019A	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	<input type="checkbox"/> 12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	<input type="checkbox"/> Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	X Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	X DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: _____	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		





ASBESTOS BULK SAMPLING FORM

Sample #:	S025	Date Sampled:	July 26, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room EN1020B	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	<input type="checkbox"/> 12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	<input type="checkbox"/> Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		X Other (fume hood)
<input type="checkbox"/> Tank Insulation	X Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: _____	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		

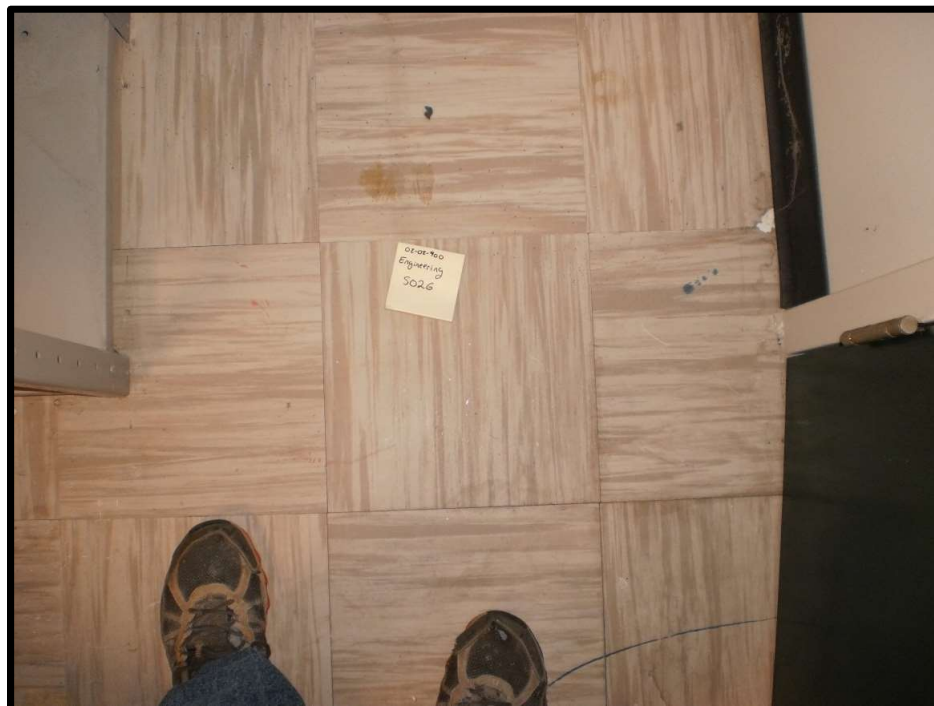




ASBESTOS BULK SAMPLING FORM

Sample #:	S026	Date Sampled:	July 26, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room EN1038F	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	X 12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	X Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: <u>Cream and brown streaks</u>	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		





ASBESTOS BULK SAMPLING FORM

Sample #:	S027	Date Sampled:	July 26, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room EN1038	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	<input type="checkbox"/> 12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	<input type="checkbox"/> Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input checked="" type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	X DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: _____	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		

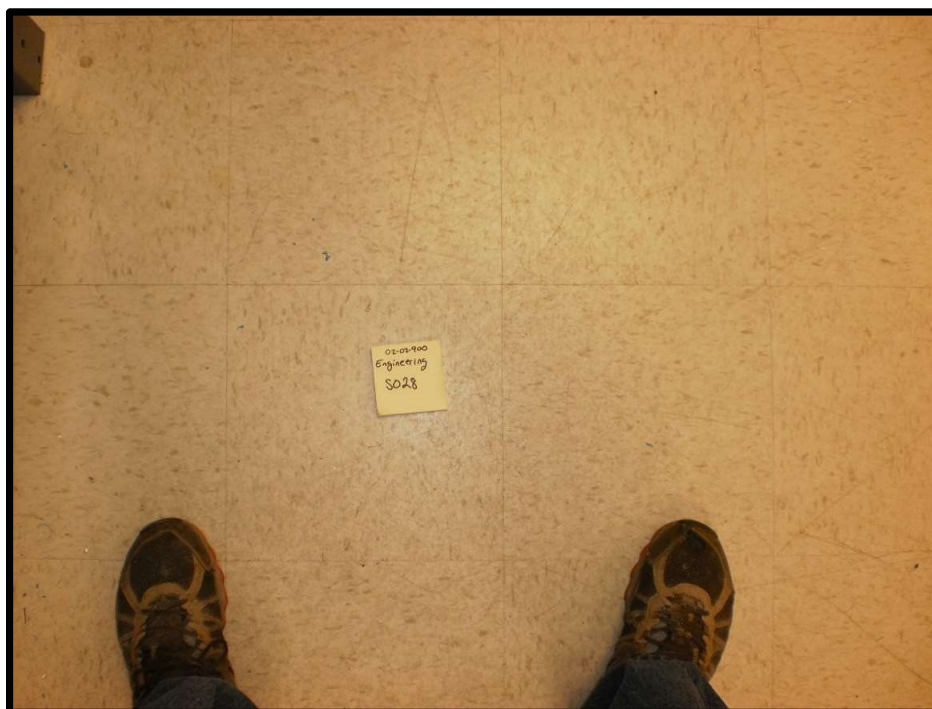




ASBESTOS BULK SAMPLING FORM

Sample #:	S028	Date Sampled:	July 26, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room EN1010	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

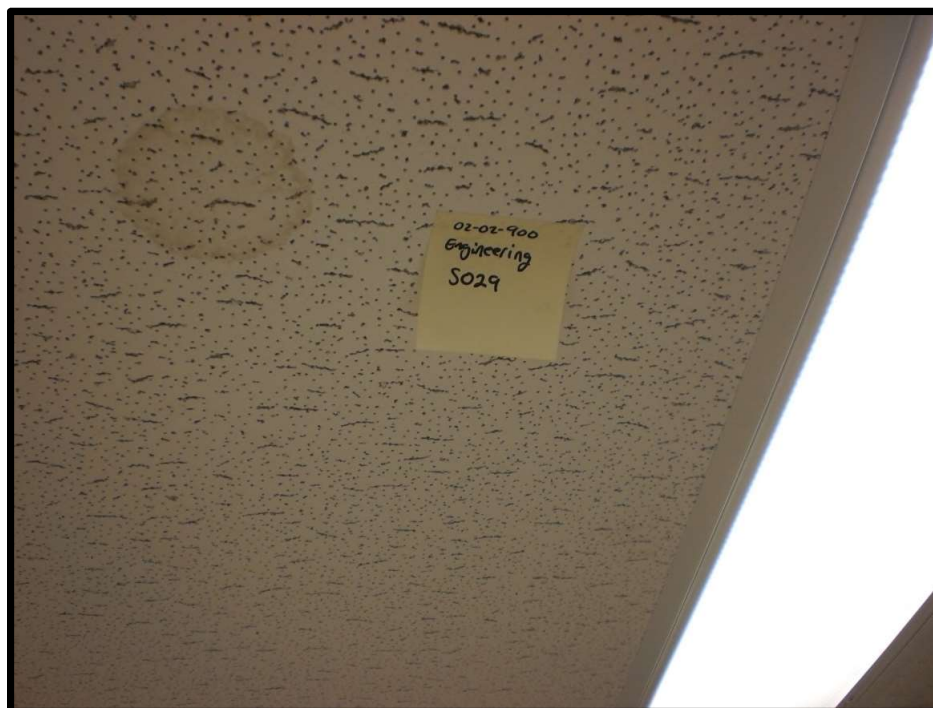
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	X12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	X Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: <u>White with large brown specks</u>	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		





ASBESTOS BULK SAMPLING FORM

Sample #:	S029	Date Sampled:	July 26, 2012	
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy	
Location:	Room EN1034B	Analysis:	SAI - PLM	
MUN Project #:	02-02-900	Work Order #:		
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation <input type="checkbox"/> Elbow <input type="checkbox"/> Fitting <input type="checkbox"/> Transite Pipe <input type="checkbox"/> Gasket <input type="checkbox"/> Tank Insulation <input type="checkbox"/> Pipe Wrap HVAC <input type="checkbox"/> Insulation <input type="checkbox"/> Tape <input type="checkbox"/> Paper Wrap	<input type="checkbox"/> 12'x12' Tile <input type="checkbox"/> 9'x9'Tile <input type="checkbox"/> Vinyl Sheet <input type="checkbox"/> Mastic Wall <input type="checkbox"/> Transite Panel <input type="checkbox"/> Textured Wall <input type="checkbox"/> Plaster <input type="checkbox"/> DWJC	<input type="checkbox"/> Textured <input type="checkbox"/> Stucco <input type="checkbox"/> Popcorn <input type="checkbox"/> DWJC <input type="checkbox"/> Plaster <input checked="" type="checkbox"/> Acoustic Tile (Dropped) <input type="checkbox"/> Acoustic Tile (Glued-on) <input type="checkbox"/> Mastic Structural <input type="checkbox"/> Steel F. P. ing <input type="checkbox"/> Deck F. P. ing	<input type="checkbox"/> Shingle <input type="checkbox"/> Rolled <input type="checkbox"/> Felt <input type="checkbox"/> Tar Miscellaneous: <u>2' x 4' pinhole fissure</u> No. of Phases: _____ Colour: _____	<input type="checkbox"/> Floor <input type="checkbox"/> Wall Orientation <input checked="" type="checkbox"/> Ceiling <input type="checkbox"/> Above Ceiling <input type="checkbox"/> Other





ASBESTOS BULK SAMPLING FORM

Sample #:	S030	Date Sampled:	July 26, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room EN1034	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	<input type="checkbox"/> 12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	<input type="checkbox"/> Floor
X Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		X Other (open area)
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: _____	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		

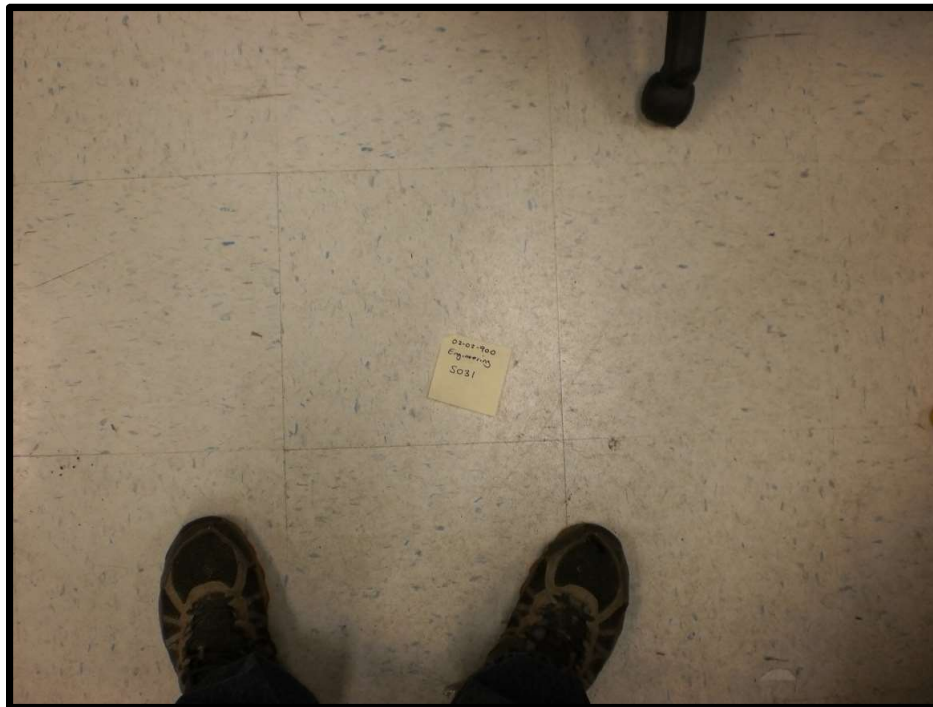




ASBESTOS BULK SAMPLING FORM

Sample #:	S031	Date Sampled:	July 26, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room 1035E	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

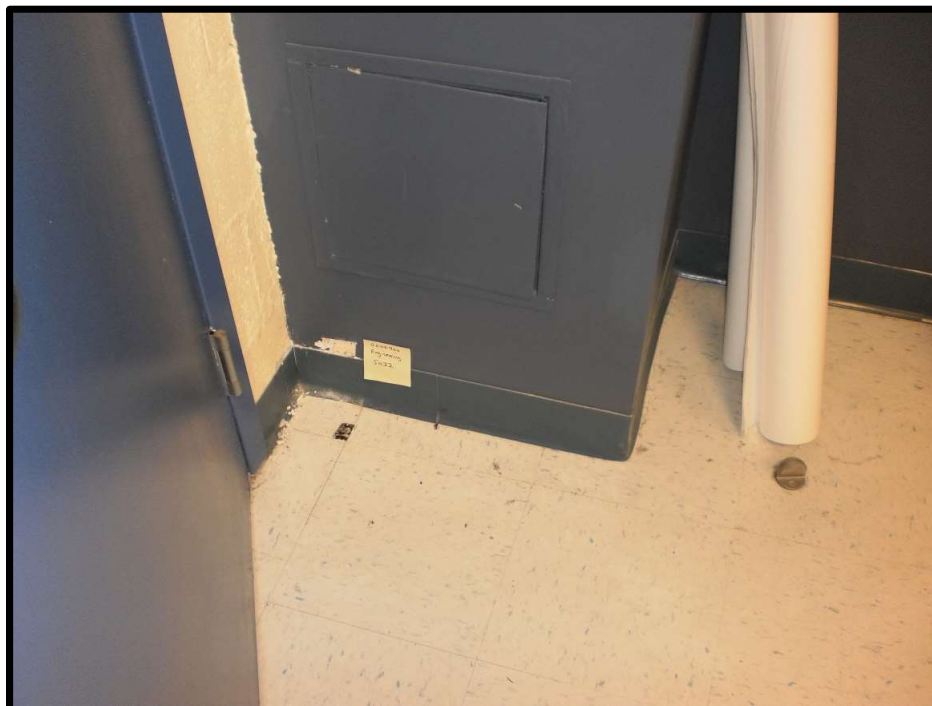
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	X12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	X Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: <u>White with light blue specks</u>	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		





ASBESTOS BULK SAMPLING FORM

Sample #:	S032	Date Sampled:	July 26, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room EN1035E	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	
Bulk Sampling Parameters			
Pipe/Tank	Flooring	Ceiling	Roofing
<input type="checkbox"/> Insulation <input type="checkbox"/> Elbow <input type="checkbox"/> Fitting <input type="checkbox"/> Transite Pipe <input type="checkbox"/> Gasket <input type="checkbox"/> Tank Insulation <input type="checkbox"/> Pipe Wrap HVAC <input type="checkbox"/> Insulation <input type="checkbox"/> Tape <input type="checkbox"/> Paper Wrap	<input type="checkbox"/> 12'x12' Tile <input type="checkbox"/> 9'x9'Tile <input type="checkbox"/> Vinyl Sheet <input type="checkbox"/> Mastic Wall <input type="checkbox"/> Transite Panel <input type="checkbox"/> Textured Wall <input type="checkbox"/> Plaster <input type="checkbox"/> DWJC	<input type="checkbox"/> Textured <input type="checkbox"/> Stucco <input type="checkbox"/> Popcorn <input type="checkbox"/> DWJC <input type="checkbox"/> Plaster <input type="checkbox"/> Acoustic Tile (Dropped) <input type="checkbox"/> Acoustic Tile (Glued-on) <input type="checkbox"/> Mastic Structural <input type="checkbox"/> Steel F. P. ing <input type="checkbox"/> Deck F. P. ing	<input type="checkbox"/> Shingle <input type="checkbox"/> Rolled <input type="checkbox"/> Felt <input type="checkbox"/> Tar Miscellaneous: _____ No. of Phases: _____ Colour: _____
Location		<input type="checkbox"/> Floor <input type="checkbox"/> X Wall Orientation <input type="checkbox"/> Ceiling <input type="checkbox"/> Above Ceiling <input type="checkbox"/> Other	

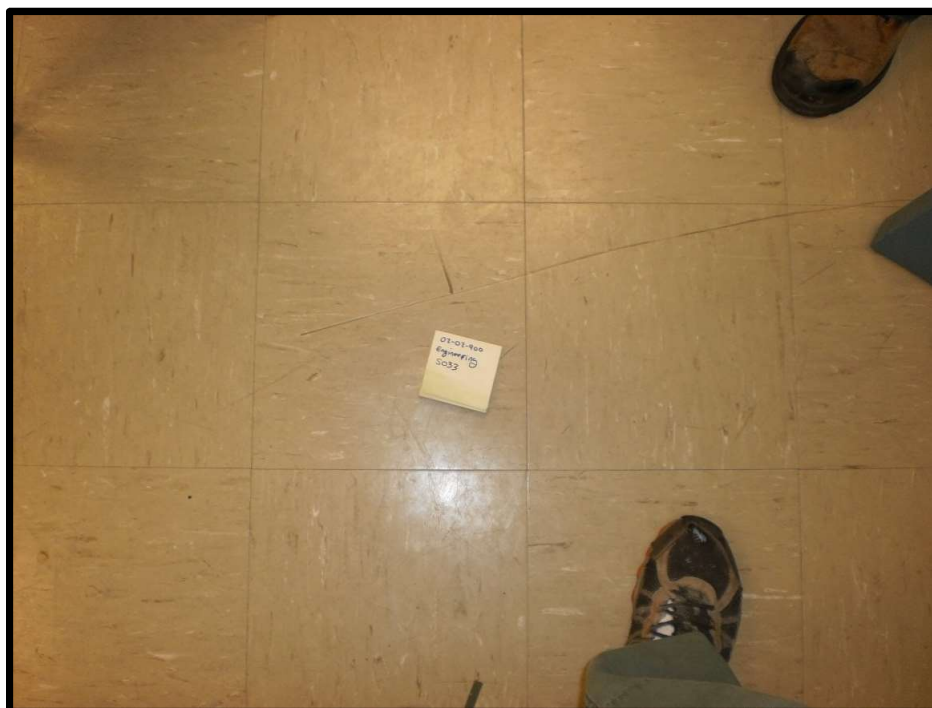




ASBESTOS BULK SAMPLING FORM

Sample #:	S033	Date Sampled:	July 27, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room EN1026A	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	X12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	X Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: <u>Green with white and brown specks</u>	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		





ASBESTOS BULK SAMPLING FORM

Sample #:	S034	Date Sampled:	July 27, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room EN1023 A	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	X12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	X Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: <u>Grey with dark grey streaks</u>	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		

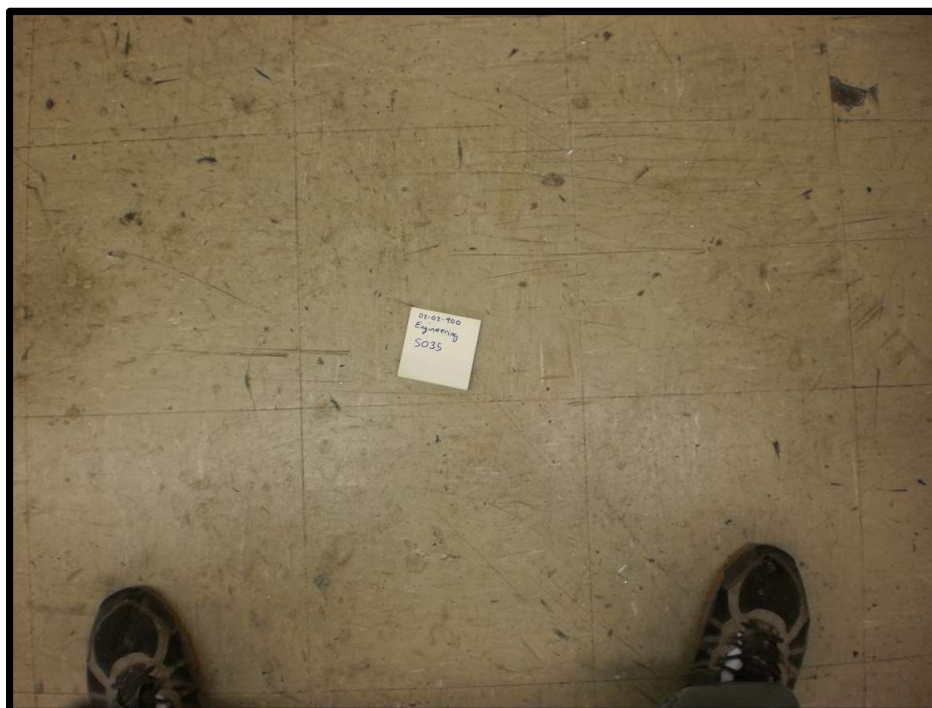




ASBESTOS BULK SAMPLING FORM

Sample #:	S035	Date Sampled:	July 27, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room EN1023F	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	X12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	X Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: <u>Brown with white and dark brown specks</u>	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		

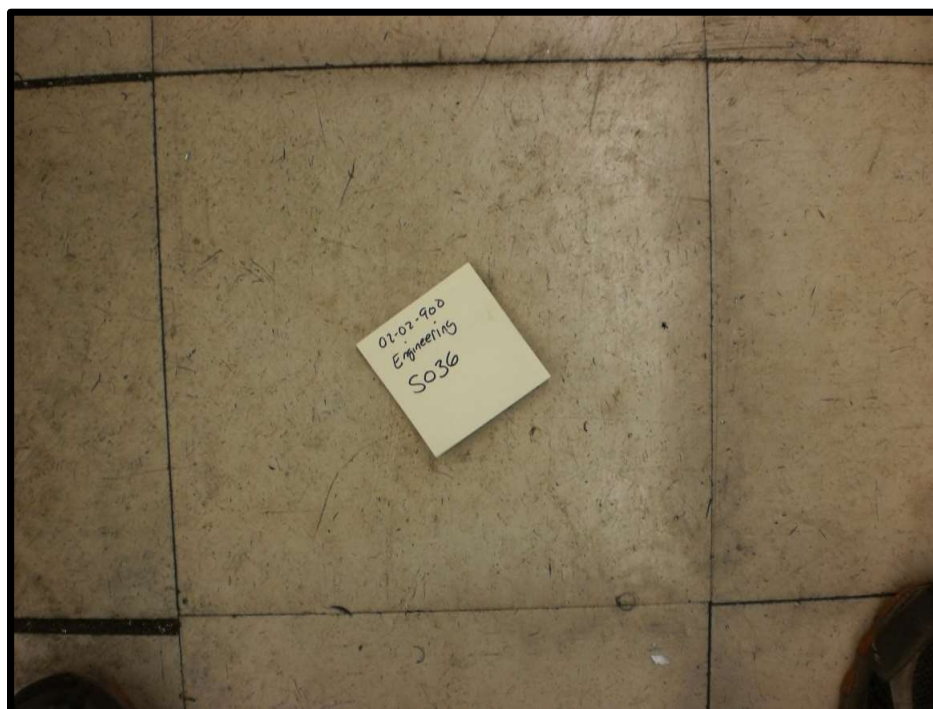




ASBESTOS BULK SAMPLING FORM

Sample #:	S036	Date Sampled:	July 27, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room EN1023F	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	X12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	X Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: <u>White</u>	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		





ASBESTOS BULK SAMPLING FORM

Sample #:	S037	Date Sampled:	July 27, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room EN1023L/M	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	<input type="checkbox"/> 12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	<input type="checkbox"/> Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	X Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	X DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: _____	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		

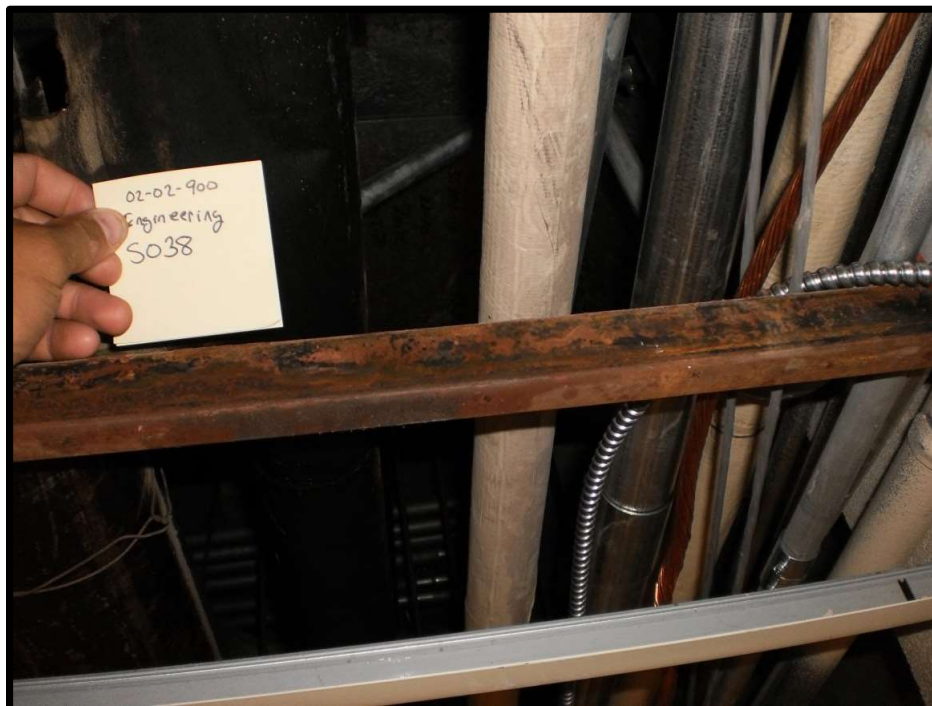




ASBESTOS BULK SAMPLING FORM

Sample #:	S038	Date Sampled:	July 27, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room 1023 (hallway)	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	<input type="checkbox"/> 12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	<input type="checkbox"/> Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9' Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input checked="" type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: <u>Tar paper</u>	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: _____	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		

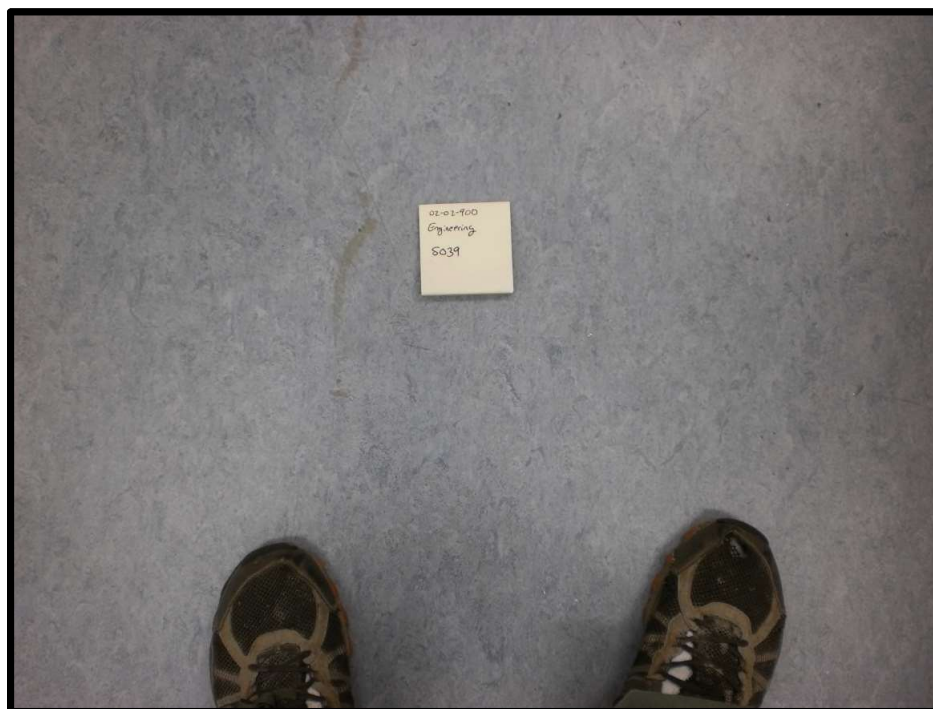




ASBESTOS BULK SAMPLING FORM

Sample #:	S039	Date Sampled:	July 27, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room EN1020E	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	<input type="checkbox"/> 12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	<input type="checkbox"/> X Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	X Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: <u>Blue wave pattern</u>	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		

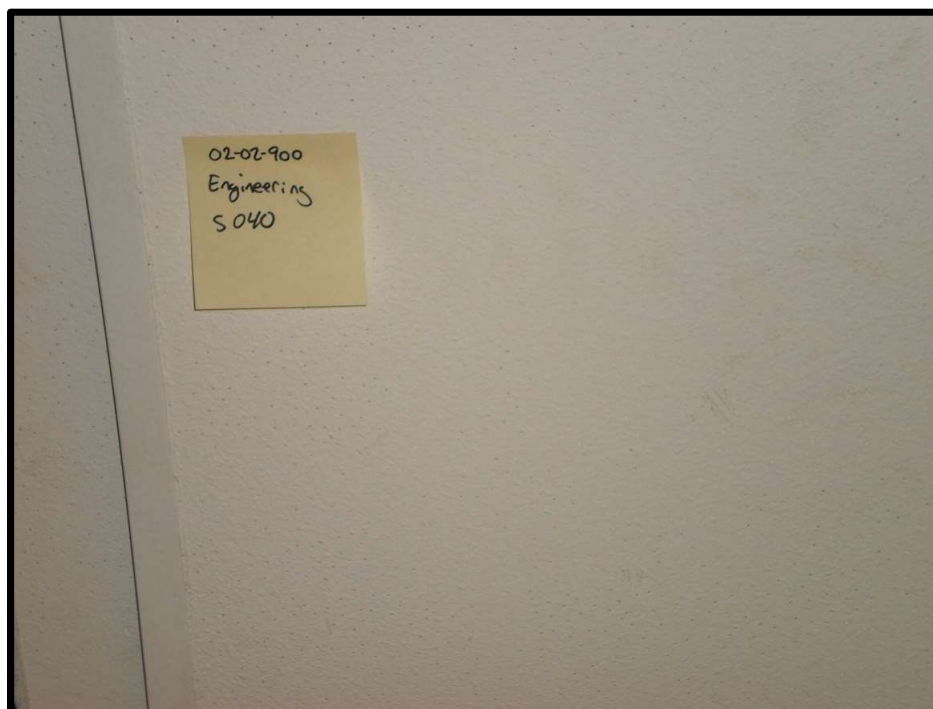




ASBESTOS BULK SAMPLING FORM

Sample #:	S040	Date Sampled:	July 27, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room EN1037	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

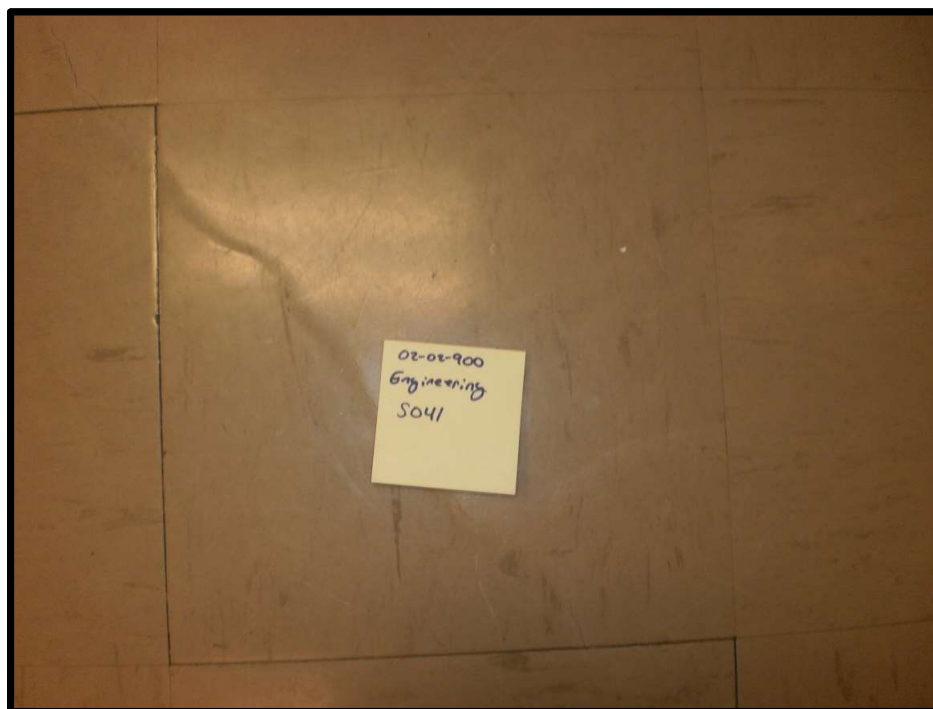
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	<input type="checkbox"/> 12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	<input type="checkbox"/> Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	X Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	X Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: <u>2' x 4' pinhole</u>	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: _____	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		





ASBESTOS BULK SAMPLING FORM

Sample #:	S041	Date Sampled:	July 30, 2012	
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy	
Location:	Room EN2025	Analysis:	SAI - PLM	
MUN Project #:	02-02-900	Work Order #:		
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation <input type="checkbox"/> Elbow <input type="checkbox"/> Fitting <input type="checkbox"/> Transite Pipe <input type="checkbox"/> Gasket <input type="checkbox"/> Tank Insulation <input type="checkbox"/> Pipe Wrap HVAC <input type="checkbox"/> Insulation <input type="checkbox"/> Tape <input type="checkbox"/> Paper Wrap	X12'x12' Tile <input type="checkbox"/> 9'x9'Tile <input type="checkbox"/> Vinyl Sheet <input type="checkbox"/> Mastic Wall <input type="checkbox"/> Transite Panel <input type="checkbox"/> Textured Wall <input type="checkbox"/> Plaster <input type="checkbox"/> DWJC	<input type="checkbox"/> Textured <input type="checkbox"/> Stucco <input type="checkbox"/> Popcorn <input type="checkbox"/> DWJC <input type="checkbox"/> Plaster <input type="checkbox"/> Acoustic Tile (Dropped) <input type="checkbox"/> Acoustic Tile (Glued-on) <input type="checkbox"/> Mastic Structural <input type="checkbox"/> Steel F. P. ing <input type="checkbox"/> Deck F. P. ing	<input type="checkbox"/> Shingle <input type="checkbox"/> Rolled <input type="checkbox"/> Felt <input type="checkbox"/> Tar Miscellaneous: _____ No. of Phases: _____ Colour: <u>Grey with dark grey streaks</u>	X Floor <input type="checkbox"/> Wall Orientation <input type="checkbox"/> Ceiling <input type="checkbox"/> Above Ceiling <input type="checkbox"/> Other

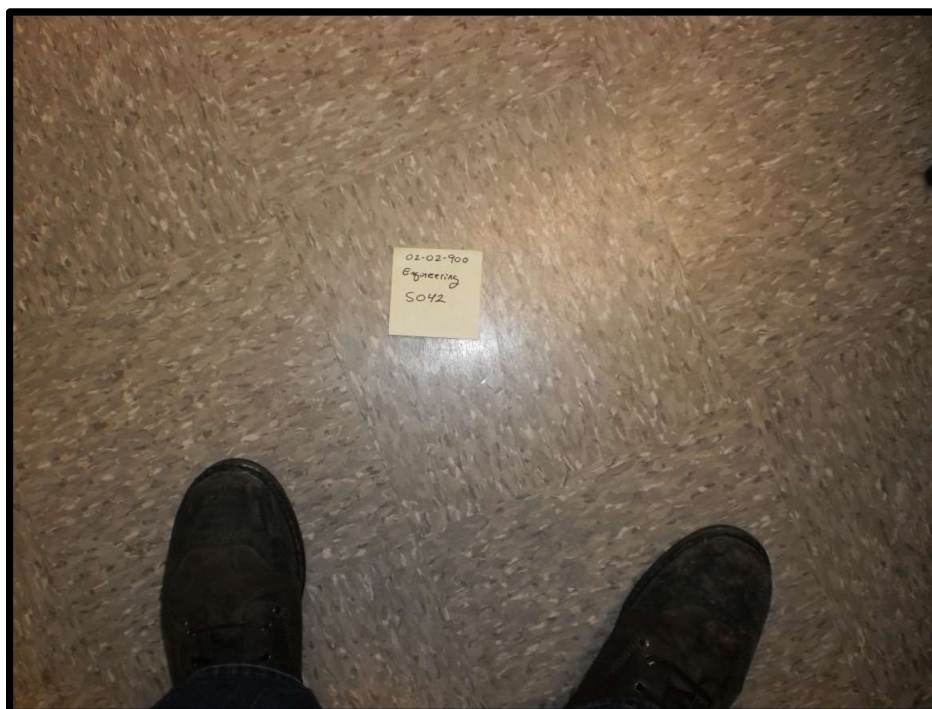




ASBESTOS BULK SAMPLING FORM

Sample #:	S042	Date Sampled:	July 30, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room EN2020	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	X12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	X Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: <u>Grey with abundant white and dark grey flecks</u>	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		





ASBESTOS BULK SAMPLING FORM

Sample #:	S043	Date Sampled:	July 30, 2012	
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy	
Location:	Room EN2018A	Analysis:	SAI - PLM	
MUN Project #:	02-02-900	Work Order #:		
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation <input type="checkbox"/> Elbow <input type="checkbox"/> Fitting <input type="checkbox"/> Transite Pipe <input type="checkbox"/> Gasket <input type="checkbox"/> Tank Insulation <input type="checkbox"/> Pipe Wrap HVAC <input type="checkbox"/> Insulation <input type="checkbox"/> Tape <input type="checkbox"/> Paper Wrap	<input type="checkbox"/> 12'x12' Tile <input type="checkbox"/> 9'x9'Tile <input type="checkbox"/> Vinyl Sheet <input type="checkbox"/> Mastic Wall <input type="checkbox"/> Transite Panel <input type="checkbox"/> Textured Wall <input type="checkbox"/> Plaster <input type="checkbox"/> DWJC	<input type="checkbox"/> Textured <input type="checkbox"/> Stucco <input type="checkbox"/> Popcorn <input type="checkbox"/> DWJC <input type="checkbox"/> Plaster <input type="checkbox"/> Acoustic Tile (Dropped) <input type="checkbox"/> Acoustic Tile (Glued-on) <input type="checkbox"/> Mastic Structural <input type="checkbox"/> Steel F. P. ing <input type="checkbox"/> Deck F. P. ing	<input type="checkbox"/> Shingle <input type="checkbox"/> Rolled <input type="checkbox"/> Felt <input type="checkbox"/> Tar Miscellaneous: _____ No. of Phases: _____ Colour: _____	<input type="checkbox"/> Floor <input checked="" type="checkbox"/> Wall Orientation <input type="checkbox"/> Ceiling <input type="checkbox"/> Above Ceiling <input type="checkbox"/> Other





ASBESTOS BULK SAMPLING FORM

Sample #:	S044	Date Sampled:	July 30, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room EN2048	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	X12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	X Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: <u>Light yellow with dark yellow and white specks</u>	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		





ASBESTOS BULK SAMPLING FORM

Sample #:	S045	Date Sampled:	July 30, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room EN2050	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	X12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	X Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: <u>White with yellow streaks</u>	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		

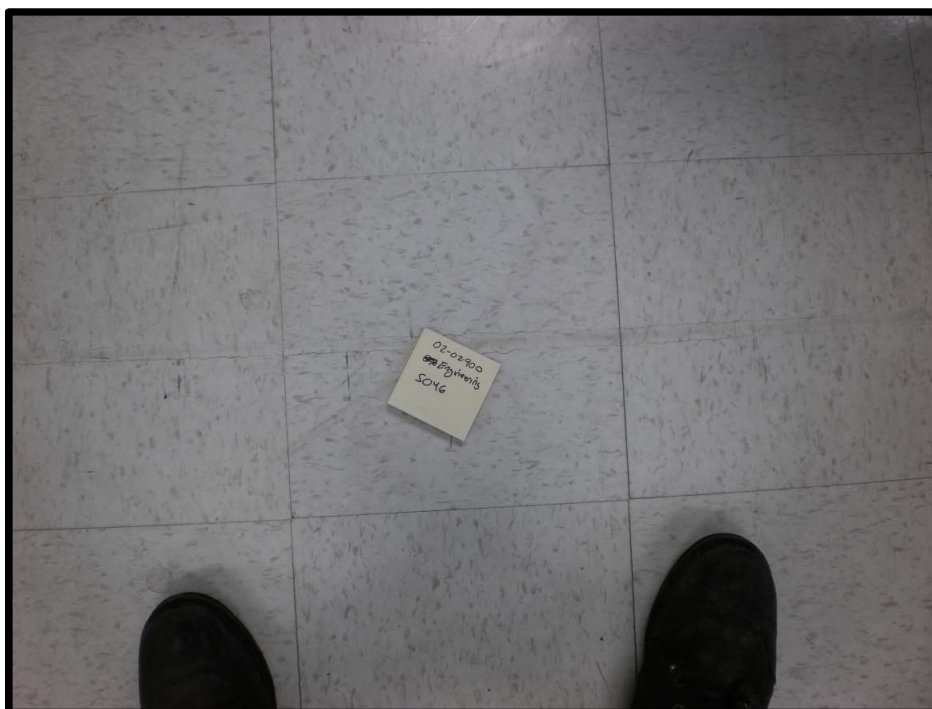




ASBESTOS BULK SAMPLING FORM

Sample #:	S046	Date Sampled:	July 30, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	Room EN2050	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	X12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	X Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: <u>White with abundant grey specks</u>	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		





ASBESTOS BULK SAMPLING FORM

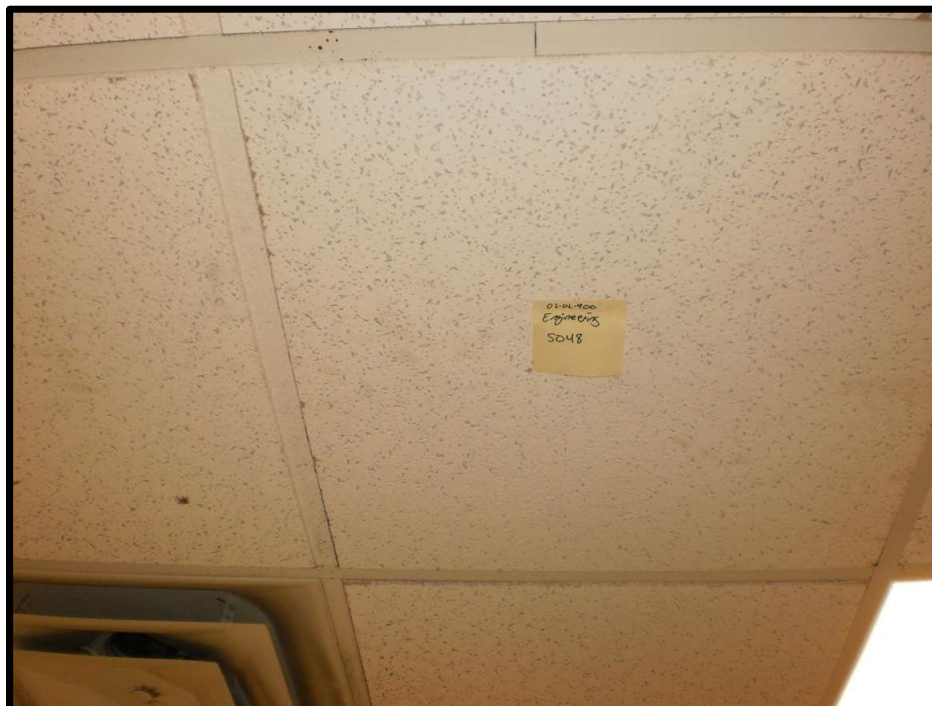
Sample #:	S047	Date Sampled:	July 30, 2012	
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy	
Location:	163, Room EN2050	Analysis:	SAI - PLM	
MUN Project #:	02-02-900	Work Order #:		
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation <input type="checkbox"/> Elbow <input type="checkbox"/> Fitting <input type="checkbox"/> Transite Pipe <input type="checkbox"/> Gasket <input type="checkbox"/> Tank Insulation <input type="checkbox"/> Pipe Wrap HVAC <input type="checkbox"/> Insulation <input type="checkbox"/> Tape <input type="checkbox"/> Paper Wrap	<input type="checkbox"/> 12'x12' Tile <input type="checkbox"/> 9'x9'Tile <input type="checkbox"/> Vinyl Sheet <input type="checkbox"/> Mastic Wall <input type="checkbox"/> Transite Panel <input type="checkbox"/> Textured Wall <input type="checkbox"/> Plaster <input checked="" type="checkbox"/> DWJC	<input type="checkbox"/> Textured <input type="checkbox"/> Stucco <input type="checkbox"/> Popcorn <input type="checkbox"/> DWJC <input type="checkbox"/> Plaster <input type="checkbox"/> Acoustic Tile (Dropped) <input type="checkbox"/> Acoustic Tile (Glued-on) <input type="checkbox"/> Mastic Structural <input type="checkbox"/> Steel F. P. ing <input type="checkbox"/> Deck F. P. ing	<input type="checkbox"/> Shingle <input type="checkbox"/> Rolled <input type="checkbox"/> Felt <input type="checkbox"/> Tar Miscellaneous: _____ No. of Phases: _____ Colour: _____	<input type="checkbox"/> Floor <input checked="" type="checkbox"/> Wall Orientation <input type="checkbox"/> Ceiling <input type="checkbox"/> Above Ceiling <input type="checkbox"/> Other





ASBESTOS BULK SAMPLING FORM

Sample #:	S048	Date Sampled:	July 30, 2012	
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy	
Location:	165, Room EN2077	Analysis:	SAI - PLM	
MUN Project #:	02-02-900	Work Order #:		
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation <input type="checkbox"/> Elbow <input type="checkbox"/> Fitting <input type="checkbox"/> Transite Pipe <input type="checkbox"/> Gasket <input type="checkbox"/> Tank Insulation <input type="checkbox"/> Pipe Wrap HVAC <input type="checkbox"/> Insulation <input type="checkbox"/> Tape <input type="checkbox"/> Paper Wrap	<input type="checkbox"/> 12'x12' Tile <input type="checkbox"/> 9'x9'Tile <input type="checkbox"/> Vinyl Sheet <input type="checkbox"/> Mastic Wall <input type="checkbox"/> Transite Panel <input type="checkbox"/> Textured Wall <input type="checkbox"/> Plaster <input type="checkbox"/> DWJC	<input type="checkbox"/> Textured <input type="checkbox"/> Stucco <input type="checkbox"/> Popcorn <input type="checkbox"/> DWJC <input type="checkbox"/> Plaster <input checked="" type="checkbox"/> Acoustic Tile (Dropped) <input type="checkbox"/> Acoustic Tile (Glued-on) <input type="checkbox"/> Mastic Structural <input type="checkbox"/> Steel F. P. ing <input type="checkbox"/> Deck F. P. ing	<input type="checkbox"/> Shingle <input type="checkbox"/> Rolled <input type="checkbox"/> Felt <input type="checkbox"/> Tar Miscellaneous: <u>2' x 4' pinhole fleck</u> No. of Phases: _____ Colour: _____	<input type="checkbox"/> Floor <input type="checkbox"/> Wall Orientation <input checked="" type="checkbox"/> Ceiling <input type="checkbox"/> Above Ceiling <input type="checkbox"/> Other





ASBESTOS BULK SAMPLING FORM

Sample #:	S049	Date Sampled:	July 30, 2012	
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy	
Location:	191, room EN2043	Analysis:	SAI - PLM	
MUN Project #:	02-02-900	Work Order #:		
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation <input type="checkbox"/> Elbow <input type="checkbox"/> Fitting <input type="checkbox"/> Transite Pipe <input type="checkbox"/> Gasket <input type="checkbox"/> Tank Insulation <input type="checkbox"/> Pipe Wrap HVAC <input type="checkbox"/> Insulation <input type="checkbox"/> Tape <input type="checkbox"/> Paper Wrap	<input type="checkbox"/> 12'x12' Tile <input type="checkbox"/> 9'x9'Tile <input type="checkbox"/> Vinyl Sheet <input type="checkbox"/> Mastic Wall <input type="checkbox"/> Transite Panel <input type="checkbox"/> Textured Wall <input type="checkbox"/> Plaster <input checked="" type="checkbox"/> DWJC	<input type="checkbox"/> Textured <input type="checkbox"/> Stucco <input type="checkbox"/> Popcorn <input type="checkbox"/> DWJC <input type="checkbox"/> Plaster <input type="checkbox"/> Acoustic Tile (Dropped) <input type="checkbox"/> Acoustic Tile (Glued-on) <input type="checkbox"/> Mastic Structural <input type="checkbox"/> Steel F. P. ing <input type="checkbox"/> Deck F. P. ing	<input type="checkbox"/> Shingle <input type="checkbox"/> Rolled <input type="checkbox"/> Felt <input type="checkbox"/> Tar Miscellaneous: _____ No. of Phases: _____ Colour: _____	<input type="checkbox"/> Floor <input checked="" type="checkbox"/> Wall Orientation <input type="checkbox"/> Ceiling <input type="checkbox"/> Above Ceiling <input type="checkbox"/> Other

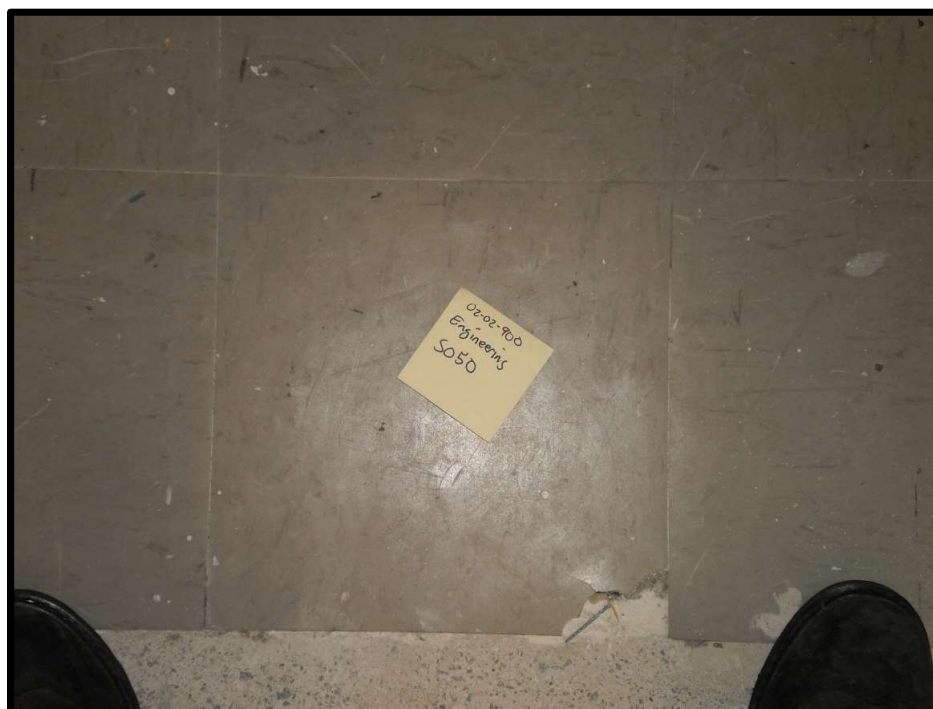




ASBESTOS BULK SAMPLING FORM

Sample #:	S050	Date Sampled:	July 30, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	194, room EN2006	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	X12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	X Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: _____	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		





ASBESTOS BULK SAMPLING FORM

Sample #:	S051	Date Sampled:	July 30, 2012	
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy	
Location:	194, room 2006	Analysis:	SAI - PLM	
MUN Project #:	02-02-900	Work Order #:		
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation <input type="checkbox"/> Elbow <input type="checkbox"/> Fitting <input type="checkbox"/> Transite Pipe <input type="checkbox"/> Gasket <input type="checkbox"/> Tank Insulation <input type="checkbox"/> Pipe Wrap HVAC <input type="checkbox"/> Insulation <input type="checkbox"/> Tape <input type="checkbox"/> Paper Wrap	<input type="checkbox"/> 12'x12' Tile <input type="checkbox"/> 9'x9'Tile <input type="checkbox"/> Vinyl Sheet <input type="checkbox"/> Mastic Wall <input type="checkbox"/> Transite Panel <input type="checkbox"/> Textured Wall <input type="checkbox"/> Plaster <input type="checkbox"/> DWJC	<input type="checkbox"/> Textured <input type="checkbox"/> Stucco <input type="checkbox"/> Popcorn <input type="checkbox"/> DWJC <input checked="" type="checkbox"/> Plaster <input type="checkbox"/> Acoustic Tile (Dropped) <input type="checkbox"/> Acoustic Tile (Glued-on) <input type="checkbox"/> Mastic Structural <input type="checkbox"/> Steel F. P. ing <input type="checkbox"/> Deck F. P. ing	<input type="checkbox"/> Shingle <input type="checkbox"/> Rolled <input type="checkbox"/> Felt <input type="checkbox"/> Tar Miscellaneous: _____ No. of Phases: _____ Colour: _____	<input type="checkbox"/> Floor <input type="checkbox"/> Wall Orientation <input checked="" type="checkbox"/> Ceiling <input type="checkbox"/> Above Ceiling <input type="checkbox"/> Other

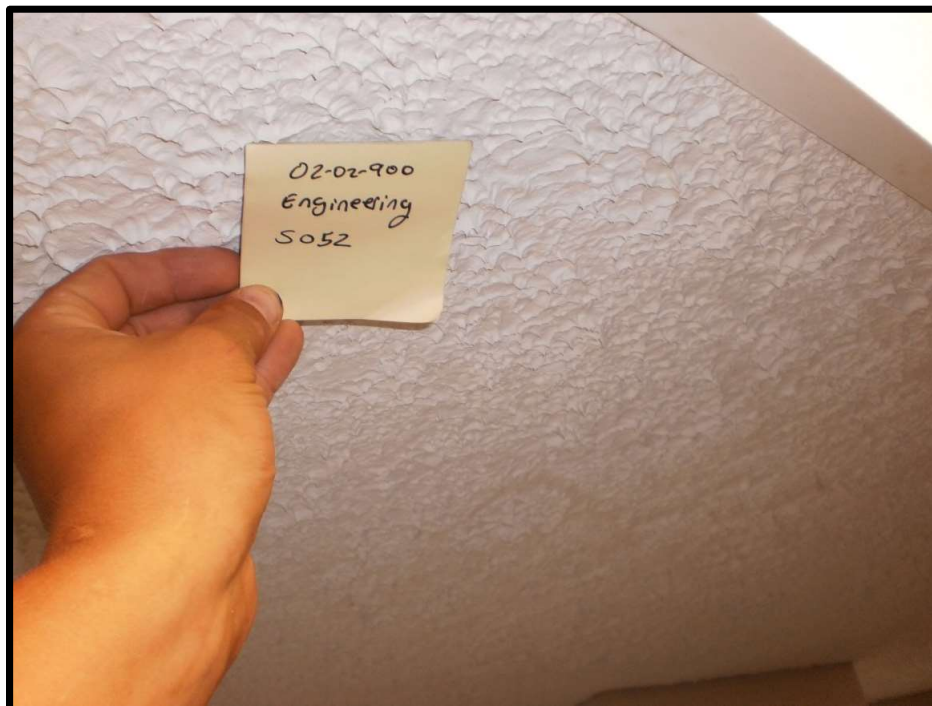




ASBESTOS BULK SAMPLING FORM

Sample #:	S052	Date Sampled:	July 31, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	196, room 2000	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	<input type="checkbox"/> 12'x12' Tile	<input checked="" type="checkbox"/> Textured	<input type="checkbox"/> Shingle	<input type="checkbox"/> Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input checked="" type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: _____	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		

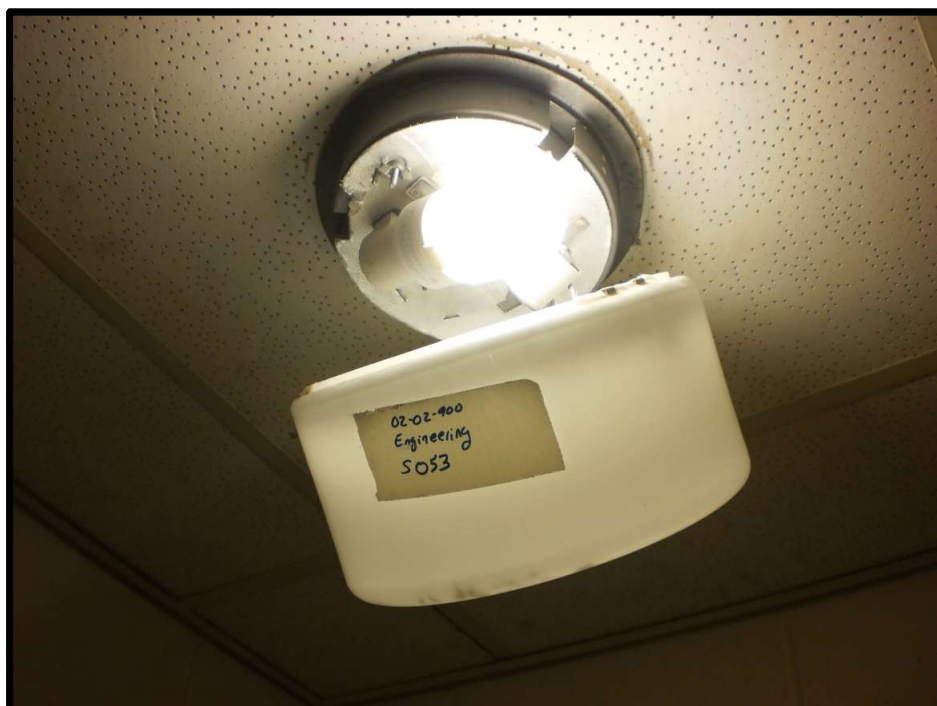




ASBESTOS BULK SAMPLING FORM

Sample #:	S053	Date Sampled:	July 31, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	196, room 2000	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	<input type="checkbox"/> 12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	<input type="checkbox"/> Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		X Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: <u>Heat Shield</u>	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: _____	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		

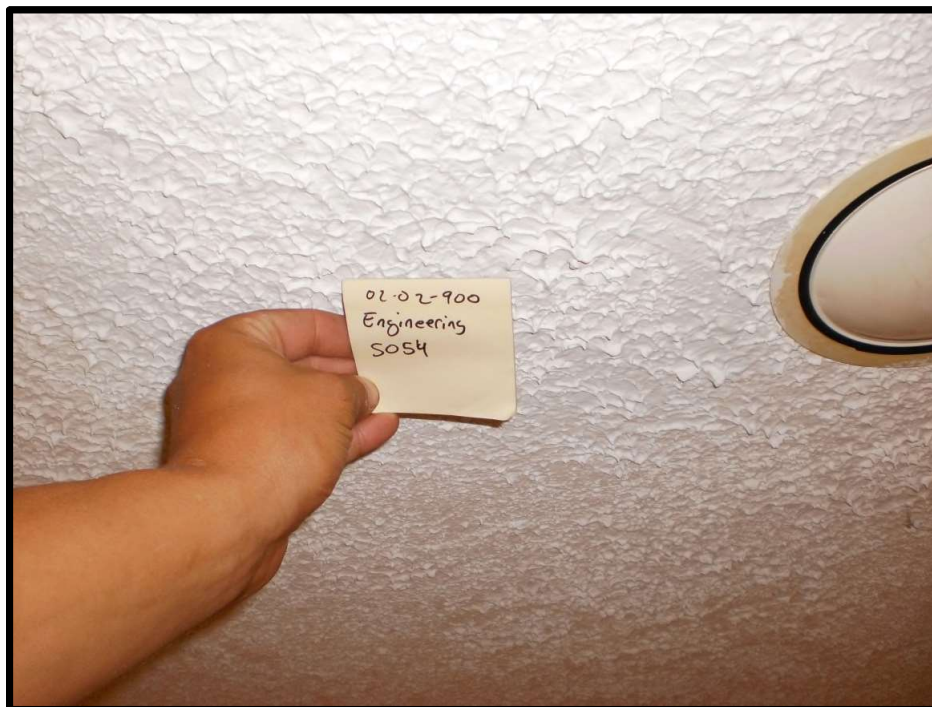




ASBESTOS BULK SAMPLING FORM

Sample #:	S054	Date Sampled:	July 31, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	200, room 2C01	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	<input type="checkbox"/> 12'x12' Tile	<input checked="" type="checkbox"/> Textured	<input type="checkbox"/> Shingle	<input type="checkbox"/> Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input checked="" type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: _____	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		

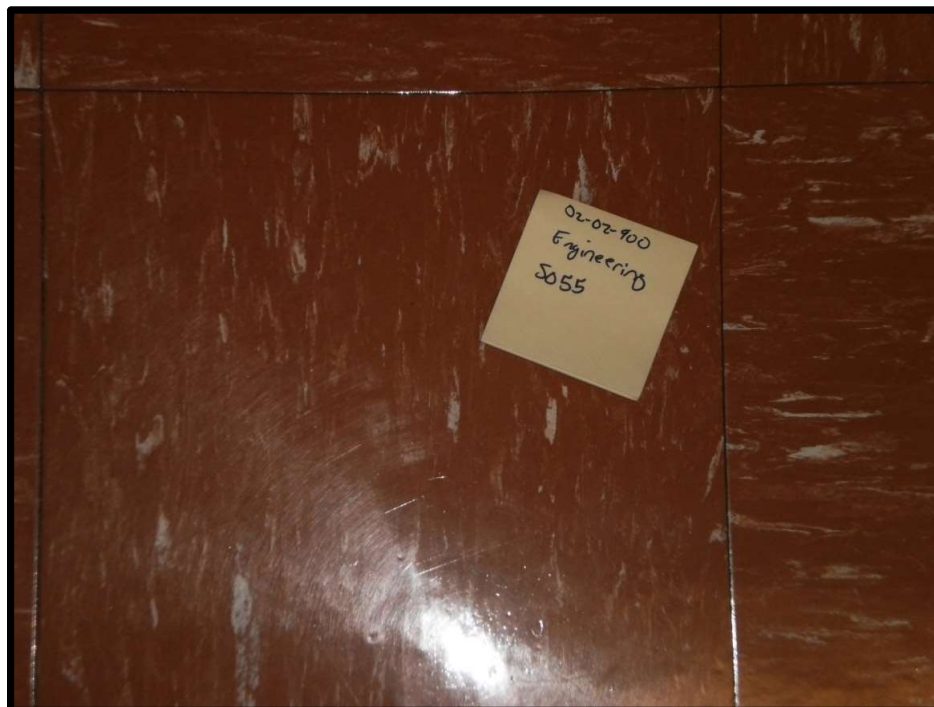




ASBESTOS BULK SAMPLING FORM

Sample #:	S055	Date Sampled:	July 31, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	201, room 2C02	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	X12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	X Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: <u>Red with abundant white streaks</u>	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		





ASBESTOS BULK SAMPLING FORM

Sample #:	S056	Date Sampled:	July 31, 2012	
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy	
Location:	202, room EN2002A	Analysis:	SAI - PLM	
MUN Project #:	02-02-900	Work Order #:		
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation <input type="checkbox"/> Elbow <input type="checkbox"/> Fitting <input type="checkbox"/> Transite Pipe <input type="checkbox"/> Gasket <input type="checkbox"/> Tank Insulation <input type="checkbox"/> Pipe Wrap HVAC <input type="checkbox"/> Insulation <input type="checkbox"/> Tape <input type="checkbox"/> Paper Wrap	<input type="checkbox"/> 12'x12' Tile <input type="checkbox"/> 9'x9'Tile <input type="checkbox"/> Vinyl Sheet <input type="checkbox"/> Mastic Wall <input type="checkbox"/> Transite Panel <input type="checkbox"/> Textured Wall <input type="checkbox"/> Plaster <input checked="" type="checkbox"/> DWJC	<input type="checkbox"/> Textured <input type="checkbox"/> Stucco <input type="checkbox"/> Popcorn <input type="checkbox"/> DWJC <input type="checkbox"/> Plaster <input type="checkbox"/> Acoustic Tile (Dropped) <input type="checkbox"/> Acoustic Tile (Glued-on) <input type="checkbox"/> Mastic Structural <input type="checkbox"/> Steel F. P. ing <input type="checkbox"/> Deck F. P. ing	<input type="checkbox"/> Shingle <input type="checkbox"/> Rolled <input type="checkbox"/> Felt <input type="checkbox"/> Tar Miscellaneous: _____ No. of Phases: _____ Colour: _____	<input type="checkbox"/> Floor <input checked="" type="checkbox"/> Wall Orientation <input type="checkbox"/> Ceiling <input type="checkbox"/> Above Ceiling <input type="checkbox"/> Other





ASBESTOS BULK SAMPLING FORM

Sample #:	S057	Date Sampled:	July 31, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	220, room 3014	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	<input type="checkbox"/> 12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	<input type="checkbox"/> Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9' Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	X Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	X DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: _____	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		





ASBESTOS BULK SAMPLING FORM

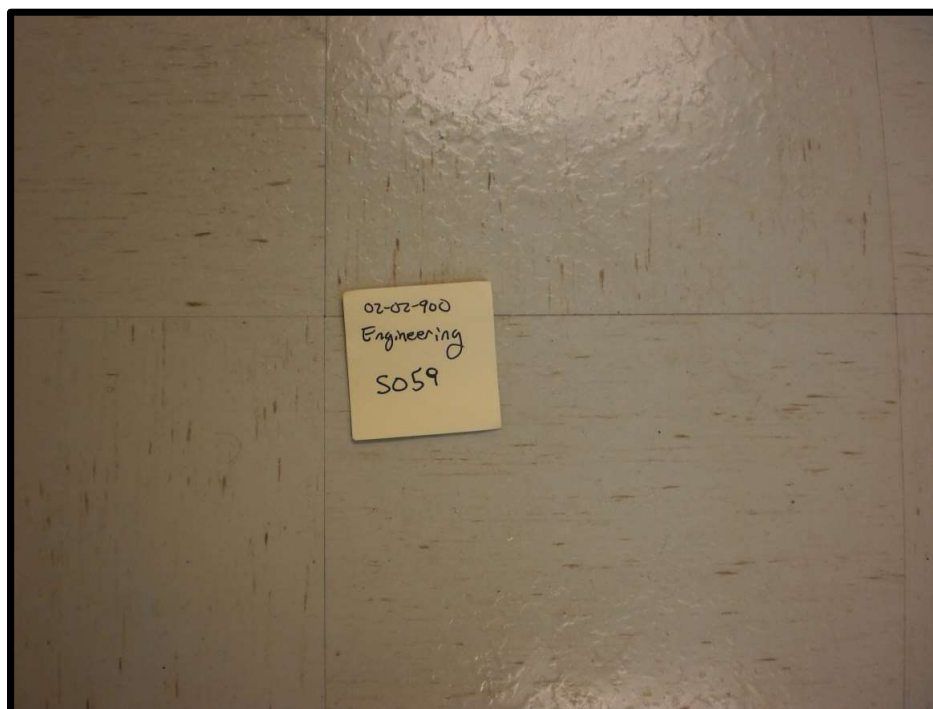
Sample #:	S058	Date Sampled:	July 31, 2012	
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy	
Location:	232, room 3076	Analysis:	SAI - PLM	
MUN Project #:	02-02-900	Work Order #:		
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation <input type="checkbox"/> Elbow <input type="checkbox"/> Fitting <input type="checkbox"/> Transite Pipe <input type="checkbox"/> Gasket <input type="checkbox"/> Tank Insulation <input type="checkbox"/> Pipe Wrap HVAC <input type="checkbox"/> Insulation <input type="checkbox"/> Tape <input type="checkbox"/> Paper Wrap	<input type="checkbox"/> 12'x12' Tile <input type="checkbox"/> 9'x9'Tile <input type="checkbox"/> Vinyl Sheet <input type="checkbox"/> Mastic Wall <input type="checkbox"/> Transite Panel <input type="checkbox"/> Textured Wall <input type="checkbox"/> Plaster <input checked="" type="checkbox"/> DWJC	<input type="checkbox"/> Textured <input type="checkbox"/> Stucco <input type="checkbox"/> Popcorn <input type="checkbox"/> DWJC <input type="checkbox"/> Plaster <input type="checkbox"/> Acoustic Tile (Dropped) <input type="checkbox"/> Acoustic Tile (Glued-on) <input type="checkbox"/> Mastic Structural <input type="checkbox"/> Steel F. P. ing <input type="checkbox"/> Deck F. P. ing	<input type="checkbox"/> Shingle <input type="checkbox"/> Rolled <input type="checkbox"/> Felt <input type="checkbox"/> Tar Miscellaneous: _____ No. of Phases: _____ Colour: _____	<input type="checkbox"/> Floor <input checked="" type="checkbox"/> Wall Orientation <input type="checkbox"/> Ceiling <input type="checkbox"/> Above Ceiling <input type="checkbox"/> Other




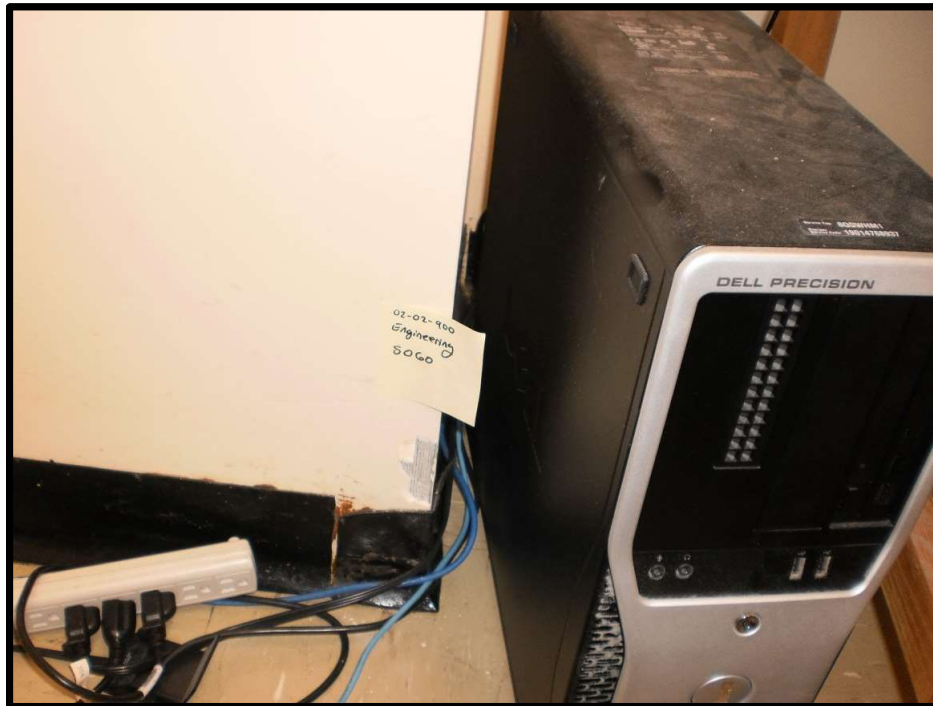


ASBESTOS BULK SAMPLING FORM

Sample #:	S059	Date Sampled:	July 31, 2012	
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy	
Location:	249, room EN3052	Analysis:	SAI - PLM	
MUN Project #:	02-02-900	Work Order #:		
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation <input type="checkbox"/> Elbow <input type="checkbox"/> Fitting <input type="checkbox"/> Transite Pipe <input type="checkbox"/> Gasket <input type="checkbox"/> Tank Insulation <input type="checkbox"/> Pipe Wrap HVAC <input type="checkbox"/> Insulation <input type="checkbox"/> Tape <input type="checkbox"/> Paper Wrap	X12'x12' Tile <input type="checkbox"/> 9'x9'Tile <input type="checkbox"/> Vinyl Sheet <input type="checkbox"/> Mastic Wall <input type="checkbox"/> Transite Panel <input type="checkbox"/> Textured Wall <input type="checkbox"/> Plaster <input type="checkbox"/> DWJC	<input type="checkbox"/> Textured <input type="checkbox"/> Stucco <input type="checkbox"/> Popcorn <input type="checkbox"/> DWJC <input type="checkbox"/> Plaster <input type="checkbox"/> Acoustic Tile (Dropped) <input type="checkbox"/> Acoustic Tile (Glued-on) <input type="checkbox"/> Mastic Structural <input type="checkbox"/> Steel F. P. ing <input type="checkbox"/> Deck F. P. ing	<input type="checkbox"/> Shingle <input type="checkbox"/> Rolled <input type="checkbox"/> Felt <input type="checkbox"/> Tar Miscellaneous: _____ No. of Phases: _____ Colour: <u>White with brown flecks</u>	X Floor <input type="checkbox"/> Wall Orientation <input type="checkbox"/> Ceiling <input type="checkbox"/> Above Ceiling <input type="checkbox"/> Other



		<h2>ASBESTOS BULK SAMPLING FORM</h2>	
Sample #:	S060	Date Sampled:	July 31, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	450, room 3054	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	
Bulk Sampling Parameters			
Pipe/Tank	Flooring	Ceiling	Roofing
<input type="checkbox"/> Insulation <input type="checkbox"/> Elbow <input type="checkbox"/> Fitting <input type="checkbox"/> Transite Pipe <input type="checkbox"/> Gasket <input type="checkbox"/> Tank Insulation <input type="checkbox"/> Pipe Wrap HVAC <input type="checkbox"/> Insulation <input type="checkbox"/> Tape <input type="checkbox"/> Paper Wrap	<input type="checkbox"/> 12'x12' Tile <input type="checkbox"/> 9'x9'Tile <input type="checkbox"/> Vinyl Sheet <input type="checkbox"/> Mastic Wall <input type="checkbox"/> Transite Panel <input type="checkbox"/> Textured Wall <input type="checkbox"/> Plaster <input checked="" type="checkbox"/> DWJC	<input type="checkbox"/> Textured <input type="checkbox"/> Stucco <input type="checkbox"/> Popcorn <input type="checkbox"/> DWJC <input type="checkbox"/> Plaster <input type="checkbox"/> Acoustic Tile (Dropped) <input type="checkbox"/> Acoustic Tile (Glued-on) <input type="checkbox"/> Mastic Structural <input type="checkbox"/> Steel F. P. ing <input type="checkbox"/> Deck F. P. ing	<input type="checkbox"/> Shingle <input type="checkbox"/> Rolled <input type="checkbox"/> Felt <input type="checkbox"/> Tar Miscellaneous: _____ No. of Phases: _____ Colour: _____
Location			
<input type="checkbox"/> Floor <input checked="" type="checkbox"/> X Wall Orientation <input type="checkbox"/> Ceiling <input type="checkbox"/> Above Ceiling <input type="checkbox"/> Other			





ASBESTOS BULK SAMPLING FORM

Sample #:	S061	Date Sampled:	July 31, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	271, room EN3058	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

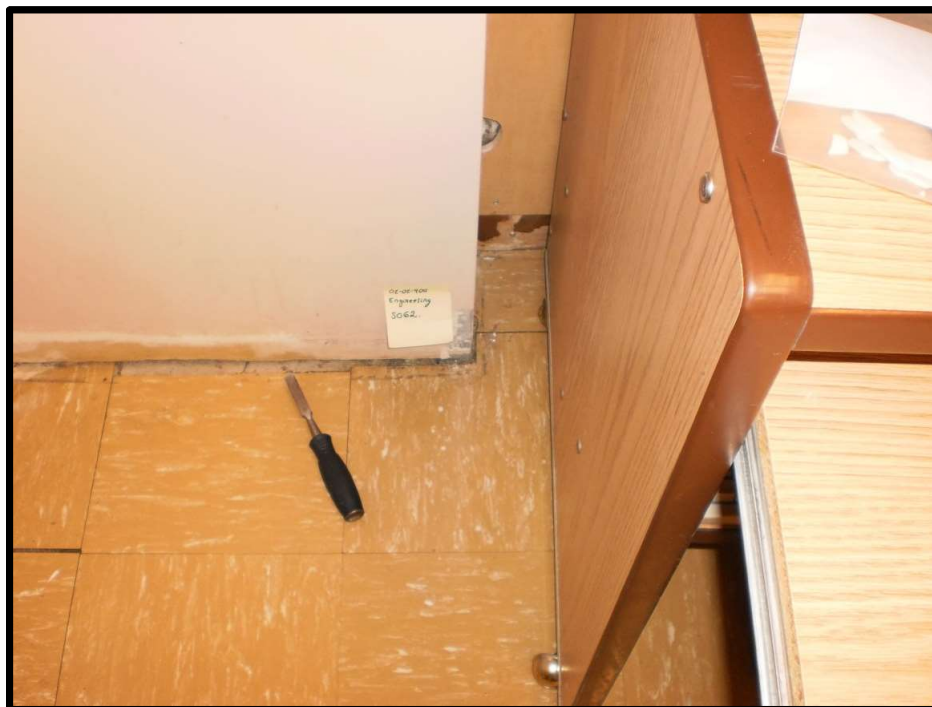
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	<input type="checkbox"/> 12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	X Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	X Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: <u>Dark blue</u>	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		





ASBESTOS BULK SAMPLING FORM

Sample #:	S062	Date Sampled:	July 31, 2012	
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy	
Location:	275, room EN3000A	Analysis:	SAI - PLM	
MUN Project #:	02-02-900	Work Order #:		
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation <input type="checkbox"/> Elbow <input type="checkbox"/> Fitting <input type="checkbox"/> Transite Pipe <input type="checkbox"/> Gasket <input type="checkbox"/> Tank Insulation <input type="checkbox"/> Pipe Wrap HVAC <input type="checkbox"/> Insulation <input type="checkbox"/> Tape <input type="checkbox"/> Paper Wrap	<input type="checkbox"/> 12'x12' Tile <input type="checkbox"/> 9'x9'Tile <input type="checkbox"/> Vinyl Sheet <input type="checkbox"/> Mastic Wall <input type="checkbox"/> Transite Panel <input type="checkbox"/> Textured Wall <input type="checkbox"/> Plaster <input checked="" type="checkbox"/> DWJC	<input type="checkbox"/> Textured <input type="checkbox"/> Stucco <input type="checkbox"/> Popcorn <input type="checkbox"/> DWJC <input type="checkbox"/> Plaster <input type="checkbox"/> Acoustic Tile (Dropped) <input type="checkbox"/> Acoustic Tile (Glued-on) <input type="checkbox"/> Mastic Structural <input type="checkbox"/> Steel F. P. ing <input type="checkbox"/> Deck F. P. ing	<input type="checkbox"/> Shingle <input type="checkbox"/> Rolled <input type="checkbox"/> Felt <input type="checkbox"/> Tar Miscellaneous: _____ No. of Phases: _____ Colour: _____	<input type="checkbox"/> Floor <input checked="" type="checkbox"/> Wall Orientation <input type="checkbox"/> Ceiling <input type="checkbox"/> Above Ceiling <input type="checkbox"/> Other





ASBESTOS BULK SAMPLING FORM

Sample #:	S063	Date Sampled:	July 31, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	275, room EN3000A	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	<input type="checkbox"/> 12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	<input type="checkbox"/> Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vainly Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		X Other (ductwork)
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: <u>Mastic</u>	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural		
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	No. of Phases: _____	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing	Colour: _____	

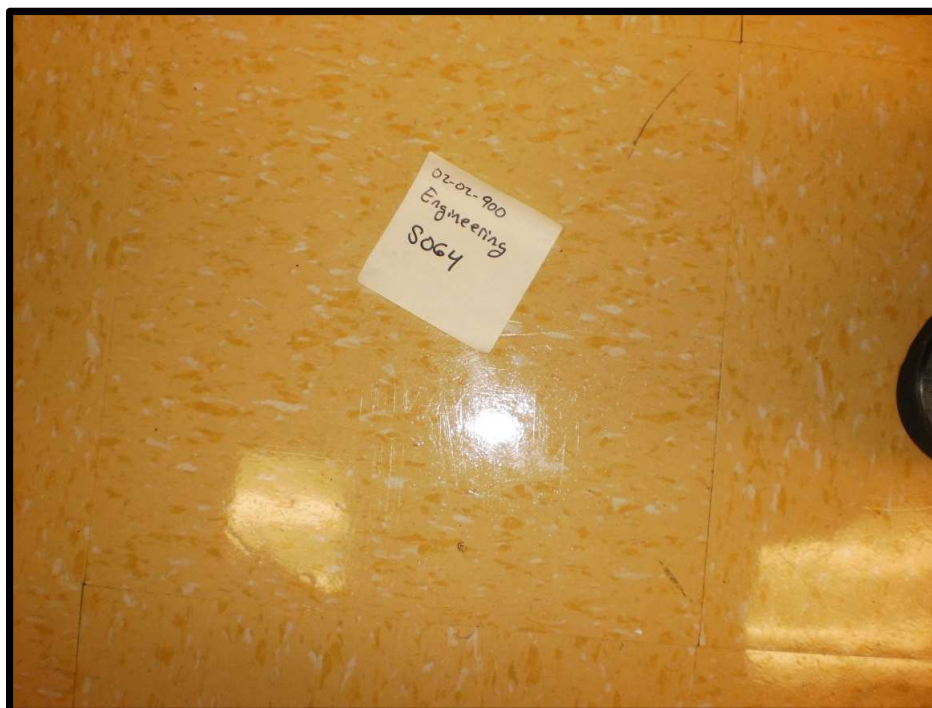




ASBESTOS BULK SAMPLING FORM

Sample #:	S064	Date Sampled:	July 31, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	275, room EN3000A	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	X12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	X Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: <u>Pale yellow with white and yellow flecks</u>	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		

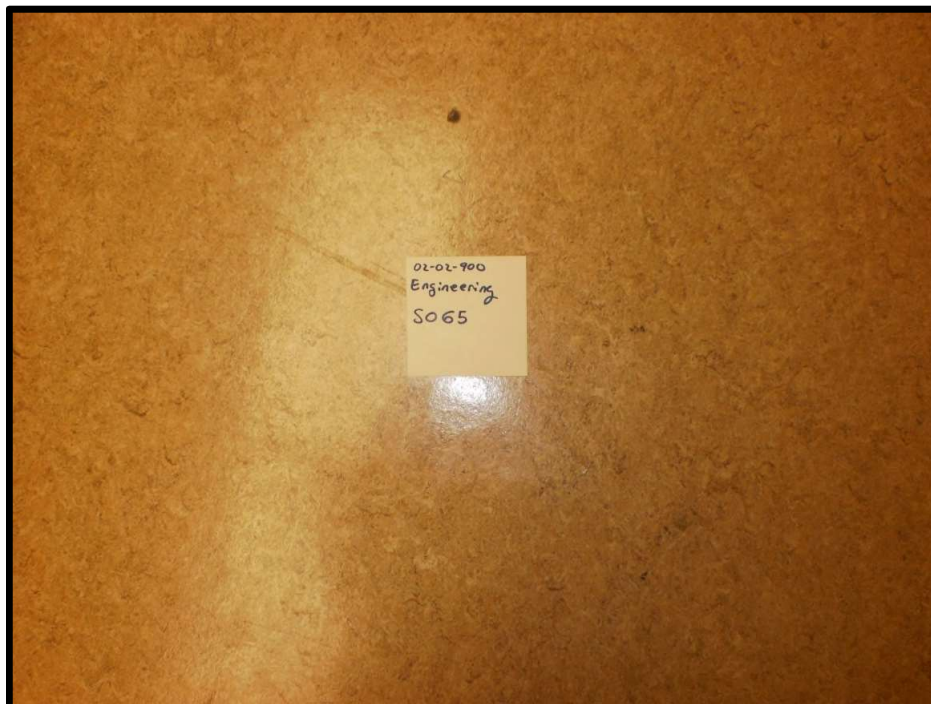




ASBESTOS BULK SAMPLING FORM

Sample #:	S065	Date Sampled:	July 31, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	285, room 4028	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	<input type="checkbox"/> 12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	X Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	X Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: <u>Brown with light grey fleck</u>	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		

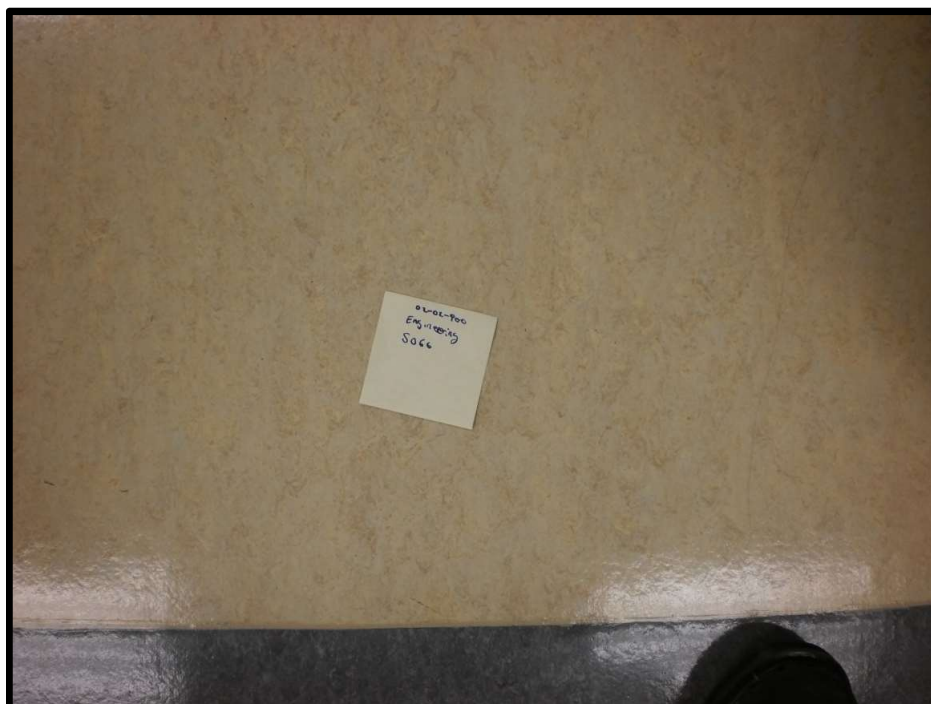




ASBESTOS BULK SAMPLING FORM

Sample #:	S066	Date Sampled:	August 1, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	289, room 4030	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	<input type="checkbox"/> 12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	X Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	X Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: <u>Pale yellow with light brown</u>	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		





ASBESTOS BULK SAMPLING FORM

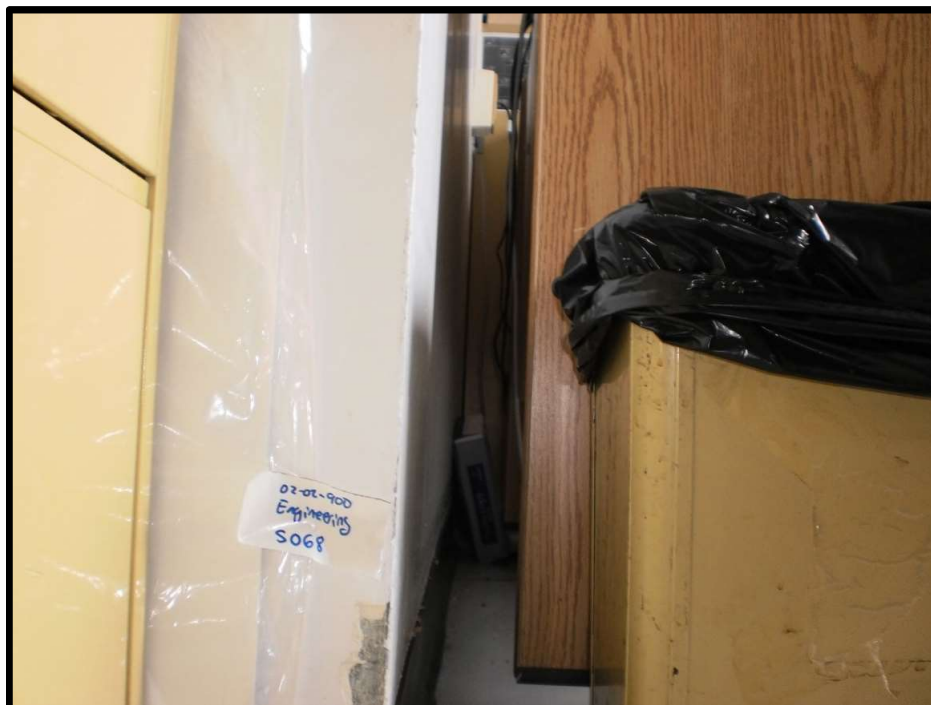
Sample #:	S067	Date Sampled:	August 1, 2012	
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy	
Location:	297, room 4032	Analysis:	SAI - PLM	
MUN Project #:	02-02-900	Work Order #:		
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation <input type="checkbox"/> Elbow <input type="checkbox"/> Fitting <input type="checkbox"/> Transite Pipe <input type="checkbox"/> Gasket <input type="checkbox"/> Tank Insulation <input type="checkbox"/> Pipe Wrap HVAC <input type="checkbox"/> Insulation <input type="checkbox"/> Tape <input type="checkbox"/> Paper Wrap	<input type="checkbox"/> 12'x12' Tile <input type="checkbox"/> 9'x9'Tile <input type="checkbox"/> Vinyl Sheet <input type="checkbox"/> Mastic Wall <input type="checkbox"/> Transite Panel <input type="checkbox"/> Textured Wall <input type="checkbox"/> Plaster <input checked="" type="checkbox"/> DWJC	<input type="checkbox"/> Textured <input type="checkbox"/> Stucco <input type="checkbox"/> Popcorn <input type="checkbox"/> DWJC <input type="checkbox"/> Plaster <input type="checkbox"/> Acoustic Tile (Dropped) <input type="checkbox"/> Acoustic Tile (Glued-on) <input type="checkbox"/> Mastic Structural <input type="checkbox"/> Steel F. P. ing <input type="checkbox"/> Deck F. P. ing	<input type="checkbox"/> Shingle <input type="checkbox"/> Rolled <input type="checkbox"/> Felt <input type="checkbox"/> Tar Miscellaneous: _____ No. of Phases: _____ Colour: _____	<input type="checkbox"/> Floor <input checked="" type="checkbox"/> Wall Orientation <input type="checkbox"/> Ceiling <input type="checkbox"/> Above Ceiling <input type="checkbox"/> Other





ASBESTOS BULK SAMPLING FORM

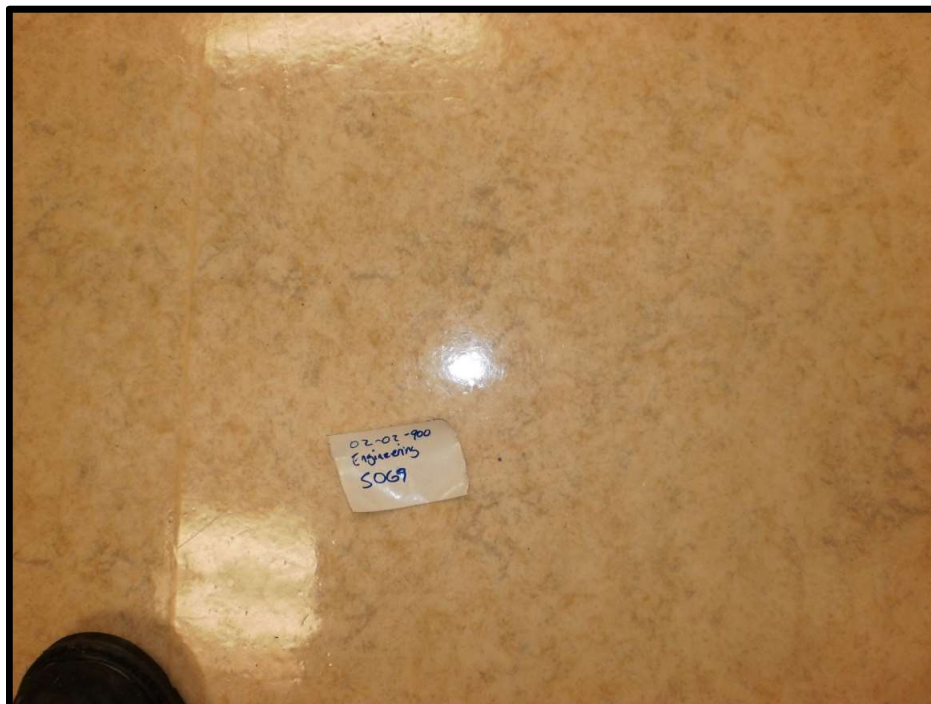
Sample #:	S068	Date Sampled:	August 1, 2012	
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy	
Location:	300, room EN4042	Analysis:	SAI - PLM	
MUN Project #:	02-02-900	Work Order #:		
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation <input type="checkbox"/> Elbow <input type="checkbox"/> Fitting <input type="checkbox"/> Transite Pipe <input type="checkbox"/> Gasket <input type="checkbox"/> Tank Insulation <input type="checkbox"/> Pipe Wrap HVAC <input type="checkbox"/> Insulation <input type="checkbox"/> Tape <input type="checkbox"/> Paper Wrap	<input type="checkbox"/> 12'x12' Tile <input type="checkbox"/> 9'x9'Tile <input type="checkbox"/> Vinyl Sheet <input type="checkbox"/> Mastic Wall <input type="checkbox"/> Transite Panel <input type="checkbox"/> Textured Wall <input type="checkbox"/> Plaster <input checked="" type="checkbox"/> DWJC	<input type="checkbox"/> Textured <input type="checkbox"/> Stucco <input type="checkbox"/> Popcorn <input type="checkbox"/> DWJC <input type="checkbox"/> Plaster <input type="checkbox"/> Acoustic Tile (Dropped) <input type="checkbox"/> Acoustic Tile (Glued-on) <input type="checkbox"/> Mastic Structural <input type="checkbox"/> Steel F. P. ing <input type="checkbox"/> Deck F. P. ing	<input type="checkbox"/> Shingle <input type="checkbox"/> Rolled <input type="checkbox"/> Felt <input type="checkbox"/> Tar Miscellaneous: _____ No. of Phases: _____ Colour: _____	<input type="checkbox"/> Floor <input checked="" type="checkbox"/> Wall Orientation <input type="checkbox"/> Ceiling <input type="checkbox"/> Above Ceiling <input type="checkbox"/> Other





ASBESTOS BULK SAMPLING FORM

Sample #:	S069	Date Sampled:	August 1, 2012	
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy	
Location:	310, room EN4029	Analysis:	SAI - PLM	
MUN Project #:	02-02-900	Work Order #:		
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation <input type="checkbox"/> Elbow <input type="checkbox"/> Fitting <input type="checkbox"/> Transite Pipe <input type="checkbox"/> Gasket <input type="checkbox"/> Tank Insulation <input type="checkbox"/> Pipe Wrap HVAC <input type="checkbox"/> Insulation <input type="checkbox"/> Tape <input type="checkbox"/> Paper Wrap	<input type="checkbox"/> 12'x12' Tile <input type="checkbox"/> 9'x9'Tile <input checked="" type="checkbox"/> Vinyl Sheet <input type="checkbox"/> Mastic Wall <input type="checkbox"/> Transite Panel <input type="checkbox"/> Textured Wall <input type="checkbox"/> Plaster <input type="checkbox"/> DWJC	<input type="checkbox"/> Textured <input type="checkbox"/> Stucco <input type="checkbox"/> Popcorn <input type="checkbox"/> DWJC <input type="checkbox"/> Plaster <input type="checkbox"/> Acoustic Tile (Dropped) <input type="checkbox"/> Acoustic Tile (Glued-on) <input type="checkbox"/> Mastic Structural <input type="checkbox"/> Steel F. P. ing <input type="checkbox"/> Deck F. P. ing	<input type="checkbox"/> Shingle <input type="checkbox"/> Rolled <input type="checkbox"/> Felt <input type="checkbox"/> Tar Miscellaneous: _____ No. of Phases: _____ Colour: _____	X Floor <input type="checkbox"/> Wall Orientation <input type="checkbox"/> Ceiling <input type="checkbox"/> Above Ceiling <input type="checkbox"/> Other





ASBESTOS BULK SAMPLING FORM

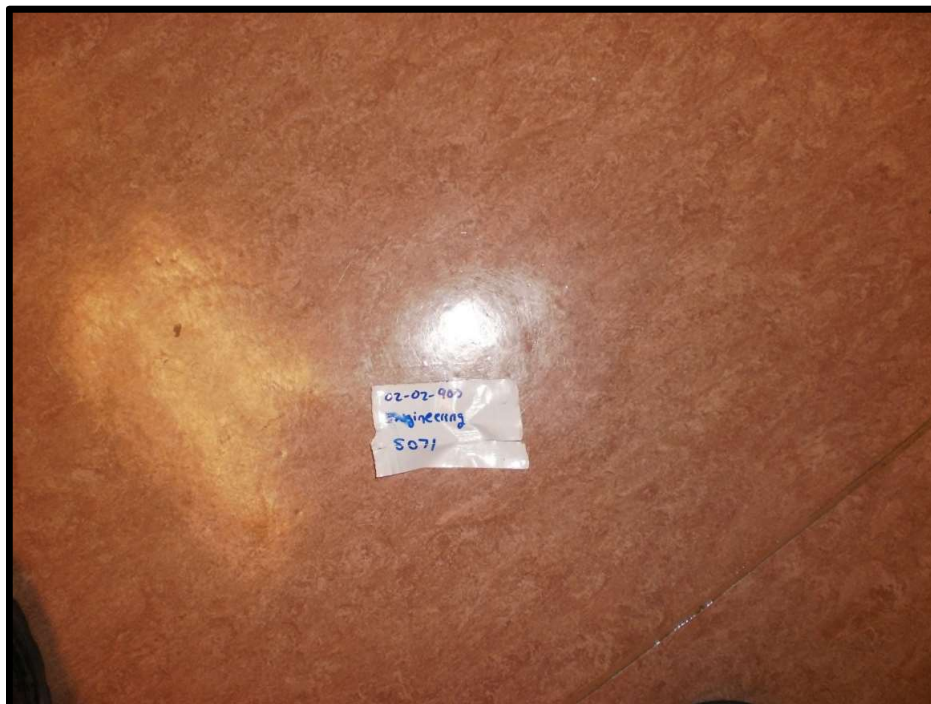
Sample #:	S070	Date Sampled:	August 1, 2012	
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy	
Location:	310, room EN4029	Analysis:	SAI - PLM	
MUN Project #:	02-02-900	Work Order #:		
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation <input type="checkbox"/> Elbow <input type="checkbox"/> Fitting <input type="checkbox"/> Transite Pipe <input type="checkbox"/> Gasket <input type="checkbox"/> Tank Insulation <input type="checkbox"/> Pipe Wrap HVAC <input type="checkbox"/> Insulation <input type="checkbox"/> Tape <input type="checkbox"/> Paper Wrap	<input type="checkbox"/> 12'x12' Tile <input type="checkbox"/> 9'x9'Tile <input type="checkbox"/> Vinyl Sheet <input type="checkbox"/> Mastic Wall <input type="checkbox"/> Transite Panel <input type="checkbox"/> Textured Wall <input type="checkbox"/> Plaster <input type="checkbox"/> DWJC	<input type="checkbox"/> Textured <input type="checkbox"/> Stucco <input type="checkbox"/> Popcorn <input type="checkbox"/> DWJC <input checked="" type="checkbox"/> Plaster <input type="checkbox"/> Acoustic Tile (Dropped) <input type="checkbox"/> Acoustic Tile (Glued-on) <input type="checkbox"/> Mastic Structural <input type="checkbox"/> Steel F. P. ing <input type="checkbox"/> Deck F. P. ing	<input type="checkbox"/> Shingle <input type="checkbox"/> Rolled <input type="checkbox"/> Felt <input type="checkbox"/> Tar Miscellaneous: _____ No. of Phases: _____ Colour: _____	<input type="checkbox"/> Floor <input type="checkbox"/> Wall Orientation <input checked="" type="checkbox"/> Ceiling <input type="checkbox"/> Above Ceiling <input type="checkbox"/> Other





ASBESTOS BULK SAMPLING FORM

Sample #:	S071	Date Sampled:	August 1, 2012	
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy	
Location:	316	Analysis:	SAI - PLM	
MUN Project #:	02-02-900	Work Order #:		
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation <input type="checkbox"/> Elbow <input type="checkbox"/> Fitting <input type="checkbox"/> Transite Pipe <input type="checkbox"/> Gasket <input type="checkbox"/> Tank Insulation <input type="checkbox"/> Pipe Wrap HVAC <input type="checkbox"/> Insulation <input type="checkbox"/> Tape <input type="checkbox"/> Paper Wrap	<input type="checkbox"/> 12'x12' Tile <input type="checkbox"/> 9'x9'Tile <input checked="" type="checkbox"/> Vinyl Sheet <input type="checkbox"/> Mastic Wall <input type="checkbox"/> Transite Panel <input type="checkbox"/> Textured Wall <input type="checkbox"/> Plaster <input type="checkbox"/> DWJC	<input type="checkbox"/> Textured <input type="checkbox"/> Stucco <input type="checkbox"/> Popcorn <input type="checkbox"/> DWJC <input type="checkbox"/> Plaster <input type="checkbox"/> Acoustic Tile (Dropped) <input type="checkbox"/> Acoustic Tile (Glued-on) <input type="checkbox"/> Mastic Structural <input type="checkbox"/> Steel F. P. ing <input type="checkbox"/> Deck F. P. ing	<input type="checkbox"/> Shingle <input type="checkbox"/> Rolled <input type="checkbox"/> Felt <input type="checkbox"/> Tar Miscellaneous: _____ No. of Phases: _____ Colour: <u>Brown stone</u>	X Floor <input type="checkbox"/> Wall Orientation <input type="checkbox"/> Ceiling <input type="checkbox"/> Above Ceiling <input type="checkbox"/> Other





ASBESTOS BULK SAMPLING FORM

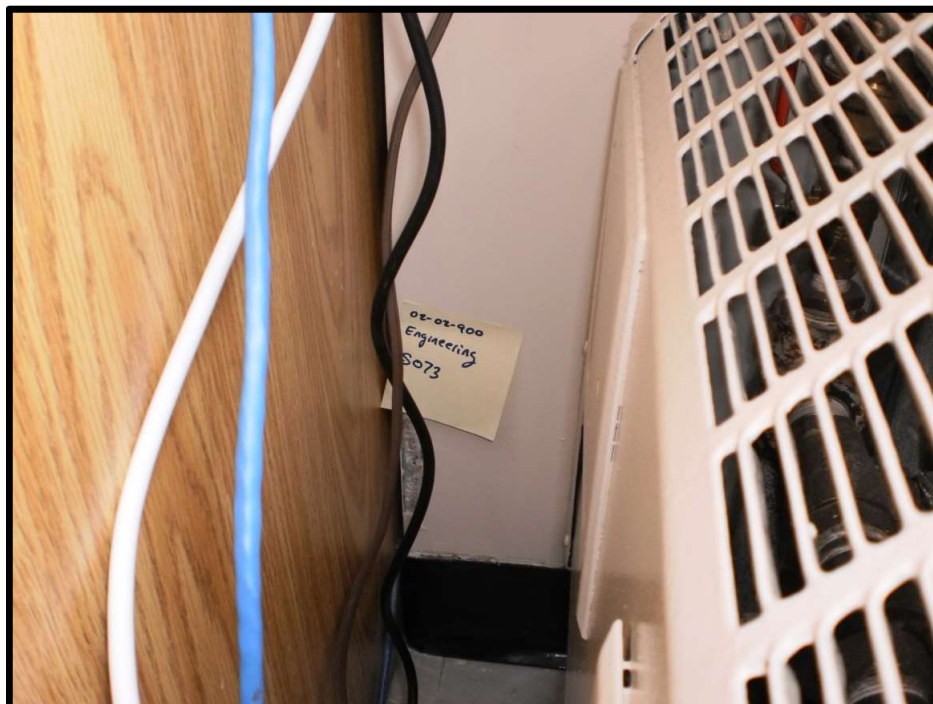
Sample #:	S072	Date Sampled:	August 1, 2012	
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy	
Location:	316	Analysis:	SAI - PLM	
MUN Project #:	02-02-900	Work Order #:		
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation <input type="checkbox"/> Elbow <input type="checkbox"/> Fitting <input type="checkbox"/> Transite Pipe <input type="checkbox"/> Gasket <input type="checkbox"/> Tank Insulation <input type="checkbox"/> Pipe Wrap HVAC <input type="checkbox"/> Insulation <input type="checkbox"/> Tape <input type="checkbox"/> Paper Wrap	<input type="checkbox"/> 12'x12' Tile <input type="checkbox"/> 9'x9'Tile <input type="checkbox"/> Vinyl Sheet <input type="checkbox"/> Mastic Wall <input type="checkbox"/> Transite Panel <input type="checkbox"/> Textured Wall <input type="checkbox"/> Plaster <input type="checkbox"/> DWJC	<input type="checkbox"/> Textured <input type="checkbox"/> Stucco <input type="checkbox"/> Popcorn <input type="checkbox"/> DWJC <input type="checkbox"/> Plaster <input type="checkbox"/> Acoustic Tile (Dropped) <input type="checkbox"/> Acoustic Tile (Glued-on) <input type="checkbox"/> Mastic Structural <input type="checkbox"/> Steel F. P. ing <input type="checkbox"/> Deck F. P. ing	<input type="checkbox"/> Shingle <input type="checkbox"/> Rolled <input type="checkbox"/> Felt <input type="checkbox"/> Tar Miscellaneous: _____ No. of Phases: _____ Colour: _____	<input type="checkbox"/> Floor <input checked="" type="checkbox"/> Wall Orientation <input type="checkbox"/> Ceiling <input type="checkbox"/> Above Ceiling <input type="checkbox"/> Other





ASBESTOS BULK SAMPLING FORM

Sample #:	S073	Date Sampled:	August 1, 2012	
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy	
Location:	329	Analysis:	SAI - PLM	
MUN Project #:	02-02-900	Work Order #:		
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation <input type="checkbox"/> Elbow <input type="checkbox"/> Fitting <input type="checkbox"/> Transite Pipe <input type="checkbox"/> Gasket <input type="checkbox"/> Tank Insulation <input type="checkbox"/> Pipe Wrap HVAC <input type="checkbox"/> Insulation <input type="checkbox"/> Tape <input type="checkbox"/> Paper Wrap	<input type="checkbox"/> 12'x12' Tile <input type="checkbox"/> 9'x9'Tile <input type="checkbox"/> Vinyl Sheet <input type="checkbox"/> Mastic Wall <input type="checkbox"/> Transite Panel <input type="checkbox"/> Textured Wall <input type="checkbox"/> Plaster <input type="checkbox"/> DWJC	<input type="checkbox"/> Textured <input type="checkbox"/> Stucco <input type="checkbox"/> Popcorn <input type="checkbox"/> DWJC <input type="checkbox"/> Plaster <input type="checkbox"/> Acoustic Tile (Dropped) <input type="checkbox"/> Acoustic Tile (Glued-on) <input type="checkbox"/> Mastic Structural <input type="checkbox"/> Steel F. P. ing <input type="checkbox"/> Deck F. P. ing	<input type="checkbox"/> Shingle <input type="checkbox"/> Rolled <input type="checkbox"/> Felt <input type="checkbox"/> Tar Miscellaneous: _____ No. of Phases: _____ Colour: _____	<input type="checkbox"/> Floor <input checked="" type="checkbox"/> Wall Orientation <input type="checkbox"/> Ceiling <input type="checkbox"/> Above Ceiling <input type="checkbox"/> Other





ASBESTOS BULK SAMPLING FORM

Sample #:	S074	Date Sampled:	August 1, 2012	
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy	
Location:	355	Analysis:	SAI - PLM	
MUN Project #:	02-02-900	Work Order #:		
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation <input type="checkbox"/> Elbow <input type="checkbox"/> Fitting <input type="checkbox"/> Transite Pipe <input type="checkbox"/> Gasket <input type="checkbox"/> Tank Insulation <input type="checkbox"/> Pipe Wrap HVAC <input type="checkbox"/> Insulation <input type="checkbox"/> Tape <input type="checkbox"/> Paper Wrap	<input type="checkbox"/> 12'x12' Tile <input type="checkbox"/> 9'x9'Tile <input type="checkbox"/> Vinyl Sheet <input type="checkbox"/> Mastic Wall <input type="checkbox"/> Transite Panel <input type="checkbox"/> Textured Wall <input type="checkbox"/> Plaster <input type="checkbox"/> DWJC	<input type="checkbox"/> Textured <input type="checkbox"/> Stucco <input type="checkbox"/> Popcorn <input type="checkbox"/> DWJC <input type="checkbox"/> Plaster <input type="checkbox"/> Acoustic Tile (Dropped) <input type="checkbox"/> Acoustic Tile (Glued-on) <input type="checkbox"/> Mastic Structural <input type="checkbox"/> Steel F. P. ing <input type="checkbox"/> Deck F. P. ing	<input type="checkbox"/> Shingle <input type="checkbox"/> Rolled <input type="checkbox"/> Felt <input type="checkbox"/> Tar Miscellaneous: _____ No. of Phases: _____ Colour: _____	<input type="checkbox"/> Floor <input type="checkbox"/> X Wall Orientation <input type="checkbox"/> Ceiling <input type="checkbox"/> Above Ceiling <input type="checkbox"/> Other





ASBESTOS BULK SAMPLING FORM

Sample #:	S075	Date Sampled:	August 1, 2012
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy
Location:	357	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	<input type="checkbox"/> 12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	<input type="checkbox"/> Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	X Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	X Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: _____	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		





ASBESTOS BULK SAMPLING FORM

Sample #:	S076	Date Sampled:	August 1, 2012	
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy	
Location:	358	Analysis:	SAI - PLM	
MUN Project #:	02-02-900	Work Order #:		
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation <input type="checkbox"/> Elbow <input type="checkbox"/> Fitting <input type="checkbox"/> Transite Pipe <input type="checkbox"/> Gasket <input type="checkbox"/> Tank Insulation <input type="checkbox"/> Pipe Wrap HVAC <input type="checkbox"/> Insulation <input type="checkbox"/> Tape <input type="checkbox"/> Paper Wrap	<input type="checkbox"/> 12'x12' Tile <input type="checkbox"/> 9'x9'Tile <input type="checkbox"/> Vinyl Sheet <input type="checkbox"/> Mastic Wall <input type="checkbox"/> Transite Panel <input type="checkbox"/> Textured Wall <input type="checkbox"/> Plaster <input type="checkbox"/> DWJC	<input type="checkbox"/> Textured <input type="checkbox"/> Stucco <input type="checkbox"/> Popcorn <input type="checkbox"/> DWJC <input checked="" type="checkbox"/> Plaster <input type="checkbox"/> Acoustic Tile (Dropped) <input type="checkbox"/> Acoustic Tile (Glued-on) <input type="checkbox"/> Mastic Structural <input type="checkbox"/> Steel F. P. ing <input type="checkbox"/> Deck F. P. ing	<input type="checkbox"/> Shingle <input type="checkbox"/> Rolled <input type="checkbox"/> Felt <input type="checkbox"/> Tar Miscellaneous: _____ No. of Phases: _____ Colour: _____	<input type="checkbox"/> Floor <input type="checkbox"/> Wall Orientation <input checked="" type="checkbox"/> Ceiling <input type="checkbox"/> Above Ceiling <input type="checkbox"/> Other





ASBESTOS BULK SAMPLING FORM

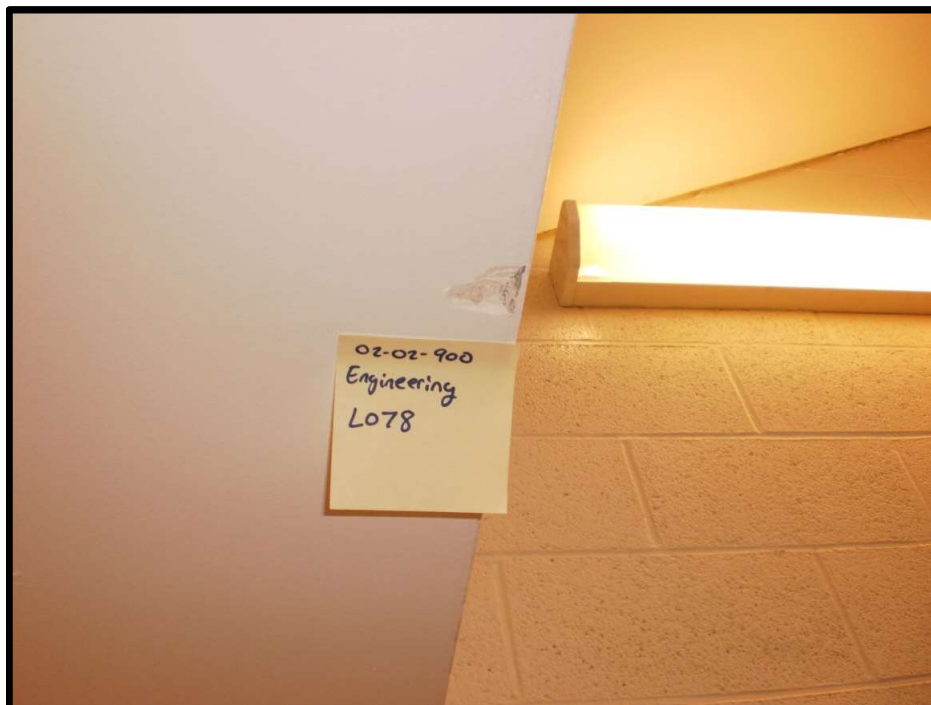
Sample #:	S077	Date Sampled:	August 1, 2012	
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy	
Location:	359	Analysis:	SAI - PLM	
MUN Project #:	02-02-900	Work Order #:		
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation <input type="checkbox"/> Elbow <input type="checkbox"/> Fitting <input type="checkbox"/> Transite Pipe <input type="checkbox"/> Gasket <input type="checkbox"/> Tank Insulation <input type="checkbox"/> Pipe Wrap HVAC <input type="checkbox"/> Insulation <input type="checkbox"/> Tape <input type="checkbox"/> Paper Wrap	<input type="checkbox"/> 12'x12' Tile <input type="checkbox"/> 9'x9'Tile <input type="checkbox"/> Vinyl Sheet <input type="checkbox"/> Mastic Wall <input type="checkbox"/> Transite Panel <input type="checkbox"/> Textured Wall <input type="checkbox"/> X Plaster <input type="checkbox"/> DWJC	<input type="checkbox"/> Textured <input type="checkbox"/> Stucco <input type="checkbox"/> Popcorn <input type="checkbox"/> DWJC <input type="checkbox"/> Plaster <input type="checkbox"/> Acoustic Tile (Dropped) <input type="checkbox"/> Acoustic Tile (Glued-on) <input type="checkbox"/> Mastic Structural <input type="checkbox"/> Steel F. P. ing <input type="checkbox"/> Deck F. P. ing	<input type="checkbox"/> Shingle <input type="checkbox"/> Rolled <input type="checkbox"/> Felt <input type="checkbox"/> Tar Miscellaneous: _____ No. of Phases: _____ Colour: _____	<input type="checkbox"/> Floor <input checked="" type="checkbox"/> Wall Orientation <input type="checkbox"/> Ceiling <input type="checkbox"/> Above Ceiling <input type="checkbox"/> Other





ASBESTOS BULK SAMPLING FORM

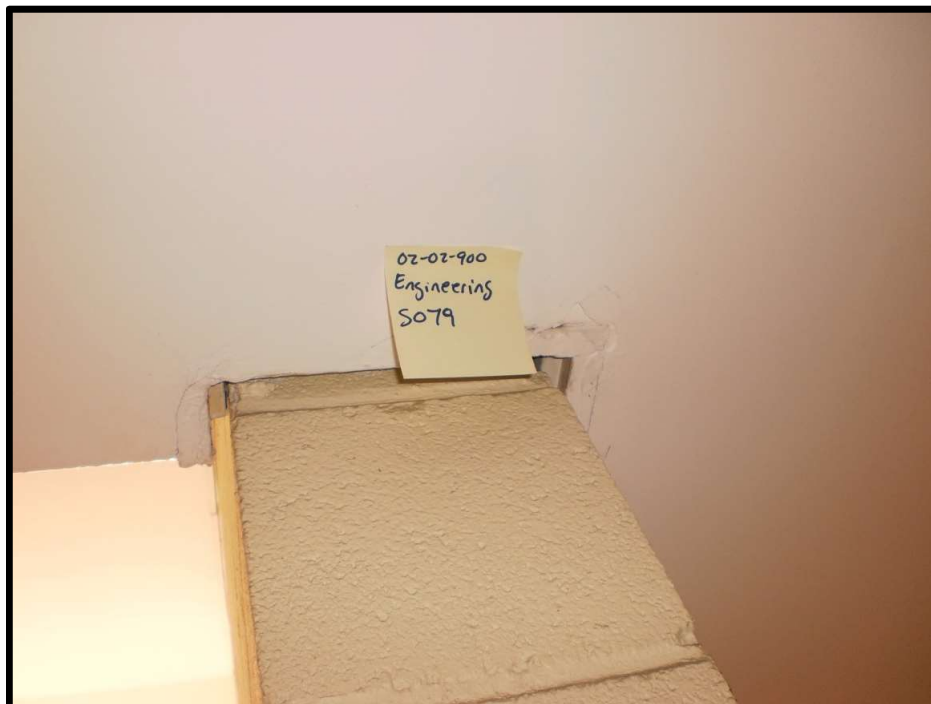
Sample #:	S078	Date Sampled:	August 1, 2012	
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy	
Location:	359	Analysis:	SAI - PLM	
MUN Project #:	02-02-900	Work Order #:		
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation <input type="checkbox"/> Elbow <input type="checkbox"/> Fitting <input type="checkbox"/> Transite Pipe <input type="checkbox"/> Gasket <input type="checkbox"/> Tank Insulation <input type="checkbox"/> Pipe Wrap HVAC <input type="checkbox"/> Insulation <input type="checkbox"/> Tape <input type="checkbox"/> Paper Wrap	<input type="checkbox"/> 12'x12' Tile <input type="checkbox"/> 9'x9'Tile <input type="checkbox"/> Vinyl Sheet <input type="checkbox"/> Mastic Wall <input type="checkbox"/> Transite Panel <input type="checkbox"/> Textured Wall <input type="checkbox"/> Plaster <input type="checkbox"/> DWJC	<input type="checkbox"/> Textured <input type="checkbox"/> Stucco <input type="checkbox"/> Popcorn <input type="checkbox"/> DWJC <input checked="" type="checkbox"/> Plaster <input type="checkbox"/> Acoustic Tile (Dropped) <input type="checkbox"/> Acoustic Tile (Glued-on) <input type="checkbox"/> Mastic Structural <input type="checkbox"/> Steel F. P. ing <input type="checkbox"/> Deck F. P. ing	<input type="checkbox"/> Shingle <input type="checkbox"/> Rolled <input type="checkbox"/> Felt <input type="checkbox"/> Tar Miscellaneous: _____ No. of Phases: _____ Colour: _____	<input type="checkbox"/> Floor <input type="checkbox"/> Wall Orientation <input checked="" type="checkbox"/> Ceiling <input type="checkbox"/> Above Ceiling <input type="checkbox"/> Other





ASBESTOS BULK SAMPLING FORM

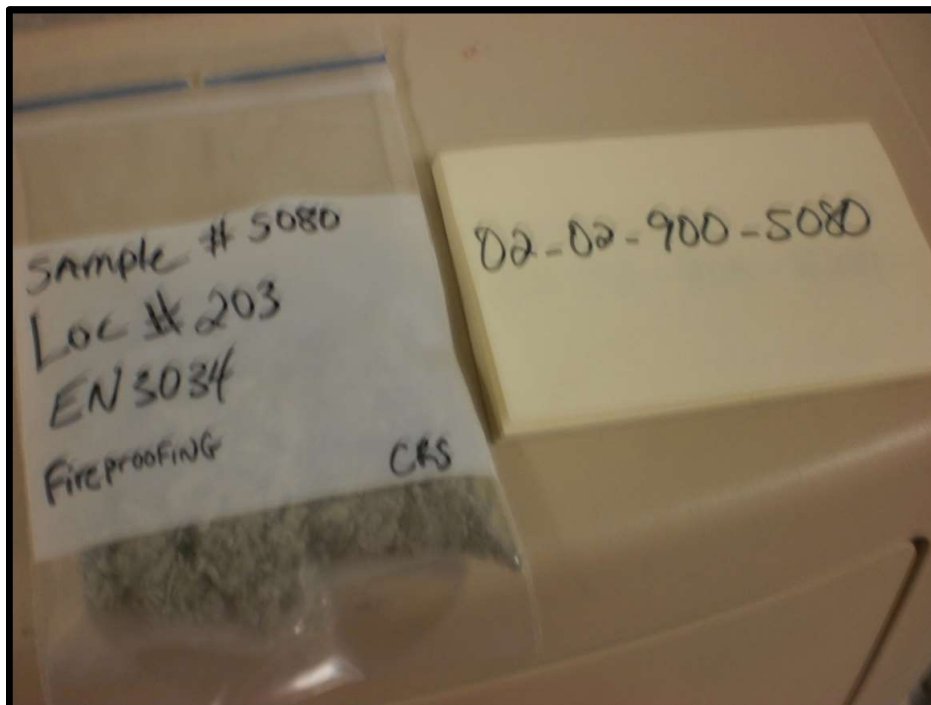
Sample #:	S079	Date Sampled:	August 1, 2012	
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy	
Location:	360	Analysis:	SAI - PLM	
MUN Project #:	02-02-900	Work Order #:		
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation <input type="checkbox"/> Elbow <input type="checkbox"/> Fitting <input type="checkbox"/> Transite Pipe <input type="checkbox"/> Gasket <input type="checkbox"/> Tank Insulation <input type="checkbox"/> Pipe Wrap HVAC <input type="checkbox"/> Insulation <input type="checkbox"/> Tape <input type="checkbox"/> Paper Wrap	<input type="checkbox"/> 12'x12' Tile <input type="checkbox"/> 9'x9'Tile <input type="checkbox"/> Vinyl Sheet <input type="checkbox"/> Mastic Wall <input type="checkbox"/> Transite Panel <input type="checkbox"/> Textured Wall <input type="checkbox"/> Plaster <input type="checkbox"/> DWJC	<input type="checkbox"/> Textured <input type="checkbox"/> Stucco <input type="checkbox"/> Popcorn <input checked="" type="checkbox"/> DWJC <input type="checkbox"/> Plaster <input type="checkbox"/> Acoustic Tile (Dropped) <input type="checkbox"/> Acoustic Tile (Glued-on) <input type="checkbox"/> Mastic Structural <input type="checkbox"/> Steel F. P. ing <input type="checkbox"/> Deck F. P. ing	<input type="checkbox"/> Shingle <input type="checkbox"/> Rolled <input type="checkbox"/> Felt <input type="checkbox"/> Tar Miscellaneous: _____ No. of Phases: _____ Colour: _____	<input type="checkbox"/> Floor <input type="checkbox"/> Wall Orientation <input checked="" type="checkbox"/> Ceiling <input type="checkbox"/> Above Ceiling <input type="checkbox"/> Other





ASBESTOS BULK SAMPLING FORM

Sample #:	S080	Date Sampled:	August 10, 2012	
Building :	Engineering and Applied Sciences	Sampler:	Curtis Snelgrove	
Location:	203, room EN3034	Analysis:	SAI - PLM	
MUN Project #:	02-02-900	Work Order #:		
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation <input type="checkbox"/> Elbow <input type="checkbox"/> Fitting <input type="checkbox"/> Transite Pipe <input type="checkbox"/> Gasket <input type="checkbox"/> Tank Insulation <input type="checkbox"/> Pipe Wrap HVAC <input type="checkbox"/> Insulation <input type="checkbox"/> Tape <input type="checkbox"/> Paper Wrap	<input type="checkbox"/> 12'x12' Tile <input type="checkbox"/> 9'x9' Tile <input type="checkbox"/> Vinyl Sheet <input type="checkbox"/> Mastic Wall <input type="checkbox"/> Transite Panel <input type="checkbox"/> Textured Wall <input type="checkbox"/> Plaster <input type="checkbox"/> DWJC	<input type="checkbox"/> Textured <input type="checkbox"/> Stucco <input type="checkbox"/> Popcorn <input type="checkbox"/> DWJC <input type="checkbox"/> Plaster <input type="checkbox"/> Acoustic Tile (Dropped) <input type="checkbox"/> Acoustic Tile (Glued-on) <input type="checkbox"/> Mastic Structural <input type="checkbox"/> Steel F. P. ing <input type="checkbox"/> Deck F. P. ing	<input type="checkbox"/> Shingle <input type="checkbox"/> Rolled <input type="checkbox"/> Felt <input type="checkbox"/> Tar Miscellaneous: <u>Fireproofing</u> No. of Phases: _____ Colour: _____	<input type="checkbox"/> Floor <input type="checkbox"/> Wall Orientation <input type="checkbox"/> Ceiling <input checked="" type="checkbox"/> Above Ceiling <input type="checkbox"/> Other

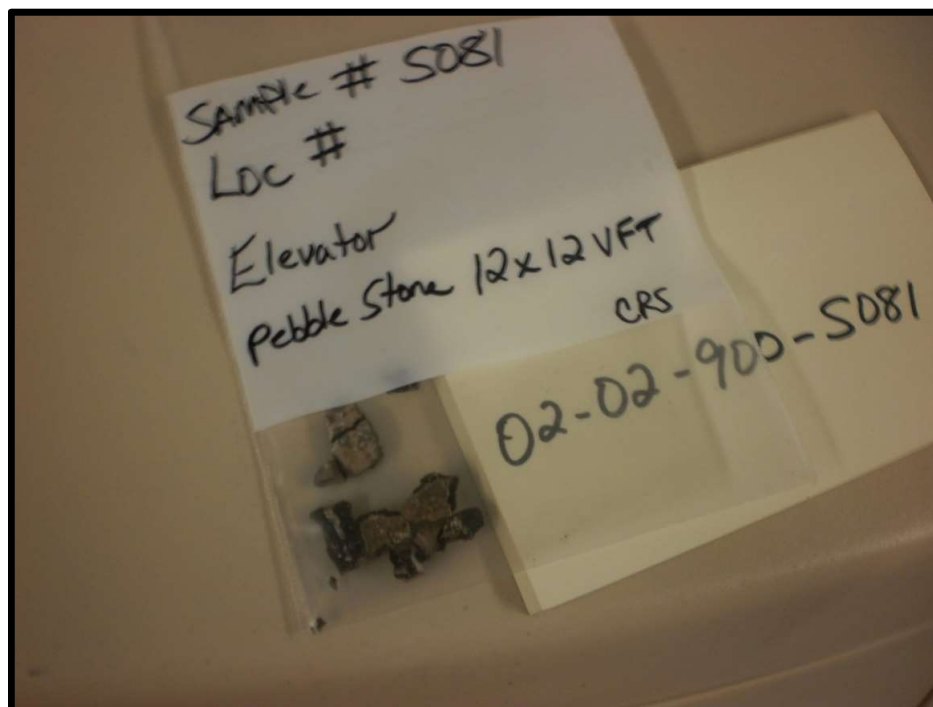




ASBESTOS BULK SAMPLING FORM

Sample #:	S081	Date Sampled:	August 10, 2012
Building :	Engineering and Applied Sciences	Sampler:	Curtis Snelgrove
Location:	Elevator	Analysis:	SAI - PLM
MUN Project #:	02-02-900	Work Order #:	

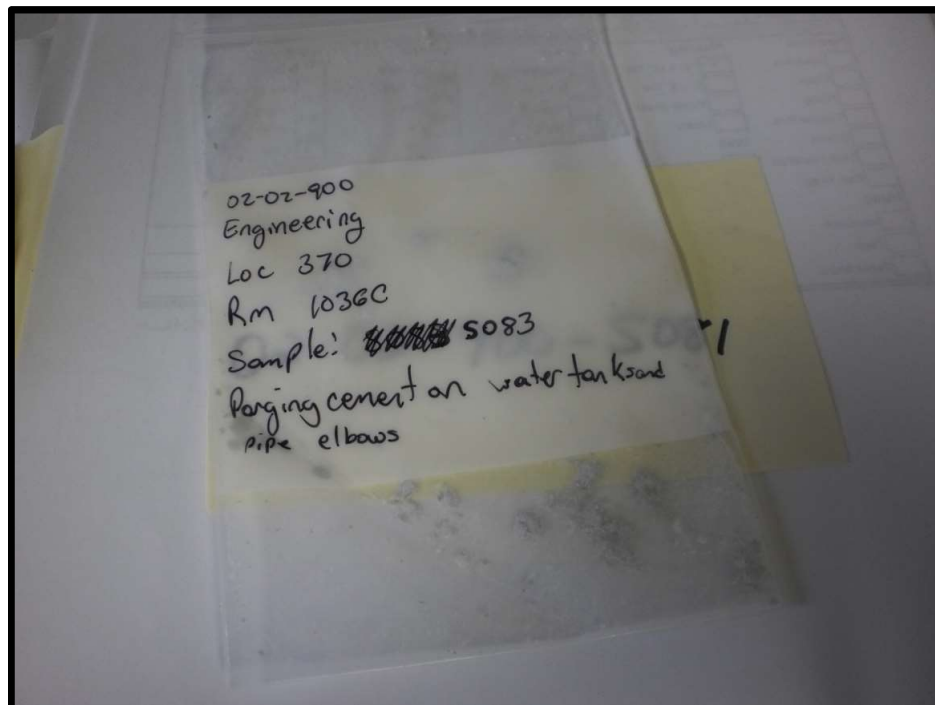
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation	X12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	X Floor
<input type="checkbox"/> Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
<input type="checkbox"/> Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		<input type="checkbox"/> Other
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural	No. of Phases: _____	
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	Colour: <u>Pebble stone pattern</u>	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing		





ASBESTOS BULK SAMPLING FORM

Sample #:	S082	Date Sampled:	August 13, 2012	
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy	
Location:	EN1036C	Analysis:	SAI - PLM	
MUN Project #:	02-02-900	Work Order #:		
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
X Insulation	<input type="checkbox"/> 12'x12' Tile	<input type="checkbox"/> Textured	<input type="checkbox"/> Shingle	<input type="checkbox"/> Floor
X Elbow	<input type="checkbox"/> 9'x9'Tile	<input type="checkbox"/> Stucco	<input type="checkbox"/> Rolled	<input type="checkbox"/> Wall Orientation
X Fitting	<input type="checkbox"/> Vinyl Sheet	<input type="checkbox"/> Popcorn	<input type="checkbox"/> Felt	<input type="checkbox"/> Ceiling
<input type="checkbox"/> Transite Pipe	<input type="checkbox"/> Mastic	<input type="checkbox"/> DWJC	<input type="checkbox"/> Tar	<input type="checkbox"/> Above Ceiling
<input type="checkbox"/> Gasket	Wall	<input type="checkbox"/> Plaster		X Other (tank)
<input type="checkbox"/> Tank Insulation	<input type="checkbox"/> Transite Panel	<input type="checkbox"/> Acoustic Tile (Dropped)		
<input type="checkbox"/> Pipe Wrap	<input type="checkbox"/> Textured Wall	<input type="checkbox"/> Acoustic Tile (Glued-on)		
HVAC	<input type="checkbox"/> Plaster	<input type="checkbox"/> Mastic	Miscellaneous: _____	
<input type="checkbox"/> Insulation	<input type="checkbox"/> DWJC	Structural		
<input type="checkbox"/> Tape		<input type="checkbox"/> Steel F. P. ing	No. of Phases: _____	
<input type="checkbox"/> Paper Wrap		<input type="checkbox"/> Deck F. P. ing	Colour: _____	





ASBESTOS BULK SAMPLING FORM

Sample #:	S083	Date Sampled:	August 13, 2012	
Building :	Engineering and Applied Sciences	Sampler:	Trent Hardy	
Location:	Room 2042	Analysis:	SAI - PLM	
MUN Project #:	02-02-900	Work Order #:		
Bulk Sampling Parameters				
Pipe/Tank	Flooring	Ceiling	Roofing	Location
<input type="checkbox"/> Insulation <input type="checkbox"/> Elbow <input type="checkbox"/> Fitting <input type="checkbox"/> Transite Pipe <input type="checkbox"/> Gasket <input type="checkbox"/> Tank Insulation <input type="checkbox"/> Pipe Wrap HVAC <input type="checkbox"/> Insulation <input type="checkbox"/> Tape <input type="checkbox"/> Paper Wrap	X 12'x12' Tile <input type="checkbox"/> 9'x9'Tile <input type="checkbox"/> Vinyl Sheet <input type="checkbox"/> Mastic Wall <input type="checkbox"/> Transite Panel <input type="checkbox"/> Textured Wall <input type="checkbox"/> Plaster <input type="checkbox"/> DWJC	<input type="checkbox"/> Textured <input type="checkbox"/> Stucco <input type="checkbox"/> Popcorn <input type="checkbox"/> DWJC <input type="checkbox"/> Plaster <input type="checkbox"/> Acoustic Tile (Dropped) <input type="checkbox"/> Acoustic Tile (Glued-on) <input type="checkbox"/> Mastic Structural <input type="checkbox"/> Steel F. P. ing <input type="checkbox"/> Deck F. P. ing	<input type="checkbox"/> Shingle <input type="checkbox"/> Rolled <input type="checkbox"/> Felt <input type="checkbox"/> Tar Miscellaneous: _____ No. of Phases: _____ Colour: _____	X Floor <input type="checkbox"/> Wall Orientation <input type="checkbox"/> Ceiling <input type="checkbox"/> Above Ceiling <input type="checkbox"/> Other

PART 1 - GENERAL

1.1 SUMMARY

- .1 Types of items described in this Section:
 - .1 Demolition and removal of selected portions of building or structure.
 - .2 Demolition and removal of selected site elements.
 - .3 Salvage of existing items to be reused or recycled.
- .2 Types of items you will not find described in this Section:
 - .1 Use of premises, and phasing, and Owner-occupancy requirements.
 - .2 Photographic Documentation for preconstruction photographs taken before selective demolition operations.
 - .3 Temporary Facilities and Controls for temporary construction and environmental-protection measures for selective demolition operations.
 - .4 Cutting and Patching for cutting and patching procedures.
 - .5 Construction Waste Management and Disposal for disposal of demolished materials.

1.2 DEFINITIONS

- .1 Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- .2 Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.
- .3 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- .4 Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.3 MATERIALS OWNERSHIP

- .1 Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.
 - .1 Coordinate with Owner's archaeologist, who will establish special procedures for removal and salvage.

1.4 SUBMITTALS

- .1 Schedule of Selective Demolition Activities: Indicate the following:
 - .1 Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's building managers and other tenants' on-site operations are uninterrupted.
 - .2 Interruption of utility services. Indicate how long utility services will be interrupted.
 - .3 Coordination for shutoff, capping, and continuation of utility services.
 - .4 Use of elevator and stairs.
 - .5 Locations of proposed dust- and noise-control temporary partitions and means of egress, including for other tenants affected by selective demolition operations.
 - .6 Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
 - .7 Means of protection for items to remain and items in path of waste removal from building.

- .2 Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.
- .3 Predemolition Photographs or Videotapes: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by selective demolition operations. Comply with Division 01 Section *Photographic Documentation*. Submit before Work begins.
- .4 Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
 - .1 Comply with submittal requirements in Division 01 Section "*Construction Waste Management and Disposal*."

1.5 QUALITY ASSURANCE

- .1 Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- .2 Standards: Comply with ANSI A10.6, NFPA 241, NBCC, and NFCC.
- .3 Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 01 Section *Project Management and Coordination*. Review methods and procedures related to selective demolition including, but not limited to, the following:
 - .1 Inspect and discuss condition of construction to be selectively demolished.
 - .2 Review structural load limitations of existing structure.
 - .3 Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - .4 Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 - .5 Review areas where existing construction is to remain and requires protection.

1.6 PROJECT CONDITIONS

- .1 Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
 - .1 Comply with requirements specified in Division 01 Section *Summary*.
- .2 Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
 - .1 Before selective demolition, Owner will remove the following items:
 - .1 Items as selected by the Owner.
- .3 Notify Owner's Representative of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- .4 Hazardous Materials: It may be possible hazardous materials could be present in construction to be selectively demolished. A report on the presence of hazardous materials is attached for review and use (If no report is attached, request clarification from Owner's Representative. Examine report to become aware of locations where hazardous materials are present.
 - .1 Hazardous material remediation is specified elsewhere in the Contract Documents.
 - .2 Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
- .5 Storage or sale of removed items or materials on-site is not permitted.

- .6 Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - .1 Maintain fire-protection facilities in service during selective demolition operations.

1.7 WARRANTY

- .1 Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Verify that utilities have been disconnected and capped.
- .2 Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- .3 Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- .4 When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Owner's Representative.
- .5 Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.
- .6 Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.
 - .1 Comply with requirements specified in Division 01 Section "*Photographic Documentation*."
 - .2 Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.
- .7 Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- .1 Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
 - .1 Comply with requirements for existing services/systems interruptions specified in Division 01 Section *Summary*.
- .2 Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - .1 Arrange to shut off indicated utilities with utility companies.
 - .2 If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

- .3 Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
 - .1 Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

3.3 PREPARATION

- .1 Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - .1 Comply with requirements for access and protection specified in Division 01 Section *Temporary Facilities and Controls*.
- .2 Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - .1 Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 - .2 Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 - .3 Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 - .4 Cover and protect furniture, furnishings, and equipment that have not been removed.
 - .5 Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 01 Section *Temporary Facilities and Controls*.
- .3 Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 - .1 Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

- .1 General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - .1 Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 - .2 Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 - .3 Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - .4 Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
 - .5 Maintain adequate ventilation when using cutting torches.
 - .6 Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 - .7 Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 - .8 Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

- .9 Dispose of demolished items and materials promptly. Comply with requirements in Division 01 Section *Construction Waste Management and Disposal*.
 - .2 Reuse of Building Elements: Project has been designed to result in end-of-Project rates for reuse of building elements as follows. Do not demolish building elements beyond what is indicated on Drawings without Owner's Representative's approval.
 - .3 Removed and Salvaged Items:
 - .1 Clean salvaged items.
 - .2 Pack or crate items after cleaning. Identify contents of containers.
 - .3 Store items in a secure area until delivery to Owner.
 - .4 Transport items to Owner's storage area designated by Owner.
 - .5 Protect items from damage during transport and storage.
 - .4 Removed and Reinstalled Items:
 - .1 Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
 - .2 Pack or crate items after cleaning and repairing. Identify contents of containers.
 - .3 Protect items from damage during transport and storage.
 - .4 Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
 - .5 Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Owner's Representative, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.
- 3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS
- .1 Concrete: Demolish in small sections. Cut concrete to a depth of at least 19 mm at junctures with construction to remain, using power-driven saw. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete indicated for selective demolition. Neatly trim openings to dimensions indicated.
 - .2 Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals, using power-driven saw, then remove concrete between saw cuts.
 - .3 Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
 - .4 Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.
 - .5 Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI-WP and its Addendum.
 - .1 Remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI.
 - .6 Roofing: Remove no more existing roofing than can be covered in one day by new roofing and so that building interior remains watertight and weather tight. Refer to Division 07 for new roofing requirements.
 - .1 Remove existing roof membrane, flashings, copings, and roof accessories.
 - .2 Remove existing roofing system down to substrate.

- .7 Air-Conditioning Equipment: Remove equipment without releasing refrigerants.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- .1 General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an approved landfill.
 - .1 Do not allow demolished materials to accumulate on-site.
 - .2 Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - .3 Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 - .4 Comply with requirements specified in Division 01 Section *Construction Waste Management and Disposal*.
- .2 Burning: Do not burn demolished materials.
- .3 Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

- .1 Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.8 SELECTIVE DEMOLITION SCHEDULE

- .1 Existing Construction to Be Removed: As noted in contract drawings.
- .2 Existing Items to Be Removed and Salvaged: As noted in contract drawings.
- .3 Existing Items to Be Removed and Reinstalled: As noted in contract drawings.
- .4 Existing Items to Remain: As noted in contract drawings.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- .1 Types of items described in this Section:
 - .1 Requirements and procedures for asbestos abatement of minor amounts of chrysotile asbestos-containing materials of the type describe within.
 - .1 Removing suspended ceilings, as indicated.
 - .2 Removal of asbestos containing material from piping and equipment.
 - .3 Enclosure of friable asbestos containing material.
 - .4 Application of tape or sealant or other covering to pipe and boiler insulation containing asbestos.
- .2 Types of items you will not find described in this Section:
 - .1 Submittal Procedures.
 - .2 Health and Safety Requirements.
 - .3 Construction/Demolition Waste Management and Disposal.
- .3 References
 - .1 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB-1.205-94, Sealer for Application of Asbestos Fibre Releasing Materials.
 - .2 Department of Justice Canada (Jus).
 - .1 Canadian Environmental Protection Act, 1999 (CEPA).
 - .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
 - .4 Transport Canada (TC).
 - .1 Transportation of Dangerous Goods Act, 1992 (TDGA).
 - .5 Underwriters' Laboratories of Canada (ULC).

1.2 DEFINITIONS

- .1 HEPA vacuum: High Efficiency Particulate Air filtered vacuum equipment with filter system capable of collecting and retaining fibres greater than 0.3 microns in any dimension at 99.97% efficiency.
- .2 Amended Water: water with non-ionic surfactant wetting agent added to reduce water tension to allow wetting of fibres.
- .3 Asbestos Containing Materials (ACMs): materials identified under *Existing Conditions* Article, including fallen materials and settled dust.
- .4 Minor Amounts of ACMs: less than or equal to 0.1 m² of friable material containing chrysotile asbestos.
- .5 Asbestos Work Area: area where work takes place which will, or may disturb ACMs.
- .6 Authorized Visitors: Owner's Representatives, or designated representatives, and representatives of regulatory agencies.
- .7 Friable Material: material that when dry can be crumbled, pulverized or powdered by hand pressure and includes such material that is crumbled, pulverized or powdered.
- .8 Occupied Area: any area of building or work site that is outside Asbestos Work Area.

- .9 Polyethylene: polyethylene sheeting or rip proof polyethylene sheeting with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide protection and isolation.
- .10 Glove Bag: prefabricated glove bag as follows:
 - .1 Minimum thickness 0.25 mm (10 mil) polyvinyl-chloride bag.
 - .2 Integral 0.25 mm (10 mil) thick polyvinyl-chloride gloves and elastic ports.
 - .3 Equipped with reversible double pull double throw zipper on top and at approximately mid-section of the bag.
 - .4 Straps for sealing ends around pipe.
 - .5 Must incorporate internal closure strip if it is to be moved or used in more than one specific location.
- .11 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Must have appropriate capacity for scope of work.

1.3 SUBMITTALS

- .1 Submit proof satisfactory to Owner's Representative that suitable arrangements have been made to dispose of asbestos containing waste in accordance with requirements of authority having jurisdiction.
- .2 Submit Provincial/Territorial and/or local requirements for Notice of Project Form.
- .3 Submit proof of Contractor's Asbestos Liability Insurance.
- .4 Submit to Owner's Representative necessary permits for transportation and disposal of asbestos containing waste and proof that asbestos containing waste has been received and properly disposed.
- .5 Submit proof satisfactory to Owner's Representative that employees have had instruction on hazards of asbestos exposure, respirator use, dress, entry and exit from Asbestos Work Area, and aspects of work procedures and protective measures.
- .6 Submit proof that supervisory personnel have attended asbestos abatement course, of not less than two days duration, approved by Owner's Representative. Minimum of one supervisor for every ten workers.
- .7 Submit Worker's Compensation Board status and transcription of insurance.
- .8 Submit documentation including test results, fire and flammability data, and Material Safety Data Sheets (MSDS) for chemicals or materials including:
 - .1 encapsulants;
 - .2 amended water;
 - .3 slow drying sealer.

1.4 QUALITY ASSURANCE

- .1 Regulatory Requirements: comply with Federal, Provincial/Territorial and local requirements pertaining to asbestos, provided that in case of conflict among these requirements or with these specifications more stringent requirement applies. Comply with regulations in effect at the time work is performed.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with *Health and Safety Requirements*.
 - .2 Safety Requirements: worker and visitor protection.
 - .1 Protective equipment and clothing to be worn by workers while in Asbestos Work Area include:

- .1 Non-powered reusable or replaceable filter type respirator equipped with HEPA filter cartridges, personally issued to worker and marked as to efficiency and purpose, suitable for protection against asbestos and acceptable to Provincial Authority having jurisdiction.
- .2 Disposable type protective clothing that does not readily retain or permit penetration of asbestos fibres, consisting of full body covering including head covering with snug fitting cuffs at wrists, ankles, and neck.
- .2 Eating, drinking, chewing, and smoking are not permitted in Asbestos Work Area.
- .3 Before leaving Asbestos Work Area, dispose of protective clothing as contaminated waste as specified.
- .4 Ensure workers wash hands and face when leaving Asbestos Work Area. Facilities for washing are located.
- .5 Ensure that no person required to enter an Asbestos Work Area has facial hair that affects seal between respirator and face.
- .3 Visitor Protection:
 - .1 Provide protective clothing and approved respirators to Authorized Visitors to work areas.
 - .2 Instruct Authorized Visitors in the use of protective clothing, respirators and procedures.
 - .3 Instruct Authorized Visitors in proper procedures to be followed in entering into and exiting from Asbestos Work Area.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Place materials defined as hazardous or toxic in designated containers.
- .2 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.
- .3 Fold up metal banding, flatten and place in designated area for recycling.
- .4 Disposal of asbestos waste generated by removal activities must comply with Federal, Provincial, Territorial and Municipal regulations. Dispose of asbestos waste in sealed double thickness 6 ml bags or leak proof drums. Label containers with appropriate warning labels.
- .5 Provide manifests describing and listing waste created. Transport containers by approved means to licensed landfill for burial.

1.6 EXISTING CONDITIONS

- .1 Results of tests of asbestos containing materials to be handled, removed, or otherwise disturbed and disposed of during this Project are bound into this specification manual. These are for general information only and are not necessarily representative of asbestos containing materials covered within scope of this Project.

1.7 SCHEDULING

- .1 Not later than ten (10) days before beginning Work on this Project notify following in writing:
 - .1 Appropriate Regional or Zone Director of Medical Services Branch, Health Canada.
 - .2 Regional Office of Labour Canada.
 - .3 Provincial/Territorial, Department of Labour.
 - .4 Disposal Authority.
- .2 Inform sub trades of presence of friable asbestos containing materials identified in *Existing Conditions*.
- .3 Submit to Owner's Representative copy of notifications prior to start of Work.

1.8 OWNER'S INSTRUCTIONS

- .1 Before beginning Work, provide to Owner's Representative satisfactory proof that every worker has had instruction and training in hazards of asbestos exposure, in personal hygiene including dress and showers, in entry and exit from Asbestos Work Area, in aspects of work procedures including glove bag procedures, and in use, cleaning, and disposal of respirators and protective clothing.
- .2 Instruction and training related to respirators includes, at minimum:
 - .1 Proper fitting of equipment.
 - .2 Inspection and maintenance of equipment.
 - .3 Disinfecting of equipment.
 - .4 Limitations of equipment.
- .3 Instruction and training must be provided by competent, qualified person.
- .4 Supervisory personnel to complete required training.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Drop and Enclosure Sheets.
 - .1 Polyethylene: 0.15 mm thick.
 - .2 FR polyethylene: 0.15 mm thick woven fibre reinforced fabric bonded both sides with polyethylene.
- .2 Wetting Agent: 50% polyoxyethylene ester and 50% polyoxyethylene ether mixed with water in concentration to provide thorough wetting of asbestos containing material.
- .3 Waste Containers: contain waste in two separate containers.
 - .1 Inner container: 0.15 mm thick sealable polyethylene bag or where glove bag method is used, glove bag itself.
 - .2 Outer container: sealable metal or fibre type where there are sharp objects included in waste material; otherwise outer container may be sealable metal or fibre type or second 0.15 mm thick sealable polyethylene bag.
 - .3 Labelling requirements: affix preprinted cautionary asbestos warning, in both official languages, that is visible when ready for removal to disposal site.
- .4 Glove bag:
 - .1 Acceptable materials: safe-T-Strip products in configuration suitable for Work, or Alternative material approved by addendum during tendering period in accordance with Instructions to Tenderers.
 - .2 Glove bags intended for use in more than one location must be equipped with reversible, double pull, double throw zipper on top and at approximately mid-section of bag.
- .5 Tape: tape suitable for sealing polyethylene to surfaces under both dry and wet conditions using amended water.
- .6 Slow - drying sealer: non-staining, clear, water - dispersible type that remains tacky on surface for at least 8 hours and designed for purpose of trapping residual asbestos fibres.
 - .1 Sealer: flame spread and smoke developed rating less than 50.
- .7 Encapsulants: Type 2 surface film forming or Type 1 penetrating type Class A water based conforming to CAN/CGSB-1.205 and approved by the Fire Commissioner of Canada.

PART 3 - EXECUTION

3.1 SUPERVISION

- .1 Minimum of one Supervisor for every ten workers is required.
- .2 Approved Supervisor must remain within Asbestos Work Area during disturbance, removal, or other handling of asbestos containing materials.

3.2 PROCEDURES

- .1 Do construction occupational health and safety in accordance with *Health and Safety Requirements*.
- .2 Before beginning Work, at each access to Asbestos Work Area, install warning signs in both official languages in upper case *Helvetica Medium* letters reading as follows, where number in parentheses indicates font size to be used : *CAUTION ASBESTOS HAZARD AREA (25 mm) / NO UNAUTHORIZED ENTRY (19 mm) / WEAR ASSIGNED PROTECTIVE EQUIPMENT (19 mm) / BREATHING ASBESTOS DUST MAY CAUSE SERIOUS BODILY HARM (7 mm)*.
- .3 Before beginning Work remove visible dust from surfaces in work area where dust is likely to be disturbed during course of work.
 - .1 Use HEPA vacuum, or damp cloths where damp cleaning does not create hazard and is otherwise appropriate.
 - .2 Do not use compressed air to clean up or remove dust from any surface.
- .4 Prevent spread of dust from Asbestos Work Area using measures appropriate to work to be done.
 - .1 Use FR polyethylene drop sheets over flooring such as carpeting that absorbs dust and over flooring in work areas where dust or contamination cannot otherwise be safely contained.
 - .2 When removing suspended ceilings and walls themselves do not enclose work area and when removing asbestos containing material from piping or equipment and *glove bag* method is not used erect enclosure of polyethylene sheeting around work area, shut off mechanical ventilation system serving work area and seal ventilation ducts to and from work area.
- .5 Before removing suspended ceilings, remove friable material on upper surfaces using HEPA vacuum equipment.
 - .1 Remove and clean surfaces of ceiling panels using HEPA vacuum, wrap clean panels in 0.10 mm thick polyethylene, and store in building as directed by Owner's Representative.
 - .2 Clean *T* grid suspension system, disconnect, wrap in 0.10 mm thick polyethylene, and store in building as directed by Owner's Representative.
- .6 Remove loose material by HEPA vacuum; thoroughly wet friable material containing asbestos to be removed or disturbed before and during Work unless wetting creates hazard or causes damage.
 - .1 Use garden reservoir type low - velocity sprayer or airless spray equipment capable of producing mist or fine spray.
 - .2 Perform Work in a manner to reduce dust creation to lowest levels practicable.
- .7 Pipe Insulation Removal Using Glove Bag:
 - .1 Place tools necessary to remove insulation in tool pouch. Wrap bag around pipe and close zippers. Seal bag to pipe with cloth straps.
 - .2 Place hands in gloves and use necessary tools to remove insulation. Arrange insulation in bag to obtain full capacity of bag.
 - .3 Insert nozzle of garden reservoir type sprayer into bag through valve and wash down pipe and interior of bag thoroughly. Wet surface of insulation in lower section of bag.

- .4 When glove bags are intended for use at more than one location: after wash down and application of sealer, seal off waste in lower section of bag using zipper at mid-section of bag. Remove air from top section of bag through elasticized valve using HEPA vacuum. Remove bag from pipe, reinstall in new location, and reseal to pipe prior to opening lower section of bag. Repeat stripping operation.
 - .5 If bag is to be moved along pipe, first remove air from top section through elasticized valve using HEPA vacuum. Next loosen straps, move bag, re-seal to pipe using double pull zipper to pass hangers. Repeat stripping operation.
 - .6 To remove bag after completion of stripping, wash top section and tools thoroughly. Remove air from top section through elasticized valve using a HEPA vacuum. Pull polyethylene waste container over glove bag before removing from pipe. Release one strap and remove freshly washed tools. Place tools in water. Remove second strap and zipper. Fold over into waste container and seal.
 - .7 After removal of bag ensure that pipe is free of residue. Remove residue using HEPA vacuum or wet cloths. Ensure that surfaces are free of sludge which after drying could release asbestos dust into atmosphere. Seal exposed surfaces of pipe and ends of insulation with slow drying sealer to seal in any residual fibres.
 - .8 Upon completion of Work shift, cover exposed ends of remaining pipe insulation with polyethylene taped in place.
- .8 Work is subject to visual inspection and air monitoring. Contamination of surrounding areas indicated by visual inspection or air monitoring will require complete enclosure and clean-up of affected areas.
- .9 Clean-up:
- .1 Frequently during Work and immediately after completion of work, clean up dust and asbestos containing waste using HEPA vacuum or by damp mopping.
 - .2 Place dust and asbestos containing waste in sealed dust tight waste bags. Treat drop sheets and disposable protective clothing as asbestos waste and wet and fold to contain dust and then place in waste bags.
 - .3 Immediately before their removal from Asbestos Work Area and disposal, clean each filled waste bag using damp cloths or HEPA vacuum and place in second clean waste bag.
 - .4 Seal and remove double bagged waste from site. Dispose of in accordance with requirements of Provincial/Territorial and Federal authority having jurisdiction. Supervise dumping and ensure that dump operator is fully aware of hazardous nature of material to be dumped and that guidelines and regulations for asbestos disposal are followed.
 - .5 Perform final thorough clean-up of Asbestos Work Areas and adjacent areas affected by Work using HEPA vacuum.
- 3.3 AIR MONITORING
- .1 From beginning of Work until completion of cleaning operations, Owner's Representative to take air samples on daily basis outside of Asbestos Work Area enclosures in accordance with Health Canada recommendations.
 - .1 Contractor will be responsible for monitoring inside enclosure in accordance with applicable Provincial/Territorial Occupational Health and Safety Regulations.
 - .2 If air monitoring shows that areas outside Asbestos Work Area enclosures are contaminated, enclose, maintain and clean these areas in same manner as that applicable to Asbestos Work Area.
 - .3 Ensure that respiratory safety factors are not exceeded.
 - .4 During the course of Work, Owner's Representative to measure fibre content of air outside Work areas by means of fibrous aerosol monitors (FAM).
 - .1 When FAM readings exceed 0.25 f/cc, adopt more stringent Work procedures immediately and perform PCM test.
 - .5 Stop Work when PCM measurements exceed 0.01 f/cc and correct procedures.

END OF SECTION .02

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- .1 Types of items described in this Section:
 - .1 Concrete masonry units (CMUs) (Non-decorative type).
 - .2 Decorative concrete masonry units.
 - .3 Acoustical concrete masonry units.
 - .4 Calcium silicate masonry units (CSUMs)
 - .5 Mortar and grout.
 - .6 Reinforcing steel.
 - .7 Masonry joint reinforcement.
 - .8 Ties and anchors.
 - .9 Embedded flashing.
 - .10 Miscellaneous masonry accessories.
 - .11 Cavity-wall insulation.
- .2 Similar types of items not described in this Section:
 - .1 Concrete building brick.
 - .2 Pre-faced concrete masonry units.
 - .3 Concrete facing brick.
 - .4 Face brick.
 - .5 Building (common) brick.
 - .6 Hollow brick.
 - .7 Glazed brick.
 - .8 Structural-clay facing tile.
 - .9 Firebox brick.
 - .10 Clay flue lining units.
 - .11 Stone trim units.
- .3 Other types of items not described in this Section:
 - .1 Dovetail slots for masonry anchors.
 - .2 Glass block.
 - .3 Furnishing cast stone trim.
 - .4 Installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
 - .5 Furnishing steel lintels and shelf angles for unit masonry.
 - .6 Water repellents applied to unit masonry.
 - .7 Exposed sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.
 - .8 Wall vents (brick vents).
 - .9 Interior brick flooring.
 - .10 Chemical-resistant, interior brick flooring.
 - .11 Stone window stools.
 - .12 Exterior unit masonry paving.
 - .13 Dry-laid, concrete unit retaining walls.
 - .14 Air barrier in exterior masonry wall assemblies.
 - .15 Firestopping at openings in masonry walls.

- .16 Fire-resistive joint systems at heads of masonry walls.
- .17 Sealing control and expansion joints in unit masonry.

1.3 DEFINITIONS

- .1 Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 SUBMITTALS

- .1 Product Data: For each type of product indicated.
 - .1 Provide manufacturer's installation instructions for calcium silicate masonry units.
- .2 Shop Drawings: For the following:
 - .1 Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 - .2 Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Show elevations of reinforced walls.
- .3 Samples for Verification: For each type and colour of the following:
 - .1 Decorative concrete masonry units.
 - .2 Calcium silicate masonry units.
 - .3 Pigmented and coloured-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project. Label Samples to indicate types and amounts of pigments used.
 - .4 Weep holes/vents.
 - .5 Accessories embedded in masonry.
- .4 Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.
- .5 Sustainability Submittals: For those products and materials required to meet the regional materials requirement specified herein, indicate location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

1.5 QUALITY ASSURANCE

- .1 Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and colour, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.
- .2 Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including colour for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.
- .3 Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per CAN/ULC-S101 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.
- .4 Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - .1 Build mockups for each type of exposed unit masonry construction in sizes approximately 1500 mm long by 1200 mm high by full thickness, including face and backup wythes and accessories.
 - .1 Include a sealant-filled joint at least 400 mm long in each exterior wall mockup.

- .2 Include lower corner of window opening at upper corner of exterior wall mockup. Make opening approximately 300 mm wide by 400 mm high.
- .3 Include through-wall flashing installed for a 600 mm length in corner of exterior wall mockup approximately 400 mm down from top of mockup; with a 300 mm length of flashing left exposed to view (omit masonry above half of flashing).
- .4 Include studs, sheathing, veneer anchors, flashing, and weep holes in exterior masonry-veneer wall mockup.
- .2 Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.
- .3 Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
- .4 Protect accepted mockups from the elements with weather-resistant membrane.
- .5 Approval of mockups is for colour, texture, and blending of masonry units; relationship of mortar and sealant colours to masonry unit colours; tooling of joints; and aesthetic qualities of workmanship.
- .1 Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Owner's Representative in writing.
- .6 Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- .5 Reinforcing Steel:
 - .1 Upon request, provide Owner's Representative with certified copy of mill test report of reinforcement steel and connectors, showing physical and chemical analysis.
 - .2 Upon request inform Owner's Representative of proposed source of material to be supplied.
- 1.6 DELIVERY, STORAGE, AND HANDLING
 - .1 Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
 - .2 Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
 - .3 Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
 - .4 Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.
 - .5 Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.
 - .6 Ship reinforcement and connectors, clearly identified in accordance with drawings.
- 1.7 PROJECT CONDITIONS
 - .1 Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - .1 Extend cover a minimum of 600 mm down both sides and hold cover securely in place.
 - .2 Where 1 wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 600 mm down face next to unconstructed wythe and hold cover in place.
 - .2 Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

- .3 Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - .1 Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - .2 Protect sills, ledges, and projections from mortar droppings.
 - .3 Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - .4 Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- .4 Cold weather requirements.
 - .1 Supplement Clause 5.15.2 of CSA-A371 with following requirements.
 - .1 Maintain temperature of mortar between 5 degrees C and 50 degrees C until batch is used or becomes stable.
 - .2 Maintain ambient temperature between 5 degrees C and 50 degrees C and protect site from wind chill.
 - .2 Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 4 deg C and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- .5 Hot weather requirements.
 - .1 Protect freshly laid masonry from drying too rapidly, by means of waterproof, non-staining coverings.
 - .2 Keep masonry dry using waterproof, non-staining coverings that extend over walls and down sides sufficient to protect walls from wind driven rain, until masonry work is completed and protected by flashings or other permanent construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- .1 In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - .1 Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

2.2 MASONRY UNITS, GENERAL

- .1 Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

2.3 CONCRETE MASONRY UNITS (CMUs)

- .1 Regional Materials: Use only products that have been manufactured within 800 km of Project site from aggregates that have been extracted, harvested, or recovered, as well as manufactured, within 800 km of Project site, whenever these products are available.
- .2 Shapes: Provide shapes indicated and as follows:
 - .1 Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 - .2 Provide bullnose units for outside corners, unless otherwise indicated.

- .3 Integral Water Repellent: Provide units made with integral water repellent where units could be exposed to the weather.
 - .1 Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive according to ASTM E 514, with test period extended to 24 hours, show no visible water or leaks on the back of test specimen.
 - .1 Available Products:
 - .1 Addiment Incorporated; Block Plus W-10.
 - .2 Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block.
 - .3 Master Builders, Inc.; Rheopel.
- .4 Concrete Masonry Units: CAN3-A165 Series (CAN3-A165.1).
 - .1 Classification: H/ 15/ A/ M; unless otherwise noted.
 - .2 Size: modular.
- .5 Decorative Concrete masonry Units: CAN3-A165 Series (CAN3-A165.1).
 - .1 Face: split face, split ribbed, single and triple scored face, and other features as indicated.
 - .2 Classification: H/ 15/ A/ M; unless otherwise noted.
 - .3 Size: modular.
 - .4 Colour: As indicated.
- .6 Acoustical Concrete masonry Units: CAN3-A165 Series (CAN3-A165.1) purpose made with slots to provide the acoustical characteristics specified.
 - .1 Classification: H/15/B/M
 - .2 Size: modular.
 - .3 Configuration: block containing two slots with noncombustible fibrous filler elements.
 - .4 Acoustical properties: Manufacturer's standard, unless otherwise indicated.

2.4 CALCIUM SILICATE MASONRY UNITS (CSUM)

- .1 Products: Subject to compliance with requirements, provide one of the following:
 - .1 Arriscraft International Inc.; Renaissance Masonry Units; and
 - .2 Approved alternate.
- .2 Calcium Silicate Masonry Units: to CSA A82.3, Grade SW; solid units that have been pressure formed and autoclaved; having the following typical average properties when tested to the identified standard:
 - .1 Compressive Strength: 45.5 MPa, to ASTM C170.
 - .2 Absorption: 8.8 percent, to ASTM C97.
 - .3 Density: 2070 kg/m³, to ASTM C97.
 - .4 Modulus of Rupture: 5.3 MPa, to ASTM C99.
- .3 Shapes, Sizes, Finishes, and Colours:
 - .1 90 mm bed depth;
 - .2 Modular sizes as indicated on drawings;
 - .3 Special shapes as indicated.
- .4 Finish: on exposed faces and ends:
 - .1 Sandblasted finish, unless otherwise noted in the *Finishes Legends*;
- .5 Colour: provide colour indicated in the *Finishes Legends*.

2.5 CONCRETE AND MASONRY LINTELS

- .1 General: Provide either concrete or masonry lintels, at Contractor's option, complying with requirements below.
- .2 Concrete Lintels: Precast or formed-in-place concrete lintels complying with requirements in Division 3 Section *Cast-in-Place Concrete*.
- .3 Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam concrete masonry units with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.6 MORTAR AND GROUT MATERIALS

- .1 Use same brands of materials and source of aggregate for entire project.
- .2 Mortar: CSA A179; natural colour unless otherwise noted.
- .3 Non-staining mortar: use non-staining masonry cement for cementitious portion of specified mortar type.
- .4 Mortar Colouring: ground coloured natural aggregates or metallic oxide pigments.
 - .1 Colour: natural unless otherwise indicated in the *Finishes Legends*.
- .5 Aggregate: aggregate passing 1.18 mm sieve, where 6 mm thick joints are indicated.
- .6 Grout: to CSA A179, Table 3.
- .7 Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
 - .1 Available Products:
 - .1 Addiment Incorporated; Mortar Kick.
 - .2 Euclid Chemical Company (The); Accelguard 80.
 - .3 Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Morset.
 - .4 Sonneborn, Div. of ChemRex; Trimix-NCA.
- .8 Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.
 - .1 Available Products:
 - .1 Addiment Incorporated; Mortar Tite.
 - .2 Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.
 - .3 Master Builders, Inc.; Colour Cure Mortar Admix or Rheomix Rheopel.

- .9 Water: Potable.

2.7 REINFORCEMENT

- .1 Bar reinforcement: to CSA-A371 and CAN/CSA G30.18.
 - .1 Fabricate reinforcing in accordance with CAN/CSA-A23.1 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Ontario.
- .2 Masonry Joint Reinforcement, General: CSA-A371 and CSA G30.14.
 - .1 Interior Walls: Mill- galvanized, carbon steel.

- .2 Exterior Walls: Hot-dip galvanized carbon or stainless steel.
- .3 Provide in lengths of not less than 3 m.
- .3 Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.
- .4 Masonry Joint Reinforcement for Multiwythe Masonry:
 - .1 Ladder type with 1 side rod at each face shell of hollow masonry units more than 100 mm in width, plus 1 side rod at each wythe of masonry 100 mm or less in width.

2.8 TIES, ANCHORS, CONNECTORS

- .1 Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with eight subparagraphs below, unless otherwise indicated.
 - .1 Mill-Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 641/A 641M, Class 1 coating.
 - .2 Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153/A 153M, Class B-2 coating.
 - .3 Stainless-Steel Wire: ASTM A 580/A 580M, Type 304 or 316.
 - .4 Galvanized Steel Sheet: ASTM A 653/A 653M, Commercial Steel, Z180 zinc coating.
 - .5 Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M.
 - .6 Stainless-Steel Sheet: ASTM A 666, Type 304 or 316.
 - .7 Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
 - .8 Stainless Steel bars: ASTM A 276 or ASTM a 666, Type 304.
- .2 Connectors, General: to CSA-A370 and CSA-S304.
- .3 Rigid Connectors: Fabricate from steel bars 38 mm wide by 6.4 mm thick by 600 mm long, with ends turned up 50 mm or with cross pins, unless otherwise indicated.
 - .1 Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.
- .4 Partition Top Anchors: 2.5 mm thick metal plate with 10 mm diameter metal rod 150 mm long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube; unless otherwise indicated. Fabricate from steel, hot-dip galvanized after fabrication.
- .5 Adjustable Masonry-Veneer Anchors
 - .1 General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to wood or metal studs, and as follows:
 - .1 Structural Performance Characteristics: Capable of withstanding a 445-N load in both tension and compression without deforming or developing play in excess of 1.3 mm.
 - .2 Screw-Attached, Masonry-Veneer Anchors for Steel Stud Back-up: Units consisting of a wire tie and a metal anchor section; with insulation retainer.
 - .1 Fabricate sheet metal anchor sections and other sheet metal parts from 1.7 mm minimum thick, steel sheet, galvanized after fabrication.
 - .2 Wire Ties: Triangular-, rectangular-, or T-shaped wire ties fabricated from 4.8 mm minimum diameter, hot-dip galvanized steel or stainless-steel wire.
 - .3 Available Products:
 - .1 Blok-Lok BL607
 - .3 Embedded-Attached Masonry-Veneer Anchors for Unit Masonry Back-up: Units consisting of a wire tie and a metal anchor section, galvanized steel, with insulation retainer.
 - .1 Fabricate sheet metal anchor sections and other sheet metal parts from 1.7 mm thick, steel sheet, galvanized after fabrication.
 - .2 Fabricate wire connector sections from 4.8 mm diameter, hot-dip galvanized, and carbon -steel wire.

- .3 Available Products:
 - .1 Blok-Lok BL507
- .4 Polymer-Coated, Steel Drill Screws for Steel Studs: ASTM C 954 except manufactured with hex washer head and neoprene washer, 4.8 mm diameter by length required to penetrate steel stud flange with not less than 3 exposed threads, and with organic polymer coating with salt-spray resistance to red rust of more than 800 hours per ASTM B 117.
 - .1 Available Products:
 - .1 ITW Buildex; Teks Maxiseal with Climaseal finish.
 - .2 Textron Inc., Textron Fastening Systems; Elco Drill-Flex with Stalgard finish.
- .5 Tie System for Concrete: stainless steel spiral bits, with insulation retainer Back-up
 - .1 Spira-Lok Helitical Wall Ties System; or equivalent.

2.9 MISCELLANEOUS ANCHORS

- .1 Anchor Bolts: Headed or L-shaped steel bolts complying with ASTM F 568M, Property Class 4.6; with ASTM A 563M hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.
- .2 Postinstalled Anchors: Provide chemical or torque-controlled expansion anchors, with capability to sustain, without failure, a load equal to six times the load imposed when installed in solid or grouted unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
 - .1 Corrosion Protection for installations inside of the building envelope's vapour barrier: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (5 microns).
 - .2 Corrosion Protection for other locations: Stainless-steel components complying with ASTM F 738M and ASTM F 836M, Alloy Group 1 or 4 for bolts and nuts; ASTM A 666 or ASTM A 276, Type 304 or 316, for anchors.

2.10 EMBEDDED FLASHING MATERIALS

- .1 Metal Flashing: Provide metal flashing, where flashing is exposed or partly exposed and where indicated, complying with Division 7 Section *Sheet Metal Flashing and Trim* and as follows:
 - .1 Metal Drip Edges: Fabricate from metal flashing. Extend at least 75 mm into wall and 13 mm out from wall, with outer edge bent down 30 degrees and hemmed.
 - .2 Metal Flashing Terminations: Fabricate from metal flashing. Extend at least 75 mm into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 19 mm and down into joint 10 mm to form a stop for retaining sealant backer rod.
- .2 Flexible Flashing: For flashing not exposed to the exterior, use the following, unless otherwise indicated:
 - .1 Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 1.0 mm.
- .3 Masonry Cavity Firestop: Firestop masonry cavities indicated by installing continuous sheet metal back-up to flexible flashing consisting of commercial quality sheet to ASTM A653-M96, with Z275 designation zinc coating, 0.38 mm minimum thickness. Overlap joints by 50 mm.
 - .1 Locations: Masonry cavities containing foam insulations.
- .4 Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.11 MISCELLANEOUS MASONRY ACCESSORIES

- .1 Compressible Filler: Premoulded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene, urethane, or PVC.
- .2 Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- .3 Weep/Vent Products: Use one of the following, unless otherwise indicated:
 - .1 Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 3 mm less than depth of outer wythe, in colour selected from manufacturer's standard.
 - .2 Aluminium Weep Hole/Vent: One-piece, L-shaped units made from sheet aluminium, designed to fit into a head joint and consisting of a vertical channel with louvers stamped in web and with a top flap to keep mortar out of the head joint; painted before installation to comply with Division 9 painting Sections in colour approved by Owner's Representative to match that of mortar.
 - .3 Vinyl Weep Hole/Vent: One-piece, offset, T-shaped units made from flexible, injection-moulded PVC, designed to fit into a head joint and consisting of a louvered vertical leg, flexible wings to seal against ends of masonry units, and a top flap to keep mortar out of the head joint; in colour approved by Owner's Representative to match that of mortar.
- .4 Cavity Drainage Material: choice of
 - .1 Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
 - .2 6 mm washed pea gravel, free of fines.

2.12 CAVITY-WALL INSULATION

- .1 Polyisocyanurate Board Insulation: ASTM C 1289, Type I (aluminium-foil-faced), Class 2 (glass-fibre-reinforced).
- .2 Adhesive: Type recommended by insulation board manufacturer for application indicated.

2.13 MASONRY CLEANERS

- .1 Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discolouring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

2.14 MORTAR AND GROUT MIXES

- .1 General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
 - .1 Do not use calcium chloride in mortar or grout.
 - .2 Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar colour is consistent.
- .2 Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- .3 Mortar for Unit Masonry: Comply with CSA 179 Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.
 - .1 For reinforced masonry, use Type S.

- .2 For exterior, above-grade, load-bearing and non-load-bearing walls, and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
- .4 Pigmented Mortar: Use coloured cement product.
 - .1 Pigments shall not exceed 10 percent of Portland cement by weight.
- .5 Coloured-Aggregate Mortar: Produce required mortar colour by using coloured aggregates and natural colour or white cement as necessary to produce required mortar colour.
- .6 Pointing Mortar: prehydrate pointing mortar by mixing ingredients dry, then mix again adding just enough water to produce damp unworkable mix that will retain its form when pressed into ball. Allow to stand for not less than 1 hour and not more than 2 hours then remix with sufficient water to produce mortar of proper consistency for pointing.
- .7 Mortar for Calcium Silicate Masonry Units: to CSA A179, Proportion specification, 1 part Portland cement, 1 part hydrated lime, 6 parts mortar aggregate by volume for both cementitious materials and aggregate; integral colour as selected by Owner's Representative.
- .8 Grout for Unit Masonry: to CSA A179, Table 3.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
 - .1 For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
 - .2 Verify that reinforcing dowels are properly placed.
- .2 Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- .3 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- .1 Do masonry work in accordance with CSA-A371 except where specified otherwise.
- .2 Calcium silicate masonry units: install in accordance with manufacturer's installation instructions including requirement to dampen units when necessary to ensure an adequate bond.
- .3 Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- .4 Build chases and recesses to accommodate items specified in this and other Sections.
- .5 Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

- .6 Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- .7 Select and arrange units for exposed unit masonry to produce a uniform blend of colours and textures.
 - .1 Mix units from several pallets or cubes as they are placed.
- .8 Matching Existing Masonry: Match coursing, bonding, colour, and texture of existing masonry.
- .9 Comply with construction tolerances in notes to Clause 5.3 of CSA-A371 and with the following:
 - .1 For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 3 mm in 3 m, 6 mm in 6 m, or 12 mm maximum.
 - .2 For vertical alignment of exposed head joints, do not vary from plumb by more than 6 mm in 3 m, or 12 mm maximum.
 - .3 For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 3 mm in 3 m, 6 mm in 6 m, or 12 mm maximum.
 - .4 For exposed bed joints, do not vary from thickness indicated by more than plus or minus 3 mm, with a maximum thickness limited to 12 mm. Do not vary from bed-joint thickness of adjacent courses by more than 3 mm.
 - .5 For exposed head joints, do not vary from thickness indicated by more than plus or minus 3 mm. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 3 mm.
 - .6 For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1.5 mm except due to warpage of masonry units within tolerances specified for warpage of units.
 - .7 For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1.5 mm from one masonry unit to the next.

3.3 LAYING MASONRY WALLS

- .1 Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- .2 Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 100 mm horizontal face dimensions at corners or jambs.
- .3 Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 100 mm. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 100 mm horizontal face dimensions at corners or jambs.
- .4 Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- .5 Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- .6 Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.
- .7 Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

- .8 Fill cores in hollow concrete masonry units with grout 600 mm under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
- .9 Supply and install Partition Top Anchors and lateral support and anchorage where masonry walls terminate at the underside of the structure in accordance with CSA-S304.1 spaced at 1200 mm maximum, and as indicated.
- .10 Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.
 - .1 Install compressible filler in joint between top of partition and underside of structure above.
 - .2 At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 7 Section "*Fire Stop Systems*."

3.4 MORTAR BEDDING AND JOINTING

- .1 Lay hollow concrete masonry units as follows:
 - .1 With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
 - .2 With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
 - .3 With webs fully bedded in mortar in grouted masonry, including starting course on footings.
 - .4 With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- .2 Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- .3 Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.
- .4 Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

3.5 MASONRY JOINT REINFORCEMENT

- .1 General: Supply and install masonry reinforcement in accordance with CSA-A370, CSA-A371, and CSA-S304.1 unless indicated otherwise.
- .2 Notify Owner's Representative 48 hours before concealing reinforcement and connectors with the placement of concrete, mortar, or grout.
- .3 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
- .4 General: Install entire length of longitudinal side rods in mortar with a minimum cover of 16 mm on exterior side of walls, 13 mm elsewhere. Lap reinforcement a minimum of 150 mm.
 - .1 Space reinforcement not more than 400 mm o.c.
 - .2 Space reinforcement not more than 200 mm o.c. in foundation walls and parapet walls.
 - .3 Provide reinforcement not more than 200 mm above and below wall openings and extending 300 mm beyond openings.
 - .1 Reinforcement above is in addition to continuous reinforcement.
- .5 Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

- .6 Provide continuity at wall intersections by using prefabricated T-shaped units.
- .7 Provide continuity at corners by using prefabricated L-shaped units.
- .8 Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.6 ANCHORING MASONRY TO STRUCTURAL MEMBERS

- .1 General: Supply and install masonry connectors in accordance with CSA-A370, CSA-A371, CAN/CSA-A23.1, and CSA-S304.1 unless indicated otherwise.
- .2 Notify Owner's Representative 48 hours before concealing reinforcement and connectors with the placement of concrete, mortar, or grout.
- .3 Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:
 - .1 Provide an open space not less than 13 mm in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 - .2 Anchor masonry to structural members with connectors embedded in masonry joints and attached to structure.
 - .3 Space connectors as indicated, but not more than 600 mm o.c. vertically and 900 mm o.c. horizontally.

3.7 CAVITY WALL INSULATION

- .1 Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 300 mm o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.
 - .1 Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.8 ANCHORING MASONRY VENEERS

- .1 Tie masonry veneer to backing in accordance with NBC, CSA-S304.1, and CSA-A371, and as indicated.
- .2 Anchor masonry veneers to wall framing and concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:
 - .1 Fasten connector through sheathing to wall framing and to concrete and masonry backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
 - .2 Embed connector sections and continuous wire in masonry joints.
 - .3 Locate anchor sections to allow maximum vertical differential movement of ties up and down.
 - .4 Space connectors as indicated, but not more than 600 mm o.c. vertically and 800 mm o.c. horizontally. Install additional anchors within 300 mm of openings and at intervals, not exceeding 200 mm, around perimeter.

3.9 CONTROL AND EXPANSION JOINTS

- .1 General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- .2 Form control joints in concrete masonry using one of the following methods:

- .1 Fit bond-breaker strips into hollow contour in ends of concrete masonry units on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
 - .2 Install preformed control-joint gaskets designed to fit standard sash block.
 - .3 Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
 - .4 Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.
- .3 Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 7 Section *Joint Sealants*, but not less than 10 mm.
- .1 Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.
- 3.10 LINTELS
- .1 Install steel lintels where indicated.
 - .2 Provide concrete or masonry lintels where shown and where openings of more than 300 mm for brick-size units and 600 mm for block-size units are shown without structural steel or other supporting lintels.
 - .3 Provide minimum bearing of 200 mm at each jamb, unless otherwise indicated.
 - .4 Reinforce masonry lintels and bond beams as indicated.
 - .5 Place and grout reinforcement in accordance with CSA-S304.1, CSA-A371, and CSA-A179.
- 3.11 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS
- .1 General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.
 - .2 Install flashing as follows, unless otherwise indicated:
 - .1 Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
 - .2 At multi-wythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 200 mm, and 38 mm into the inner wythe.
 - .3 At masonry-veneer walls, extend flashing through veneer, across air space behind veneer, and up face of sheathing at least 200 mm; with upper edge tucked under building paper or building wrap, lapping at least 100 mm.
 - .4 At lintels and shelf angles, extend flashing a minimum of 150 mm into masonry at each end. At heads and sills, extend flashing 150 mm at ends and turn up not less than 50 mm to form end dams.
 - .5 Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 13 mm back from outside face of wall and adhere flexible flashing to top of metal drip edge.
 - .3 Masonry Cavity Firestop: Locate sheet metal firestop immediately underneath the Masonry Cavity Flashing. Extend sheet metal firestop 50 mm under veneer, across air space behind veneer and up face of sheathing at least 50 mm and mechanically secure to back-up at 600 mm o.c., lapping at least 100 mm.

- .4 Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:
 - .1 Use specified weep/vent products to form weep holes.
 - .2 Space weep holes 600 mm o.c., unless otherwise indicated.
- .5 Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in Part 2 *Miscellaneous Masonry Accessories* Article.
 - .1 Place pea gravel in cavities as soon as practical to a height equal to height of first course above top of flashing, but not less than 50 mm, to maintain drainage.
- .6 Install vents in head joints in exterior wythes of first course of masonry immediately below embedded flashing and as follows.
 - .1 Space vents 600 mm o.c., unless otherwise indicated.
 - .2 Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.12 REINFORCED UNIT MASONRY INSTALLATION

- .1 Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 - .1 Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 - .2 Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.
- .2 Supply and install masonry reinforcement in accordance with CSA-A370, CSA-A371, and CSA-S304.1 unless indicated otherwise.
 - .1 Fabricate reinforcing in accordance with CAN/CSA-A23.1 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Ontario.
 - .2 Do not field bend reinforcement and connectors except where indicated or authorized by Owner's Representative.
 - .3 When field bending is authorized, bend without heat, applying a slow and steady pressure.
 - .4 Replace bars and connectors which develop cracks or splits.
 - .5 Insure reinforcement is not continuous across movement joints unless otherwise indicated.
- .3 Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 - .1 Do grout work in accordance with CSA A179 except where specified otherwise.
 - .2 Limit height of vertical grout pours to not more than 1520 mm.
 - .3 Notify Owner's Representative 48 hours before concealing reinforcement and connectors with the placement of concrete, mortar, or grout.

3.13 FIELD QUALITY CONTROL

- .1 Inspectors: Owner may engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.
- .2 Take representative samples of mortar for testing consistency of strength and colour according to CSA A179.

3.14 REPAIRING, POINTING, AND CLEANING

- .1 Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- .2 Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- .3 In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- .4 Final Cleaning - General: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - .1 Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - .2 Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Owner's Representative's approval of sample cleaning before proceeding with cleaning of masonry.
 - .3 Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - .4 Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - .5 Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
 - .6 Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
- .5 Final Cleaning - CSUM: Clean a 10 sq. m. area of wall designated by Owner's Representative as directed below and leave for one week. If no harmful effects appear and after mortar has set and cured, clean masonry as follows:
 - .1 Protect windows, sills, doors, trim, and other work from damage.
 - .2 Remove large particles with stiff fibre brushes or wood paddles without damaging surface. Saturate masonry with clean water and flush off loose mortar and dirt.
 - .3 Scrub with solution of 25 ml trisodium phosphate and 25 ml household detergent dissolved in 1 L of clean water using stiff fibre brushes, then clean off immediately with clean water using hose.
 - .4 Repeat cleaning process as often as necessary to remove mortar and other stains.
- .6 Use alternative cleaning solutions and methods for difficult to clean masonry only after consultation with masonry unit manufacturer.

3.15 MASONRY WASTE DISPOSAL

- .1 Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- .2 Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
 - .1 Crush masonry waste to less than 100 mm in each dimension.
 - .2 Mix masonry waste with at least two parts of specified fill material for each part of masonry waste.
 - .3 Do not dispose of masonry waste as fill within 450 mm of finished grade.
- .3 Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- .1 Types of items described in this Section:
 - .1 Framing with dimension lumber.
 - .2 Framing with engineered wood products.
 - .3 Rooftop equipment bases and support curbs.
 - .4 Wood blocking, cants, and nailers.
 - .5 Wood furring.
 - .6 Wood sleepers.
 - .7 Backing panels for electrical equipment.
- .2 Types of items you will not find described in this Section:
 - .1 Interior wood stairs intended to be covered with tread and riser covers, excluding landings.
 - .2 Elevated exterior decks including wood decking, stairs, guards, and support framing.
 - .3 Utility shelving.
 - .4 Heavy timber construction.
 - .5 Sheathing, including wall, floor, and roof sheathing and plywood floor underlayment.
 - .6 Building wrap.
 - .7 Shop-fabricated wood trusses.

1.3 DEFINITIONS

- .1 Exposed Framing: Framing not concealed by other construction.
- .2 Dimension Lumber: Lumber of 38 mm actual or greater but less than 114 mm actual in least dimension.
- .3 Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - .1 NLGA: National Lumber Grades Authority.

1.4 SUBMITTALS

- .1 Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
- .2 Sustainability Submittal:
 - .1 Provide chain-of-custody certificates certifying that wood products comply with forest certification requirements. Include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.

1.5 QUALITY ASSURANCE

- .1 Source Limitations for Engineered Wood Products: Obtain each type of engineered wood product through one source from a single manufacturer.

- .2 Forest Certification: Provide lumber obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, *FSC Principles and Criteria for Forest Stewardship*.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- .1 Lumber: Lumber: unless specified otherwise, softwood, moisture content 19% (S-dry) or less.
 - .1 In accordance with:
 - .1 CAN/CSA-O141.
 - .2 NLGA Standard Grading Rules for Canadian Lumber.
 - .2 Factory mark each piece of lumber with grade stamp of grading agency.
 - .3 For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
 - .4 Provide dressed lumber, S4S, unless otherwise indicated.
 - .5 Forestry Stewardship Council (FSC) certified.
- .2 Engineered Wood Products:
 - .1 Glulam in accordance with Structural Glued-Laminated Timber CAN/CSA-O122.
 - .2 Wood I-joists in accordance with Prefabricated Wood I-Joists ASTM D 5055.
 - .3 Structural Composite Lumber (SCL) in accordance with ASTM D 5456.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- .1 Preservative Treatment by Pressure Process: to CSA O80 Series 2, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated with inorganic boron (SBX).
 - .1 Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 - .2 For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colourants, bleed through, or otherwise adversely affect finishes.
- .2 Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- .3 Mark lumber with treatment quality mark of an inspection agency approved by the Canadian Lumber Standards Accreditation Board.
 - .1 For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.
- .4 Application: Treat items indicated on Drawings, and the following, unless otherwise noted.
 - .1 Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapour barriers, and waterproofing.
 - .2 Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete.
 - .3 Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
 - .4 Wood framing members that are less than 460 mm above the ground in crawlspaces or unexcavated areas.
 - .5 Wood floor plates that are installed over concrete slabs-on-grade.

- .5 Surface treat wood materials with wood preservative and not pressure treated when wood materials are in direct contact with modified bituminous roofing membranes.

2.3 DIMENSION LUMBER FRAMING

- .1 Maximum Moisture Content: 19 percent.
- .2 Non-Load-Bearing Interior Partitions: No. 2 grade and the following species:
 - .1 Spruce-pine-fir; NLGA.
- .3 Framing Other Than Non-Load-Bearing Interior Partitions: No. 2 grade and the following species:
 - .1 Spruce-pine-fir; NLGA.
- .4 Ceiling Joists (Non-Load-Bearing): Construction or No. 2 grade and the following species:
 - .1 Spruce-pine-fir; NLGA.
- .5 Joists, Rafters, and other framing not listed above: No. 1 or No. 2 grade and the following species:
 - .1 Spruce-pine-fir; NLGA.
- .6 Exposed Framing Indicated to Receive a Stained or Natural Finish: Provide material hand-selected for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain, and wane.
 - .1 Species and Grade: Spruce-pine-fir, No. 1 grade; NLGA.

2.4 ENGINEERED WOOD PRODUCTS

- .1 Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, to Structural Glued-Laminated Timber CAN/CSA-O122 and manufactured with an exterior-type adhesive containing no urea formaldehyde.
- .2 Parallel-Strand Lumber: Structural composite lumber made from wood strand elements with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive and containing no urea formaldehyde.
- .3 Wood I-Joists: Prefabricated units, I-shaped in cross section, made with solid or structural composite lumber flanges and wood-based structural panel webs, let into and bonded to flanges. Provide units complying with material requirements of and with structural capacities established and monitored according to ASTM D 5055.
 - .1 Provide I-joists manufactured without urea formaldehyde.
 - .2 Structural Properties: Provide units with depths and design values not less than those indicated.
- .4 Rim Boards: Product designed to be used as a load-bearing member and to brace wood I-joists at bearing ends, complying with research/evaluation report for I-joists.
 - .1 Manufacturer: Provide products by same manufacturer as I-joists.
 - .2 Material: All-veneer product glued-laminated wood or product made from any combination solid lumber, wood strands, and veneers. Provide rim boards made without urea formaldehyde.
 - .3 Thickness: 32 mm, unless otherwise noted.

2.5 MISCELLANEOUS LUMBER

- .1 General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

- .1 Blocking.
 - .2 Nailers.
 - .3 Rooftop equipment bases and support curbs.
 - .4 Cants.
 - .5 Furring.
 - .2 For items of dimension lumber size, provide Standard grade lumber with 19 percent maximum moisture content and the following species:
 - .1 Spruce-pine-fir; NLGA.
 - .3 For exposed boards, provide lumber with 19 percent maximum moisture content and the following species and grades:
 - .1 Spruce-pine-fir, No. 1 Common grade, NLGA.
 - .4 For concealed boards, provide lumber with 19 percent maximum moisture content and the following species and grades:
 - .1 Spruce -pine-fir, Standard grade, NLGA.
 - .5 For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
 - .6 For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
 - .7 For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.
- 2.6 BACKING PANELS FOR ELECTRICAL EQUIPMENT
- .1 Telephone and Electrical Equipment Backing Panels: G1S plywood to CSA O151, fire-retardant treated in other than wood structured buildings, in thickness indicated or, if not indicated, not less than 18.5 mm thickness.
- 2.7 FASTENERS
- .1 General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 - .1 Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M or of Type 304 stainless steel.
 - .1 Do not use electro-plated galvanized fasteners.
 - .2 Nails, Brads, and Staples: CSA B111.
 - .3 Power-Driven Fasteners: NES NER-272.
 - .4 Wood Screws: ASME B18.6.1.
 - .5 Lag Bolts: ASME B18.2.3.8M.
 - .6 Bolts: Steel bolts complying with ASTM F 568M, Property Class 4.6; with ASTM A 563M hex nuts and, where indicated, flat washers.

.1 Anchor bolts: 12.5 mm diameter x 250 mm long.

.7 Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

.1 Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2.8 METAL FRAMING ANCHORS

.1 Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, Z180 coating designation, unless otherwise noted.

.1 Provide anchors with Z550 coating when in contact with wood treated with preservative.

.2 Joist Hangers: U-shaped joist hangers with 50 mm long seat and 32 mm wide nailing flanges at least 85 percent of joist depth.

.1 Thickness: as required but not less than 1.3 mm.

.3 I-Joist Hangers: U-shaped joist hangers with 50 mm long seat and 32 mm wide nailing flanges full depth of joist. Nailing flanges provide lateral support at joist top chord.

.1 Thickness: as required but not less than 1.3 mm.

.4 Top Flange Hangers: U-shaped joist hangers, full depth of joist, formed from metal strap with tabs bent to extend over and be fastened to supporting member.

.1 Thickness: as required but not less than 1.3 mm.

.5 Post Bases: Adjustable-socket type for bolting in place with standoff plate to raise post 25 mm above base and with 50 mm minimum side cover, socket 1.6 mm thick, and standoff and adjustment plates 2.8 mm thick.

.6 Joist Ties: Flat straps, with holes for fasteners, for tying joists together over supports.

.1 Width: 32 mm.

.2 Thickness: 1.3 mm.

.3 Length: 600 mm.

.7 Rafter Tie-Downs: Bent strap tie for fastening rafters or roof trusses to wall studs below, 38 mm wide by 1.3 mm thick.

2.9 MISCELLANEOUS MATERIALS

.1 Sill-Sealer Gaskets: Closed-cell neoprene foam, 6.4 mm thick, selected from manufacturer's standard widths to suit width of sill members indicated.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

.1 Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.

.2 Framing Standard: Comply with more stringent of *NBCC 2005 Part 9* and these specifications.

- .3 Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
 - .4 Metal Framing Anchors: Install metal framing to comply with manufacturer's written instructions.
 - .5 Do not splice structural members between supports, unless otherwise indicated.
 - .6 Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - .7 Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Use longest practical lengths.
 - .8 Comply with manufacturer's instructions for applying field treatment to cut surfaces of preservative-treated lumber.
 - .1 Use inorganic boron for items that are continuously protected from liquid water.
 - .2 Use copper naphthenate for items not continuously protected from liquid water.
 - .9 Securely attach rough carpentry work to substrate by anchoring and fastening.
 - .10 Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.
 - .11 For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
 - .1 Use finishing nails, unless otherwise indicated. Countersink nail heads and fill holes with wood filler.
- 3.2 ANCHOR BOLT AND SILL PLATE INSTALLATION
- .1 Construct sill plates from wood treated with preservative.
 - .2 Anchor sill plates to concrete and masonry foundation using anchor bolts embedded into foundation.
 - .1 Insure each individual sill plate segment is secured to concrete and masonry foundations with a minimum of two anchor bolts spaced not more than 1800 mm, within 300 mm of each end, and embedded into the foundation a minimum of 100 mm..
 - .2 Provide full contact between sill plate and foundation. Fill any voids between the sill plate and concrete and masonry foundations with full bed of non-shrink structural grout.
 - .3 Grind level any concrete and masonry imperfections preventing the level installation of the sill plate.
 - .3 Provide continuous sill-sealer gaskets between sill plates and concrete and masonry construction.
- 3.3 WOOD SLEEPER, BLOCKING, AND NAILER INSTALLATION
- .1 Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved. Blocking for the following items includes, but is not limited to:
 - .1 Handrails.
 - .2 Grab bars.
 - .3 Cabinetry.
 - .4 Stair stringers.

- .5 Wood panelling.
- .6 M&E supports.

- .2 Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

3.4 WOOD FURRING INSTALLATION

- .1 Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

3.5 WALL AND PARTITION FRAMING INSTALLATION

- .1 General: Provide single bottom plate and double top plates using members of 38 mm actual thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions. Fasten plates to supporting construction, unless otherwise indicated.
 - .1 For exterior walls, provide 38-by-140 mm actual size wood studs spaced 610 mm o.c., unless otherwise indicated.
 - .2 For interior partitions and walls, provide 38-by-89 mm actual size wood studs spaced 406 mm o.c., unless otherwise indicated.
 - .3 Provide continuous horizontal blocking at mid-height of partitions, using members of 38 mm actual thickness and of same width as wall or partitions.
- .2 Construct corners and intersections with three or more studs.
- .3 Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.
 - .1 For non-load-bearing partitions, provide double-jamb studs and headers not less than 89 mm actual depth for openings 1200 mm and less in width, 140 mm actual depth for openings 1200 to 1800 mm in width, 184 mm actual depth for openings 1800 to 3000 mm in width, and not less than 235 mm actual depth for openings 3 to 3.6 m in width.
 - .2 For load-bearing walls, provide double-jamb studs for openings 1500 mm and less in width, and triple-jamb studs for wider openings. Provide headers of depth indicated or, if not indicated, according to NBCC 2005 Part 9.
- .4 Provide diagonal bracing in exterior walls, at both walls of each external corner and walls, at locations indicated, at 45-degree angle, full-story height, unless otherwise indicated. Use 19-by-89 mm actual- size boards, let-in flush with faces of studs.

3.6 FLOOR JOIST FRAMING INSTALLATION

- .1 General: Install floor joists with crown edge up and support ends of each member with not less than 38 mm of bearing on wood or metal, or 76 mm on masonry. Attach floor joists as follows:
 - .1 Where supported on wood members, by toe nailing or by using metal framing anchors.
 - .2 Where framed into wood supporting members, by using wood ledgers as indicated or, if not indicated, by using metal joist hangers.
- .2 Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 1200 mm.

- .3 Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than 1/3 depth of joist; do not locate closer than 50 mm from top or bottom.
- .4 Provide solid blocking of 38 mm actual thickness by depth of joist at ends of joists unless nailed to header or band.
- .5 Lap members framing from opposite sides of beams, girders, or partitions not less than 102 mm or securely tie opposing members together. Provide solid blocking of 38 mm actual thickness by depth of joist over supports.
- .6 Anchor members paralleling masonry with 6.4-by-32 mm metal strap anchors spaced not more than 2438 mm o.c., extending over and fastening to 3 joists. Embed anchors at least 102 mm into grouted masonry with ends bent at right angles and extending 102 mm beyond bend.
- .7 Provide solid blocking between joists under jamb studs for openings.
- .8 Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.
 - .1 Provide triple joists separated as above, under partitions receiving ceramic tile and similar heavy finishes or fixtures.
- .9 Provide bridging of type indicated below, at intervals of 2438 mm o.c., between joists.
 - .1 Diagonal wood bridging formed from bevel-cut, 19-by-64 mm actual- size lumber, double-crossed and nailed at both ends to joists.

3.7 CEILING JOIST AND RAFTER FRAMING INSTALLATION

- .1 Ceiling Joists: Install ceiling joists with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.
 - .1 Where ceiling joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail to ends of rafters and to top plate and nail to first joist or anchor with framing anchors or metal straps. Provide 19-by-184 mm actual- size or 38-by-89 mm actual- size stringers spaced 1200 mm o.c. crosswise over main ceiling joists.
- .2 Rafters: Notch to fit exterior wall plates and toe nail or use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.
 - .1 At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and 50 mm deeper. Bevel ends of jack rafters for full bearing against valley rafters.
 - .2 At hips, provide hip rafter of size indicated or, if not indicated, of same thickness as regular rafters and 50 mm deeper. Bevel ends of jack rafters for full bearing against hip rafter.
- .3 Provide collar beams (ties) as indicated or, if not indicated, provide 19-by-140 mm actual size boards between every third pair of rafters, but not more than 1219 mm o.c. Locate below ridge member, at third point of rafter span. Cut ends to fit roof slope and nail to rafters.
- .4 Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions, if any.

3.8 PROTECTION

- .1 Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply borate treatment. Apply borate solution by spraying

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- .1 Types of items described in this Section:
 - .1 Wall sheathing: plywood, gypsum board, and board types.
 - .2 Roof sheathing: plywood and board types.
 - .3 Subflooring: plywood and board types.
 - .4 Underlayment: plywood and board types.
 - .5 Building wrap.
 - .6 Sheathing joint-and-penetration treatment.
 - .7 Flexible flashing at openings in sheathing.

- .2 Types of items you will not find described in this Section:
 - .1 Backing panels for electrical equipment.

1.3 SUBMITTALS

- .1 Product Data: For building wrap, flexible flashings, and joint-and-penetration treatment. Include manufacturer's installation instructions.
- .2 Sustainability Submittals:
 - .1 For adhesives, including printed statement of VOC content.
 - .2 For composite-wood products, documentation indicating that product contains no urea formaldehyde.
 - .3 Chain-of-custody certificates certifying that products specified to be made from certified wood comply with forest certification requirements. Include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.

1.4 QUALITY ASSURANCE

- .1 Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance by a testing and inspecting agency acceptable to authorities having jurisdiction.
- .2 Source Limitations: Obtain building wrap and flexible flashing material from single source.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Stack plywood and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- .1 Lumber: unless specified otherwise, softwood, S4S, moisture content 19% (S-dry) or less in accordance with following standards:
 - .1 CAN/CSA-O141.
 - .2 NLGA Standard Grading Rules for Canadian Lumber.
 - .3 Provide dressed lumber, S4S, unless otherwise indicated.

2.2 WOOD PANEL PRODUCTS, GENERAL

- .1 Plywood panels: to CAN/CSA-O325.0.
- .2 Douglas fir plywood (DFP): to CSA O121, standard construction.
- .3 Canadian softwood plywood (CSP): to CSA O151, standard construction.
- .4 Poplar plywood (PP): to CSA O153, standard construction.
- .5 Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- .6 Factory mark panels to indicate compliance with applicable standard.

2.3 PRESERVATIVE-TREATED LUMBER AND PLYWOOD

- .1 Preservative Treatment by Pressure Process: to CSA O80 Series.
 - .1 Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- .2 Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.
- .3 Application: Treat items specifically indicated on drawings as pressure treated and lumber and plywood in contact with masonry or concrete.

2.4 WALL SHEATHING

- .1 Plywood Wall Sheathing: DFP or CSP sheathing grade or PP standard sheathing grade, T&G edge.
 - .1 Locations: Over wood framing, unless otherwise noted.
- .2 Board Sheathing: NLGA Number 4 common grade or better, 19 mm thick.
 - .1 Location: Only where specified on drawings.
- .3 Glass-Mat Gypsum Wall Sheathing: ASTM C 1177/1177M.
 - .1 Locations: Over steel stud framing and where specifically indicated on drawings.

2.5 ROOF SHEATHING

- .1 Plywood Roof Sheathing: Plywood, DFP or CSP sheathing grade or PP standard sheathing grade, T&G edge.
 - .1 Locations: Typical, unless otherwise indicated.
- .2 Board Sheathing: NLGA Number 3 common grade or better, 19 mm thick.
 - .1 Location: Only where specified on drawings.

2.6 SUBFLOORING AND UNDERLAYMENT

- .1 Plywood Subflooring: Plywood, DFP or CSP sheathing grade or PP standard sheathing grade, T&G edge.
 - .1 Locations: Typical, unless otherwise indicated.
- .2 Board Sub-Floor: NLGA Number 3 common grade or better, 19 mm thick.
 - .1 Location: Only where specified on drawings.
- .3 Underlayment, General: Provide underlayment in nominal thicknesses indicated or, if not indicated, not less than 6.4 mm over smooth subfloors and not less than 9.5 mm over board or uneven subfloors.
- .4 Plywood Underlayment: Plywood, DFP or CSP grade, or PP grade, square edge.
 - .1 Locations: Typical, unless otherwise indicated.
- .5 Board Underlayment: NLGA Number 2 grade or better, 19 mm thick.
 - .1 Location: When specified on drawings.

2.7 FASTENERS

- .1 General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 - .1 For roof and wall sheathing and wood treated with preservative, provide fasteners with hot-dip zinc coating complying with A CAN/CSA-G164 or Type 304 stainless steel.
- .2 Nails, Brads, and Staples: to CSA B111.
- .3 Power-Driven Fasteners: NES NER-272.
- .4 Wood Screws: ASME B18.6.1.
- .5 Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
 - .1 For wall and roof sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
- .6 Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
 - .1 For steel framing from 0.84 to 2.84 mm thick, attach sheathing to comply with ASTM C 954.

2.8 WEATHER-RESISTANT SHEATHING PAPER

- .1 Building Wrap: spunbonded olefin type to CAN/CGSB-51.32.
 - .1 Air leakage rate at 75 Pa air pressure not greater than 0.02 L/s/m².
 - .2 Water vapour transmission of greater than 1100 Ng/Pa.s.m².
 - .3 Water penetration resistance of 200 cm minimum in accordance with AATCC-127.
 - .4 Allowable UV Exposure Time: Not less than three months.
- .2 Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

2.9 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- .1 Sealant for Glass-Mat Gypsum Sheathing Board: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing, and recommended by tape and sheathing manufacturers for use with glass-fibre sheathing tape and for covering exposed fasteners.
- .2 Sheathing Tape for Glass-Mat Gypsum Sheathing Board: Self-adhering glass-fibre tape, minimum 50 mm wide, 390 by 390 or 390 by 780 threads/m , of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing board and with a history of successful in-service use.

2.10 MISCELLANEOUS MATERIALS

- .1 Adhesives for Field Gluing Panels to Framing: Formulation complying with CGSB-71.26, cartridge-loaded, that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.
 - .1 Use adhesives that have a VOC content of 70g/L or less.
- .2 Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.6 mm.
- .3 Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.
- .4 Floor Underlayment Paper: purpose made heavy-weight underlayment flooring paper made from 100% recycled paper products.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- .1 Comply with requirements of NBC 1995 Part 9 supplemented by following paragraphs.
- .2 Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- .3 Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.
- .4 Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
- .5 Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- .6 Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- .7 Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

- .8 Install underlayment floor paper over top of subfloor when either or both the subfloor and the underlayment consist of board lumber.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

- .1 Fastening Methods: Fasten panels as indicated below:
 - .1 Subflooring:
 - .1 Glue and nail to wood framing.
 - .2 Screw to cold-formed metal framing.
 - .3 Space panels 3 mm apart at edges and ends.
 - .4 Install board type sub-flooring at 45 degrees to floor framing.
 - .2 Wall and Roof Sheathing:
 - .1 Nail to wood framing.
 - .2 Screw to cold-formed metal framing.
 - .3 Space panels 3 mm apart at edges and ends.
 - .3 Underlayment:
 - .1 Nail to subflooring.
 - .2 Space panels 0.8 mm apart at edges and ends.
 - .3 Install board-type underlayment perpendicular to the subfloor.
 - .4 Fill and sand edge joints of underlayment receiving resilient flooring right before installing flooring.

3.3 GYPSUM SHEATHING INSTALLATION

- .1 Comply with GA-253 and with manufacturer's written instructions.
 - .1 Fasten gypsum sheathing to wood framing with screws.
 - .2 Fasten gypsum sheathing to cold-formed metal framing with screws.
 - .3 Install boards with a 9.5-mm gap where non-load-bearing construction abuts structural elements.
 - .4 Install boards with a 6.4-mm gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- .2 Apply fasteners so heads bear tightly against face of sheathing boards but do not cut into facing.
- .3 Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each steel stud.
 - .1 Space fasteners approximately 200 mm o.c. and set back a minimum of 9.5 mm from edges and ends of boards.
 - .2 For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.
- .4 Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.
 - .1 Space fasteners approximately 200 mm o.c. and set back a minimum of 9.5 mm from edges and ends of boards.
 - .2 For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

3.4 WEATHER-RESISTANT SHEATHING-PAPER INSTALLATION

- .1 General: Cover sheathing with weather-resistant sheathing paper as follows:

- .1 Cut back barrier 13 mm on each side of the break in supporting members at expansion- or control-joint locations.
 - .2 Apply barrier to cover vertical flashing with a minimum 100 mm overlap, unless otherwise indicated.
 - .2 Building Wrap: Comply with manufacturer's written instructions.
 - .1 Seal seams, edges, fasteners, and penetrations with tape.
 - .2 Extend into jambs of openings and seal corners with tape.
- 3.5 SHEATHING JOINT-AND-PENETRATION TREATMENT
- .1 Seal gypsum board sheathing joints according to sheathing manufacturer's written instructions, except when adhered membrane is scheduled for application directly over top of panel.
 - .1 Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient quantity of sealant to completely cover joints and fasteners after towelling. Seal other penetrations and openings.
- 3.6 FLEXIBLE FLASHING INSTALLATION
- .1 Apply flexible flashing at all framed openings and where indicated to comply with manufacturers written instructions.
 - .1 Prime substrates as recommended by flashing manufacturer.
 - .2 Lap seams and junctures with other materials at least 100 mm, except that at flashing flanges of other construction, laps need not exceed flange width.
 - .3 Lap flashing over weather-resistant building paper at bottom and sides of openings.
 - .4 Lap weather-resistant building paper over flashing at heads of openings.
 - .5 After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- .1 Types of items described in this Section:
 - .1 Interior standing and running trim.
 - .2 Clothes closet shelving and clothes rods.
 - .3 Interior wood frames and jambs.
 - .4 Interior wood stairs intended to be covered with tread and riser covers.
 - .5 Interior wood hand railings.
 - .6 Flush wood panelling and wainscoting.
- .2 Types of items you will not find described in this Section:
 - .1 Shop-fabricated interior woodwork.
 - .2 Wood Panelling as follows
 - .1 Pre-manufactured / proprietary wood panelling system.
 - .2 Board paneling.
 - .3 Plastic-laminate-clad flush paneling.
 - .4 Stile and rail wood paneling.
 - .3 Foam-plastic mouldings.
 - .4 Stair and Landing guards, newel posts, balustrades, and integrated railings.
 - .5 Interior ornamental wood columns.
 - .6 Furring, blocking, and other carpentry work not exposed to view and for structural wood decking and framing exposed to view.
 - .7 Platform framing, headers, partition framing, and other rough framing associated with stairwork
 - .8 Priming, backpriming, and finishing of interior finish carpentry.
 - .9 Stair tread and riser covers.

1.3 DEFINITIONS

- .1 Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - .1 NHLA: National Hardwood Lumber Association.
 - .2 NLGA: National Lumber Grades Authority.

1.4 SUBMITTALS

- .1 Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colours and include construction and application details.
 - .1 Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained. Include chemical treatment manufacturer's written instructions for finishing treated material.
 - .2 Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.

- .3 For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 - .4 Include copies of warranties from chemical treatment manufacturers for each type of treatment.
 - .2 Samples for Verification
 - .1 For each species and cut of lumber and panel products with non-factory-applied finish, with 1/2 of exposed surface finished, 300 sq. cm for lumber and 200 by 250 mm for panels.
 - .3 Sustainability Submittals:
 - .1 Product Data for adhesives and glues used at Project site, including printed statement of VOC content.
 - .2 Product Data for composite-wood products, documentation indicating that product contains no urea formaldehyde.
 - .3 Chain-of-custody certificates certifying that products specified to be made from certified wood comply with forest certification requirements. Include evidence that mill is certified for chain of custody by an FSC-accredited certification body.
 - .1 Include statement indicating costs for each certified wood product.
 - .4 Warranty: Special warranty specified in this Section.
- 1.5 QUALITY ASSURANCE
 - .1 Quality Standard
 - .1 Unless otherwise indicated, comply with AWMAC's "*Architectural Woodwork Quality Standards*" for grades of interior finish carpentry indicated for construction, installation, and other requirements.
 - .2 Forest Certification
 - .1 Provide interior finish carpentry produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "*FSC Principles and Criteria for Forest Stewardship*."
 - .3 Mock-ups
 - .1 Build mock-ups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - .2 Reviewed mock-ups may become part of the completed Work if undisturbed at time of Substantial Completion.
- 1.6 DELIVERY, STORAGE, AND HANDLING
 - .1 Protect materials against weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation within and around stacks and under temporary coverings.
 - .2 Deliver interior finish carpentry materials only when environmental conditions meet requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions meet requirements specified for installation areas.
- 1.7 PROJECT CONDITIONS
 - .1 Environmental Limitations
 - .1 Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

- .2 Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
 - .1 Indications that materials are wet or moisture damaged include, but are not limited to, discolouration, sagging, or irregular shape.
 - .2 Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discolouration.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 General
 - .1 Provide materials that comply with requirements of AWMAC's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- .2 Hardwood Lumber Trim for Transparent Finish (Stain or Clear Finish)
 - .1 Species
 - .1 Refer to drawings.
 - .2 If drawings do not indicate species, provide maple.
 - .2 Forestry Stewardship Council (FSC) certified.
 - .3 Maximum Moisture Content: 13 percent.
 - .4 Finger Jointing: Not allowed.
 - .5 Gluing for Width: Allowed.
 - .6 Veneered Material: Allowed.
 - .7 Face Surface: Surfaced (smooth).
 - .8 Matching: Selected for compatible grain and colour.
- .3 Lumber Trim for Opaque Finish (Painted)
 - .1 Species
 - .1 Refer to drawings.
 - .2 If drawings do not indicate species, provide any closed grain hardwood.
 - .2 Forestry Stewardship Council (FSC) certified.
 - .3 Maximum Moisture Content: 13 percent.
 - .4 Finger Jointing: Allowed.
 - .5 Face Surface: Surfaced (smooth).
 - .6 Optional Material: Primed MDF of same actual dimensions as lumber indicated may be used in lieu of lumber.
- .4 Lumber for Concealed Locations
 - .1 Forest Stewardship Council (FSC) certified.
 - .2 Softwood lumber: to CAN/CSA-O141. Kiln dried to 15 percent maximum moisture content.
 - .1 Wood species: Pine.
 - .3 Hardwood lumber: to National Hardwood Lumber Association (NHLA)
- .5 Veneer-Faced Panel Products (Hardwood Plywood)
 - .1 To HPVA HP-1.
 - .2 Made with adhesive containing no urea formaldehyde.
 - .3 Forestry Stewardship Council (FSC) certified.
 - .4 Wood Species
 - .1 Refer to drawings.
 - .2 If drawings do not indicate wood species, provide maple.
 - .5 Grade: Grade B or better veneer for, unless otherwise noted.

- .6 Medium-Density Fiberboard
 - .1 To ANSI A208.2, Grade MD.
 - .2 Made with binder containing no urea formaldehyde.
 - .3 Provide products made from not less than 80% recycled wood fibre.
- .7 Softwood Plywood
 - .1 Canadian softwood plywood (CSP) to CSA O151, standard construction or better.
 - .2 Made with adhesive containing no urea formaldehyde.
 - .3 Forestry Stewardship Council (FSC) certified.
- .8 Structural Composite Lumber
 - .1 Made from wood veneers with grain primarily parallel to member lengths, to Structural Glued-Laminated Timber CAN/CSA-O122 and manufactured with an exterior-type adhesive containing no urea formaldehyde.
- .9 Furring, Blocking, Shims, and Hanging Strips
 - .1 Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- .10 Anchors
 - .1 Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.
- .11 Adhesives, General
 - .1 Do not use adhesives that contain urea formaldehyde.
 - .2 VOC Limits for Installation Adhesives and Glues
 - .1 Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - .1 Wood Glues: 30 g/L.
 - .2 Contact Adhesive: 250 g/L.

2.2 FABRICATION, GENERAL

- .1 Interior Finish Carpentry Grade: Unless otherwise indicated, provide AWMAC Custom-grade.
- .2 Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- .3 Back out or kerf backs of the following members except those with ends exposed in finished work:
 - .1 Interior standing and running trim except shoe and crown mouldings.
 - .2 Interior wood door frames.

2.3 STANDING AND RUNNING TRIM

- .1 Wood Species
 - .1 Refer to drawings for wood species.
 - .2 If drawings do not indicate wood species, provide maple for transparent finish.
- .2 Sizes and Profiles
 - .1 Refer to drawings.

2.4 CLOTHES CLOSET SHELVING AND CLOTHES RODS

- .1 Wood Species
 - .1 Refer to drawings for wood species.
 - .2 If drawings do not indicate wood species, provide maple for transparent finish.
- .2 Closet Shelving
 - .1 Refer to drawings.
 - .2 If drawings do not indicate requirements, provide 19 mm hardwood plywood with 19x64 mm hardwood nosing.
- .3 Closet Shelf Bulkheads/Gable Ends
 - .1 Refer to drawings.
 - .2 If drawings do not indicate requirements, provide 19 mm hardwood plywood with hardwood edging.
- .4 Shelf Cleats
 - .1 Refer to drawings.
 - .2 If drawings do not indicate requirements, provide 19-by-114 mm boards, hardwood lumber trim for transparent finish.
- .5 Clothes Rods
 - .1 33 mm diameter, chrome-plated steel tubes.
- .6 Rod Flanges
 - .1 Chrome-plated steel or stainless steel.

2.5 INTERIOR WOOD FRAMES AND JAMBS

- .1 Wood Species
 - .1 Refer to drawings for wood species.
 - .2 If drawings do not indicate wood species, provide maple for transparent finish.
- .2 For frames or jambs wider than available lumber, use veneered construction. Do not glue for width.
- .3 Profiles
 - .1 Refer to drawings.
 - .2 If drawings do not describe interior frames and jambs, provide 19 mm thick frames and jambs, 38 mm wide mullions, and 9.5 x 38 mm applied wood stops and glazing beads.

2.6 INTERIOR WOOD STAIRS

- .1 Rough Carriages for Stairs
 - .1 Cut rough carriages from one of the following.
 - .1 Softwood Lumber, No. 1 grade or better.
 - .2 Structural composite lumber, Grade 1700Fb-1.3E; or better.
- .2 Treads
 - .1 Refer to drawings.
 - .2 If drawings do not indicate material, fabricate treads from 38 mm softwood lumber.
 - .3 Groove underside of risers to accept risers.

- .3 Risers
 - .1 Refer to drawings.
 - .2 If drawings do not indicate material, fabricate from 19 mm thick softwood plywood.
- .4 False Stringers
 - .1 Refer to drawings.
 - .2 If drawings do not indicate material, fabricate from 19 mm hardwood plywood. Finish exposed edges with hardwood lumber.

2.7 WOOD HAND RAILS

- .1 Wood Species
 - .1 Refer to drawings for wood species.
 - .2 If drawings do not indicate wood species, provide maple for transparent finish.
- .2 Interior Railings
 - .1 Solid or laminated lumber.
 - .2 Profile and Sizes
 - .1 Refer to drawings.
 - .2 If drawings do not describe interior railings, then provide 40 mm round hardwood railing.
 - .3 Joinery
 - .1 Refer to drawings.
 - .2 If drawings do not describe joinery, then join railings at changes in direction or elevation using mitred cuts and concealed draw bolts.

2.8 FLUSH WOOD PANELING AND WAINSCOTS

- .1 Wood Species and Cut:
 - .1 Duo HDF Wall Panelling, 6x32" size model PANDU 0632-blanc by MUR design or approved alternate.
- .2 Panel-Matching Method: No matching between panels is required. Select and arrange panels as show on drawing and as approved by owners' representative.
- .3 Use largest practical sheets.

2.9 MISCELLANEOUS MATERIALS

- .1 Fasteners for Interior Finish Carpentry
 - .1 Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
- .2 Glue
 - .1 Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.
 - .2 Use wood glue that has a VOC content of 30 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- .3 Multipurpose Construction Adhesive: Formulation complying with ASTM D 3498 that is recommended for indicated use by adhesive manufacturer.
 - .1 Use adhesive that has a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- .2 Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- .3 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- .1 Clean substrates of projections and substances detrimental to application.
- .2 Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours.

3.3 INSTALLATION, GENERAL

- .1 Grade
 - .1 Install interior finish carpentry to comply with requirements for AWMAC Custom grade.
- .2 Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
- .3 Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
 - .1 Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
 - .2 Countersink fasteners, fill surface flush, and sand where face fastening is unavoidable.
 - .3 Install to tolerance of 3 mm in 2438 mm for level and plumb. Install adjoining interior finish carpentry with 0.8-mm maximum offset for flush installation and 1.5-mm maximum offset for reveal installation.
 - .4 Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.
- .4 Preparation for Finishing
 - .1 Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for interior finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

- .1 Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 610 mm long, except where necessary. Stagger joints in adjacent and related standing and running trim. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.
 - .1 Match colour and grain pattern of trim for transparent finish (stain or clear finish) across joints.
 - .2 Install trim after gypsum board joint finishing operations are completed.

- .3 Drill pilot holes in hardwood before fastening to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.

3.5 CLOTHES CLOSET SHELVING AND CLOTHES ROD INSTALLATION

.1 Cleats

- .1 Cut shelf cleats at ends of shelves about 13 mm less than width of shelves and sand exposed ends smooth.
- .2 Install shelf cleats by fastening to framing or backing with finish nails or trim screws, set below face and filled. Space fasteners not more than 400 mm o.c. Use 2 fasteners at each framing member or fastener location for cleats 89 mm actual in width and wider.
 - .1 Apply a bead of multipurpose construction adhesive to back of shelf cleats right before installing. Remove adhesive that is squeezed out immediately after fastening shelf cleats in place.

.2 Shelves

- .1 Cut shelves to neatly fit openings with only enough gap to allow shelves to be removed and reinstalled. Install shelves, fully seated on cleats, brackets, and supports.
- .2 Fasten shelves to cleats with finish nails or trim screws, set flush.

.3 Bulkheads / Gable Ends

- .1 Refer to drawings.
- .2 If drawings do not show end supports for shelves or do not show intermediate supports for shelves longer than 1200 mm in length, then provide unsupported ends of shelves with gable ends and support shelves at 1200 mm o.c. with bulkheads that extend from the floor to the underside of the shelf, fabricated the same width as shelf and secured to the floor with continuous 19 x 19 hardwood cleats all sides.

.4 Rods

- .1 Install rod flanges for rods. Fasten to shelf cleats, framing members, blocking, or metal backing, or use toggle bolts or hollow wall anchors. Install rods in rod flanges.

3.6 INTERIOR WOOD FRAMES AND JAMBS

- .1 Install wood frames and jambs in accordance with the referenced quality standard.

3.7 INTERIOR WOOD STAIRS

.1 False Stringers

- .1 Maintain 75 mm clearance from top edge of false stringer an imagery line running through the leading edge of stair nosings, unless otherwise noted.
- .2 Secure false stringers flat against adjacent stairwell walls using counter sunk finishing nails in exposed locations.
- .3 Use longest practical lengths for false stringers, with seams placed symmetrical along the full length of the flight of stairs.
- .4 Extend false strings out at top and bottom of stairs level with floor a distance of 75 mm from the last nosing, unless otherwise noted.

.2 Rough Carriages

- .1 Securely anchor carriages through false stringers and into supporting substrates.
- .2 Install intermediate rough carriages spaced at no greater than 900 mm o.c.

.3 General

- .1 Glue and screw-fasten treads, risers, and carriage boards securely together to form strong and rigid assembly.
- .2 Ensure riser and tread dimensions do not vary greater than 3 mm from adjacent treads and risers and not more than 6 mm between any treads and risers in any one flight of stairs.

3.8 WOOD HAND RAIL INSTALLATION

- .1 Railings
 - .1 Secure wall rails with metal brackets. Fasten freestanding railings to handrail brackets and to trim at walls with countersunk-head wood screws or rail bolts, and glue. Assemble railings at goosenecks, easements, and splices with rail bolts and glue.
 - .2 Space metal brackets within 300 mm of the end of handrails and of changes in direction, and intermediate brackets symmetrical spaced at no greater than 1200 mm.
 - .3 At turns in the handrail, ensure every segment of handrail is supported by a metal bracket.

3.9 FLUSH WOOD PANELLING AND WAINSCOTING

- .1 Anchor paneling to supporting substrate with concealed face fasteners laid out in a symmetrically pattern; unless otherwise indicated and recommended by manufacturer.
- .2 Install flush paneling with no more than 1.5 mm in 2400 mm vertical cup or bow and 3 mm in 2400 mm horizontal variation from a true plane.
- .3 Provide hardwood battens at all seams and hardwood cap moulding at all exposed edges; unless otherwise indicated.
- .4 Orient wood grain vertically and plumb.

3.10 ADJUSTING

- .1 Replace interior finish carpentry that is damaged or does not comply with requirements. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.11 CLEANING

- .1 Clean interior finish carpentry on exposed and semi-exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

3.12 PROTECTION

- .1 Protect installed products from damage from weather and other causes during remainder of the construction period.
- .2 Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
 - .1 Indications that materials are wet or moisture damaged include, but are not limited to, discolouration, sagging, or irregular shape.
 - .2 Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discolouration.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- .1 Types of items described in this Section:
 - .1 Through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.
 - .2 Fire-resistive joint systems for the following:
 - .1 Floor-to-floor joints.
 - .2 Floor-to-wall joints.
 - .3 Head-of-wall joints.
 - .4 Wall-to-wall joints.
 - .5 Perimeter fire-resistive joint systems consisting of floor-to-wall joints between perimeter edge of fire-resistance-rated floor assemblies and exterior curtain walls.
 - .3 Identification of vertical fire separations.
- .2 Types of items not described in this Section:
 - .1 Expansion control for fire-resistive architectural joint systems.

1.3 DEFINITIONS

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

1.4 PERFORMANCE REQUIREMENTS

- .1 General: For through-penetration through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
- .2 General: Provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly in which fire-resistive joint systems are installed.
- .3 Regulatory Requirements: Provide firestop systems that meet requirements of:
 - .1 ULC S-115-M.
 - .2 Governing codes having local jurisdiction.
- .4 Required Ratings: Provide firestop systems with the following ratings determined per *Regulatory Requirements*:
 - .1 For penetrations through a fire separation or a membrane forming part of an assembly required to have a fire resistance rating provide a firestop system with a *F* Rating, as determined by ULC-S115-M that is equal to the fire resistance rating of the construction being penetrated.

- .2 For penetrations through a Fire Wall or horizontal fire separation provide a firestop system with a *FT* Rating, as determined by ULC-S115-M, that is equal to the fire resistance rating of the construction being penetrated.
- .3 For joints provide a firestop system with an Assembly Rating as determined by ULC-S115-M which is equal to the fire resistance rating of the construction being penetrated.
- .5 Exposure: For firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.
 - .1 For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant firestop systems.
 - .2 For floor penetrations with annular spaces exceeding 100 mm in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
 - .3 For penetrations involving insulated piping, provide firestop systems not requiring removal of insulation.
- .6 Flame Spread and Smoke Classifications: For firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per CAN/ULC-S102.
- .7 Movement: Provide firestop system capable of 50% movement for locations specifically indicated, and 25% movement for all other locations.
- .8 Re-Entry: Provide firestop system capable of enduring periodic re-entry to add or remove penetrating items.
 - .1 For the purposes of this project, cast-in-place materials such as mortars are not considered capable of allowing periodic re-entry. Further, and as an example, removable bricks and pillows would be considered as a firestop material intended to allow re-entry at cable tray penetrations, provided they are in compliance with all other aspects of this specification. Re-entry locations would include but not be limited to those penetrations and sleeves containing or intended to contain wires, conduits, pipes, and cable trays. Locations not intended for re-entry would include cracks, seams, and joints, and seams between wall/floor construction and pipe sleeves or ductwork.

1.5 QUALITY ASSURANCE

- .1 Installer Qualifications: A firm experienced in installing firestop systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its firestop system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.
- .2 Installation Responsibility: Assign installation of firestop systems and fire-resistive joint systems in Project to a single qualified installer.
- .3 Source Limitations: Obtain firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.
- .4 Fire-Test-Response Characteristics: Provide firestop systems that comply with one of the following requirements and those specified in Part 1 *Performance Requirements* Article:
 - .1 Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is cUL or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
 - .2 Firestop systems are identical to those tested per testing standard referenced in Part 1 *Performance Requirements* Article. Provide rated systems complying with the following requirements:
 - .1 Firestop system products bear classification marking of qualified testing and inspecting agency.

- .2 Firestop systems correspond to those indicated by reference to firestop system designations listed by the following:
 - .1 U.L.C Fire Resistance Directory.
- .3 For those firestop applications that exist for which no ULC or cUL tested system is available through a manufacturer, a manufacturer's engineering judgment derived from similar ULC system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineer judgment drawings must follow requirements set forth by the International Firestop Council (September 7, 1994, as may be amended from time to time).

1.6 SUBMITTALS

- .1 Product Data: For each type of product indicated, including manufacturer's specifications and technical data for each material including the composition and limitations, documentation of ULC firestop systems to be used and manufacturer's installation instructions.
- .2 Shop Drawings: For each firestop system, show each type of construction condition penetrated, relationships to adjoining construction and type of penetrating item. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated.
 - .1 Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each firestop system configuration for construction and penetrating items.
 - .2 Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular firestop condition, submit illustration, with modifications marked, approved by firestop system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.
- .3 Firestop System Schedule: Indicate locations of each firestop system, along with the following information:
 - .1 Types of penetrating items.
 - .2 Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.
 - .3 firestop systems for each location identified by firestop design designation of qualified testing and inspecting agency.
- .4 Manufacturer's engineering judgment identification number and drawing details when no ULC system is available for an application. Engineered judgment must include both project name and contractor's name who will install firestop system as described in drawing.
- .5 Sustainability Submittals
 - .1 For penetration firestopping, including printed statement of VOC content and chemical components.
 - .2 For fire-resistive joint systems, including printed statement of VOC content.
- .6 Material Safety Data Sheets for each product delivered to job-site.
- .7 Field quality-control test reports.

1.7 INSTALLER QUALIFICATIONS

- .1 Installer Qualifications: A firm with one of its primary services offered being firestopping, who is experienced in installing firestop systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its firestop system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

- .2 Installation Responsibility: Assign installation of firestop systems and fire-resistive joint systems in Project to a single qualified installer.
- .3 Source Limitations: Obtain firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.
- .4 Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section *Project Management and Coordination*.

1.8 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multicomponent materials.
- .2 Store and handle materials for firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.9 PROJECT CONDITIONS

- .1 Existing Conditions: Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.
- .2 Environmental Limitations: Do not install firestop systems when ambient or substrate temperatures are outside limits permitted by firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- .3 Protection: During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.
- .4 Ventilation: Ventilate firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.
- .5 Flammability: Do not use materials that contain flammable solvents.
- .6 Scheduling:
 - .1 Schedule installation of cast-in-place firestop devices after completion of floor formwork, metal form deck, or composite deck but before placement of concrete.
 - .2 Schedule installation of other firestopping materials after completion of penetrating item installation but prior to covering or concealing of openings.

1.10 COORDINATION

- .1 Coordinate construction of openings and penetrating items to ensure that firestop systems are installed according to specified requirements.
- .2 Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate firestop systems.
- .3 Notify Owner's inspecting agency at least seven days in advance of firestop system installations; confirm dates and times on days preceding each series of installations.

- .4 Do not cover up firestop system installations that will become concealed behind other construction until time as been given to the Owner for the opportunity to review each installation, and has been examined by building inspector, if required by authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- .1 Products: Subject to compliance with requirements, provide one of the firestop systems indicated for each application that are produced by one of the following manufacturers:
 - .1 Hilti.
 - .2 3M.
 - .3 Tremco.

2.2 FIRE STOP SYSTEMS, GENERAL

- .1 Fire stopping and smoke seal systems: in accordance with ULC-S115.
 - .1 Asbestos-free materials and systems capable of maintaining an effective barrier against flame, smoke and gases in compliance with requirements of ULC-S115 and not to exceed opening sizes for which they are intended.
- .2 VOC Content: Provide firestopping that complies with the following limits for VOC content:
 - .1 Architectural Sealants: 250 g/L.
 - .2 Sealant Primers for Nonporous Substrates: 250 g/L.
 - .3 Sealant Primers for Porous Substrates: 775 g/L.
- .3 Fire stopping and smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal.
- .4 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal.
- .5 Primers: to manufacturer's recommendation for specific material, substrate, and end use.
- .6 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.
- .7 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.
- .8 Sealants for vertical joints: non-sagging.

2.3 THROUGH-PENETRATION FIRESTOP SYSTEMS

- .1 Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
- .2 Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 *Performance Requirements* Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:

- .1 Permanent forming/damming/backing materials, including the following:
 - .1 Slag-/rock-wool-fiber insulation.
 - .2 Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
 - .3 Fire-rated form board.
 - .4 Fillers for sealants.
- .2 Temporary forming materials.
- .3 Substrate primers.
- .4 Collars.
- .5 Steel sleeves.

2.4 FIRE-RESISTIVE JOINT SYSTEMS

- .1 Compatibility: Provide fire-resistive joint systems that are compatible with joint substrates, under conditions of service and application, as demonstrated by fire-resistive joint system manufacturer based on testing and field experience.
- .2 Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to comply with Part 1 *Performance Requirements* Article. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing and inspecting agency for systems indicated.

2.5 MIXING

- .1 For those products requiring mixing before application, comply with firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

2.6 IDENTIFICATION

- .1 Fire Stop Labels: metal or plastic, no bigger than 40 x 75 mm in size.
 - .1 Include the following information on labels:
 - .1 The words *Warning - Firestop System - Do Not Disturb. Notify Building Management of Any Damage.*
 - .2 Firestop system designation of applicable testing and inspecting agency.
 - .3 Date of installation.
 - .4 Through-penetration firestop system manufacturer's name.
- .2 Vertical fire separations: conventional latex spray paint, bright red colour.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of work.
 - .1 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- .1 Surface Cleaning: Clean out openings immediately before installing firestop systems to comply with firestop system manufacturer's written instructions and with the following requirements:
 - .1 Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of firestop systems.
 - .2 Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestop systems. Remove loose particles remaining from cleaning operation.
 - .3 Remove laitance and form-release agents from concrete.
- .2 Priming: Prime substrates where recommended in writing by firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- .3 Masking Tape: Use masking tape to prevent firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 COORDINATION

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

3.4 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

- General: Install through-penetration firestop systems to comply with Part 1 *Performance Requirements* Article, Part 1 *Quality Assurance* Article, and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.
- .1 Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - .1 After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
 - .2 Install fill materials for firestop systems by proven techniques to produce the following results:
 - .1 Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 - .2 Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - .3 For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.5 FIRE-RESISTIVE JOINT SYSTEM INSTALLATION

- .1 General: Install fire-resistive joint systems to comply with Part 1 *Performance Requirements* Article and fire-resistive joint system manufacturer's written installation instructions for products and applications indicated.

- .2 Install forming/packing/backing materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
- .3 Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:
 - .1 Fill voids and cavities formed by openings and forming/packing/backing materials as required to achieve fire-resistance ratings indicated.
 - .2 Apply fill materials so they contact and adhere to substrates formed by joints.
 - .3 For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.6 FIELD QUALITY CONTROL

- .1 Inspection and Certification by Manufacturer's Representative:
 - .1 Inspecting of completed installations of fire-resistive joint systems shall take place in successive stages as installation of fire-resistive joint systems proceeds. Do not proceed with installation of joint systems for the next area until Manufacturer's representative determines completed work shows compliance with requirements.
 - .2 Inspecting agency shall state in each report whether inspected fire-resistive joint systems comply with or deviate from requirements.
- .2 Remove and replace fire-resistive joint systems where inspections indicate that they do not comply with specified requirements.
- .3 Additional inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- .4 Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and fire-resistive joint systems comply with requirements.
 - .1 Have the manufacture's representative Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.
 - .2 Have manufacturer's representative undertake destructive testing on a minimum of 10 suspect fire stop installations or 3 percent of the total number of installations, whichever is greater; or where there are insufficient suspect installations then, randomly selected installations. If more than 25% of the tests are below contract requirements, undertake destructive testing on an additional 3% of the installations. If then more than 12.5% of the total number of tests is below contract requirements, remove all firestopping installations throughout the project and reinstall new throughout, at no additional cost to the Owner, and repeat destructive testing procedures all over again.
 - .3 Reinstate those areas that have undergone destructive testing.
 - .4 Based on results of destructive testing, undertake any remedial action to other fire stop installations that are recommended by the manufacturer's representative to insure compliance with the Contract requirements.
 - .5 Reinspect reinstated work and remedial work.
 - .6 When all reinstated and remedial work is completed and reinspected, have manufacturer's representative provide the following signed certification:
 - .1 *This is to certify that I have reviewed the Contract Documents and have reviewed each and every individual firestop installation installed under this Contract, and I am of the opinion that for each installation it is of the appropriate type and it has been installed in accordance with the manufacturer's installation instructions.*
- .5 Inspections by Authorities Having Jurisdiction:
 - .1 Keep areas of work accessible until inspection by applicable code authorities.

- .6 Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.

3.7 ADJUSTING AND CLEANING

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

3.8 IDENTIFICATION

- .1 Identify firestop systems with preprinted metal or plastic labels, 40 x 65 mm. Attach labels permanently to surfaces adjacent to and within 150 mm of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. For plastic labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and, in combination with label material, will result in partial destruction of label if removal is attempted. Include the following information on labels:
 - .1 The words *Warning - Firestop System - Do Not Disturb. Notify Building Management of Any Damage.*
 - .2 Contractor's name, address, and phone number.
 - .3 Firestop system designation of applicable testing and inspecting agency.
 - .4 Date of installation.
 - .5 Through-penetration firestop system manufacturer's name.
 - .6 Installer's name.

3.9 IDENTIFICATION OF VERTICAL FIRE SEPARATIONS

- .1 Identify all vertical fire separations using spray paint and 25 mm stencilled lettering.
- .2 Wording:
 - .1 For non-rated fire separations *This partition designed as a non-rated fire separation.*
 - .2 For ¾ hour rated fire separations *This partition designed as a ¾ hour fire separation.*
 - .3 For 1 hour rated fire separations *This partition designed as a 1 hour fire separation.*
 - .4 For 2 hour rated fire separations *This partition designed as a 2 hour fire separation.*
- .3 Placement:
 - .1 Rooms with finished ceilings: Place label above finished ceiling within 50 mm of where the wall intersects the floor/roof deck above..
 - .2 M&E, storage, and industrial rooms with no finished ceilings: Place label within 50 mm of where the wall intersect the floor/roof deck above.
 - .3 Finished spaces with no ceilings; Review with Engineer for location of labelling prior to starting work.
- .4 Spray lettering on either side of vertical fire separation. Repeat lettering every 10 metres on each side of separation, with a minimum of one set of labelling for every segment of fire separation. Insure lettering is level and in alignment with each other.

3.10 CLEANING AND PROTECTING

- .1 Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by firestop system manufacturers and that do not damage materials in which openings occur.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- .1 Types of items described in this Section:
 - .1 Silicone joint sealants.
 - .2 Urethane joint sealants.
 - .3 Polysulfide joint sealants.
 - .4 Latex joint sealants.
 - .5 Solvent-release-curing joint sealants.
 - .6 Preformed joint sealants.
 - .7 Acoustical joint sealants.
 - .8 Security grade sealants used inside secure blocks inside detention facilities.
- .2 Types of items you will not find described in this Section:
 - .1 Masonry control and expansion joint fillers and gaskets.
 - .2 Building expansion joints.
 - .3 Sealing joints in fire-resistance-rated construction.
 - .4 Structural and other glazing sealants.
 - .5 Plastic glazing sealants.
 - .6 Sealing perimeter joints and penetrations at gypsum veneer plastering
 - .7 Sealing perimeter joints at gypsum board.
 - .8 Sealing tile joints.
 - .9 Sealing edge mouldings at perimeters with acoustical sealant at acoustical panel ceilings and acoustical tile ceilings.
 - .10 Sealing joints in pavements, walkways, and curbing.

1.2 SUBMITTALS

- .1 Product Data: For each joint-sealant product indicated.
- .2 Samples for Initial Selection: Manufacturer's colour charts consisting of strips of cured sealants showing the full range of colours available for each product exposed to view.
- .3 Joint-Sealant Schedule: Include the following information:
 - .1 Joint-sealant application, joint location, and designation.
 - .2 Joint-sealant manufacturer and product name.
 - .3 Joint-sealant formulation.
 - .4 Joint-sealant colour.
- .4 Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.
- .5 Warranties: Sample of special warranties.

1.3 QUALITY ASSURANCE

- .1 Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.
- .2 Mock-ups: Install sealant in mock-ups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

- .3 Preinstallation Conference: Conduct conference at Project site.

1.4 PROJECT CONDITIONS

- .1 Do not proceed with installation of joint sealants under the following conditions:
 - .1 When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 5 deg C.
 - .2 When joint substrates are wet.
 - .3 Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - .4 Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.5 WARRANTY

- .1 Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - .1 Warranty Period: Two years from date of Substantial Completion.
- .2 Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
 - .1 Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 - .2 Disintegration of joint substrates from natural causes exceeding design specifications.
 - .3 Mechanical damage caused by individuals, tools, or other outside agents.
 - .4 Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- .1 Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- .2 VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when:
 - .1 Architectural Sealants: 250 g/L.
 - .2 Sealant Primers for Nonporous Substrates: 250 g/L.
 - .3 Sealant Primers for Porous Substrates: 775 g/L.
- .3 Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
 - .1 Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.
- .4 Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

.5 Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

.6 Colours of Exposed Joint Sealants: As selected by Owner's Representative from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

.1 Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.

.2 Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT.

.3 Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

.4 Single-Component, Nonsag, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

.5 Single-Component, Nonsag, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use T.

.6 Single-Component, Pourable, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade P, Class 100/50, for Use T.

.7 Multicomponent, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type M, Grade NS, Class 50, for Use NT.

.8 Multicomponent, Pourable, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type M, Grade P, Class 100/50, for Use T.

.9 Mildew-Resistant, Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

.10 Mildew-Resistant, Single-Component, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

2.3 URETHANE JOINT SEALANTS

.1 Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.

.2 Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT.

.3 Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

.4 Single-Component, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use T.

.5 Single-Component, Pourable, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type S, Grade P, Class 25, for Use T.

- .6 Multicomponent, Nonsag, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 50, for Use NT.
- .7 Multicomponent, Nonsag, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use NT.
- .8 Multicomponent, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 50, for Use T.
- .9 Multicomponent, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use T.
- .10 Immersible, Single-Component, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Uses T and I.
- .11 Immersible, Single-Component, Pourable, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type S, Grade P, Class 25, for Uses T and I.
- .12 Immersible Multicomponent, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Uses T and I.
- .13 Immersible Multicomponent, Pourable, Traffic-Grade, Urethane Joint Sealant: ASTM C 920. Type M, Grade P, Class 25, for Use T and I.

2.4 LATEX JOINT SEALANTS

- .1 Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

2.5 SOLVENT-RELEASE-CURING JOINT SEALANTS

- .1 Acrylic-Based Joint Sealant: ASTM C 1311.
- .2 Butyl-Rubber-Based Joint Sealant: ASTM C 1311.

2.6 SECURITY SEALANTS

- .1 Pick-Proof Sealant Two Part: high-strength, high-modulus, non-sag epoxy gel adhesive:
 - .1 Meeting or exceeding the following:
 - .1 Consistency: 0 (no flow).
 - .2 Shore D: 90.
 - .3 Pot Life: 35 minutes at 77 25 degrees C.
 - .4 Bond Strength, 2-Day Cure: 15.4 MPa per ASTM C 882.
 - .5 Bond Strength, 14-Day Cure: 17.0 MPa per ASTM C 882.
 - .6 Water Absorption: 0.63 percent per ASTM D 570.
 - .7 Linear Coefficient of Shrinkage: 0.0007 percent.
 - .8 Compressive Strength: 77.5 MPa per ASTM D 695.
 - .9 Compressive Modulus: 1,725 MPa per ASTM D 695.
 - .10 Elongation at Break: 2.56 percent per ASTM D 638.
 - .11 Shear Strength: 24.5 MPa per ASTM D 732.
 - .12 Flexural Strength: 38.5 MPa minimum, per ASTM D 790.
 - .2 Consisting of:
 - .1 Component A: Modified epoxy resin adhesive of epichlorohydrin bisphenol type A, containing suitable viscosity control agents and pigments.

- .2 Component B: Reaction product of a selected blend of amines with an epoxy resin of epichlorohydrin bisphenol type A, containing suitable viscosity control agents, pigments and accelerators.
- .3 Mixing Ratio: 2:1 by volume, Component A to Component B.
- .3 Acceptable Material:
 - .1 Sonocrete Epogel by Sonneborn, www.chemrex.com, tel 1.800.433.9517.
 - .2 Alternative Products: Approved by addendum in accordance with the General Instructions to Bidders.

2.7 PREFORMED JOINT SEALANTS

- .1 Preformed Silicone Joint Sealants: Manufacturer's standard sealant consisting of precured low-modulus silicone extrusion, in sizes to fit joint widths indicated, combined with a neutral-curing silicone sealant for bonding extrusions to substrates.
- .2 Preformed Foam Joint Sealant: Manufacturer's standard preformed, precompressed, open-cell foam sealant manufactured from urethane foam with minimum density of 160 kg/cu. m and impregnated with a nondrying, water-repellent agent. Factory produce in precompressed sizes in roll or stick form to fit joint widths indicated; coated on one side with a pressure-sensitive adhesive and covered with protective wrapping.

2.8 ACOUSTICAL JOINT SEALANTS

- .1 Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

2.9 JOINT SEALANT BACKING

- .1 General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- .2 Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) Type O, (open-cell material), Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- .3 Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.10 MISCELLANEOUS MATERIALS

- .1 Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- .2 Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- .3 Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- .2 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- .1 Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - .1 Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - .2 Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - .1 Concrete.
 - .2 Masonry.
 - .3 Unglazed surfaces of ceramic tile.
 - .4 Exterior insulation and finish systems.
 - .3 Remove laitance and form-release agents from concrete.
 - .4 Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - .1 Metal.
 - .2 Glass.
 - .3 Porcelain enamel.
 - .4 Glazed surfaces of ceramic tile.
- .2 Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- .3 Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- .1 General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- .2 Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

- .3 Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - .1 Do not leave gaps between ends of sealant backings.
 - .2 Do not stretch, twist, puncture, or tear sealant backings.
 - .3 Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- .4 Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- .5 Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - .1 Place sealants so they directly contact and fully wet joint substrates.
 - .2 Completely fill recesses in each joint configuration.
 - .3 Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- .6 Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - .1 Remove excess sealant from surfaces adjacent to joints.
 - .2 Use tooling agents that are approved in writing by sealant manufacturer and that do not discolour sealants or adjacent surfaces.
 - .3 Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
 - .4 Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.
 - .5 Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.
 - .1 Use masking tape to protect surfaces adjacent to recessed tooled joints.
- .7 Installation of Preformed Silicone-Sealant System: Comply with the following requirements:
 - .1 Apply masking tape to each side of joint, outside of area to be covered by sealant system.
 - .2 Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's written instructions and covering a bonding area of not less than 10 mm . Hold edge of sealant bead 6 mm inside masking tape.
 - .3 Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
 - .4 Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.
- .8 Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping. Do not pull or stretch material. Produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures, apply heat to sealant in compliance with sealant manufacturer's written instructions.
- .9 Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 CLEANING

- .1 Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- .1 Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

- .1 Joint-Sealant Colour: As selected by Owner's Representative from manufacturer's full range of colours.
- .2 For police detachment projects use only Security Sealants inside cell block.
- .3 Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.
 - .1 Joint Locations:
 - .1 Isolation and contraction joints in cast-in-place concrete slabs.
 - .2 Tile control and expansion joints.
 - .3 Joints between different materials listed above.
 - .4 Other joints as indicated.
 - .2 Joint Sealant: any one of the following:
 - .1 Silicone Joint Sealant: Single component, nonsag, traffic grade, neutral curing; Single component, pourable, traffic grade, neutral curing.
 - .2 Urethane Joint Sealant: Single component, nonsag, traffic grade; Single component, pourable, traffic grade; Multicomponent, nonsag, traffic grade, Class 50; Multicomponent, nonsag, traffic grade, Class 25.
 - .3 Preformed Joint Sealant: Preformed foam sealant.
- .4 Joint-Sealant Application: Exterior joints in horizontal traffic surfaces subject to water immersion.
 - .1 Joint Locations:
 - .1 Joints in pedestrian plazas.
 - .2 Joints in swimming pool decks.
 - .3 Other joints as indicated.
 - .2 Joint Sealant: any one of the following:
 - .1 Urethane Joint Sealant: Immersible, single component, nonsag, traffic grade; Immersible, single component, pourable, traffic grade; Immersible, multicomponent, nonsag, traffic grade; Immersible, multicomponent, pourable, traffic grade.
- .5 Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
 - .1 Joint Locations:
 - .1 Construction joints in cast-in-place concrete.
 - .2 Joints between plant-precast architectural concrete units.
 - .3 Control and expansion joints in unit masonry.
 - .4 Joints in dimension stone cladding.
 - .5 Joints in glass unit masonry assemblies.
 - .6 Joints in exterior insulation and finish systems.
 - .7 Joints between metal panels.
 - .8 Joints between different materials listed above.

- .9 Perimeter joints between materials listed above and frames of doors windows and louvers.
- .10 Control and expansion joints in ceilings and other overhead surfaces.
- .11 Other joints as indicated.
- .2 Joint Sealant: any one of the following:
 - .1 Silicone Joint Sealant: Single component, nonsag, neutral curing, Class 100/50; Single component, nonsag, neutral curing, Class 50; Single component, nonsag, acid curing; Multicomponent, nonsag, neutral curing.
 - .2 Urethane Joint Sealant: Single component, nonsag, Class 100/50; Single component, nonsag, Class 50; Multicomponent, nonsag, Class 50.
 - .3 Preformed Joint Sealant: Preformed silicone; Preformed foam.
- .6 Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
 - .1 Joint Locations:
 - .1 Isolation joints in cast-in-place concrete slabs.
 - .2 Control and expansion joints in stone flooring.
 - .3 Control and expansion joints in brick flooring.
 - .4 Control and expansion joints in tile flooring.
 - .5 Other joints as indicated.
 - .2 Joint Sealant: any one of the following:
 - .1 Silicone Joint Sealant: Single component, nonsag, traffic grade, neutral curing; Single component, pourable, traffic grade, neutral curing; Multicomponent, pourable, traffic grade, neutral curing.
 - .2 Urethane Joint Sealant: Single component, nonsag, traffic grade; Single component, pourable, traffic grade; Multicomponent, nonsag, traffic grade, Class 50.
 - .3 Preformed Joint Sealant: Preformed foam.
- .7 Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.
 - .1 Joint Locations:
 - .1 Control and expansion joints on exposed interior surfaces of exterior walls.
 - .2 Perimeter joints of exterior openings where indicated.
 - .3 Tile control and expansion joints.
 - .4 Vertical joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
 - .5 Joints on underside of plant-precast structural concrete beams and planks.
 - .6 Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
 - .7 Other joints as indicated.
 - .2 Joint Sealant: any one of the following:
 - .1 Latex.
 - .2 Acrylic based.
 - .3 Butyl rubber based.
- .8 Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
 - .1 Joint Sealant Location:
 - .1 Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - .2 Tile control and expansion joints where indicated.
 - .3 Other joints as indicated.
 - .2 Joint Sealant: Any one of the following:
 - .1 Silicone Joint Sealant: Mildew resistant, single component, nonsag, neutral curing; Single component, nonsag, mildew resistant, acid curing.
- .9 Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces.
 - .1 Joint Location:
 - .1 Acoustical joints where indicated.

- .2 Other joints as indicated.
- .2 Joint Sealant: Acoustical.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- .1 Types of items described in this Section:
 - .1 Steel frame products including frames, transom frames (glazed or paneled), sidelight and window assemblies, fire-rated and non-rated.
 - .2 Steel panels, fixed or removable, flush or rebated, similar in construction to steel doors, for use in steel frame product.
 - .3 Steel doors, swing type, flush, with or without embossed face sheets, with or without glazed or louvered openings, fire-rated, with or without temperature rise ratings, and non-rated.
- .2 Types of items you will not find described in this Section:
 - .1 Unit Masonry for embedding anchors for hollow metal work into masonry construction.
 - .2 Hollow metal doors and frames manufactured from stainless steel.
 - .3 Detention Doors and Frames.
 - .4 Sound Control Door Assemblies for packaged, acoustical hollow metal door and frame assemblies with STC ratings of 35 or more.
 - .5 Door Hardware.
 - .6 Field painting hollow metal doors and frames.
 - .7 Lead-lined, hollow metal doors and frames.
 - .8 Electrical connections including conduit and wiring for door controls and operators.

1.2 DEFINITIONS

- .1 Minimum Thickness: Minimum thickness of base metal without coatings.

1.3 SUBMITTALS

- .1 Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, and finishes.
- .2 Shop Drawings: Include the following:
 - .1 Elevations of each door design.
 - .2 Details of doors, including vertical and horizontal edge details and metal thicknesses.
 - .3 Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - .4 Locations of reinforcement and preparations for hardware.
 - .5 Details of each different wall opening condition.
 - .6 Details of anchorages, joints, field splices, and connections.
 - .7 Details of accessories.
 - .8 Details of mouldings, removable stops, and glazing.
 - .9 Details of conduit and preparations for power, signal, and control systems.
- .3 Other Action Submittals:
 - .1 Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.
- .4 Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labelled assemblies.

1.4 QUALITY ASSURANCE

- .1 Except as otherwise specified, comply with requirements of Canadian Manufacturing Standards for Steel Doors and Frames published by the Canadian Steel Door and Frame Manufacturers' Association.
- .2 Source Limitations: Obtain hollow metal work from single source from single manufacturer.
- .3 Fire-Rated Door Assemblies: Assemblies complying with CAN4-S104-M that are listed and labelled by a qualified testing agency, for fire-protection ratings indicated.
 - .1 Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labelled fire-rated door assemblies except for size.
- .4 Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with CAN4-S104-M that are listed and labelled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated. Label each individual glazed lite.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
 - .1 Provide additional protection to prevent damage to finish of factory-finished units.
- .2 Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- .3 Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 102 mm high wood blocking. Do not store in a manner that traps excess humidity.
 - .1 Provide minimum 6 mm space between each stacked door to permit air circulation.

1.6 PROJECT CONDITIONS

- .1 Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

- .1 Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Steel
 - .1 Commercial grade steel to ASTM A924-97 (M-97), galvanized to ASTM A653-97 (M-97), Commercial Steel (CS), Type B, A40 (ZF120) minimum unless otherwise noted.
 - .2 Minimum steel thicknesses shall be in accordance with Appendix 1 of the CSDMA, *Recommended Specifications for Commercial Steel Door and Frame Products*.

.2 Door Core Materials

- .1 Honeycomb: Structural small cell 25.4 mm maximum kraft paper 'honeycomb'. Weight: 36.3 kg per ream minimum, density: 16.5 kg/m³ minimum, sanded to required thickness.
- .2 Fibreglass: Loose batt type, density 24 kg/m³ minimum, conforming to ASTM C553 or ASTM C592.
- .3 Polystyrene: Rigid extruded, fire retardant, closed cell board, Type 1, density: 16 to 32 kg/m³, thermal values: RSI 1.06 (R 6.0) minimum, conforming to ASTM C578.
- .4 Polystyrene: Rigid extruded fire retardant, closed cell board. Density: 16 to 32 kg/m³, thermal values; RSI 1.0 (R 6.0) minimum, Type 1, in accordance with ASTM C578.
- .5 Polyisocyanurate: Rigid foam. closed cell, faced board, thermal value: RSI 2.17 (R12.3) minimum, conforming to ASTM C1289

2.2 MISCELLANEOUS

.1 Primers

- .1 Rust inhibitive touch-up only.

.2 Door Silencers

- .1 Single stud rubber/neoprene type.

.3 Exterior Top Caps

- .1 Rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19MA.

.4 Frame Thermal Breaks

- .1 Rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19MA.

.5 Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

.6 Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.

.7 Grout: ASTM C 476, except with a maximum slump of 102 mm, as measured according to ASTM C 143/C 143M.

.8 Glazing: Comply with requirements in Division 08 Section *Glazing*.

.9 Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 0.4 mm dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibres, sulphur components, and other deleterious impurities.

2.3 FABRICATION – GENERAL

.1 Manufacturer door and frame products in accordance with the CSDMA's, *Recommended Dimensional Standards for Commercial Steel Doors and Frames*.

.2 Selected Door and Frame Requirements, unless noted otherwise (uno)

Item	Location		
	Interior, Unless noted otherwise	Exterior, Unless noted otherwise	Steel Stiffened, where noted
Steel Coating	A40 (ZF120) minimum; uno.	A40 (ZF120) minimum, uno. Provide G90 (Z275) coating where noted.	A40 (ZF120) minimum, uno. Provide G90 (Z275) coating where noted.
Doors			
Duty / Min. Steel Thickness	Medium duty / 1.3 mm (18 gauge nominal); uno.	Heavy duty / 1.6 mm (16 gauge nominal); uno.	Extra heavy duty / 2.0 mm (14 gauge nominal), uno.
Design	Flush panel, uno.	Flush panel, uno.	Flush panel, uno
Core,	Stiffened, insulated and sound deadened with hon- eycomb core laminated under pressure to each face sheet; uno.	Stiffened, insulated and sound deadened with poly- styrene or polyisocyanurate core laminated under pres- sure to each face sheet; uno.	Internally reinforced with continuous interlocking steel stiffeners at 150 mm on centre, securely welded to each face sheet at 150 mm on centre maximum, with voids between stiffen- ers filled and sound dead- ened with 24 kg/m3 loose batt type fibreglass materi- al.
Longitudinal Seams	Mechanically interlocked, adhesive assisted with edge seams tack welded, filled and sanded flush with no visible seam; uno.	Mechanically interlocked, adhesive assisted with edge seams tack welded, filled and sanded flush with no visible seam; uno.	Continuously welded the full height of the door filled and ground smooth with no visible seams.
Caps	None, uno.	PVC, uno. Provide steel caps where noted.	Steel cap.
Thermally Broken?	No	No, uno.	No.
Frames			
Duty / Min. Steel Thickness	Medium duty / 1.3 mm (18 gauge nominal); uno. Standard duty / 1.0 mm 20 gauge nominal) for hollow core doors.	Heavy duty / 1.6 mm (16 gauge nominal); uno.	Heavy duty / 1.6 mm (16 gauge nominal); uno.
Construction	Full face, punch-mitred, or saw mitred welded con- struction; uno.	Full face welded construc- tion.	Full face welded construc- tion.
Thermally Broken?	No	No, uno.	No.

2.4 FABRICATION - FRAME PRODUCTS
.1 General

- .1 Provide frame mortised, blanked, reinforced, drilled, and tapped at the factory for templated hardware only, in accordance with the approved hardware schedule and templates provided by the hardware supplier.
- .2 Protect mortised cut-outs with steel guard boxes except for dry wall applications.
- .3 Reinforce frame where required, for surface mounted hardware, anchor hinges, thrust pivots, pivot reinforced hinges, or non-templated hardware.
- .4 Provide anchorage appropriate to floor, wall, and frame construction. Each wall anchor shall be located immediately above or below each hinge reinforcement on the hinge jamb and directly opposite on the strike

jamb. For rebate opening heights up to and including 1520 mm provide two anchors, and an additional anchor for each additional 760 mm of height or fraction thereof, except as indicated below. Frames in previously placed concrete, masonry, or structural steel shall be provided with anchors located not more than 150 mm from the top and bottom of each jamb, and intermediate anchors at 660 mm on centre maximum. Fasteners for such anchors shall be provided by others.

- .5 Provide minimum reinforcing, anchor and other component gauges in accordance with Table 1 of the CSDMA, *Recommended Specifications for Commercial Steel Door and Frame Products*.
- .6 Prepare each door opening for single stud rubber door silencers, three 3 for single
- .7 Provide fire-rated frame products for those openings requiring fire protection. Provide frames, transom and sidelight assemblies listed for conformance with CAN4-S104. Provide window assemblies listed for conformance with CAN4-S106. Ensure all fire-rated frame products bear the label of, and be listed by a nationally recognized testing agency having a factory inspection service. Labelling shall be in accordance with NFPA 80, the listing authority's policies and label materials, and identify the manufacturer. Construct fire-rated frame products as listed for labelling in the Follow-Up Service Procedures/Factory Inspection Manuals issued by the listing agency to individual manufacturers.
- .8 For each grade frame indicated from a steel sheet having a minimum thickness of:
 - .1 Standard Duty grade frames: 1.0 mm
 - .2 Medium Duty grade frames: 1.3 mm
 - .3 Heavy Duty and Extra Heavy Duty grade frames: 1.6 mm

.2 Welded Type

- .1 Accurately mitre or mechanically join frame products.
- .2 Ensure frame product perimeter corner joints shall be as defined in Appendix 2 of the CSDMA, *Recommended Specifications for Commercial Steel Door and Frame Products*, and as follows
 - .1 Profile welded; punch-mitred - continuously welded on the profile faces, rabbets, returns and soffit intersections, or saw-mitred - continuously welded on the profile faces, rabbets, returns, stops and soffit intersections. Punch or saw-mitred, at the manufacturer's discretion. All profile welded frame product exposed faces shall be filled and ground to a smooth, uniform, seamless surface.
 - .2 Face welded; continuously welded on the profile faces, with exposed faces filled and ground to a smooth, uniform, seamless surface.
 - .3 Tack welded; welded on the faces and returns, with exposed hairline joint intersections.
- .3 Ensure joints at mullions, sills and center rails are:
 - .1 Coped accurately, butted and tightly fitted.
 - .2 At intersecting flush profile faces, securely welded, filled and ground to a smooth, uniform, seamless surface.
 - .3 At intersecting recessed profile faces, securely welded to concealed reinforcements, with exposed hairline face seams.
 - .4 At all other intersecting profile elements have exposed hairline face seams.
- .4 Welding: to CSA W59.
- .5 Ensure a floor anchor is securely attached to the inside of each jamb profile where frame product is to be installed prior to the adjacent partition. Provide each floor anchor s with two holes for securing to the floor. For conditions that do not permit the use of a floor anchor, substitute with an additional wall anchor, located within 150 mm of the base of the jamb.
- .6 Weld in two temporary jamb spreaders per door opening to maintain proper alignment during shipment and handling. Do not be used for installation.
- .7 Form glazing stops from steel channel, minimum 16 mm height, accurately fitted, butted at corners and fastened to frame sections with counter-sunk oval head sheet metal screws.

- .8 When required due to site access or due to shipping limitations, fabricate frame product for large openings in sections as designated on the submittal drawings, with splice joints for field assembly and welding.
- .9 Prior to shipment, mark each frame product with an identification number as shown on submittal drawings.
- .3 Knocked-Down Type
 - .1 Ship knocked-down type frames unassembled.
 - .2 Ensure frames have mechanical joints which inter-lock securely and provide functionally satisfactory performance when assembled and installed in accordance with the manufacturer's published instructions.
 - .3 Where frame product is to be installed prior to the adjacent partition, securely attach a floor anchor to the inside of each jamb profile. Provide each floor anchor with two 2 holes for securing to the floor. For conditions that do not permit the use of a floor anchor, substitute with an additional wall anchor, located within 150 mm of the base of the jamb.
 - .4 Prior to shipment, mark each frame product with an identification number as shown on submittal drawings.
- 2.5 FABRICATION - DOORS
 - .1 General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with requirements of Canadian Manufacturing Standards for Steel Doors and Frames published by the Canadian Steel Door and Frame Manufacturers' Association except as noted.
 - .1 Longitudinal Edge Profile:
 - .1 Vertical Edges for Single-Acting Doors: Manufacturer's standard.
 - .2 Vertical Edges for Double-Acting Doors: Round vertical edges with 54 mm radius.
 - .2 Provide doors mortised, blanked, reinforced, drilled and tapped at the factory for templated hardware only, in accordance with the approved hardware schedule and templates provided by the hardware supplier.
 - .3 Factory prepare holes 12.7 mm diameter and larger, except for mounting and through-bolt holes.. Factory-prepare holes less than 12.7 mm when required for the function of the device (for knob, lever, cylinder, thumb or turn pieces) or when these holes over-lap function holes.
 - .4 Reinforce doors where required for surface mounted hardware, anchor hinges, thrust pivots, pivot reinforced hinges, or non-templated hardware.
 - .5 Provide top and bottom of doors with inverted, recessed, welded steel channels.
 - .6 Provide minimum reinforcing and component gauges in accordance with Table 1 of the CSDMA, *Recommended Specifications for Commercial Steel Door and Frame Products*.
 - .7 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.
 - .8 Provide fire-rated doors for those openings requiring fire protection. Provide products listed for conformance with CAN4-S104. Provide fire-rated doors bearing label of, and be listed by a nationally recognized testing agency having a factory inspection service. Labelling shall be in accordance with NFPA 80, the listing authority's policies and label materials, and shall identify the manufacturer. Construct fire-rated doors as listed for labelling in the Follow-Up Service Procedures/Factory Inspection Manuals issued by the listing agency to individual manufacturers.
 - .9 Prior to shipment, mark each door with an identification number as shown on the submittal drawings.
 - .10 For each grade door indicated form both face sheets for doors from a steel sheet having a minimum thickness of:
 - .1 Standard Duty grade doors: 1.0 mm
 - .2 Medium Duty grade doors: 1.3 mm
 - .3 Heavy Duty grade doors: 1.6 mm
 - .4 Extra Heavy Duty grade doors: 2.0 mm
- 2.6 HOLLOW METAL PANELS
 - .1 Provide hollow metal panels of same materials, construction, and finish as specified for adjoining hollow metal doors.

2.7 FRAME ANCHORS

.1 Jamb Anchors:

- .1 Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 1.0 mm thick, with corrugated or perforated straps not less than 50 mm wide by 250 mm long; or wire anchors not less than 4.5 mm thick.
- .2 Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 1.0 mm thick.
- .3 Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
- .4 Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 9.5 mm diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

.2 Floor Anchors: Formed from same material as frames, not less than 1.0 mm thick, and as follows:

- .1 Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
- .2 Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 50 mm height adjustment. Terminate bottom of frames at finish floor surface.

2.8 STOPS AND MOULDINGS

- .1 Mouldings for Glazed Lites in Doors: Minimum 0.8 mm thick, fabricated from same material as door face sheet in which they are installed.
- .2 Fixed Frame Mouldings: Formed integral with hollow metal frames, a minimum of 16 mm high unless otherwise indicated.
- .3 Loose Stops for Glazed Lites in Frames: Minimum 0.8 mm thick, fabricated from same material as frames in which they are installed.
- .4 Terminated Stops: Where indicated on interior door frames, terminate stops 152 mm above finish floor with a 45-degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.

- .1 Provide terminated stops only where indicated.

2.9 LOUVERS

- .1 Provide louvers for interior doors, where indicated, with blades or baffles formed of 0.5 mm thick, cold-rolled steel sheet set into 0.8 mm thick steel frame.

- .1 Sightproof Louver: Stationary louvers constructed with inverted V-shaped or Y-shaped blades.
- .2 Fire-Rated Automatic Louvers: Louvers constructed with movable blades closed by actuating fusible link, and listed and labelled for use in fire-rated door assemblies of type and fire-resistance rating indicated by same testing and inspecting agency that established fire-resistance rating of door assembly.

2.10 ACCESSORIES

- .1 Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- .2 Ceiling Struts: Minimum 6.4 mm thick by 25.4 mm wide steel.
- .3 Grout Guards: Formed from same material as frames, not less than 0.4 mm thick.

2.11 FABRICATION

- .1 Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- .2 Hollow Metal Doors:
 - .1 Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
 - .2 Glazed Lites: Factory cut openings in doors.

- .3 Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 19 mm beyond edge of door on which astragal is mounted.
- .3 Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 - .1 Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 - .2 Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 - .3 Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - .4 Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 - .5 Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 - .6 Jamb Anchors: Provide number and spacing of anchors as follows:
 - .1 Masonry Type: Locate anchors not more than 457 mm from top and bottom of frame. Space anchors not more than 813 mm o.c. and as follows:
 - .1 Two anchors per jamb up to 1524 mm high.
 - .2 Three anchors per jamb from 1524 to 2286 mm high.
 - .3 Four anchors per jamb from 2286 to 3048 mm high.
 - .4 Four anchors per jamb plus 1 additional anchor per jamb for each 610 mm or fraction thereof above 3048 mm high.
 - .2 Stud-Wall Type: Locate anchors not more than 457 mm from top and bottom of frame. Space anchors not more than 813 mm o.c. and as follows:
 - .1 Three anchors per jamb up to 1524 mm high.
 - .2 Four anchors per jamb from 1524 to 2286 mm high.
 - .3 Five anchors per jamb from 2286 to 2438 mm high.
 - .4 Five anchors per jamb plus 1 additional anchor per jamb for each 610 mm or fraction thereof above 2438 mm high.
 - .5 Two anchors per head for frames above 1066 mm wide and mounted in metal-stud partitions.
 - .3 Compression Type: Not less than two anchors in each jamb.
 - .4 Postinstalled Expansion Type: Locate anchors not more than 152 mm from top and bottom of frame. Space anchors not more than 660 mm o.c.
- .7 Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - .1 Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - .2 Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- .4 Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- .5 Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cut-outs, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section *Door Hardware*.
 - .1 Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 - .2 Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
 - .3 Coordinate locations of conduit and wiring boxes for electrical connections with Electrical sections.

- .6 Stops and Mouldings: Provide stops and mouldings around glazed lites indicated. Form corners of stops and mouldings with butted or mitred hairline joints.
 - .1 Single Glazed Lites: Provide fixed stops and mouldings welded on secure side of hollow metal work.
 - .2 Multiple Glazed Lites: Provide fixed and removable stops and mouldings so that each glazed lite is capable of being removed independently.
 - .3 Provide fixed frame mouldings on outside of exterior and on secure side of interior doors and frames.
 - .4 Provide loose stops and mouldings on inside of hollow metal work.
 - .5 Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- .2 Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- .3 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- .1 Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- .2 Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:

- .1 Squareness: Plus or minus 1.6 mm, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
- .2 Alignment: Plus or minus 1.6 mm, measured at jambs on a horizontal line parallel to plane of wall.
- .3 Twist: Plus or minus 1.6 mm, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
- .4 Plumbness: Plus or minus 1.6 mm, measured at jambs on a perpendicular line from head to floor.

- .3 Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- .1 General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- .2 Hollow Metal Frames: Install hollow metal frames of size and profile indicated.
 - .1 Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - .1 At fire-protection-rated openings, install frames according to NFPA 80.
 - .2 Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - .3 Install frames with removable glazing stops located on secure side of opening.
 - .4 Install door silencers in frames before grouting.
 - .5 Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - .6 Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - .7 Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.
 - .2 Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

- .1 Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
- .3 Metal-Stud Partitions: Solidly pack mineral-fibre insulation behind frames.
- .4 Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
- .5 Concrete Walls: Solidly fill space between frames and concrete with grout, but only when specifically noted. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
- .6 In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
- .7 In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
- .8 Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
- .9 Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - .1 Squareness: Plus or minus 1.6 mm, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - .2 Alignment: Plus or minus 1.6 mm, measured at jambs on a horizontal line parallel to plane of wall.
 - .3 Twist: Plus or minus 1.6 mm, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - .4 Plumbness: Plus or minus 1.6 mm, measured at jambs at floor.
- .3 Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
 - .1 Non-Fire-Rated Standard Steel Doors:
 - .1 Jambs and Head: 3 mm plus or minus 1.6 mm.
 - .2 Between Edges of Pairs of Doors: 3 mm plus or minus 1.6 mm.
 - .3 Between Bottom of Door and Top of Threshold: Maximum 9.5 mm.
 - .4 Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 19 mm.
 - .2 Fire-Rated Doors: Install doors with clearances according to NFPA 80.
- .4 Glazing: Comply with installation requirements in Division 08 Section *Glazing* and with hollow metal manufacturer's written instructions.
 - .1 Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 230 mm o.c. and not more than 50 mm o.c. from each corner.
- 3.4 ADJUSTING AND CLEANING
 - .1 Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
 - .2 Remove grout and other bonding material from hollow metal work immediately after installation.
 - .3 Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- .1 Types of items described in this Section:
 - .1 Solid-core doors with wood-veneer faces.
 - .2 Hollow-core doors with hardboard or MDF faces.
 - .3 Shop priming and factory finishing flush wood doors.
- .2 Types of items you will not find described in this Section:
 - .1 Solid-core doors with hardboard, MDF, or plastic-laminate faces.
 - .2 Hollow-core doors with wood-veneer and plastic-laminate faces.
 - .3 Wood door frames including fire-rated wood door frames.
 - .4 Factory fitting flush wood doors to frames and factory machining for hardware.
 - .5 Requirements for veneers from the same flitches for both flush wood doors and wood paneling.
 - .6 Exterior painting, interior painting and staining and transparent finishing for field finishing doors.
 - .7 Lead-lined flush wood doors.
 - .8 Glass view panels in flush wood doors.

1.3 SUBMITTALS

- .1 Product Data: For each type of door indicated. Include details of core and edge construction, louvers, and trim for openings.
- .2 Sustainability Submittals:
 - .1 Chain-of-custody certificates certifying that flush wood doors comply with forest certification requirements. Include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.
 - .2 For adhesives and composite wood products, indicating that product contains no urea formaldehyde.
- .3 Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
 - .1 Indicate dimensions and locations of cut-outs.
 - .2 Indicate doors to be factory finished and finish requirements.
 - .3 Indicate fire-protection ratings for fire-rated doors.
- .4 Samples for Verification:
 - .1 Factory finishes applied to actual door face materials, approximately 200 by 250 mm, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of colour and grain to be expected in the finished work.
- .5 Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

- .1 Non-Rated Wood Flush Doors: complying with CAN/CSA-O132.2 Series 90.

- .2 Fire-Rated Wood Doors: Doors complying with CAN4-S104-M that are listed and labelled by a qualified testing agency, for fire-protection ratings indicated. .
 - .1 Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labelled fire-rated door assemblies except for size.
- 1.5 DELIVERY, STORAGE, AND HANDLING
 - .1 Comply with requirements of referenced standard and manufacturer's written instructions.
 - .2 For wood veneer doors, package doors individually in plastic bags or cardboard cartons.
- 1.6 PROJECT CONDITIONS
 - .1 Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weather tight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
 - .2 Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weather tight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 16 and 32 deg C and relative humidity between 43 and 70 percent during the remainder of the construction period.
- 1.7 WARRANTY
 - .1 Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
 - .1 Failures include, but are not limited to, the following:
 - .1 Warping (bow, cup, or twist) more than 6.4 mm in a 1067-by-2134 mm section.
 - .2 Telegraphing of core construction in face veneers exceeding 0.25 mm in a 76.2 mm span.
 - .2 Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - .3 Warranty Period for Solid-Core Interior Doors: Life of installation.
 - .4 Warranty Period for Hollow-Core Interior Doors: One year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

- 2.1 DOOR CONSTRUCTION, GENERAL
 - .1 Low-Emitting Materials: provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.
 - .2 Particleboard-Core Doors: to CAN/CSA-O132.2 Series 90
 - .1 Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
 - .2 Provide doors with either glued-wood-stave or structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.
 - .3 Mineral-Core Doors:
 - .1 Tested in accordance with CAN4 S104 or NFPA 252 to achieve rating as specified.
 - .2 Core: Non-combustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.

- .3 Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.
 - .4 Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.
 - .5 Pairs: Provide fire-retardant stiles that are listed and labelled for applications indicated without formed-steel edges and astragals. Comply with specified requirements for exposed edges.
- .4 Hollow-Core Doors:
- .1 Moulded residential-type panel doors fabricated moulded wood fibre facing, wood or MDF stiles and rails, and corrugated cell, bonded together to form a 3-ply structural attachment, internally reinforced for hardware, factory-machined to accommodate scheduled hardware, and primed with latex primer.
 - .1 Overall thickness: 35 mm.
- 2.2 VENEERED-FACED DOORS FOR TRANSPARENT FINISH
- .1 Interior Solid-Core Doors:
- .1 Grade: Hardwood Veneer Grade II (Good).
 - .2 Species: Select white maple; unless otherwise noted.
 - .3 Cut: Quarter sliced, unless otherwise noted
 - .4 Match between Veneer Leaves: Slip match.
 - .5 Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
 - .6 Exposed Vertical Edges: Same species as faces or a compatible species.
 - .7 Core: Particleboard.
 - .1 Substitute particleboard core with mineral core when required to achieve the fire rating specified.
 - .8 Construction: Seven plies, either bonded or non-bonded construction.
- 2.3 DOORS FOR OPAQUE FINISH
- .1 Interior Solid-Core Doors:
- .1 Grade: Sound (paint).
 - .2 Faces: Any closed-grain hardwood of mill option.
 - .3 Exposed Vertical Edges: Any closed-grain hardwood.
 - .4 Core: Particleboard.
 - .1 Substitute particleboard core with mineral core when required to achieve the fire rating specified.
 - .5 Construction: Five or seven plies. Stiles and rails are bonded to core, and then entire unit abrasive planed before veneering. Faces are bonded to core using a hot press.
- .2 Interior Hollow-Core Doors:
- .1 Panel design: see door elevation drawings.
 - .2 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - .1 Masonite Corporation.
 - .2 Or approved alternate.
- 2.4 LOUVERS AND LIGHT FRAMES
- .1 Wood Louvers: Provide door manufacturer's standard solid-wood louvers, unless otherwise indicated.
- .1 Wood Species: Species compatible with door faces.
- .2 Metal Louvers: Provide metal louvers only when specifically indicated.
- .1 Blade Type: Vision-proof, inverted Y.
 - .2 Metal and Finish: Hot-dip galvanized steel, 1.0 mm thick, with baked-enamel- or powder-coated finish.

- .3 Louvers for Fire-Rated Doors: Provide metal louvers with fusible link and closing device, listed and labelled for use in doors with fire-protection rating of 1-1/2 hours and less.
 - .1 Metal and Finish: Hot-dip galvanized steel, 1.0 mm thick, with baked-enamel- or powder-coated finish.
- .4 Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads as follows, unless otherwise indicated.
 - .1 Wood Species: Species compatible with door faces.
 - .2 Profile: Manufacturer's standard shape.
 - .3 At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.
- .5 Metal Frames for Light Openings in Fire-Rated Doors: Provide manufacturer's standard frame formed of 1.2 mm thick, cold-rolled steel sheet; with baked-enamel- or powder-coated finish; and approved for use in doors of fire-protection rating greater than 20 minutes.

2.5 FABRICATION

- .1 Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
 - .1 Comply with requirements in NFPA 80 for fire-rated doors.
- .2 Openings: Cut and trim openings through doors in factory.
 - .1 Light Openings: Trim openings with mouldings of material and profile indicated.
 - .2 Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 08 Section *Glazing*.
 - .3 Louvers: Factory-install louvers in prepared openings.

2.6 FACTORY FINISHING

- .1 General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 - .1 Finish faces, all four edges, edges of cut-outs, and mortises. Stains and fillers may be omitted on bottom edges, edges of cut-outs, and mortises.
- .2 Factory finish doors only when specifically indicated.
- .3 Transparent Factory Finish:
 - .1 Grade: Custom.
 - .2 Finish: AWI conversion varnish or catalyzed polyurethane system.
 - .3 Effect: Semi filled finish, produced by applying an additional finish coat to partially fill the wood pores.
 - .4 Staining: As selected by Owner's Representative from full range of manufacturer's stain colour if not specifically indicated elsewhere.
 - .5 Sheen: Satin, unless otherwise noted.
- .4 Opaque Factory Finish:
 - .1 Grade: Custom.
 - .2 Finish: AWI conversion varnish or catalyzed polyurethane system.
 - .3 Colour: As selected by Owner's Representative from full range of manufacturer's colours if not specifically indicated elsewhere.
 - .4 Sheen: Semi gloss, unless otherwise noted.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Examine doors and installed door frames before hanging doors.
 - .1 Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 - .2 Reject doors with defects.
- .2 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- .1 Hardware: For installation, see Division 08 Section *Door Hardware*.
- .2 Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.
 - .1 Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
- .3 Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cut-outs, and mortises after fitting and machining.
 - .1 Clearances: Provide 3.2 mm at heads, jambs, and between pairs of doors. Provide 3.2 mm from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 6.4 mm from bottom of door to top of threshold unless otherwise indicated.
 - .1 Comply with NFPA 80 for fire-rated doors.
 - .2 Bevel non-fire-rated doors 3-1/2 degrees at lock and hinge edges.
 - .3 Bevel fire-rated doors 3-1/2 degrees at lock edge; trim stiles and rails only to extent permitted by labelling agency.
- .4 Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.
- .5 Doors indicated on drawing to be removed and reinstalled are to be stock piled on site as to avoid damage. Contractor to identify all doors to be reinstalled according to door schedule.

3.3 ADJUSTING

- .1 Operation: Rehang or replace doors that do not swing or operate freely.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- .1 Types of items described in this Section:
 - .1 Commercial door hardware for the following:
 - .1 Swinging doors.
 - .2 Non-fire-rated sliding doors.
 - .3 Other doors to the extent indicated.
 - .2 Cylinders for doors specified in other Sections.
 - .3 Electrified door hardware.
- .2 Types of items you will not find described in this Section:
 - .1 Commercial door hardware for the following:
 - .1 Non-fire-rated folding doors.
 - .2 Astragals provided as part of fire-rated labelled assemblies and for door silencers provided as part of hollow-metal frames.
 - .3 Door silencers provided as part of aluminum frames.
 - .4 Astragals and integral intumescent seals provided as part of fire-rated labelled flush wood door assemblies.
 - .5 Astragals and integral intumescent seals provided as part of fire-rated labelled stile and rail wood door assemblies.
 - .6 Access door hardware.
 - .7 Door hardware provided as part of overhead door assemblies.
 - .8 Door hardware provided as part of overhead grille assemblies.
 - .9 Door silencers provided as part of hollow-metal detention frames.
 - .10 Hinges and gasketing provided as part of sound-rated door assemblies.
 - .11 Specialized entrance door hardware for aluminum-framed entrances and storefronts
 - .12 Specialized entrance door hardware for all-glass entrances and storefronts.
 - .13 Specialized entrance door hardware for automatic entrances
 - .14 Specialized entrance door hardware for intensive care unit/critical care unit (ICU/CCU) entrances.
 - .15 Detention door hardware.
 - .16 Door hardware for doors in wire mesh partitions.
 - .17 Plastic door protection units that match wall protection units.
 - .18 Radiation protection for lead-lined astragals provided as part of fire-rated labelled assemblies.
 - .19 Connections to electrical power system and for low-voltage wiring work.
 - .20 Access control devices installed at door openings and provided as part of a security access system.
 - .21 Detection devices installed at door openings and provided as part of an intrusion detection system.
 - .22 Connections to building fire alarm system.
- .3 Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.
 - .1 Cylinders for locks specified in other Sections.

1.2 SUBMITTALS

- .1 Product Data: Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- .2 Shop Drawings: Details of electrified door hardware, indicating the following:
 - .1 Wiring Diagrams: Power, signal, and control wiring. Include the following:
 - .1 System schematic.

- .2 Point-to-point wiring diagram.
 - .3 Riser diagram.
 - .4 Elevation of each door.
 - .2 Detail interface between electrified door hardware and fire alarm, access control, security, and building control systems.
 - .3 Operation Narrative: Describe the operation of doors controlled by electrified door hardware.
 - .3 Qualification Data: For Architectural Hardware Consultant.
 - .4 Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.
 - .5 Warranty: Special warranty specified in this Section.
 - .6 Other Action Submittals:
 - .1 Door Hardware Sets: Prepared by or under the supervision of Architectural Hardware Consultant, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final door hardware sets with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - .1 Format: Comply with scheduling sequence and vertical format in DHI's *Sequence and Format for the Hardware Schedule*. Double space entries, and number and date each page.
 - .2 Content: Include the following information:
 - .1 Identification number, location, hand, fire rating, and material of each door and frame.
 - .2 Type, style, function, size, quantity, and finish of each door hardware item. Include description and function of each lockset and exit device.
 - .3 Complete designations of every item required for each door or opening including name and manufacturer.
 - .4 Fastenings and other pertinent information.
 - .5 Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - .6 Explanation of abbreviations, symbols, and codes contained in schedule.
 - .7 Mounting locations for door hardware.
 - .8 Door and frame sizes and materials.
 - .9 Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.
 - .1 Sequence of Operation: Include description of component functions that occur in the following situations: authorized person wants to enter; authorized person wants to exit; unauthorized person wants to enter; unauthorized person wants to exit.
 - .10 List of related door devices specified in other Sections for each door and frame.
 - .3 Submittal Sequence: Submit the final door hardware sets at earliest possible date, particularly where approval of the door hardware sets must precede fabrication of other work that is critical in Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the door hardware sets.
 - .2 Keying Schedule: Prepared by or under the supervision of Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.
- 1.3 QUALITY ASSURANCE
- .1 Installer Qualifications: An employer of workers trained and approved by lock manufacturer.

- .1 Installer's responsibilities include supplying and installing door hardware and providing a qualified Architectural Hardware Consultant available during the course of the Work to consult with Contractor, Owner's Representative, and Owner about door hardware and keying.
- .2 Installer shall have warehousing facilities in Project's vicinity.
- .3 Scheduling Responsibility: Preparation of door hardware and keying schedules.
- .4 Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- .2 Architectural Hardware Consultant Qualifications: A person who is currently certified by DHI as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.
 - .1 Electrified Door Hardware Consultant Qualifications: A qualified Architectural Hardware Consultant who is experienced in providing consulting services for electrified door hardware installations.
- .3 Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.
 - .1 Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.
- .4 Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labelled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
- .5 Electrified Door Hardware: Listed and labelled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- .6 Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section *Project Management and Coordination*. Review methods and procedures related to electrified door hardware including, but not limited to, the following:
 - .1 Inspect and discuss electrical roughing-in and other preparatory work performed by other trades.
 - .2 Review sequence of operation for each type of electrified door hardware.
 - .3 Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - .4 Review required testing, inspecting, and certifying procedures.
- 1.4 DELIVERY, STORAGE, AND HANDLING
 - .1 Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
 - .2 Tag each item or package separately with identification related to the final door hardware sets, and include basic installation instructions, templates, and necessary fasteners with each item or package.
 - .3 Deliver keys to manufacturer of key control system for subsequent delivery to Owner.
 - .4 Deliver keys and permanent cores, when specified, to Owner by registered mail or overnight package service.
 - .1 Obtain name and mailing address from Owner's Representative.
- 1.5 COORDINATION

- .1 Coordinate layout and installation of recessed pivots and closers with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- .2 Templates: Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- .3 Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to power supplies, fire alarm system and detection devices, access control system, security system, and building control system.
- .4 Existing Openings: Where new hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide for proper operation.

1.6 WARRANTY

- .1 Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fails in materials or workmanship within specified warranty period.
 - .1 Failures include, but are not limited to, the following:
 - .1 Structural failures including excessive deflection, cracking, or breakage.
 - .2 Faulty operation of operators and door hardware.
 - .3 Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 - .2 Warranty Period: Three years from date of Substantial Completion, except as follows:
 - .1 Electromagnetic and Delayed-Egress Locks: Five years from date of Substantial Completion.
 - .2 Exit Devices: Two years from date of Substantial Completion.
 - .3 Manual Closers: 10 years from date of Substantial Completion.
 - .4 Concealed Floor Closers: 10 years from date of Substantial Completion.

1.7 MAINTENANCE SERVICE

- .1 Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
- .2 Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair, or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door hardware operation. Provide parts and supplies same as those used in the manufacture and installation of original products.

1.8 EXTRA MATERIALS

- .1 Furnish full-size units of door hardware described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - .1 Door Hardware: None required.
 - .2 Electrical Parts: None required.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- .1 General: Provide door hardware for each door to comply with requirements in this Section.

- .1 Door Hardware Sets: Provide quantity, item, size, finish or colour indicated, and products complying with BHMA standard referenced.
- .2 Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
- .2 Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 *Door Hardware Groups* Article or on drawings. Products are identified by using door hardware designations, as follows:
 - .1 Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 3 Door Hardware Groups Article.
 - .2 References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.
- .3 In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - .1 Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 HINGES, GENERAL

- .1 Quantity: Provide the following, unless otherwise indicated:
 - .1 Two Hinges: For doors with heights up to 1524 mm.
 - .2 Three Hinges: For doors with heights 1549 to 2286 mm.
 - .3 Four Hinges: For doors with heights 2311 to 3048 mm.
 - .4 For doors with heights more than 3048 mm, provide 4 hinges, plus 1 hinge for every 750 mm of door height greater than 3048 mm.
- .2 Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.
- .3 Hinge Weight: Unless otherwise indicated, provide the following:
 - .1 Entrance Doors: Heavy-weight hinges.
 - .2 Doors with Closers: Antifriction-bearing hinges.
 - .3 Interior Doors: Standard-weight hinges.
- .4 Hinge Base Metal: Unless otherwise indicated, provide the following:
 - .1 Exterior Hinges: Stainless steel, with stainless-steel pin.
 - .2 Interior Hinges: Steel, with steel pin .
 - .3 Hinges for Fire-Rated Assemblies: Steel, with steel pin.
- .5 Hinge Options: Where indicated in door hardware sets or on Drawings:
 - .1 Hospital Tips: Slope ends of hinge barrel.
 - .2 Maximum Security Pin: Fix pin in hinge barrel after it is inserted.
 - .3 Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for out swinging exterior doors .
 - .4 Corners: Square.
- .6 Electrified Functions for Hinges: Comply with the following:
 - .1 Power Transfer: Concealed PTFE-jacketed wires, secured at each leaf and continuous through hinge knuckle.
 - .2 Monitoring: Concealed electrical monitoring switch.
 - .3 Power Transfer and Monitoring: Concealed PTFE-jacketed wires, secured at each leaf and continuous through hinge knuckle, and with concealed electrical monitoring switch.

- .7 Fasteners: Comply with the following:
 - .1 Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
 - .2 Wood Screws: For wood doors and frames.
 - .3 Threaded-to-the-Head Wood Screws: For fire-rated wood doors.
 - .4 Screws: Phillips flat-head; machine screws (drilled and tapped holes) for metal doors, wood screws for wood doors and frames. Finish screw heads to match surface of hinges.

2.3 HINGES

- .1 Butts and Hinges: BHMA A156.1. Listed under Category A in BHMA's *Certified Product Directory*.
- .2 Template Hinge Dimensions: BHMA A156.7.
- .3 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - .1 Hager Companies (HAG).
 - .2 McKinney Products Company; an ASSA ABLOY Group company (MCK).
 - .3 Stanley Commercial Hardware; Div. of The Stanley Works (STH).
 - .4 Or approved alternate.

2.4 CONTINUOUS HINGES

- .1 Standard: BHMA A156.26, Grade 1 .
 - .1 Listed under Category N in BHMA's *Certified Product Directory*.
- .2 General: Minimum 3.0 mm thick, hinge leaves with minimum overall width of 102 mm; fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.
 - .1 Fire Pins: Steel pins to hold labelled fire doors in place if required by tested listing.
- .3 Continuous, Barrel-Type Hinges: Hinge with knuckles formed around a pin that extends entire length of hinge.
 - .1 Base Metal for Exterior Hinges: Stainless steel.
 - .2 Base Metal for Interior Hinges: Aluminium.
 - .3 Base Metal for Hinges for Fire-Rated Assemblies: Steel.
 - .4 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - .1 Hager Companies (HAG).
 - .2 McKinney Products Company; an ASSA ABLOY Group company (MCK).
 - .3 Stanley Commercial Hardware; Div. of The Stanley Works (STH).
 - .4 Or approved alternate.
- .4 Continuous, Gear-Type Hinges: Extruded-aluminium, pinless, geared hinge leaves; joined by a continuous extruded-aluminium channel cap; with concealed, self-lubricating thrust bearings.
 - .1 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - .1 Hager Companies (HAG).
 - .2 McKinney Products Company; an ASSA ABLOY Group company (MCK).
 - .3 Pemko Manufacturing Co. (PEM).
 - .4 Or approved alternate.

2.5 LOCKS AND LATCHES, GENERAL

- .1 Accessibility Requirements: Where indicated to comply with accessibility requirements, comply with local accessibility regulations

- .1 Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 22 N.
- .2 Latches and Locks for Means of Egress Doors: Comply with NFPA 101. Latches shall not require more than 67 N to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.
- .3 Electrified Locking Devices: BHMA A156.25.
- .4 Lock Trim:
 - .1 Levers: Cast.
 - .1 **<Insert model number and description.>**
 - .2 Escutcheons (Roses): Cast.
 - .3 Dummy Trim: Match lever lock trim and escutcheons.
 - .4 Lockset Designs: **<Insert name(s) of manufacturer(s) and product name(s) designating lockset design(s) that other manufacturers must match>** or, if sets are provided by another manufacturer, provide designs that match those designated.
- .5 Lock Throw: Comply with testing requirements for length of bolts required for labelled fire doors, and as follows:
 - .1 Bored Locks: Minimum 13 mm latch bolt throw.
 - .2 Mortise Locks: Minimum 19 mm latch bolt throw.
 - .3 Deadbolts: Minimum 25 mm bolt throw.
- .6 Rebated Meeting Doors: Provide special rebated front and strike on locksets for rebated meeting stiles.
- .7 Backset: 70 mm, unless otherwise indicated.
- .8 Strikes: Manufacturer's standard strike with strike box for each latchbolt or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, and as follows:
 - .1 Strikes for Bored Locks and Latches: BHMA A156.2.
 - .2 Strikes for Mortise Locks and Latches: BHMA A156.13.
 - .3 Strikes for Interconnected Locks and Latches: BHMA A156.12.
 - .4 Strikes for Auxiliary Deadlocks: BHMA A156.5.
 - .5 Flat-Lip Strikes: For locks with three-piece antifriction latchbolt, as recommended by manufacturer.
 - .6 Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 - .7 Aluminium-Frame Strike Box: Manufacturer's special strike box fabricated for aluminium framing.

2.6 MECHANICAL LOCKS AND LATCHES

- .1 Lock Functions: Function numbers and descriptions indicated in door hardware sets comply with the following:
 - .1 Bored Locks: BHMA A156.2.
 - .2 Mortise Locks: BHMA A156.13.
 - .3 Interconnected Locks: BHMA A156.12.
- .2 Bored Locks: BHMA A156.2, Grade 1 ; Series 4000. Listed under Category F in BHMA's *Certified Product Directory*.
 - .1 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - .1 Best Access Systems; Div. of The Stanley Works (BAS).
 - .2 Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company (CR).
 - .3 SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
 - .4 Schlage Commercial Lock Division; an Ingersoll-Rand Company (SCH).
 - .5 Yale Commercial Locks and Hardware; an ASSA ABLOY Group company (YAL).
 - .6 Or approved alternate.

- .3 Mortise Locks: Stamped steel case with steel or brass parts; BHMA A156.13, Grade 1 ; Series 1000. Listed under Category F in BHMA's *Certified Product Directory*.
 - .1 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - .1 Best Access Systems; Div. of The Stanley Works (BAS).
 - .2 Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company (CR).
 - .3 SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
 - .4 Schlage Commercial Lock Division; an Ingersoll-Rand Company (SCH).
 - .5 Yale Commercial Locks and Hardware; an ASSA ABLOY Group company (YAL).
 - .6 Or approved alternate
- .4 Interconnected Locks: BHMA A156.12, Grade 1 ; Series 5000. Listed under Category F in BHMA's *Certified Product Directory*.
 - .1 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - .1 Schlage Commercial Lock Division; an Ingersoll-Rand Company (SCH).

2.7 AUXILIARY LOCKS AND LATCHES

- .1 Auxiliary Locks: BHMA A156.5, Grade 1 . Listed under Category E in BHMA's *Certified Product Directory*.
 - .1 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - .1 Best Access Systems; Div. of The Stanley Works (BAS).
 - .2 SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
 - .3 Schlage Commercial Lock Division; an Ingersoll-Rand Company (SCH).
 - .4 Yale Commercial Locks and Hardware; an ASSA ABLOY Group company (YAL).
 - .5 Or approved alternate.

2.8 ELECTROMECHANICAL LOCKS

- .1 General: Grade 1 for type of lock indicated; motor or solenoid driven.
- .2 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - .1 Best Access Systems; Div. of The Stanley Works (BAS).
 - .2 SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
 - .3 Schlage Commercial Lock Division; an Ingersoll-Rand Company (SCH).
 - .4 Yale Commercial Locks and Hardware; an ASSA ABLOY Group company (YAL).
 - .5 Or approved alternate.

2.9 EXIT LOCKS AND EXIT ALARMS

- .1 Exit Locks: BHMA A156.29, Grade 1, surface mounted, battery powered, housed in metal case; with red-and-white lettering reading *EMERGENCY EXIT PUSH TO OPEN--ALARM WILL SOUND*. Include the following features:
 - .1 Low-battery alert.
 - .2 Outside key control.
 - .3 Audible alarm that sounds when unauthorized use of door occurs.
 - .4 Silent alarm with remote signal capability for connection to remote indicating panel.
- .2 Stand-Alone Exit Alarms: BHMA A156.29, Grade 1, surface mounted on door. Include the following features:
 - .1 Low-battery alert.
 - .2 Outside key control.
 - .3 Automatic rearming after authorized use, with adjustable time delay.
 - .4 Remote signal capability for connection to remote indicating panel.

- .3 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - .1 Detex Corporation (DTX).
 - .2 SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
 - .3 Or approved alternate.

2.10 DOOR BOLTS

- .1 Bolt Throw: Comply with testing requirements for length of bolts required for labelled fire doors, and as follows:
 - .1 Half-Round Surface Bolts: Minimum 22 mm throw.
 - .2 Interlocking Surface Bolts: Minimum 24 mm throw.
 - .3 Fire-Rated Surface Bolts: Minimum 25 mm throw; listed and labelled for fire-rated doors.
 - .4 Dutch-Door Bolts: Minimum 19 mm throw.
 - .5 Mortise Flush Bolts: Minimum 19 mm throw.
- .2 Dustproof Strikes: BHMA A156.16, Grade 1.
- .3 Surface Bolts: BHMA A156.16, Grade 1 .
 - .1 Flush Bolt Heads: Minimum of 13 mm diameter rods of brass, bronze, or stainless steel with minimum 305 mm long rod for doors up to 2134 mm in height. Provide longer rods as necessary for doors exceeding 2134 mm.
 - .2 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - .1 Glynn-Johnson; an Ingersoll-Rand Company (GJ).
 - .2 Hager Companies (HAG).
 - .3 IVES Hardware; an Ingersoll-Rand Company (IVS).
 - .4 Stanley Commercial Hardware; Div. of The Stanley Works (STH).
 - .5 Or approved alternate.
- .4 Manual Flush Bolts: BHMA A156.16, Grade 1 ; designed for mortising into door edge.
 - .1 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - .1 Glynn-Johnson; an Ingersoll-Rand Company (GJ).
 - .2 Hager Companies (HAG).
 - .3 IVES Hardware; an Ingersoll-Rand Company (IVS).
 - .4 Stanley Commercial Hardware; Div. of The Stanley Works (STH).
 - .5 Or approved alternate.
- .5 Automatic and Self-Latching Flush Bolts: BHMA A156.3, Grade 1 ; designed for mortising into door edge.
 - .1 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - .1 Glynn-Johnson; an Ingersoll-Rand Company (GJ).
 - .2 Hager Companies (HAG).
 - .3 IVES Hardware; an Ingersoll-Rand Company (IVS).
 - .4 Or approved alternate.

2.11 EXIT DEVICES

- .1 Exit Devices: BHMA A156.3, Grade 1 . Listed under Category G in BHMA's *Certified Product Directory*.
- .2 Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with local accessibility regulations.
 - .1 Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 22 N.

- .3 Exit Devices for Means of Egress Doors: Comply with NFPA 101. Exit devices shall not require more than 67 N to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.
 - .4 Panic Exit Devices: Listed and labelled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
 - .5 Fire Exit Devices: Devices complying with NFPA 80 that are listed and labelled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.
 - .6 Removable Mullions: BHMA A156.3.
 - .7 Fire-Exit Removable Mullions: Provide removable mullions for use with fire exit devices complying with NFPA 80 that are listed and labelled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252. Mullions shall be used only with exit devices for which they have been tested.
 - .8 Dummy Push Bar: Non-functioning push bar matching functional push bar.
 - .1 Operation: Movable.
 - .9 Outside Trim:
 - .1 Material and finish to match locksets, unless otherwise indicated.
 - .2 Heavy-duty commercial grade exterior trim based on style to match design for locksets and latchsets; unless otherwise indicated.
 - .10 Through Bolts: For exit devices and trim on metal doors, non-fire-rated wood doors, and fire-rated wood doors.
 - .11 Electronic Exit Bars: Non-latching electronic releasing device activated by an adjustable capacitance sensor, with no moving parts; listed and labelled as panic exit hardware. Fabricate bar from extruded aluminium, and provide door and frame transfer device and 4.9 m of cord to route wiring off the door frame.
 - .12 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - .1 DORMA Architectural Hardware; Member of The DORMA Group North America (DAH).
 - .2 SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
 - .3 Von Duprin; an Ingersoll-Rand Company (VD).
 - .4 Or approved alternate.
- 2.12 LOCK CYLINDERS
- .1 Standard Lock Cylinders: BHMA A156.5, Grade 1 .
 - .2 Cylinders: Manufacturer's standard tumbler type, constructed from brass or bronze, stainless steel, or nickel silver, and complying with the following:
 - .1 Number of Pins: Seven.
 - .2 Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
 - .3 Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 - .4 Bored-Lock Type: Cylinders with tailpieces to suit locks.
 - .1 High-Security Grade: BHMA A156.5, Grade 1A, listed and labelled as complying with pick- and drill-resistant testing requirements in UL 437 (Suffix A).
 - .3 Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:

- .1 Removable Cores: Core insert, removable by use of a special key; for use only with core manufacturer's cylinder and door hardware.
- .4 Construction Keying: Comply with the following:
 - .1 Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.
- .5 Manufacturer: Same manufacturer as for locks and latches.

2.13 KEYING

- .1 Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference, and as follows:
 - .1 Existing Buildings: Master key or grand master key locks to Owner's existing system.
 - .2 New Buildings: Provide master key system.
- .2 Keys: Nickel silver.
 - .1 Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
 - .1 Notation: *DO NOT DUPLICATE*.
 - .2 Quantity: In addition to one extra key blank for each lock, provide the following:
 - .1 Cylinder Change Keys: Three.
 - .2 Master Keys: Five.
 - .3 Grand Master Keys: Five.
 - .4 Great-Grand Master Keys: Five.

2.14 KEY CONTROL SYSTEM

- .1 Key Control Cabinet: BHMA A156.5, Grade 1; metal cabinet with baked-enamel finish; containing key-holding hooks, labels, 2 sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers; with key capacity of 150percent of the number of locks.
 - .1 Wall-Mounted Cabinet: Cabinet with hinged-panel door equipped with key-holding panels and pin-tumbler cylinder door lock.

2.15 ELECTRIC STRIKES

- .1 Standard: BHMA A156.31, Grade 1 .
- .2 General: Use fail-secure electric strikes with fire-rated devices, unless otherwise noted.
- .3 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - .1 Adams Rite Manufacturing Co. (ARM).
 - .2 Folger Adam Security Inc.; an ASSA ABLOY Group company (FAS).
 - .3 HES, Inc.; an ASSA ABLOY Group company (HES).
 - .4 Locknetics; an Ingersoll-Rand Company (LSE).
 - .5 Rutherford Controls Int'l. Corp. (RCI).
 - .6 Von Duprin; an Ingersoll-Rand Company (VD).
 - .7 Or approved alternate.

2.16 OPERATING TRIM

- .1 Standard: BHMA A156.6.

- .2 Materials: Fabricate from stainless steel, unless otherwise indicated.
- .3 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - .1 Hager Companies (HAG).
 - .2 IVES Hardware; an Ingersoll-Rand Company (IVS).
 - .3 Or approved alternate.

2.17 CLOSERS

- .1 Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with local accessibility regulations.
 - .1 Comply with the following maximum opening-force requirements:
 - .1 Interior, Non-Fire-Rated Hinged Doors: 22.2 N applied perpendicular to door.
 - .2 Sliding or Folding Doors: 22.2 N applied parallel to door at latch.
 - .3 Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
- .2 Door Closers for Means of Egress Doors: Comply with NFPA 101. Door closers shall not require more than 133 N to set door in motion and not more than 67 N to open door to minimum required width.
- .3 Hold-Open Closers/Detectors: Coordinate and interface integral smoke detector and closer device with fire alarm system.
- .4 Flush Floor Plates: Provide finish cover plates for floor closers unless thresholds are indicated. Match door hardware finish, unless otherwise indicated.
- .5 Recessed Floor Plates: Provide recessed floor plates with insert of floor finish material for floor closers unless thresholds are indicated. Provide extended closer spindle to accommodate thickness of floor finish.
- .6 Power-Assist Closers: As specified in Division 08 Section *Automatic Door Operators* for access doors for people with disabilities or where listed in the door hardware sets.
- .7 Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
- .8 Surface Closers: BHMA A156.4 . Listed under Category C in BHMA's *Certified Product Directory*. Provide type of arm required for closer to be located on non-public side of door, unless otherwise indicated.
 - .1 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - .1 DORMA Architectural Hardware; Member of The DORMA Group North America (DAH).
 - .2 LCN Closers; an Ingersoll-Rand Company (LCN).
 - .3 Norton Door Controls; an ASSA ABLOY Group company (NDC).
 - .4 SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
 - .5 Yale Commercial Locks and Hardware; an ASSA ABLOY Group company (YAL).
 - .6 Or approved alternate.
- .9 Concealed Closers: BHMA A156.4, Grade 1 . Listed under Category C in BHMA's *Certified Product Directory*.
 - .1 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - .1 DORMA Architectural Hardware; Member of The DORMA Group North America (DAH).
 - .2 LCN Closers; an Ingersoll-Rand Company (LCN).
 - .3 Norton Door Controls; an ASSA ABLOY Group company (NDC).
 - .4 SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).

- .5 Or approved alternate.
- .10 Closer Holder Release Devices: BHMA A156.15. Listed under Category C in BHMA's *Certified Product Directory*.
 - .1 Life-Safety Type: On release of hold open, door becomes self-closing. Automatic release is activated by smoke detection system or loss of power.
 - .2 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - .1 Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company (CR).
 - .2 DORMA Architectural Hardware; Member of The DORMA Group North America (DAH).
 - .3 LCN Closers; an Ingersoll-Rand Company (LCN).
 - .4 Norton Door Controls; an ASSA ABLOY Group company (NDC).
 - .5 SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
 - .6 Or approved alternate.
- .11 Coordinators: BHMA A156.3.
- 2.18 PROTECTIVE TRIM UNITS
 - .1 Size: 38 mm less than door width on push side and 13 mm less than door width on pull side, by height specified in door hardware sets.
 - .2 Fasteners: Manufacturer's standard machine or self-tapping screws.
 - .3 Metal Protective Trim Units: BHMA A156.6; bevelled top and 2 sides; fabricated from the following material:
 - .1 Material: 1.3 mm thick stainless steel.
 - .2 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - .1 Hager Companies (HAG).
 - .2 IVES Hardware; an Ingersoll-Rand Company (IVS).
 - .3 Or approved alternate.
- 2.19 STOPS AND HOLDERS
 - .1 Stops and Bumpers: BHMA A156.16, Grade 1 .
 - .1 Provide floor stops for doors unless wall or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic. Where floor or wall stops are not appropriate, provide overhead holders.
 - .2 Mechanical Door Holders: BHMA A156.16, Grade 1 .
 - .3 Combination Floor and Wall Stops and Holders: BHMA A156.8, Grade 1 .
 - .4 Combination Overhead Stops and Holders: BHMA A156.8, Grade 1 .
 - .5 Electromagnetic Door Holders: BHMA A156.15. Listed under Category C in BHMA's *Certified Product Directory*.
 - .1 Coordinate with fire detectors and interface with fire alarm system for labelled fire door assemblies.
 - .6 Silencers for Wood Door Frames: BHMA A156.16, Grade 1; neoprene or rubber, minimum 16 by 19 mm; fabricated for drilled-in application to frame.
 - .7 Silencers for Metal Door Frames: BHMA A156.16, Grade 1; neoprene or rubber, minimum diameter 13 mm; fabricated for drilled-in application to frame.
 - .8 Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- .1 DORMA Architectural Hardware; Member of The DORMA Group North America (DAH).
- .2 Glynn-Johnson; an Ingersoll-Rand Company (GJ).
- .3 Hager Companies (HAG).
- .4 IVES Hardware; an Ingersoll-Rand Company (IVS).
- .5 SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
- .6 Stanley Commercial Hardware; Div. of The Stanley Works (STH).
- .7 Or approved alternate.

2.20 DOOR GASKETING

- .1 Standard: BHMA A156.22. Listed under Category J in BHMA's *Certified Product Directory*.
- .2 General: Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.
 - .1 Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
 - .2 Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
 - .3 Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.
- .3 Air Leakage: Not to exceed 0.000774 cu. m/s per m of crack length for gasketing other than for smoke control, as tested according to ASTM E 283.
- .4 Smoke-Labelled Gasketing: Assemblies complying with NFPA 105 that are listed and labelled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke-control ratings indicated, based on testing according to UL 1784.
 - .1 Provide smoke-labelled gasketing on 20-minute-rated doors and on smoke-labelled doors.
- .5 Fire-Labelled Gasketing: Assemblies complying with NFPA 80 that are listed and labelled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
- .6 Sound-Rated Gasketing: Assemblies that are listed and labelled by a testing and inspecting agency, for sound ratings indicated, based on testing according to ASTM E 1408.
- .7 Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- .8 Gasketing Materials: ASTM D 2000 and AAMA 701/702.
- .9 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - .1 Hager Companies (HAG).
 - .2 National Guard Products (NGP).
 - .3 Pemko Manufacturing Co. (PEM).
 - .4 Zero International (ZRO).
 - .5 Or approved alternate.

2.21 THRESHOLDS

- .1 Standard: BHMA A156.21. Listed under Category J in BHMA's *Certified Product Directory*.
- .2 Accessibility Requirements: Where thresholds are indicated to comply with accessibility requirements, comply with local accessibility regulations

- .1 Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 13 mm high.
- .3 Thresholds for Means of Egress Doors: Comply with NFPA 101. Maximum 13 mm high.
- .4 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - .1 Hager Companies (HAG).
 - .2 National Guard Products (NGP).
 - .3 Pemko Manufacturing Co. (PEM).
 - .4 Zero International (ZRO).
 - .5 Or approved alternate.

2.22 SLIDING DOOR HARDWARE

- .1 Sliding Door Hardware: BHMA A156.14; consisting of complete sets including rails, hangers, supports, bumpers, floor guides, and accessories indicated.
 - .1 Manufacturers: Subject to compliance with requirements, provide products by one of the following offering products that may be incorporated into the Work include, but are not limited to, the following:
 - .1 Hager Companies.
 - .2 Stanley Commercial Hardware; Div. of The Stanley Works.
 - .3 Or approved alternate.
 - .2 Horizontal Sliding Door Hardware: Grade 1; rated for door weight, but not less than 205 kg.
 - .1 Material: Wrought steel.
 - .2 Rail: Box without mounting brackets.
 - .3 Rail Supports: Double sidewall style.
 - .1 Provide intermediate, end, and splice type track supports as required by rail configuration and door weight indicated.
 - .4 Hanger Configuration: Four-wheel truck hanger assembly with drop bolt.
 - .1 Wheel Assembly: Steel wheels with ball bearings.
 - .5 Accessories:
 - .1 Guide rail and guide rail brackets as required by rail configuration.
 - .2 Flush pull, minimum 100 by 140 by 19 mm, mortised into door.
 - .3 End guide and stop.
 - .4 Parallel door floor guides.
 - .5 Bumper shoe, minimum 1.5 mm thickness.

2.23 MISCELLANEOUS DOOR HARDWARE

- .1 Boxed Power Supplies: Modular unit in NEMA ICS 6, Type 4 enclosure; filtered and regulated; voltage rating and type matching requirements of door hardware served; and listed and labelled for use with fire alarm systems.
- .2 Monitor Strikes: Cast strike with toggle.
- .3 Auxiliary Hardware: BHMA A156.16, Grade 1 .
 - .1 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - .1 Hager Companies (HAG).
 - .2 Stanley Commercial Hardware; Div. of The Stanley Works (STH).
 - .3 Or approved alternate.

2.24 FABRICATION

- .1 Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Owner's Representative.
 - .1 Manufacturer's identification is permitted on rim of lock cylinders only.
- .2 Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.
- .3 Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended, except aluminium fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
 - .1 Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
 - .2 Steel Machine or Wood Screws: For the following fire-rated applications:
 - .1 Mortise hinges to doors.
 - .2 Strike plates to frames.
 - .3 Closers to doors and frames.
 - .3 Steel Through Bolts: For the following fire-rated applications unless door blocking is provided:
 - .1 Surface hinges to doors.
 - .2 Closers to doors and frames.
 - .3 Surface-mounted exit devices.
 - .4 Spacers or Sex Bolts: For through bolting of hollow-metal doors.
 - .5 Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, *Recommended Fasteners for Wood Doors*.

2.25 FINISHES

- .1 Standard: BHMA A156.18, as indicated in door hardware sets.
- .2 Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- .3 Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labelled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- .2 Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

- .3 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- .1 Steel Doors and Frames: Comply with DHI A115 Series.
 - .1 Surface-Applied Door Hardware: Drill and tap doors and frames according to ANSI A250.6.
- .2 Wood Doors: Comply with DHI A115-W Series.

3.3 INSTALLATION

- .1 Mounting Heights: Mount door hardware units at heights indicated as follows unless otherwise indicated or required to comply with governing regulations.
 - .1 Standard Steel Doors and Frames: *DHI's Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames.*
 - .2 Wood Doors: *DHI WDHS.3, Recommended Locations for Architectural Hardware for Wood Flush Doors.*
- .2 Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - .1 Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - .2 Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- .3 Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- .4 Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings. Verify location with Owner's Representative.
 - .1 Configuration: Provide the least number of power supplies required to adequately serve doors with electrified door hardware.
- .5 Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 07 Section *Joint Sealants*.

3.4 FIELD QUALITY CONTROL

- .1 Independent Architectural Hardware Consultant: Owner will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.
 - .1 Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.5 ADJUSTING

- .1 Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door

control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

- .1 Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
- .2 Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
- .3 Door Closers: Unless otherwise required by authorities having jurisdiction, adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 75 mm from the latch, measured to the leading edge of the door.

- .2 Occupancy Adjustment: Approximately six months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust, including adjusting operating forces, each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.6 CLEANING AND PROTECTION

- .1 Clean adjacent surfaces soiled by door hardware installation.
- .2 Clean operating items as necessary to restore proper function and finish.
- .3 Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.7 HARDWARE GROUPS

- .1 Refer to schedule on drawings.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- .1 Types of items described in this Section:
 - .1 Low-energy door operators for swinging doors.
- .2 Types of items you will not find described in this Section:
 - .1 Power door operators for swinging doors.
 - .2 Power-assist door operators for swinging doors.
 - .3 Automatic entrances for sliding, swinging, and folding entrances packaged with automatic door operators.
 - .4 Manual ICU/CCU entrance packages.

1.3 DEFINITIONS

- .1 Double Egress Doors: A pair of doors that simultaneously swing with the two doors moving in opposite directions with no mullion between them.
- .2 Double Swing Doors: A pair of doors that swing with the two doors moving in opposite directions with a mullion between them; each door functioning as a single swing door.

1.4 SUBMITTALS

- .1 Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for automatic door operators, including activation and safety devices. Include operating characteristics, electrical characteristics, and furnished accessories.
- .2 Shop Drawings: For automatic door operators. Include plans, elevations, sections, details, and attachments to other work.
 - .1 Indicate required clearances, method of field assembly, components, and location and size of each field connection.
 - .2 Include locations and elevations of entrances showing activation and safety devices.
 - .3 Wiring Diagrams: For power, signal, and activation- and safety-device wiring.
 - .4 Include plans, elevations, sections, details, and attachments to other work for guide rails.
- .3 Product Certificates: For each operator for fire-rated door assemblies, signed by product manufacturer. Certify that operator is listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for use on types and sizes of labeled fire doors required.
- .4 Field quality-control reports.
- .5 Maintenance Data: For automatic door operators, including activation and safety devices, to include in maintenance manuals.
- .6 Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

- .1 Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation and maintenance of units required for this Project.
 - .1 Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.
- .2 Source Limitations: Obtain automatic door operators, including activation and safety devices, from single source from single manufacturer.
- .3 Electrical Components, Devices, and Accessories: Listed and labelled as defined in National Electrical Code of Canada by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- .4 Exit-Door Requirements: Comply with requirements of authorities having jurisdiction for doors with automatic door operators serving as a component of a required means of egress.

1.6 PROJECT CONDITIONS

- .1 Field Measurements: Verify actual dimensions of door frames by field measurements before fabrication of exposed covers for automatic door operators.

1.7 COORDINATION

- .1 Templates: Obtain and distribute, to the parties involved, templates for doors, frames, operators, and other work specified to be factory prepared and reinforced for installing automatic door operators. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing automatic door operators to comply with indicated requirements.
- .2 Electrical System Roughing-in: Coordinate layout and installation of automatic door operators, including activation and safety devices, with connections to power supplies and to access-control system.

1.8 WARRANTY

- .1 Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of automatic door operators that fail in materials or workmanship within specified warranty period.
 - .1 Failures include, but are not limited to, the following:
 - .1 Faulty or sporadic operation of automatic door operator, including activation and safety devices.
 - .2 Deterioration of metals, metal finishes, and other materials beyond normal weathering or use.
 - .2 Warranty Period: Two years from date of Substantial Completion.

1.9 MAINTENANCE SERVICE

- .1 Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of automatic door operator Installer. Include planned and preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door operation. Provide parts and supplies the same as those used in the manufacture and installation of original equipment.
 - .1 Perform maintenance, including emergency callback service, during normal working hours.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- .1 Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - .1 Besam Automated Entrance Systems, Inc.; an ASSA ABLOY Group company.
 - .2 DORMA Architectural Hardware.
 - .3 DORMA Automatics.
 - .4 Horton Automatics; a division of Overhead Door Corporation.
 - .5 Stanley Access Technologies; Division of The Stanley Works.

2.2 MATERIALS

- .1 Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with standards indicated below:
 - .1 Sheet: ASTM B 209M.
 - .2 Extrusions: ASTM B 221M.
- .2 Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, stretcher-leveled standard of flatness, in manufacturer's standard thickness.
- .3 Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

2.3 AUTOMATIC DOOR OPERATORS, GENERAL

- .1 General: Provide operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; for long-term, maintenance-free operation under normal traffic load for type of occupancy indicated; and complying with UL 325. Coordinate operator mechanisms with door operation, hinges, and activation and safety devices.
 - .1 Fire-Rated Doors: Provide door operators for fire-rated door assemblies that comply with NFPA 80 for fire-rated door components and are listed and labeled by a qualified testing agency.
 - .2 Wind Load: Provide door operators on exterior doors that will open and close doors and maintain them in fully closed position when subjected to wind load as prescribed for locality in the National Building Code of Canada.
- .2 Electromechanical Operating System: Self-contained unit powered by permanent-magnet dc motor; with closing speed controlled mechanically by gear train and dynamically by braking action of electric motor, connections for power and activation- and safety-device wiring, and manual operation including spring closing when power is off.
- .3 Hinges: See Division 08 Section *Door Hardware* for type of hinge for each door that door operator shall accommodate.
- .4 Cover for Surface-Mounted Operators: Fabricated from 3.2 mm thick extruded or formed aluminum ; continuous over full width of operator-controlled door opening; with enclosed end caps, provision for maintenance access, and fasteners concealed when door is in closed position.
- .5 Brackets and Reinforcements: Manufacturer's standard, fabricated from aluminum with nonstaining, nonferrous shims for aligning system components.

- .6 Fire-Door Package: Consisting of UL-listed latch mechanism, power-reset box, and caution signage for fire-rated doors. Latch mechanism shall allow door to swing free during automatic operation; when fire is detected, latch actuator shall cause exit hardware to latch when door closes. Provide latch actuators with fail-secure design.

2.4 LOW-ENERGY DOOR OPERATORS

- .1 Standard: BHMA A156.19.
- .2 Performance Requirements:
 - .1 Opening Force if Power Fails: Not more than 67 N required to release a latch if provided, not more than 133 N required to manually set door in motion, and not more than 67 N required to fully open door.
 - .2 Entrapment Protection: Not more than 67 N required to prevent stopped door from closing or opening.
- .3 Configuration: Operator to control single swinging door unless otherwise noted .
 - .1 Traffic Pattern: Two way.
 - .2 Operator Mounting: Surface, unless otherwise noted.
- .4 Operation: Power opening and power-assisted spring closing. Provide time delay for door to remain open before initiating closing cycle as required by BHMA A156.19. When not in automatic mode, door operator shall function as manual door closer, with or without electrical power.
- .5 Operating System: Electromechanical.
- .6 Microprocessor Control Unit: Solid-state controls.
- .7 Features:
 - .1 Adjustable opening and closing speed.
 - .2 Adjustable opening and closing force.
 - .3 Adjustable backcheck.
 - .4 Adjustable hold-open time from zero to 30 seconds.
 - .5 Adjustable time delay.
 - .6 Adjustable acceleration.
 - .7 Obstruction recycle.
 - .8 On-off/hold-open switch to control electric power to operator; key operated.
 - .9 .
- .8 Exposed Finish: Finish exposed components with finish matching door and frame.

2.5 FABRICATION

- .1 Factory fabricate automatic door operators to comply with indicated standards.
- .2 Fabricate exterior components to drain water passing joints and condensation and moisture occurring or migrating within operator enclosure to the exterior.
- .3 Form aluminum shapes before finishing.
- .4 Use concealed fasteners to greatest extent possible. Where exposed fasteners are required, use countersunk Phillips flat-head machine screws, finished to match operator.

2.6 ACCESSORIES

- .1 Signage: As required by cited BHMA standard for the type of operator.
 - .1 Application Process: Door manufacturer's standard process.
 - .2 Provide sign materials with instructions for field application when operators are installed.

2.7 GENERAL FINISH REQUIREMENTS

- .1 Comply with NAAMM's *Metal Finishes Manual for Architectural and Metal Products* for recommendations for applying and designating finishes.
- .2 Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- .3 Apply organic and anodic finishes to formed metal after fabrication unless otherwise indicated.
- .4 Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES

- .1 Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
- .2 Colour Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
- .3 Baked-Enamel or Powder-Coat Finish: AAMA 2603. Comply with coating manufacturer's written instructions for cleaning, conversion coating, application, and baking.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Examine conditions, with Installer present, for compliance with requirements for installation tolerances, door and frame preparation and reinforcements, and other conditions affecting performance of automatic door operators.
- .2 Examine roughing-in for electrical systems to verify actual locations of power connections before automatic door operator installation.
- .3 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- .1 General: Install complete automatic door operators according to manufacturer's written instructions, including activation and safety devices, control wiring, and remote power units if any; connection to the building's power supply; and signage.
 - .1 Do not install damaged components. Fit joints to produce hairline joints free of burrs and distortion.
 - .2 Install operators true in alignment with established lines and door geometry without warp or rack. Anchor securely in place.
 - .3 Low-Energy Door Operator Installation Standard: BHMA A156.19.
- .2 Power Connection: See Division 26 Sections for connection to electrical power distribution system.

- .3 Access-Control System: Connect operators to access-control system if specified and then in accordance with Division 28 Section *Access Control*.
- .4 Signage: Apply on both sides of each door as required by cited BHMA standard for type of door operator and direction of pedestrian travel.

3.3 ADJUSTING

- .1 Adjust automatic door operators to function smoothly, and lubricate as recommended by manufacturer; comply with requirements of applicable BHMA standards.
 - .1 Adjust operators on exterior doors for weather tight closure.
- .2 After completing installation of exposed, factory-finished automatic door operators, inspect exposed finishes on doors and operators. Repair damaged finish to match original finish.
- .3 Readjust automatic door operators after repeated operation of completed installation equivalent to three days' use by normal traffic (100 to 300 cycles).
- .4 Occupancy Adjustment: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.4 DEMONSTRATION

- .1 Engage a certified inspector to train Owner's maintenance personnel to adjust, operate, and maintain automatic door operators.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- .1 Moisture testing of substrates.
- .2 Surface preparation of substrates as required for acceptance of paint, including cleaning, small crack repair, patching, caulking, and making good surfaces and areas to limits defined under MPI Repainting Maintenance Manual requirements.
- .3 Specific pre-treatments noted herein or specified in the MPI Repainting Maintenance Manual.
- .4 Sealing/touch-up, spot priming, and/or full priming surfaces for repainting in accordance with MPI Repainting Maintenance Manual requirements.
- .5 Provision of safe and adequate ventilation as required where toxic and/or volatile/flammable materials are being used over and above temporary ventilation supplied by others.

1.2 REFERENCES

- .1 Maintenance Repainting Manual by the Master Painters Institute (MPI), including Identifiers, Evaluation, Systems, Preparation and Approved Product List.
- .2 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings) of the Environmental Protection Agency (EPA).
- .3 National Fire Code of Canada.

1.3 QUALITY ASSURANCE

- .1 Contractor shall have a minimum of five years proven satisfactory experience. Provide a list of last three comparable jobs including, job name and location, specifying authority, and project manager.
- .2 Qualified journeymen who have a "Tradesman Qualification Certificate of Proficiency" shall be engaged in repainting work. Apprentices may be employed provided they work under the direct supervision of a qualified journeyman in accordance with applicable trade regulations.
- .3 Conform to latest MPI requirements for interior repainting work including cleaning, preparation and priming.
- .4 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) shall be in accordance with the latest edition of the MPI Approved Product List and shall be from a single manufacturer for each system used.
- .5 Paint materials such as linseed oil, shellac, turpentine, etc. shall be the highest quality product of an approved manufacturer listed in MPI Maintenance Repainting Manual and shall be compatible with other coating materials as required.
- .6 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Owner's Representative.

- .7 Standard of Acceptance: When viewed using final lighting source surfaces shall indicate the following:
 - .1 Walls: No defects visible from a distance of 1000 mm at 90° to surface.
 - .2 Ceilings: No defects visible from floor at 45° to surface.
 - .3 Final coat to exhibit uniformity of colour and sheen across full surface area.
- 1.4 ENVIRONMENTAL PERFORMANCE REQUIREMENTS
 - .1 Provide paint products meeting MPI "Environmentally Friendly" E2 or E3 ratings based on VOC (EPA Method 24) content levels.
- 1.5 SCHEDULING OF WORK
 - .1 Submit work schedule for various stages of painting to Owner's Representative for approval. Submit schedule a minimum of two (2) working days in advance of proposed operations.
 - .2 Paint occupied facilities in accordance with approved schedule. Schedule operations to approval of Owner's Representative such that painted surfaces will have dried and cured sufficiently before occupants are affected.
 - .3 Obtain written authorization from Owner's Representative for changes in work schedule.
 - .4 Schedule repainting operations to prevent disruption by other trades if applicable and by occupants in and about the building.
- 1.6 SUBMITTALS
 - .1 Submit full range colour sample chips for review and selection. Indicate where colour availability is restricted.
 - .2 Submit product data and manufacturer's installation/application instructions for paints and coating products to be used.
 - .3 Submit WHMIS MSDS - Material Safety Data Sheets for paint and coating materials to be used.
 - .4 Upon completion, submit records of products used. List products in relation to finish system and include the following:
 - .1 Product name, type and use (i.e. materials and location).
 - .2 Manufacturer's product number.
 - .3 Colour code numbers.
 - .4 MPI Environmentally Friendly classification system rating.
 - .5 Manufacturer's Material Safety Data Sheets (MSDS).
 - .5 Submit duplicate 200 x 300 mm sample panels of each paint, stain, clear coating, with specified paint or coating in colours, gloss/sheen and textures required to MPI Painting Specification Manual standards submitted on the following substrate materials:
 - .1 3 mm plate steel for finishes over metal surfaces.
 - .2 13 mm birch plywood for finishes over wood surfaces.
 - .3 50 mm concrete block for finishes over concrete or concrete masonry surfaces.

- .4 13 mm gypsum board for finishes over gypsum board and other smooth surfaces.
- .6 When approved, samples shall become acceptable standard of quality for appropriate on-site surface with one of each sample retained on-site.
- 1.7 QUALITY CONTROL
 - .1 Provide a mock-up in accordance with requirements of Section 01 45 00 - Quality Control to Owner's Representative.
 - .2 Prepare and repaint mock-up designated interior room, surface or item to requirements specified herein, with specified paint or coating showing selected colours, gloss/sheen, textures and workmanship to MPI Maintenance Repainting Manual standards for review and approval.
 - .3 When approved, repainted room, surface and/or item shall become acceptable standard of finish quality and workmanship for similar on-site interior repainting work.
- 1.8 DELIVERY, HANDLING AND STORAGE
 - .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
 - .2 Deliver and store materials in original containers, sealed, with labels intact.
 - .3 Labels shall clearly indicate:
 - .1 Manufacturer's name and address.
 - .2 Type of paint or coating.
 - .3 Compliance with applicable standard.
 - .4 Colour number in accordance with established colour schedule.
 - .4 Remove damaged, opened and rejected materials from site.
 - .5 Observe manufacturer's recommendations for storage and handling.
 - .6 Store materials and equipment in a secure, dry, well-ventilated area with temperature range between 7°C to 30°C. Store materials and supplies away from heat generating devices and sensitive products above minimum temperature as recommended by manufacturer.
 - .7 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of Owner's Representative. After completion of operations, return areas to clean condition to approval of Owner's Representative.
 - .8 Remove paint materials from storage in quantities required for same day use.
 - .9 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.
 - .10 Fire Safety Requirements:
 - .1 Provide one 9 kg Type ABC dry chemical fire extinguisher adjacent to storage area.
 - .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.

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

1.9 SITE REQUIREMENTS

.1 Heating, Ventilation and Lighting:

- .1 Ventilate enclosed spaces.
- .2 Perform no repainting work unless adequate and continuous ventilation and sufficient heating facilities are in place to maintain ambient air and substrate temperatures above 10°C for 24 hours before, during and after paint application and until paint has cured sufficiently.
- .3 Where required, provide continuous ventilation for seven days after completion of application of paint.
- .4 Provide temporary ventilating and heating equipment where permanent facilities are not available.
- .5 Perform no painting work unless a minimum lighting level of 323 Lux is provided on surfaces to be painted. Adequate lighting facilities shall be provided by General Contractor.

.2 Temperature, Humidity and Substrate Moisture Content Levels:

- .1 Unless specifically pre-approved by Owner's Representative and applied product manufacturer, perform no repainting work when:
 - .1 Ambient air and substrate temperatures are below 10°C.
 - .2 Substrate temperature is over 32°C unless paint is specifically formulated for application at high temperatures.
 - .3 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's prescribed limits.
 - .4 Relative humidity is above 85% or when dew point is less than 3°C variance between air/surface temperature.
 - .5 Rain or snow is forecast to occur before paint has thoroughly cured.
 - .6 It is foggy, misty, raining or snowing at site.
- .2 Conduct moisture tests using a properly calibrated electronic Moisture Meter, except use a simple "cover patch test" on concrete floors to be repainted.
- .3 Perform no repainting work when maximum moisture content of substrate exceeds:
 - .1 12% for concrete and masonry (clay and concrete brick/block).
 - .2 15% for wood.
 - .3 12% for plaster and gypsum board.
- .4 Test painted concrete, masonry and plaster surfaces for alkalinity as required.

.3 Application Requirements:

- .1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when ventilation conditions are such that airborne particles will not affect quality of finished surface.
- .2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits noted herein.
- .3 Apply paint when previous coat of paint is dry or adequately cured, unless otherwise pre-approved by the specific coating manufacturer.

- .4 Apply paint finishes when conditions forecast for entire period of application fall within manufacturer's recommendations.
- .5 Do not apply paint when:
 - .1 Temperature is expected to drop below 10°C before paint has thoroughly cured.
 - .2 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's limits.
 - .3 Surface to be painted is wet, damp or frosted.
- .6 Provide and maintain cover when paint must be applied in damp or cold weather. Heat substrates and surrounding air to comply with temperature and humidity conditions specified by manufacturer. Protect until paint is dry or until weather conditions are suitable.
- .7 Schedule repainting operations such that surfaces exposed to direct, intense sunlight are scheduled for completion during early morning.
- .8 Remove paint from areas which have been exposed to freezing, excess humidity, rain, snow or condensation. Prepare surface again and repaint.

1.10 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Place materials defined as hazardous or toxic in designated containers.
- .4 Ensure emptied containers are sealed and stored safely.
- .5 Unused paint, coating materials must be disposed of at official hazardous material collections site as approved by Owner's Representative.
- .6 Paint, stain and wood preservative finishes and related materials (thinners, solvents, etc.) are hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.
- .7 Materials that cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.
- .8 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.
- .9 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into the ground the following procedures shall be strictly adhered to:
 - .1 Retain cleaning water for water-based materials to allow sediments to be filtered out. In no case shall equipment be cleaned using free draining water.
 - .2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
 - .3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
 - .4 Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.

- .10 Empty paint cans are to be dry prior to disposal or recycling (where available).
- .11 Close and seal tightly partly used cans of materials including sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Paint materials listed in the latest edition of the MPI Approved Product List (APL) are acceptable for use on this project.
- .2 Paint materials for repaint systems shall be products of a single manufacturer.
- .3 Low odour products: whenever possible, select products exhibiting low odour characteristics. If two products are otherwise equivalent, select the product with the lowest odour. Only qualified products with E2 or E3 "Environmentally Friendly" rating are acceptable for use on this project.
- .4 Paints, coatings, thinners, solvents, cleaners and other fluids used in repainting, shall:
 - .1 Be water-based, water soluble, water clean-up.
 - .2 Be non-flammable.
 - .3 Not contain methylene chloride, chlorinated hydrocarbons, toxic metal pigments.
 - .4 Be manufactured without compounds which contribute to ozone depletion in the upper atmosphere.
 - .5 Be manufactured without compounds which contribute to smog in the lower atmosphere.
 - .6 Be manufactured in a manner where matter generating a 'Biochemical Oxygen Demand' (BOD) in undiluted production plant effluent discharged to a natural watercourse or a sewage treatment facility lacking secondary treatment does not exceed 15 mg/L.
 - .7 Be manufactured in a manner where the total suspended solids (TSS) content in undiluted production plant effluent discharged to a natural watercourse or a sewage treatment facility lacking secondary treatment does not exceed 15 mg/L.
- .5 Paints and coatings must be manufactured and transported in a manner that steps of processes, including disposal of waste products arising therefrom, will meet requirements of applicable governmental acts, by-laws and regulations including, for facilities located in Canada, Fisheries Act and Canadian Environmental Protection Act (CEPA).
- .6 Paints and coatings must not be formulated or manufactured with formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium or their compounds.
- .7 Water-borne paints and stains, and water borne varnishes must meet a minimum "Environmentally Friendly" E2 rating.

2.2 COLOURS

- .1 Owner's Representative will provide Colour Schedule after Contract award.
- .2 Selection of colours will be from manufacturers full range of colours.

- .3 Where specific products are available in a restricted range of colours, selection will be based on the limited range.
- .4 Second coat in a three coat repaint system to be tinted slightly lighter colour than top coat to show visible difference between coats.

2.3 MIXING AND TINTING

- .1 Perform colour tinting operations prior to delivery of paint to site. On-site tinting of painting materials is allowed with Owner's Representative written permission.
- .2 Paste, powder or catalyzed paint mixes shall be mixed in strict accordance with manufacturer's written instructions.
- .3 Where thinner is used, addition shall not exceed paint manufacturer's recommendations. Do not use kerosene or such organic solvents to thin water-based paints.
- .4 Thin paint for spraying according in strict accordance with paint manufacturer' instructions. If directions are not on container, obtain instructions in writing from manufacturer and provide copy of instructions to Owner's Representative.
- .5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

2.4 GLOSS/SHEEN RATINGS

- .1 Paint gloss shall be defined as the sheen rating of applied paint, in accordance with the following MPI gloss / sheen standard values:

Gloss Level Category	Units @ 60°	Units @ 85°
G1 - matte finish	0 to 5	maximum 10
G2 - velvet finish	0 to 10	10 to 35
G3 - eggshell finish	10 to 25	10 to 35
G4 - satin finish	20 to 35	minimum 35
G5 - semi-gloss finish	35 to 70	
G6 - gloss finish	70 to 85	
G7 - high gloss finish	> 85	

- .2 Gloss level ratings of repainted surfaces shall be as specified herein.

2.5 INTERIOR PAINTING SYSTEMS

- .1 The following paint formulas requires a two coat finish as indicated in the MPI Repainting Maintenance Manual.
- .2 RIN 2.1 - Asphalt Surfaces: (zone/traffic marking on interior drive and parking areas, etc.).
 - .1 RIN 2.1B - Alkyd Zone/Traffic Marking.
- .3 RIN 3.1 - Concrete Vertical Surfaces: (including soffits).
 - .1 RIN 3.1A - Latex G4 finish.
- .4 RIN 3.2 - Concrete Horizontal Surfaces: (floors and stairs, etc.).

- .1 RIN 3.2A - Latex Floor Enamel G4.
- .5 RIN 4.1 - Clay Masonry Units: (pressed and extruded brick).
 - .1 RIN 4.1A - Latex G4 finish.
- .6 RIN 4.2 - Concrete Masonry Units: (Concrete Block and Concrete Brick).
 - .1 RIN 4.2A - Latex G4 finish.
- .7 RIN 5.1 - Structural Steel and Metal Fabrications.
 - .1 RIN 5.1K - 2 Component Epoxy finish.
- .8 RIN 5.3 - Galvanized Metal: (High Contact/High Traffic Areas (Doors, Frames, Railings, Pipes, Handrails, etc.). Low Contact/Low traffic areas (Overhead Decking, Pipes, Ducts, etc.)
 - .1 RIN 5.3C - Alkyd G5 finish.
- .9 RIN 6.2 - Dimension Lumber: (Columns, Beams, Exposed Joists, Underside of Decking, etc.)
 - .1 RIN 6.2A - Latex G4 (over latex primer).
- .10 RIN 6.3 - Dressed Lumber: (Including Doors, Door and Window Frames, Mouldings, etc.)
 - .1 RIN 6.3A - Latex G5 finish.
- .11 RIN 6.4 - Wood Panelling and Casework: (Partitions, Panels, Shelving, Millwork, etc.).
 - .1 RIN 6.4B - Latex G4 finish.
- .12 RIN 6.5 - Wood Floors and Stairs: (Including Hardwood Flooring).
 - .1 RIN 6.5A - Alkyd Floor Enamel G4 (over primer).
- .13 RIN 9.2 - Plaster and Gypsum Board: (gypsum wallboard, drywall, "sheet rock type material", etc.,
 - .1 RIN 9.2A - Latex G5 (over latex sealer) for walls.
 - .2 RIN 9.2A - Latex G1 (over latex sealer) for ceilings.
- .14 RIN 10.1 - Canvas and Cotton Coverings:
 - .1 RIN 10.1B - Alkyd G5 finish.

PART 3 EXECUTION

3.1 GENERAL

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

3.2 EXISTING CONDITIONS

- .1 Prior to commencing work, thoroughly examine site conditions and existing interior substrates to be repainted. Report in writing to Owner's Representative damages, defects, or unsatisfactory or unfavourable conditions or surfaces that will adversely affect this work.

- .2 Conduct moisture testing of surfaces to be painted using a properly calibrated electronic moisture meter, except test concrete floors for moisture using a simple "cover patch test" and report findings to Owner's Representative. Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.
- .3 Maximum moisture content as follows:
 - .1 Concrete: 12%.
 - .2 Clay and Concrete Block/Brick: 12%.
 - .3 Wood: 15%.
- .4 No repainting work shall commence until such adverse conditions and defects have been corrected and surfaces and conditions are acceptable to the Painting Subcontractor and Inspection Agency. Commencement of work shall not be held to imply acceptance of surfaces except as qualified herein.
- .5 Degree of surface deterioration (DSD) shall be assessed using MPI Identifiers and Assessment criteria indicated in the MPI Maintenance Repainting Manual. MPI DSD ratings and descriptions are as follows:

Condition	Description
DSD-0	Sound Surface (includes visual (aesthetic) defects that do not affect film's protective properties).
DSD-1	Slightly Deteriorated Surface (indicating fading; gloss reduction, slight surface contamination, minor pin holes scratches, etc.).
DSD-2	Moderately Deteriorated Surface (small areas of peeling, flaking, slight cracking, staining, etc.).
DSD-3	Severely Deteriorated Surface (heavy peeling, flaking, cracking, checking, scratches, scuffs, abrasion, small holes and gouges).
DSD-4	Substrate Damage (repair or replacement of surface required by others).

3.3 PROTECTION

- .1 Protect existing surfaces and adjacent fixtures and furnishings from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore such surfaces as directed by Owner's Representative.
- .2 Cover or mask windows and other ornamental hardware adjacent to areas being painted to prevent damage and to protect from paint drops and splatters. Use non-staining coverings.
- .3 Protect items that are permanently attached such as Fire Labels on doors and frames.
- .4 Protect factory finished products and equipment.
- .5 Protect general public and building occupants in and about the building.
- .6 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and surface mounted equipment, fittings and fastenings prior to undertaking re-painting operations. Items shall be securely stored and re-installed after painting is completed.
- .7 Move and cover furniture and portable equipment as necessary to carry out repainting operations. Replace as painting operations progress.

- .8 As repainting operations progress, place "WET PAINT" signs in occupied areas to approval of Owner's Representative.

3.4 CLEANING AND PREPARATION

- .1 Clean and prepare interior surfaces to be repainted in accordance with MPI Maintenance Repainting Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:
 - .1 Remove dust, dirt, and surface debris by vacuuming, wiping with dry, clean cloths or compressed air.
 - .2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil and surface contaminants.
 - .3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
 - .4 Allow surfaces to drain completely and to dry thoroughly. Allow sufficient drying time and test surfaces using an electronic moisture meter before commencing work.
 - .5 Use water-based cleaners in place of organic solvents where surfaces will be repainted using water based paints.
 - .6 Many water-based paints cannot be removed with water once dried. Minimize the use of kerosene or such organic solvents to clean up water-based paints.
- .2 Where required, pressure wash exterior surfaces prior to repainting in accordance with MPI standards for type of surfaces and recommended pressures to ensure complete removal of loose paint, stains, dirt, and foreign matter. This work to be carried out by qualified tradesman experienced in pressure water cleaning. Use of spray equipment such as water hose cleaning will not be considered satisfactory unless specified herein. Allow sufficient drying time and test surfaces using an electronic moisture meter before commencing work.
- .3 Clean metal surfaces to be repainted by removing rust, dirt, oil, grease and foreign substances in accordance with MPI requirements. Remove such contaminants from surfaces, pockets and corners to be repainted by brushing with clean brushes, blowing with clean dry compressed air, or brushing/vacuum cleaning as required.
- .4 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before priming and between applications of remaining coats. Touch-up, spot prime, and apply primer, paint, or pre-treatment as soon as possible after cleaning and before deterioration occurs.
- .5 Do not apply paint until prepared surfaces have been accepted by Owner's Representative.
- .6 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.

3.5 APPLICATION

- .1 Method of application to be as approved by Owner's Representative. Apply paint by brush, roller, air sprayer, airless sprayer. Conform to manufacturer's application instructions unless specified otherwise.
- .2 Brush and Roller Application:
 - .1 Apply paint in a uniform layer using brush and/or roller of types suitable for application.

- .2 Work paint into cracks, crevices and corners.
- .3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
- .4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces shall be free of roller tracking and heavy.
- .5 Remove runs, sags and brush marks from finished work and repaint.
- .3 Spray Application:
 - .1 Provide and maintain equipment that is suitable for intended purpose, capable of properly atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
 - .2 Keep paint ingredients properly mixed in containers during paint application by either continuous mechanical agitation or intermittent agitation frequently as necessary.
 - .3 Apply paint in a uniform layer, with overlapping at edges of spray pattern.
 - .4 Back roll spray applications and brush out runs and sags immediately.
 - .5 Use brushes to work paint into cracks, crevices and places which are not adequately painted by spray.
- .4 Use dipping, sheepskins or daubers when no other method is practical in places of difficult access and when specifically authorized by Owner's Representative.
- .5 Apply paint coats in a continuous manner and allow surfaces to dry and properly cure between coats for minimum time period as recommended by manufacturer. Minimum dry film thickness of coats shall not be less than that recommended by the manufacturer. Repaint thin spots or bare areas before next coat of paint is applied.
- .6 Sand and dust between coats to remove visible defects.
- .7 Repaint surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.
- .8 Repaint top, bottom, and vertical edges of doors to be repainted.
- .9 Repaint inside of cupboards and cabinets as specified for outside surfaces.
- .10 Repaint closets and alcoves to match existing, unless otherwise scheduled or noted.
- 3.6 MECHANICAL / ELECTRICAL EQUIPMENT
 - .1 Unless otherwise noted, repainting shall also include exposed to view / previously painted mechanical and electrical equipment and components (panels, conduits, piping, hangers, ductwork, etc.).
 - .2 Touch up scratches and marks and repaint such mechanical and electrical equipment and components with colour, and sheen finish to match existing unless otherwise noted or scheduled.
 - .3 Do not paint over name plates or instruction labels.
 - .4 Leave unfinished exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish.

- .5 Keep sprinkler heads free of paint.
- .6 Do not paint interior transformers and substation equipment.
- 3.7 FIRE SEPARATIONS
 - .1 Contractor to stencil on both sides of fire rated partitions the fire rating for that assembly (i.e.: 1 HR FIRE SEPARATION).
 - .2 Stenciled fire ratings to be minimum 100 mm high RED letters, minimum 150 mm above finished ceilings, and minimum 2400 mm o.c. along partition.
- 3.8 FIELD QUALITY CONTROL
 - .1 Field inspection of exterior painting operations to be carried out by Owner's Representative.
 - .2 Advise Owner's Representative when each surface and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.
 - .3 Co-operate with Owner's Representative and provide access to areas of work.
- 3.9 CLEAN-UP
 - .1 Remove paint where spilled, splashed, splattered or sprayed as work progresses using means and materials that are not detrimental to affected surfaces.
 - .2 Keep work area free from an unnecessary accumulation of tools, equipment, surplus materials and debris.
 - .3 Remove combustible rubbish materials and empty paint cans each day and safely dispose of same in accordance with requirements of authorities having jurisdiction.
 - .4 Clean equipment and dispose of wash water used for water borne materials, solvents used for oil based materials as well as other cleaning and protective materials (e.g. rags, drop cloths, masking papers, etc.), paints, thinners, paint removers/strippers in accordance with the safety requirements of authorities having jurisdiction and as noted herein.
 - .5 Painting equipment shall be cleaned in leak-proof containers that will permit particulate matter to settle out and be collected. Sediment remaining from cleaning operations shall be recycled or disposed of in a manner acceptable to authorities having jurisdiction.
 - .6 Paint and coatings in excess of repainting requirements shall be recycled as noted herein.
- 3.10 RESTORATION
 - .1 Clean and re-install hardware items removed before undertaken painting operations.
 - .2 Remove protective coverings and warning signs as soon as practical after operations cease.
 - .3 Remove paint splashings on affected exposed surfaces. Remove smears and spatter immediately as operations progress, using compatible solvent.

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

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- .1 Types of items described in this Section:
 - .1 Non-load-bearing steel framing members for the following applications:
 - .1 Interior framing systems (e.g., supports for partition walls, framed soffits, furring, etc.).
 - .2 Interior suspension systems (e.g., supports for ceilings, suspended soffits, etc.).
 - .2 Sheet steel security linear panel.
- .2 Types of items you will not find described in this Section:
 - .1 Wind-bearing steel stud framing.
 - .2 Insulation.
 - .3 Head-of-wall joint systems installed with non-load-bearing steel framing.
 - .4 Non-load-bearing metal shaft-wall framing, gypsum panels, and other components of shaft-wall assemblies.

1.3 SUBMITTALS

- .1 Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

- .1 Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to CAN/ULC-S101 by an independent testing agency.
- .2 STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

PART 2 - PRODUCTS

2.1 NON-LOAD-BEARING STEEL FRAMING, GENERAL

- .1 Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - .1 Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
 - .2 Protective Coating: G60 Coating with equivalent corrosion resistance of ASTM A 653/A 653M, Z120, hot-dip galvanized, unless otherwise indicated.

2.2 SUSPENSION SYSTEM COMPONENTS

- .1 Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 1.59 mm diameter wire, or double strand of 1.21 mm diameter wire.
- .2 Hanger Attachments to Concrete:

- .1 Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
- .2 Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.
- .3 Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 4.12 mm diameter.
- .4 Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 1.37 mm and minimum 12.7 mm wide flanges.
- .5 Furring Channels (Furring Members):
 - .1 Cold-Rolled Channels: 1.37 mm bare-steel thickness, with minimum 12.7 mm wide flanges, 19.1 mm deep.
 - .2 Steel Studs: ASTM C 645.
 - .1 Minimum Base-Metal Thickness: 0.45 mm.
 - .2 Depth: As indicated on Drawings.
 - .3 Hat-Shaped, Rigid Furring Channels: ASTM C 645, 22.2 mm deep.
 - .1 Minimum Base Metal Thickness: 0.45 mm.
 - .4 Resilient Furring Channels: 12.7 mm deep members designed to reduce sound transmission.
 - .1 Configuration: Asymmetrical or hat shaped.

2.3 STEEL FRAMING FOR FRAMED ASSEMBLIES

- .1 Steel Studs and Runners: ASTM C 645.
 - .1 Minimum Base-Metal Thickness: 0.45 mm.
 - .2 Depth: As indicated on Drawings.
- .2 Slip-Type Head Joints: At underside of floor and roof decks and underside of structural framing, provide one of the following:
 - .1 Single Long-Leg Runner System: ASTM C 645 top runner with 50.8 mm deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 305 mm of the top of studs to provide lateral bracing.
 - .2 Double-Runner System: ASTM C 645 top runners, inside runner with 50.8 mm deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
 - .3 Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- .3 Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
- .4 Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
 - .1 Minimum Base-Metal Thickness: 0.79 mm.
- .5 Cold-Rolled Channel Bridging: 1.37 mm bare-steel thickness, with minimum 12.7 mm wide flanges.
- .6 Hat-Shaped, Rigid Furring Channels: ASTM C 645.
- .7 Resilient Furring Channels: 12.7 mm deep, steel sheet members designed to reduce sound transmission.

- .8 Cold-Rolled Furring Channels: 1.37 mm bare-steel thickness, with minimum 12.7 mm wide flanges.

2.4 SHEET METAL SECURITY LINEAR PANEL

- .1 Linear Panel: sheet metal of 1.99 mm minimum bare metal thickness, commercial quality consisting of one of the following:
 - .1 Zinc coated sheet steel to ASTM A 653/A 653M, with Z275 designation zinc coating;
 - .2 Aluminum-zinc alloy coated sheet steel to ASTM A 792/A 792M, grade 33 or 37 with AZ150 coating, regular spangle surface, not chemically treated for paint finish.

2.5 AUXILIARY MATERIALS

- .1 General: Provide auxiliary materials that comply with referenced installation standards.
 - .1 Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- .2 Isolation Strip at Exterior Walls: Provide the following:
 - .1 Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 3.2 mm thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.
 - .1 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- .1 Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
- .2 Coordination with Sprayed Fire-Resistive Materials, if material is used on this project:
 - .1 Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 600 mm o.c.
 - .2 After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

- .1 Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.
 - .1 Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- .2 Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- .3 Install bracing at terminations in assemblies.

- .4 Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING SUSPENSION SYSTEMS

- .1 Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.
- .2 Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- .3 Suspend hangers from building structure as follows:
 - .1 Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - .1 Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - .2 Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - .1 Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
 - .3 Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - .4 Do not connect or suspend steel framing from ducts, pipes, or conduit.
- .4 Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- .5 Installation Tolerances: Install suspension systems that are level to within 3 mm in 3.6 m measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.5 INSTALLING FRAMED ASSEMBLIES

- .1 Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- .2 Install studs so flanges within framing system point in same direction.
- .3 Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
 - .1 Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 - .2 Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - .1 Install two studs at each jamb, unless otherwise indicated.
 - .2 Frame around door openings intended for doors greater than 90 kg in weight using studs having minimum thickness of 0.79 mm
 - .3 Install cripple studs at head adjacent to each jamb stud, with a minimum 12.7 mm clearance from jamb stud to allow for installation of control joint in finished assembly.
 - .4 Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

- .3 Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 - .4 Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - .1 Firestop Track: Install to maintain continuity of fire-resistance-rated assembly indicated.
 - .5 Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
 - .6 Curved Partitions:
 - .1 Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
 - .2 Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of not less than 2 studs at ends of arcs, place studs 150 mm o.c.
 - .4 Direct Furring:
 - .1 Screw to wood framing.
 - .2 Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 610 mm o.c.
 - .5 Installation Tolerance: Install each framing member so fastening surfaces vary not more than 3 mm from the plane formed by faces of adjacent framing.
- 3.6 SHEET METAL SECURITY LINEAR PANEL
- .1 Install sheet metal security linear panels in locations indicated.
 - .2 Prepare sheet metal security linear panel with 9.5 mm holes for installation, plug welded to the room-exterior side of metal studs vertically or screw-fasten to the room-exterior side of wood studs; at 400 mm o.c. and horizontally at 300 mm o.c. maximum.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- .1 Types of items described in this Section:
 - .1 Interior gypsum board.
 - .2 Tile backing panels.
 - .3 Cementitious backer units (cement board).
- .2 Types of items you will not find described in this Section:
 - .1 Exterior gypsum board for ceilings and soffits.
 - .2 Cement board as a substrate for exterior cement board stucco system.
 - .3 Load-bearing steel framing that supports gypsum board.
 - .4 Wood framing and furring that supports gypsum board.
 - .5 Gypsum sheathing.
 - .6 Insulation and vapour retarders installed in assemblies that incorporate gypsum board.
 - .7 Fire Stop Systems for head-of-wall assemblies that incorporate gypsum board.
 - .8 Non-structural framing and suspension systems that support gypsum board.
 - .9 Metal shaft-wall framing, gypsum shaft liners, and other components of shaft-wall assemblies.
 - .10 Gypsum base for veneer plaster and for other components of gypsum-veneer-plaster finishes.
 - .11 Primers applied to gypsum board surfaces.

1.2 SUBMITTALS

- .1 Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

- .1 Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to CAN/ULC-S101 by an independent testing agency.
- .2 STC -Rated Assemblies: For STC-rated assemblies provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

1.4 STORAGE AND HANDLING

- .1 Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.5 PROJECT CONDITIONS

- .1 Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- .2 Do not install interior products until installation areas are enclosed and conditioned.
- .3 Do not install panels that are wet, those that are moisture damaged, and those that are mould damaged.
 - .1 Indications that panels are wet or moisture damaged include, but are not limited to, discolouration, sagging, or irregular shape.

- .2 Indications that panels are mould damaged include, but are not limited to, fuzzy or splotchy surface contamination and discolouration.

PART 2 - PRODUCTS

2.1 PANELS, GENERAL

- .1 Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.2 INTERIOR GYPSUM BOARD (Also referred on drawings as **GYP BD**)

- .1 General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.
 - .1 Regular Type.
 - .2 Type X.
 - .3 Flexible Type: Manufactured to bend to fit radii and to be more flexible than standard regular-type gypsum board of same thickness.
 - .4 Ceiling Type: Manufactured to have more sag resistance than regular-type gypsum board.
 - .5 Abuse-Resistant Type: Manufactured to produce greater resistance to surface indentation, through-penetration (impact resistance), and abrasion than standard, regular-type and Type X gypsum board.
 - .6 Moisture- and Mould-Resistant Type: With moisture- and mould-resistant core and surfaces, regular type and Type X gypsum board.

2.3 TILE BACKING PANELS (Also referred on drawings as **TILE BACKER**)

- .1 Glass-Mat, Water-Resistant Backing Board: Any of the following:
 - .1 Complying with ASTM C 1178/C 1178M.
 - .1 Product: Subject to compliance with requirements, provide *DensShield Tile Guard* by G-P Gypsum; or approved alternate.
 - .2 Product: Subject to compliance with requirements, provide *GlasRoc Tile Backer Regular* by CertainTeed; or approved alternate.
 - .2 Complying with ASTM C1177/C 1177M.
 - .1 Product: Subject to compliance with requirements, provide *DensArmor Plus Interior Guard* by G-P Gypsum; or approved alternate.

2.4 CEMENTITIOUS BACKER UNITS (Also referred on drawings as **CBU** or **Cement Board**)

- .1 Cementitious Backer Units: ANSI A118.9.
 - .1 Thickness: As indicated on Drawings.

2.5 TRIM ACCESSORIES

- .1 Interior Trim: ASTM C 1047.
 - .1 Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
 - .2 Shapes:
 - .1 Corner bead.
 - .2 Bullnose bead.
 - .3 LC-Bead: J-shaped; exposed long flange receives joint compound.
 - .4 L-Bead: L-shaped; exposed long flange receives joint compound.
 - .5 U-Bead: J-shaped; exposed short flange does not receive joint compound.

- .6 Expansion (control) joint.
- .7 Curved-Edge Corner bead: With notched or flexible flanges.
- .8 Other profiles as indicated or required.

2.6 JOINT TREATMENT MATERIALS

- .1 General: Comply with ASTM C 475/C 475M.
- .2 Joint Tape:
 - .1 Interior Gypsum Wallboard: Paper.
 - .2 Tile Backing Panels: As recommended by panel manufacturer.
- .3 Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - .1 Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
 - .2 Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 - .1 Use setting-type compound for installing paper-faced metal trim accessories.
 - .3 Fill Coat: For second coat, use setting-type, sandable topping compound.
 - .4 Finish Coat: For third coat, use setting-type, sandable topping compound.
 - .5 Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound or high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.
- .4 Joint Compound for Tile Backing Panels:
 - .1 Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
- .5 Joint Compound for Cementitious Backer Units:
 - .1 Cementitious Backer Units: As recommended by backer unit manufacturer.

2.7 AUXILIARY MATERIALS

- .1 General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- .2 Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
- .3 Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 - .1 Use screws complying with ASTM C 954 for fastening panels to steel members from 0.84 to 2.84 mm thick.
 - .2 For fastening cementitious backer units, use non-corrosive screws of type and size recommended by panel manufacturer.
- .4 Acoustical Sealant: As specified in Division 07 Section *Joint Sealants*.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.

.2 Examine panels before installation. Reject panels that are wet, moisture damaged, and mould damaged.

.3 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

.1 Comply with ASTM C 840.

.2 Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

.3 Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1.5 mm of open space between panels. Do not force into place.

.4 Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

.5 Form control and expansion joints with space between edges of adjoining gypsum panels.

.6 Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

.1 Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 0.7 sq. m in area.

.2 Fit gypsum panels around ducts, pipes, and conduits.

.3 Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 6.4 to 9.5 mm wide joints to install sealant.

.7 Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 6.4 to 12.7 mm wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

.8 Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

.9 Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members, or provide control joints to counteract wood shrinkage.

.10 STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

3.3 APPLYING INTERIOR GYPSUM BOARD

.1 Install interior gypsum board in the following locations:

.1 Regular Type: Apply on vertical surfaces, unless otherwise indicated.

.2 Type X: Apply where required for fire-resistance-rated assembly.

- .3 Flexible Type: Apply in double layer at curved assemblies.
 - .4 Ceiling Type: Apply at ceiling and horizontal surfaces.
 - .5 Abuse-Resistant Type: Apply where indicated on Drawings.
 - .6 Moisture- and Mould-Resistant Type: Apply to inside of all exterior walls, in janitor's closets, in locker rooms, and in shower areas, provided the surface does not serve as a substrate for tile; and other locations indicated on Drawings.
- .2 Single-Layer Application:
- .1 On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
 - .2 On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - .1 Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - .2 At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
 - .3 On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 - .4 Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- .3 Multilayer Application:
- .1 On ceilings, apply gypsum board indicated for base layers before applying face layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, 400 mm minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
 - .2 On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
 - .3 On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
 - .4 Fastening Methods: Fasten base layers and face layers separately to supports with screws.
- .4 Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.
- .5 Curved Surfaces:
- .1 Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 300-mm- long straight sections at ends of curves and tangent to them.
 - .2 For double-layer construction, fasten base layer to studs with screws 400 mm o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 300 mm o.c.
- 3.4 APPLYING TILE BACKING PANELS
- .1 Install tile backing panels in the following locations:
 - .1 Regular type: As substrate for tile finishes, except as noted.
 - .1 Use Type X as substrate for tile finish where required for fire-resistance-rated assembly.
 - .2 Glass-Mat, Water-Resistant Backing Panel: Comply with manufacturer's written installation instructions. Install with 6.4 mm gap where panels abut other construction or penetrations.

- .3 Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 APPLY CEMENTITIOUS BACKER UNITS

- .1 Install cementitious backer units in the following locations:
 - .1 Only at locations specifically indicated to receive cementitious backer units.
- .2 Cementitious Backer Units: install to ANSI A108.11.

3.6 INSTALLING TRIM ACCESSORIES

- .1 General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- .2 Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Engineer for visual effect.
- .3 Interior Trim: Install in the following locations:
 - .1 Corner bead: Use at outside corners.
 - .2 Bullnose Bead: Use where indicated.
 - .3 LC-Bead: Use at exposed panel edges.
 - .4 Curved-Edge Corner bead: Use at curved openings.

3.7 FINISHING GYPSUM BOARD

- .1 General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- .2 Prefill open joints and damaged surface areas.
- .3 Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- .4 Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - .1 Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - .2 Level 2: Panels that are substrate for tile.
 - .3 Level 3: Where indicated on Drawings.
 - .4 Level 4: At panel surfaces that will be exposed to view, unless otherwise indicated.
 - .1 Primer and its application to surfaces are specified in other Division 09 Sections.
 - .5 Level 5: Where indicated on Drawings.
 - .1 Primer and its application to surfaces are specified in other Division 09 Sections.
- .5 Glass-Mat, Water-Resistant Backing Panels: Finish according to manufacturer's written instructions.
- .6 Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.8 PROTECTION

- .1 Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

- .2 Remove and replace panels that are wet, moisture damaged, and mould damaged.
 - .1 Indications that panels are wet or moisture damaged include, but are not limited to, discolouration, sagging, or irregular shape.
 - .2 Indications that panels are mould damaged include, but are not limited to, fuzzy or splotchy surface contamination and discolouration.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- .1 Types of items described in this Section:
 - .1 Acoustical ceiling panels.
 - .2 Exposed suspension systems for ceilings, having narrow and wide capped steel faces.
- .2 Types of items you will not find described in this Section:
 - .1 Exposed suspension systems having extra-wide faces.
 - .2 Exposed face suspension systems of aluminum construction.
 - .3 Clean room suspension systems.
 - .4 Ceilings consisting of mineral-base acoustical tiles used with concealed suspension systems, stapling, or adhesive bonding.
 - .5 Acoustical Metal Pan Ceilings.
 - .6 Linear Metal Ceilings.
 - .7 Suspended Decorative Grids.
- .3 Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete at ceilings.

1.2 DEFINITIONS

- .1 AC: Articulation Class.
- .2 CAC: Ceiling Attenuation Class.
- .3 LR: Light Reflectance coefficient.
- .4 NRC: Noise Reduction Coefficient.

1.3 SUBMITTALS

- .1 Product Data: For each type of product indicated.
- .2 Samples for Initial Selection: For components with factory-applied colour finishes.
- .3 Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - .1 Acoustical Panel: Set of 150 mm square Samples of each type, colour, pattern, and texture.
 - .2 Exposed Suspension System Members, Mouldings, and Trim: Set of 300 mm long Samples of each type, finish, and colour.
- .4 Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical panel ceiling.
- .5 Maintenance Data: For finishes to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- .1 Source Limitations:

- .1 Acoustical Ceiling Panel: Obtain each type through one source from a single manufacturer.
 - .2 Suspension System: Obtain each type through one source from a single manufacturer.
 - .2 Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
 - .1 Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per CAN/ULC-S101 by ULC or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - .1 Fire-Resistance Ratings: Indicated by design designations from ULC's *Fire Resistance Directory* or from the listings of another testing and inspecting agency.
 - .2 Identify materials with appropriate markings of applicable testing and inspecting agency.
 - .2 Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with CAN/ULC S102:
 - .1 Flame Spread Rating: 25 or less.
 - .2 Smoke-Developed Rating: 50 or less.
 - .3 Mock-ups: Build mock-ups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - .1 Approved mock-ups may become part of the completed Work if undisturbed at time of Substantial Completion.
 - .4 Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section *Project Management and Coordination*.
- 1.5 DELIVERY, STORAGE, AND HANDLING
- .1 Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
 - .2 Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
 - .3 Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.
- 1.6 PROJECT CONDITIONS
- .1 Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
 - .1 Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.
- 1.7 COORDINATION
- .1 Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.
- 1.8 EXTRA MATERIALS
- .1 Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - .1 Acoustical Ceiling Panels: Full-size panels equal to 2.0 percent of quantity installed.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANELS, GENERAL

- .1 Recycled Content
 - .1 Provide acoustical panels with recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content constitutes a minimum of 25 percent by weight.
- .2 Acoustical Panel Standard
 - .1 Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
- .3 Acoustical Panel Colours and Patterns
 - .1 Match appearance characteristics indicated for each product type.
 - .2 Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Owner's Representative from each manufacturer's full range that comply with requirements indicated for type, pattern, colour, light reflectance, acoustical performance, edge detail, and size.
- .4 Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment
 - .1 For acoustical panels indicated, treat with manufacturer's standard antimicrobial formulation that inhibits fungus, mould, mildew, and gram-positive and gram-negative bacteria and showing no mould, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.2 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING

- .1 General
 - .1 Provide panels complying with ASTM E 1264 for type, form, and pattern indicated and as outlined below.
 - .2 Fire Rating
 - .1 Required when installed in a fire rated assembly.
 - .3 Colour
 - .1 White, unless otherwise noted.
 - .4 Edge Detail
 - .1 Square edge, unless otherwise noted.
 - .5 Thickness
 - .1 15 mm unless otherwise indicated or required for fire rating.
 - .6 Modular Size
 - .1 610 x 610 and 610 x 1220 mm as implied by grid shown on drawings.
 - .7 Flame Spread Rating: 25 or less.
 - .8 Smoke Developed: 50 or less.
- .2 Acoustical Panel **AP1**; if required (typical)
 - .1 Type and Form: Type III, mineral base with painted finish; Form 2, water felted.
 - .2 Pattern: CD (perforated small holes and fissured).
 - .3 Light Reflectance (LR): Not less than 0.80.
 - .4 Noise Reduction Coefficient (NRC): Range of 0.55 to 0.65
 - .5 Ceiling Attenuation Class (CAC): Not less than 35.
 - .6 Thickness: 15mm
 - .7 Colour: White

- .8 Acceptable Products:
 - .1 "USG Radar Basic, Item No. 2110" (610 x 610) by USG CGC or approved alternate.
 - .2 "USG Radar Basic, Item No. 2310" (610 x 1220) by USG CGC or approved alternate.
 - .3 Acoustical Panel **AP2**; if required (high performance for open office environments)
 - .1 Type and Form: Type XII, glass-fibre base with membrane-faced overlay; Form 2, cloth.
 - .2 Pattern: E (lightly textured).
 - .3 Light Reflectance (LR): Not less than 0.90.
 - .4 Noise Reduction Coefficient (NRC): Not less than 0.95.
 - .5 Thickness: 25 mm
 - .4 Acoustical Panels **AP3, AP4, AP5**...; if required
 - .1 Refer to drawings.
- 2.3 METAL SUSPENSION SYSTEMS, GENERAL
- .1 Recycled Content: Provide products made from steel sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
 - .2 Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.
 - .3 Finishes and Colours, General: Comply with NAAMM's *Metal Finishes Manual for Architectural and Metal Products* for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
 - .1 High-Humidity Finish: Comply with ASTM C 635 requirements for *Coating Classification for Severe Environment Performance* where high-humidity finishes are indicated.
 - .4 Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, *Direct Hung*, unless otherwise indicated.
 - .1 Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to times that imposed by ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
 - .1 Type: any one of the following:
 - .1 Cast-in-place
 - .2 Postinstalled expansion
 - .3 Postinstalled bonded anchors.
 - .2 Corrosion Protection: any one of the following:
 - .1 Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.
 - .2 Stainless-steel components complying with ASTM F 593 and ASTM F 594, Group 1 Alloy 304 or 316 for bolts; Alloy 304 or 316 for anchor.
 - .3 Components fabricated from nickel-copper-alloy rods complying with ASTM B 164 for UNS No. N04400 alloy.
 - .2 Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.
 - .5 Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

- .1 Material: any one of the following:
 - .1 Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 - .2 Stainless-Steel Wire: ASTM A 580/A 580M, Type 304, nonmagnetic.
 - .3 Nickel-Copper-Alloy Wire: ASTM B 164, nickel-copper-alloy UNS No. N04400.
- .6 Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- .7 Angle Hangers: Angles with legs not less than 22 mm wide; formed with 1 mm thick, galvanized steel sheet complying with ASTM A 653/A 653M, Z275 coating designation; with bolted connections and 8 mm diameter bolts.

2.4 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING

- .1 Use wide-face suspension system unless otherwise indicated.
 - .1 Use narrow-face suspension system only when specifically indicated.
- .2 Wide-Face, Capped, Double-Web, Hot-Dip Galvanized, Z180, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, hot-dip galvanized according to ASTM A 653/A 653M, Z180 coating designation, with prefinished, cold-rolled, 24 mm wide, aluminum caps on flanges.
 - .1 Fire Rating: required when installed in a fire rated assembly.
 - .2 Structural Classification: Intermediate-duty system.
 - .3 Face Design: Flat, flush.
 - .4 Cap Finish: Painted white, unless otherwise noted.
- .3 Narrow-Face, Steel-Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than Z90 coating designation, with prefinished, cold-rolled, 15 mm wide metal caps on flanges.
 - .1 Fire Rating: required when installed in a fire rated assembly.
 - .2 Structural Classification: Intermediate-duty system.
 - .3 Face Design: Flat, flush.
 - .4 Cap Finish: Painted white, unless otherwise noted.

2.5 METAL EDGE MOLDINGS AND TRIM

- .1 Roll-Formed, Sheet-Metal Edge Mouldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard mouldings; formed from sheet metal of same material, finish, and colour as that used for exposed flanges of suspension system runners.
 - .1 Provide manufacturer's standard edge mouldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners, unless otherwise indicated.
 - .2 For lay-in panels with reveal edge details, provide stepped edge moulding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
 - .3 For circular penetrations of ceiling, provide edge mouldings fabricated to diameter required to fit penetration exactly.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

- .1 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- .1 Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- .1 General: Install acoustical panel ceilings to comply with ASTM C 63, per manufacturer's written instructions and CISCA's *Ceiling Systems Handbook*.
 - .1 Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.
- .2 Suspend ceiling hangers from building's structural members and as follows:
 - .1 Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - .2 Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - .3 Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - .4 Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - .5 Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 - .6 When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 - .7 Do not attach hangers to steel roof deck. Attach hangers to structural members.
 - .8 Space hangers not more than 1200 mm o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 200 mm from ends of each member.
 - .9 Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- .3 Install edge mouldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
 - .1 Screw attach mouldings to substrate at intervals not more than 400 mm o.c. and not more than 75 mm from ends, levelling with ceiling suspension system to a tolerance of 3.2 mm in 3.6 m. Mitre corners accurately and connect securely.
 - .2 Do not use exposed fasteners, including pop rivets, on mouldings and trim.
- .4 Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- .5 Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge mouldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
 - .1 Arrange directionally patterned acoustical panels as follows:
 - .1 Install panels with pattern running in one direction parallel to long axis of space.

- .2 For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and mouldings.
- .3 For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
- .4 For reveal-edged panels on suspension system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension system surfaces and panel faces flush with bottom face of runners.
- .5 Paint cut edges of panel remaining exposed after installation; match colour of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
- .6 Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 CLEANING

- .1 Clean exposed surfaces of acoustical panel ceilings, including trim, edge mouldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touch-up of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- .1 Types of items described in this Section:
 - .1 Resilient Base
 - .1 Typical
 - .2 Contoured resilient base.
 - .2 Resilient stair accessories
 - .1 One piece resilient stair tread and riser
 - .3 Resilient moulding accessories.
- .2 Types of items you will not find described in this Section:
 - .1 Resilient sheet floor coverings.
 - .2 Linoleum floor coverings.
 - .3 Resilient floor tile.
 - .4 Resilient floor coverings designed to control electrostatic discharge.
 - .5 Resilient floor coverings for use in athletic-activity or support areas.

1.2 SUBMITTALS

- .1 Product Data: For each type of product indicated.
- .2 Samples for Initial Selection: For each type of product indicated.
- .3 Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 300 mm long, of each resilient product colour, texture, and pattern required.

1.3 QUALITY ASSURANCE

- .1 Mock-ups: Provide resilient products with mock-ups specified in other Sections.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 10 deg C or more than 32 deg C.

1.5 PROJECT CONDITIONS

- .1 Maintain ambient temperatures within range recommended by manufacturer, but not less than 21 deg C or more than 35 deg C, in spaces to receive resilient products during the following time periods:
 - .1 48 hours before installation.
 - .2 During installation.
 - .3 48 hours after installation.
- .2 Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 13 deg C or more than 35 deg C.
- .3 Install resilient products after other finishing operations, including painting, have been completed.

1.6 EXTRA MATERIALS

- .1 Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - .1 Furnish not less than 3 linear m for every 150 linear m or fraction thereof, of each type, colour, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE - TYPICAL

- .1 Refer to drawings to determine if resilient base is required and if so, the required locations.
- .2 Resilient Base Standard: to ASTM F 1861.
 - .1 Material Requirement: Type TS (rubber, vulcanized thermoset) or Type TP (rubber, thermoplastic).
 - .2 Manufacturing Method: Group I (solid, homogeneous) or Group II (layered).
 - .3 Style:
 - .1 Cove (base with toe): unless otherwise indicated.
 - .2 Straight (flat or toeless), at carpet flooring locations.
 - .4 Minimum Thickness
 - .1 3.2 mm.
 - .5 Height
 - .1 102 mm, unless otherwise indicated.
 - .6 Lengths
 - .1 Coils in manufacturer's standard length.
 - .7 Outside Corners
 - .1 Job formed or preformed.
 - .8 Inside Corners
 - .1 Job formed or preformed.
 - .9 Colours and Patterns
 - .1 As selected by Owner's Representative from full range of industry colours if not specifically indicated in the *Interior Finishes Legend*.

2.2 CONTOURED RESILIENT BASE

- .1 Refer to drawings to determine if contoured resilient base is required and if so, the required locations.
- .2 Contoured resilient base to replicated moulded wood base profiles, to ASTM F-1861, Type TP, Group 1 (solid) Standard.
- .3 Colours and Profiles
 - .1 As selected by Owner's Representative from full range of manufacturer's colours and profiles if not specifically indicated in the *Interior Finishes Legend*.

2.3 RESILIENT STAIR ACCESSORIES

- .1 Refer to drawings to determine if resilient stair accessories are required and if so, the required locations.
- .2 Resilient Stair Treads: to ASTM F 2169.
 - .1 Material
 - .1 Type TS (rubber, vulcanized thermoset) or Type TP (rubber, thermoplastic); unless otherwise noted.

- .2 Surface Design
 - .1 Class 1, Smooth (flat): to be used only when specifically indicated
 - .2 Class 2, Pattern: choose any one of the following patterns, unless otherwise noted on drawings.
 - .1 Raised disc design
 - .2 Raised-square design
 - .3 Raised-chevron design
 - .4 Raised-diamond design
 - .5 Raised-rib design
 - .3 Nosing
 - .1 Complete with contrasting colour, embedded abrasive strips, unless otherwise indicated.
 - .2 Square profile, adjustable to cover angles between 60 and 90 degrees, unless otherwise indicated.
 - .3 Height: as required to completely cover stair nosing.
 - .4 Riser
 - .1 Integral with thread cover, full height of stair riser.
 - .5 Thickness
 - .1 6 mm and tapered to back edge.
 - .6 Size
 - .1 Lengths and depths to fit each stair tread in one piece or, for treads exceeding maximum lengths manufactured, in equal-length units.
 - .3 Stringers
 - .1 Same thickness as risers; height and length after cutting to fit risers and treads and to cover stair stringers.
 - .2 Produced by same manufacturer as treads and recommended by manufacturer for installation with treads.
 - .4 Colours and Patterns
 - .1 As selected by Owner's Representative from full range of industry colours if not specifically indicated in the *Interior Finishes Legend*.
- 2.4 RESILIENT MOULDING ACCESSORY
- .1 Description
 - .1 Cap for cove carpet
 - .2 Cap for cove resilient floor covering
 - .3 Carpet edge for glue-down applications
 - .4 Nosing for carpet
 - .5 Nosing for resilient floor covering
 - .6 Reducer strip for resilient floor covering
 - .7 Joiner for tile and carpet
 - .8 Transition strips.
 - .2 Material
 - .1 Rubber.
 - .3 Profile and Dimensions
 - .1 As required, absolute minimal height.
 - .4 Colours and Patterns
 - .1 As selected by Owner's Representative from full range of industry colours if not specifically indicated in the *Interior Finishes Legend*.
- 2.5 INSTALLATION MATERIALS

- .1 Trowelable Levelling and Patching Compounds
 - .1 Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- .2 Adhesives
 - .1 Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
 - .2 Use adhesives that comply with the following limits for VOC content:
 - .1 Cove Base Adhesives: Not more than 50 g/L.
 - .2 Rubber Floor Adhesives: Not more than 60 g/L.
- .3 Stair-Tread-Nose Filler
 - .1 Two-part epoxy compound recommended by resilient tread manufacturer to fill nosing substrates that do not conform to tread contours.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- .2 Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- .3 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- .1 Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- .2 Concrete Substrates for Resilient Stair Treads and Accessories: Prepare according to ASTM F 710.
 - .1 Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - .2 Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - .3 Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.
 - .4 Moisture Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
- .3 Fill cracks, holes, and depressions in substrates with trowelable levelling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- .4 Do not install resilient products until they are same temperature as the space where they are to be installed.
 - .1 Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- .5 Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT BASE INSTALLATION

- .1 Comply with manufacturer's written instructions for installing resilient base.
 - .2 Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
 - .3 Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
 - .4 Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
 - .5 Do not stretch resilient base during installation.
 - .6 On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
 - .7 Preformed Corners: Install preformed corners before installing straight pieces.
 - .8 Job-Formed Corners:
 - .1 Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discolouration (whitening) at bends.
 - .2 Inside Corners: Use straight pieces of maximum lengths possible.
- 3.4 RESILIENT ACCESSORY INSTALLATION
- .1 Comply with manufacturer's written instructions for installing resilient accessories.
 - .2 Resilient Stair Accessories:
 - .1 Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
 - .2 Tightly adhere to substrates throughout length of each piece.
 - .3 For treads installed as separate, equal-length units, install to produce a flush joint between units.
 - .3 Resilient Moulding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet and resilient floor covering that would otherwise be exposed.
- 3.5 CLEANING AND PROTECTION
- .1 Comply with manufacturer's written instructions for cleaning and protection of resilient products.
 - .2 Perform the following operations immediately after completing resilient product installation:
 - .1 Remove adhesive and other blemishes from exposed surfaces.
 - .2 Sweep and vacuum surfaces thoroughly.
 - .3 Damp-mop surfaces to remove marks and soil.
 - .3 Protect resilient products from marks, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
 - .4 Cover resilient products until Substantial Completion.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- .1 Types of items described in this Section:
 - .1 Sheet carpet.
- .2 Types of items you will not find described in this Section:
 - .1 Carpet cushion.
 - .2 Removal of existing floor coverings.
 - .3 Resilient wall base and accessories installed with carpet.
 - .4 Tile carpeting.

1.2 SUBMITTALS

- .1 Product Data: For the following, including installation recommendations for each type of substrate:
 - .1 Carpet: For each type indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
- .2 Shop Drawings: Provide shop drawings only when specifically indicated on drawings. Show the following:
 - .1 Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cut-outs are required in carpet.
 - .2 Existing flooring materials to be removed.
 - .3 Existing flooring materials to remain.
 - .4 Carpet type, colour, and dye lot.
 - .5 Locations where dye lot changes occur.
 - .6 Seam locations, types, and methods.
 - .7 Type of subfloor.
 - .8 Type of installation.
 - .9 Pattern type, repeat size, location, direction, and starting point.
 - .10 Pile direction.
 - .11 Type, colour, and location of insets and borders.
 - .12 Type, colour, and location of edge, transition, and other accessory strips.
 - .13 Transition details to other flooring materials.
- .3 Samples: For each of the following products and for each colour and texture required. Label each Sample with manufacturer's name, material description, colour, pattern, and designation indicated on Drawings and in schedules.
 - .1 Carpet: 300 mm square Sample.
 - .2 Exposed Edge, Transition, and other Accessory Stripping: 300 mm long Samples.
 - .3 Carpet Seam: 150 mm Sample.
 - .4 Mitred Carpet Border Seam: 300 mm square Sample. Show carpet pattern alignment.
- .4 Qualification Data: For Installer.
- .5 Maintenance Data: For carpet to include in maintenance manuals. Include the following:
 - .1 Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 - .2 Precautions for cleaning materials and methods that could be detrimental to carpet.
- .6 Warranties: Special warranties specified in this Section.

1.3 QUALITY ASSURANCE

- .1 Mock-ups: Before installing carpet, build mock-ups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - .1 Approved mock-ups may become part of the completed Work if undisturbed at time of Substantial Completion.
- .2 Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section *Project Management and Coordination*.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Comply with CRI 104, Section 5, *Storage and Handling*.

1.5 PROJECT CONDITIONS

- .1 Comply with CRI 104, Section 7.2, *Site Conditions; Temperature and Humidity* and Section 7.12, *Ventilation*.
- .2 Environmental Limitations: Do not install carpet until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- .3 Do not install carpet over concrete slabs until slabs have cured, are sufficiently dry to bond with adhesive, and have pH range recommended by carpet manufacturer.
- .4 Where demountable partitions or other items are indicated for installation on top of carpet, install carpet before installing these items.

1.6 WARRANTY

- .1 Special Warranty for Carpet: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet installation that fail in materials or workmanship within specified warranty period.
 - .1 Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse.
 - .2 Failures include, but are not limited to, more than 10 percent loss of face fibre, edge revelling, snags, runs, loss of tuft bind strength, excess static discharge, and delimitation.
 - .3 Warranty Period: manufacturer's standard warranty but in no case less than 10 years from date of Substantial Completion.

1.7 EXTRA MATERIALS

- .1 Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - .1 Carpet: Full-width rolls equal to 5 percent of amount installed for each type indicated, but not less than 8.3 sq. m.

PART 2 - PRODUCTS

2.1 SHEET CARPET

- .1 Type, Colour, Pattern: Refer to *drawings*, complete with

- .1 Applied Soil-Resistance Treatment: Manufacturer's standard material, unless otherwise noted.
- .2 Antimicrobial Treatment: Manufacturer's standard material.

2.2 INSTALLATION ACCESSORIES

- .1 Trowelable Levelling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet manufacturer.
- .2 Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and is recommended or provided by carpet manufacturer.
 - .1 VOC Limits: Provide adhesives with VOC content not more than 50g/L.
- .3 Seam Adhesive: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for sealing and taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Examine carpet for type, colour, pattern, and potential defects.
- .2 Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
 - .1 Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet manufacturer.
 - .2 Subfloor finishes comply with requirements specified in Division 03 Section *Cast-in-Place Concrete* for slabs receiving carpet.
 - .3 Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- .3 For wood subfloors, verify the following:
 - .1 Underlayment over subfloor complies with requirements specified in Division 06 Section *Rough Carpentry*.
 - .2 Underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.
- .4 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- .1 General: Comply with CRI 104, Section 7.3, *Site Conditions; Floor Preparation*, and with carpet manufacturer's written installation instructions for preparing substrates.
- .2 Use trowelable levelling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 3 mm wide or wider, and protrusions more than 0.8 mm, unless more stringent requirements are required by manufacturer's written instructions.
- .3 Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet manufacturer.

- .4 Broom and vacuum clean substrates to be covered immediately before installing carpet.

3.3 INSTALLATION

- .1 Comply with CRI 104 and carpet manufacturer's written installation instructions for the following:
 - .1 Direct-Glue-Down Installation: Comply with CRI 104, Section 9, *Direct Glue-Down Installation*.
 - .2 Stair Installation: Comply with CRI 104, Section 13, *Carpet on Stairs* for glue-down installation.
- .2 Comply with carpet manufacturer's written recommendations and Shop Drawings for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.
 - .1 Level adjoining border edges.
- .3 Do not bridge building expansion joints with carpet.
- .4 Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.
- .5 Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- .6 Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- .7 Install pattern parallel to walls and borders to comply with CRI 104, Section 15, *Patterned Carpet Installations* and with carpet manufacturer's written recommendations.
- .8 Comply with carpet cushion manufacturer's written recommendations.
- .9 Where new carpet is laid adjacent to existing floor finishes, appropriate metal low threshold transition strips are to be installed.

3.4 CLEANING AND PROTECTING

- .1 Perform the following operations immediately after installing carpet:
 - .1 Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
 - .2 Remove yarns that protrude from carpet surface.
 - .3 Vacuum carpet using commercial machine with face-beater element.
- .2 Protect installed carpet to comply with CRI 104, Section 16, *Protection of Indoor Installations*.
- .3 Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet manufacturer and carpet adhesive manufacturer.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- .1 Types of items described in this Section:
 - .1 Surface preparation and the application of paint systems on the following interior substrates:
 - .1 Concrete.
 - .2 Clay masonry.
 - .3 Concrete masonry units (CMU).
 - .4 Steel.
 - .5 Galvanized metal.
 - .6 Aluminum (not anodized or otherwise coated).
 - .7 Wood.
 - .8 Gypsum board.
 - .9 Plaster.
 - .10 Spray-textured ceilings.
 - .11 Cotton or canvas insulation covering.
 - .2 Types of items you will not find described in this Section:
 - .1 Wood stains and transparent finishes.
 - .2 Shop priming of metal substrates with primers specified in this Section.
 - .3 Shop priming carpentry with primers specified in this Section.
 - .4 Factory finishing of steel doors and frames and of wood doors; where specified.
 - .5 Gypsum board spackling.
 - .6 Special-use coatings.
 - .7 Intumescent painting.
 - .8 Surface preparation and the application of paint systems on exterior substrates.
 - .9 Surface preparation and the application of wood stains and transparent finishes on interior wood substrates.
 - .3 Scope of Work of this Contract
 - .1 While drawings and schedules identify locations for some finishes, the scope of work entails painting all of the following interior surfaces:
 - .1 All surfaces explicitly noted to be painted.
 - .2 All surfaces scheduled to be covered with wall coverings.
 - .3 All unfinished surfaces that are either exposed-to-view or semi-exposed-to-view and not otherwise scheduled to receive another type of finish, excluding finished hardwood; unless otherwise noted.
 - .2 Specifically, do not paint any of the following surfaces:
 - .1 Grating.
 - .2 Concrete floors, unless specifically indicated.
 - .3 Stainless steel.
 - .4 Aluminum handrail and aluminum stair and ladder components.
 - .5 PVC, rubber, copper, bronze or brass surfaces.

1.2 DEFINITIONS

- .1 Concealed Surface: A surface that cannot be seen because the view from any angle is obstructed by an immovable object.
- .2 Exposed and semi-exposed surface: Any surface that is not a concealed surface.

- .3 Finish: a final surface treatment intended to enhance the appearance of a substrate or protect it from the adverse effects of its environmental, or both, and includes but is not limited to paint, stains, coatings, laminates, tiles, fabrics and carpets.
 - .1 Primer finish is not considered a finish.

- .4 Unfinished Surface: A surface having no Finish.

1.3 SUBMITTALS

- .1 Product Data: For each type of product indicated.
- .2 Samples for Verification: For each type of paint system and in each colour and gloss of topcoat indicated.
 - .1 Submit Samples on rigid backing, 200 mm square.
 - .2 Step coats on Samples to show each coat required for system.
 - .3 Label each coat of each Sample.
 - .4 Label each Sample for location and application area.
- .3 Product List: For each product indicated, include the following:
 - .1 Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
- .4 Sustainability Submittal:
 - .1 Product Data for paints, including printed statement of VOC content and chemical components.

1.4 QUALITY ASSURANCE

- .1 MPI Standards:
 - .1 Products: Complying with MPI standards indicated and listed in *MPI Approved Products List*.
 - .2 Preparation and Workmanship: Comply with requirements in *MPI Architectural Painting Specification Manual* for products and paint systems indicated.
- .2 Mock-ups: While paint colours may be specifically indicated in the documents, still proceed with mock-ups. Apply benchmark samples of each paint system indicated and each colour and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - .1 Owner's Representative will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
 - .1 Wall and Ceiling Surfaces: Provide samples of at least 9 sq. m.
 - .2 Other Items: Owner's Representative will designate items or areas required.
 - .2 Apply benchmark samples after permanent lighting and other environmental services have been activated.
 - .3 Final approval of colour selections will be based on benchmark samples.
 - .1 If preliminary colour selections are not approved, apply additional benchmark samples of additional colours selected by Owner's Representative at no added cost to Owner.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 7 deg C.
 - .1 Maintain containers in clean condition, free of foreign materials and residue.
 - .2 Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

- .1 Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 10 and 35 deg C.
- .2 Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 3 deg C above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

- .1 Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
 - .1 Quantity: Furnish an additional 5 percent, but not less than 3.8 L of each material and colour applied.

PART 2 - PRODUCTS

2.1 PAINT, GENERAL

- .1 Material Compatibility:
 - .1 Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - .2 For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- .2 VOC Content of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colourants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24); these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:
 - .1 Flat Paints, Coatings, and Primers: VOC content of not more than 50 g/L.
 - .2 Nonflat Paints, Coatings, and Primers: VOC content of not more than 150 g/L.
 - .3 Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
 - .4 Floor Coatings: VOC not more than 100 g/L.
 - .5 Shellacs, Clear: VOC not more than 730 g/L.
 - .6 Shellacs, Pigmented: VOC not more than 550 g/L.
 - .7 Flat Topcoat Paints: VOC content of not more than 50 g/L.
 - .8 Nonflat Topcoat Paints: VOC content of not more than 150 g/L.
 - .9 Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
 - .10 Floor Coatings: VOC not more than 100 g/L.
 - .11 Shellacs, Clear: VOC not more than 730 g/L.
 - .12 Shellacs, Pigmented: VOC not more than 550 g/L.
 - .13 Primers, Sealers, and Undercoaters: VOC content of not more than 200 g/L.
 - .14 Dry-Fog Coatings: VOC content of not more than 400 g/L.
 - .15 Zinc-Rich Industrial Maintenance Primers: VOC content of not more than 340 g/L.
 - .16 Pre-Treatment Wash Primers: VOC content of not more than 420 g/L.
- .3 Chemical Components of Field-Applied Interior Paints and Coatings: Provide topcoat paints and anti-corrosive and anti-rust paints applied to ferrous metals that comply with the following chemical restrictions; these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:
 - .1 Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).

- .2 Restricted Components: Paints and coatings shall not contain any of the following:
 - .1 Acrolein.
 - .2 Acrylonitrile.
 - .3 Antimony.
 - .4 Benzene.
 - .5 Butyl benzyl phthalate.
 - .6 Cadmium.
 - .7 Di (2-ethylhexyl) phthalate.
 - .8 Di-n-butyl phthalate.
 - .9 Di-n-octyl phthalate.
 - .10 1,2-dichlorobenzene.
 - .11 Diethyl phthalate.
 - .12 Dimethyl phthalate.
 - .13 Ethylbenzene.
 - .14 Formaldehyde.
 - .15 Hexavalent chromium.
 - .16 Isophorone.
 - .17 Lead.
 - .18 Mercury.
 - .19 Methyl ethyl ketone.
 - .20 Methyl isobutyl ketone.
 - .21 Methylene chloride.
 - .22 Naphthalene.
 - .23 Toluene (methylbenzene).
 - .24 1,1,1-trichloroethane.
 - .25 Vinyl chloride.
 - .4 Colours: Refer to *Interior Finishes Legend*. When no colour is identified, then selected by Owner's Representative.
 - .1 M&E equipment: Assume no colour coding required unless otherwise indicated in mechanical and electrical specification sections.
 - .2 Where no colour is identified, Owner's Representative shall chose up to a combination of 8 colours in each suite. Colours can be a combination of main and accent colours in each room.
 - .5 Gloss Levels: As determined by Owner's Representative.
- 2.2 BLOCK FILLERS
- .1 Interior/Exterior Latex Block Filler: MPI #4.
 - .1 VOC Content: E Range of E3.
- 2.3 PRIMERS/SEALERS
- .1 Interior Latex Primer/Sealer: MPI #50.
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 3.
 - .2 Interior Alkyd Primer/Sealer: MPI #45.
 - .1 VOC Content: E Range of E2.
 - .3 Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint systems indicated.
- 2.4 METAL PRIMERS

- .1 Alkyd Anticorrosive Metal Primer: MPI #79.
 - .1 VOC Content: E Range of E2.
- .2 Quick-Drying Alkyd Metal Primer: MPI #76.
 - .1 VOC Content: E Range of E3.
- .3 Rust-Inhibitive Primer (Water Based): MPI #107.
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 3.
- .4 Cementitious Galvanized-Metal Primer: MPI #26.
 - .1 VOC Content: E Range of E1.
- .5 Waterborne Galvanized-Metal Primer: MPI #134.
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 3.
- .6 Vinyl Wash Primer: MPI #80.
 - .1 VOC Content: E Range of E3.
- .7 Quick-Drying Primer for Aluminum: MPI #95.
 - .1 VOC Content: E Range of E3.

2.5 WOOD PRIMERS

- .1 Interior Latex-Based Wood Primer: MPI #39.
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 3.

2.6 LATEX PAINTS

- .1 Interior Latex (Flat): MPI #53 (Gloss Level 1).
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 2.5.
- .2 Interior Latex (Low Sheen): MPI #44 (Gloss Level 2).
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 3.
- .3 Interior Latex (Eggshell): MPI #52 (Gloss Level 3).
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 3.
- .4 Interior Latex (Satin): MPI #43 (Gloss Level 4).
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 3.5.
- .5 Interior Latex (Semigloss): MPI #54 (Gloss Level 5).
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 4.

- .6 Interior Latex (Gloss): MPI #114 (Gloss Level 6, except minimum gloss of 65 units at 60 deg).
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 4.
- .7 Institutional Low-Odour/VOC Latex (Flat): MPI #143 (Gloss Level 1).
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 5.5.
- .8 Institutional Low-Odour/VOC Latex (Low Sheen): MPI #144 (Gloss Level 2).
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 4.5.
- .9 Institutional Low-Odour/VOC Latex (Eggshell): MPI #145 (Gloss Level 3).
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 4.5.
- .10 Institutional Low-Odour/VOC Latex (Semigloss): MPI #147 (Gloss Level 5).
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 5.5.
- .11 High-Performance Architectural Latex (Low Sheen): MPI #138 (Gloss Level 2).
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 6.
- .12 High-Performance Architectural Latex (Eggshell): MPI #139 (Gloss Level 3).
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 6.
- .13 High-Performance Architectural Latex (Satin): MPI #140 (Gloss Level 4).
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 6.5.
- .14 High-Performance Architectural Latex (Semigloss): MPI #141 (Gloss Level 5).
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 7.
- .15 Exterior Latex (Flat): MPI #10 (Gloss Level 1).
 - .1 VOC Content: E Range of E3.
- .16 Exterior Latex (Semigloss): MPI #11 (Gloss Level 5).
 - .1 VOC Content: E Range of E3.
- .17 Exterior Latex (Gloss): MPI #119 (Gloss Level 6, except minimum gloss of 65 units at 60 deg).
 - .1 VOC Content: E Range of E3.

2.7 ALKYD PAINTS

- .1 Interior Alkyd (Flat): MPI #49 (Gloss Level 1).
 - .1 VOC Content: E Range of E3.
- .2 Interior Alkyd (Eggshell): MPI #51 (Gloss Level 3).

- .1 VOC Content: E Range of E2.
- .3 Interior Alkyd (Semigloss): MPI #47 (Gloss Level 5).
 - .1 VOC Content: E Range of E2.
 - .2 Environmental Performance Rating: EPR 3.
- .4 Interior Alkyd (Gloss): MPI #48 (Gloss Level 6).
 - .1 VOC Content: E Range of E2.
- 2.8 QUICK-DRYING ENAMELS
 - .1 Quick-Drying Enamel (Semigloss): MPI #81 (Gloss Level 5).
 - .1 VOC Content: E Range of E3.
 - .2 Quick-Drying Enamel (High Gloss): MPI #96 (Gloss Level 7).
 - .1 VOC Content: E Range of E3.
- 2.9 TEXTURED COATING
 - .1 Latex Stucco and Masonry Textured Coating: MPI #42.
 - .1 VOC Content: E Range of E3.
- 2.10 DRY FOG/FALL COATINGS
 - .1 Latex Dry Fog/Fall: MPI #118.
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 3.
 - .2 Waterborne Dry Fall: MPI #133.
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 3.
 - .3 Interior Alkyd Dry Fog/Fall: MPI #55.
 - .1 VOC Content: E Range of E3.
- 2.11 ALUMINUM PAINT
 - .1 Aluminum Paint: MPI #1.
 - .1 VOC Content: E Range of E3.
- 2.12 FLOOR COATINGS
 - .1 Interior Concrete Floor Stain: MPI #58.
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 2.
 - .2 Interior/Exterior Clear Concrete Floor Sealer (Water Based): MPI #99.
 - .1 VOC Content: E Range of E3.
 - .3 Interior/Exterior Clear Concrete Floor Sealer (Solvent Based): MPI #104.
 - .1 VOC Content: E Range of E2.

- .4 Interior/Exterior Latex Floor and Porch Paint (Low Gloss): MPI #60 (maximum Gloss Level 3).
 - .1 VOC Content: E Range of E3.
 - .2 Environmental Performance Rating: EPR 3.
- .5 Exterior/Interior Alkyd Floor Enamel (Gloss): MPI #27 (Gloss Level 6).
 - .1 VOC Content: E Range of E2.
 - .2 Additives: Manufacturer's standard additive to increase skid resistance of painted surface.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.
- .2 Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - .1 Concrete: 12 percent.
 - .2 Masonry (Clay and CMU): 12 percent.
 - .3 Wood: 15 percent.
 - .4 Gypsum Board: 12 percent.
 - .5 Plaster: 12 percent.
- .3 Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- .4 Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 - .1 Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- .1 Comply with manufacturer's written instructions and recommendations in *MPI Architectural Painting Specification Manual* applicable to substrates indicated.
- .2 Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - .1 After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
 - .2 Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- .3 Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
 - .1 Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- .4 Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- .5 Clay Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content of surfaces or alkalinity of mortar joints to be painted exceed that permitted in manufacturer's written instructions.

- .6 Concrete Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- .7 Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- .8 Aluminum Substrates: Remove surface oxidation.
- .9 Wood Substrates:
 - .1 Scrape and clean knots, and apply coat of knot sealer before applying primer.
 - .2 Sand surfaces that will be exposed to view, and dust off.
 - .3 Prime edges, ends, faces, undersides, and backsides of wood.
 - .4 After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.
- .10 Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.
- .11 Plaster Substrates: Do not begin paint application until plaster is fully cured and dry.
- .12 Spray-Textured Ceiling Substrates: Do not begin paint application until surfaces are dry.
- .13 Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

- .1 Apply paints according to manufacturer's written instructions.
 - .1 Use applicators and techniques suited for paint and substrate indicated.
 - .2 Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - .3 Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
- .2 Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match colour of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- .3 If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, colour, and appearance.
- .4 Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and colour breaks.
- .5 Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:
 - .1 Mechanical Work:
 - .1 Uninsulated metal piping.
 - .2 Uninsulated plastic piping.
 - .3 Pipe hangers and supports.
 - .4 Tanks that do not have factory-applied final finishes.

- .5 Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
- .6 Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
- .7 Mechanical equipment that is indicated to have a factory-primed finish for field painting.
- .2 Electrical Work:
 - .1 Galvanized and steel conduits.
 - .2 Electrical equipment that is indicated to have a factory-primed finish for field painting.

3.4 CLEANING AND PROTECTION

- .1 At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- .2 After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- .3 Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Owner's Representative, and leave in an undamaged condition.
- .4 At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 INTERIOR PAINTING SCHEDULE

- .1 Propose paint system for any surfaces not listed. Propose paint system consisting of a minimum of a prime coat, intermediate coat, and topcoat.
- .2 Concrete Substrates, Nontraffic Surfaces:
 - .1 High-Performance Architectural Latex System: MPI INT 3.1C.
 - .1 Prime Coat: Interior latex primer/sealer.
 - .2 Intermediate Coat: High-performance Architectural latex matching topcoat.
 - .3 Topcoat: High-performance Architectural latex.
- .3 Concrete Substrates, Traffic Surfaces:
 - .1 Alkyd Floor Enamel System: MPI INT 3.2B.
 - .1 Prime Coat: Exterior/interior alkyd floor enamel.
 - .2 Intermediate Coat: Exterior/interior alkyd floor enamel.
 - .3 Topcoat: Exterior/interior alkyd floor enamel.
- .4 Clay-Masonry Substrates:
 - .1 High-Performance Architectural Latex System: MPI INT 4.1L.
 - .1 Prime Coat: High-performance Architectural latex matching topcoat.
 - .2 Intermediate Coat: High-performance Architectural latex matching topcoat.
 - .3 Topcoat: High-performance Architectural latex .
- .5 CMU Substrates:
 - .1 High-Performance Architectural Latex System: MPI INT 4.2D.
 - .1 Prime Coat: Interior/exterior latex block filler.
 - .2 Intermediate Coat: High-performance Architectural latex matching topcoat.
 - .3 Topcoat: High-performance Architectural latex .
- .6 Steel Pipes filled with liquids, including but not limited to sprinkler pipes:
 - .1 Alkyd System: MPI INT 5.1E.

- .1 Prime Coat: Alkyd anticorrosive metal primer.
 - .2 Intermediate Coat: Interior alkyd matching topcoat.
 - .3 Topcoat: Interior alkyd
- .7 Galvanized Metal Pipes filled with liquids, including but not limited to sprinkler pipes:
 - .1 Alkyd System: MPI INT 5.3C.
 - .1 Prime Coat: Cementitious galvanized-metal primer.
 - .2 Intermediate Coat: Interior alkyd matching topcoat.
 - .3 Topcoat: Interior alkyd
- .8 Steel Substrates:
 - .1 High-Performance Architectural Latex System: MPI INT 5.1R.
 - .1 Prime Coat: Alkyd anticorrosive metal primer.
 - .2 Intermediate Coat: High-performance Architectural latex matching topcoat.
 - .3 Topcoat: High-performance Architectural latex.
- .9 Galvanized-Metal Substrates:
 - .1 High-Performance Architectural Latex System: MPI INT 5.3M.
 - .1 Prime Coat: Waterborne galvanized-metal primer.
 - .2 Intermediate Coat: High-performance Architectural latex matching topcoat.
 - .3 Topcoat: High-performance Architectural latex .
- .10 Aluminum (Not Anodized or Otherwise Coated) Substrates:
 - .1 High-Performance Architectural Latex System: MPI INT 5.4F.
 - .1 Prime Coat: Quick-drying primer for aluminum.
 - .2 Intermediate Coat: High-performance Architectural latex matching topcoat.
 - .3 Topcoat: High-performance Architectural latex.
- .11 Glue-Laminated Beam and Column Substrates:
 - .1 High-Performance Architectural Latex System: MPI INT 6.1N.
 - .1 Prime Coat: Interior latex-based wood primer.
 - .2 Intermediate Coat: High-performance Architectural latex matching topcoat.
 - .3 Topcoat: High-performance Architectural latex .
- .12 Dressed Lumber Substrates: Including Architectural woodwork and doors.
 - .1 High-Performance Architectural Latex System: MPI INT 6.3A.
 - .1 Prime Coat: Interior latex-based wood primer.
 - .2 Intermediate Coat: High-performance Architectural latex matching topcoat.
 - .3 Topcoat: High-performance Architectural latex.
- .13 Wood Panel Substrates: Including painted plywood, medium-density fiberboard, and hardboard.
 - .1 High-Performance Architectural Latex System: MPI INT 6.4S.
 - .1 Prime Coat: Interior latex-based wood primer.
 - .2 Intermediate Coat: High-performance Architectural latex matching topcoat.
 - .3 Topcoat: High-performance Architectural latex.
- .14 Dimension Lumber Substrates, Nontraffic Surfaces: Including exposed joists and exposed beams.
 - .1 High-Performance Architectural Latex System: MPI INT 6.2B.
 - .1 Prime Coat: Interior alkyd primer/sealer.
 - .2 Intermediate Coat: High-performance Architectural latex matching topcoat.
 - .3 Topcoat: High-performance Architectural latex.

- .15 Wood Substrates, Traffic Surfaces:
 - .1 Latex Floor Paint System: MPI INT 6.5G.
 - .1 Prime Coat: Interior alkyd primer/sealer.
 - .2 Intermediate Coat: Interior/exterior latex floor and porch paint.
 - .3 Topcoat: Interior/exterior latex floor and porch paint.
- .16 Gypsum Board Substrates:
 - .1 High-Performance Architectural Latex System: MPI INT 9.2B.
 - .1 Prime Coat: Interior latex primer/sealer.
 - .2 Intermediate Coat: High-performance Architectural latex matching topcoat.
 - .3 Topcoat: High-performance Architectural latex.
- .17 Plaster Substrates:
 - .1 High-Performance Architectural Latex System: MPI INT 9.2B.
 - .1 Prime Coat: Interior latex primer/sealer.
 - .2 Intermediate Coat: High-performance Architectural latex matching topcoat.
 - .3 Topcoat: High-performance Architectural latex.
- .18 Spray-Textured Ceiling Substrates:
 - .1 Latex System: MPI INT 9.1E, spray applied.
 - .1 Prime Coat: Interior latex matching topcoat.
 - .2 Intermediate Coat: Interior latex matching topcoat.
 - .3 Topcoat: Interior latex.
- .19 Cotton or Canvas Insulation-Covering Substrates: Including pipe and duct coverings.
 - .1 Latex System: MPI INT 10.1A.
 - .1 Prime Coat: Interior latex matching topcoat.
 - .2 Intermediate Coat: Interior latex matching topcoat.
 - .3 Topcoat: Interior latex.

END OF SECTION

PART 1 **GENERAL**

1.1 **SUMMARY**

- .1 Section Includes.
 - .1 Methods and procedures for start-up, verification and commissioning, for building Energy Monitoring and Control System (EMCS) and includes:
 - .1 Start-up testing and verification of systems
 - .2 Check-out demonstration or proper operation of components.
 - .3 On-site operational tests

1.2 **RELATED SECTIONS**

- .1 The contractor is to ensure that all related work is co-ordinated among all specification sections, as well as between all Divisions, and that the tender price includes all related work. The referenced sections below are for guidance only and are not necessarily a complete list of related sections.
- .2 Section 01 33 00 - Submittal Procedures.
- .3 Section 01 78 00 - Closeout Submittals.
- .4 Section 01 91 13 - General Commissioning (Cx) Requirements.
- .5 Section 25 05 01 - EMCS: General Requirements.

1.3 **DEFINITIONS**

- .1 For additional acronyms and definitions refer to Section 25 05 01 - EMCS: General Requirements.
- .2 AEL (Average Effectiveness Level): ratio between total test period less any system downtime accumulated within that period and test period.
- .3 Downtime: results whenever EMCS is unable to fulfill required functions due to malfunction of equipment defined under responsibility of EMCS contractor. Downtime is measured by duration, in time, between time that Contractor is notified of failure and time system is restored to proper operating condition. Downtime not to include following:
 - .1 Outage of main power supply in excess of back-up power sources, provided that:
 - .1 Automatic initiation of back-up was accomplished.
 - .2 Automatic shut-down and re-start of components was as specified.
 - .2 Failure of communications link, provided that:
 - .1 Controller automatically and correctly operated in stand-alone mode.
 - .2 Failure was not due to failure of any specified EMCS equipment.
 - .3 Functional failure resulting from individual sensor inputs or output devices, provided that:
 - .1 System recorded said fault.
 - .2 Equipment defaulted to fail-safe mode.

- .3 AEL of total of all input sensors and output devices is at least 99 % during test period.

1.4 DESIGN REQUIREMENTS

- .1 Confirm with Owner's Representative that Design Criteria and Design Intent are still applicable.
- .2 Commissioning personnel to be fully aware of and qualified to interpret Design Criteria and Design Intent.

1.5 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Final Report: submit report to Owner's Representative.
 - .1 Include measurements, final settings and certified test results.
 - .2 Bear signature of commissioning technician and supervisor
 - .3 Report format to be approved by Owner's Representative before commissioning is started.
 - .4 Revise "as-built" documentation, commissioning reports to reflect changes, adjustments and modifications to EMCS as set during commissioning and submit to Owner's Representative in accordance with Section 01 78 00 - Closeout Submittals.
 - .5 Recommend additional changes and/or modifications deemed advisable in order to improve performance, environmental conditions or energy consumption.

1.6 CLOSEOUT SUBMITTALS

- .1 Provide documentation, O&M Manuals, and training materials of O&M personnel for review by Owner's Representative before interim acceptance in accordance with Section 01 78 00 - Closeout Submittals and Section 25 05 03 – EMCS: Project Record Documents.

1.7 COMMISSIONING

- .1 Do commissioning in accordance with Section 01 91 13 – General Commissioning (Cx) Requirements.
- .2 Carry out commissioning under direction of Owner's Representative and in presence of Owner's Representative and Commissioning Co-ordinator.
- .3 Inform, and obtain approval from, Owner's Representative in writing at least 14 days prior to commissioning or each test. Indicate:
 - .1 Location and part of system to be tested or commissioned.
 - .2 Testing/commissioning procedures, anticipated results.
 - .3 Names of testing/commissioning personnel.
- .4 Correct deficiencies, re-test in presence of Owner's Representative until satisfactory performance is obtained.

- .5 Acceptance of tests will not relieve Contractor from responsibility for ensuring that complete systems meet every requirement of Contract.
- .6 Perform tests as required.

1.8 COMPLETION OF COMMISSIONING

- .1 Commissioning to be considered as satisfactorily completed when objectives of commissioning have been achieved and reviewed by Owner's Representative and Commissioning Co-ordinator.

1.9 ISSUANCE OF FINAL CERTIFICATE OF COMPLETION

- .1 Final Certificate of Completion will not be issued until receipt of written approval indicating successful completion of specified commissioning activities including receipt of commissioning documentation.

PART 2 PRODUCTS

2.1 EQUIPMENT

- .1 Provide sufficient instrumentation to verify and commission the installed system. Provide two-way radios.
- .2 Instrumentation accuracy tolerances: higher order of magnitude than equipment or system being tested.
- .3 Independent testing laboratory to certify test equipment as accurate to within approved tolerances no more than 2 months prior to tests.
- .4 Locations to be approved, readily accessible and readable.
- .5 Application: to conform to normal industry standards.

PART 3 EXECUTION

3.1 PROCEDURES

- .1 Test each system independently and then in unison with other related systems.
- .2 Commission each system using procedures prescribed by the Commissioning Co-ordinator and/or Owner's Representative.
- .3 Commission integrated systems using procedures prescribed by Commissioning Co-ordinator and/or Owner's Representative.
- .4 Debug system software.

- .5 Optimize operation and performance of systems by fine-tuning PID values and modifying CDLs as required.
- .6 Test full scale emergency evacuation and life safety procedures including operation and integrity of smoke management systems under normal and emergency power conditions as applicable.

3.2 FIELD QUALITY CONTROL

- .1 Pre-Installation Testing.
 - .1 General: consists of field tests of equipment just prior to installation.
 - .2 Testing may be on site or at Contractor's premises as approved by Owner's Representative.
 - .3 Configure major components to be tested in same architecture as designed system. Include all required network and control components.
 - .4 Equip each Building Controller with sensor and controlled device of each type (AI, AO, DI, DO).
 - .5 Additional instruments to include:
 - .1 DP transmitters.
 - .2 VAV supply duct SP transmitters.
 - .3 DP switches used for dirty filter indication and fan status.
 - .6 In addition to test equipment, provide inclined manometer, digital micro-manometer, milli-amp meter, source of air pressure infinitely adjustable between 0 and 500 Pa, to hold steady at any setting and with direct output to milli-amp meter at source.
 - .7 After setting, test zero and span in 10 % increments through entire range while both increasing and decreasing pressure.
 - .8 Owner's Representative to mark instruments tracking within 0.5 % in both directions as "approved for installation".
 - .9 Transmitters above 0.5 % error will be rejected.
 - .10 DP switches to open and close within 2% of setpoint.
- .2 Completion Testing.
 - .1 General: test after installation of each part of system and after completion of mechanical and electrical hook-ups, to verify correct installation and functioning.
 - .2 Include following activities:
 - .1 Test and calibrate field hardware including stand-alone capability of each controller.
 - .2 Verify each A-to-D convertor.
 - .3 Test and calibrate each AI using calibrated digital instruments.
 - .4 Test each DI to ensure proper settings and switching contacts.
 - .5 Test each DO to ensure proper operation and lag time.
 - .6 Test each AO to ensure proper operation of controlled devices. Verify tight closure and signals.
 - .7 Test operating software.

- .8 Test application software and provide samples of logs and commands.
- .9 Verify each CDL including energy optimization programs.
- .10 Debug software.
- .11 Blow out flow measuring and static pressure stations with high pressure air at 700 kPa.
- .12 Provide point verification list in table format including point identifier, point identifier expansion, point type and address, low and high limits and Engineering units. This document will be used in final startup testing.
- .3 Final Startup Testing: Upon satisfactory completion of tests, perform point-by-point test of entire system under direction of Owner's Representative and Commissioning Co-ordinator and provide:
 - .1 2 technical personnel capable of re-calibrating field hardware and modifying software.
 - .2 Detailed daily schedule showing items to be tested and personnel available.
 - .3 Owner's Representative's acceptance signature to be on executive and applications programs.
 - .4 Commissioning to commence during final startup testing.
 - .5 O&M personnel to assist in commissioning procedures as part of training.
 - .6 Commissioning to be supervised by qualified supervisory personnel and Owner's Representative.
 - .7 Commission systems considered as life safety systems before affected parts of the facility are occupied.
 - .8 Operate systems as long as necessary to commission entire project.
 - .9 Monitor progress and keep detailed records of activities and results.
- .4 Final Operational Testing: to demonstrate that EMCS functions in accordance with contract requirements.
 - .1 Prior to beginning of 30 day test demonstrate that operating parameters (setpoints, alarm limits, operating control software, sequences of operation, trends, graphics and CDL's) have been implemented to ensure proper operation and operator notification in event of off-normal operation.
 - .1 Repetitive alarm conditions to be resolved to minimize reporting of nuisance conditions.
 - .2 Test to last at least 30 consecutive 24 hour days.
 - .3 Tests to include:
 - .1 Demonstration of correct operation of monitored and controlled points.
 - .2 Operation and capabilities of sequences, reports, special control algorithms, diagnostics, software.
 - .4 System will be accepted when:
 - .1 EMCS equipment operates to meet overall performance requirements. Downtime as defined in this Section must not exceed allowable time calculated for this site.
 - .2 Requirements of Contract have been met.

- .5 In event of failure to attain specified AEL during test period, extend test period on day-to-day basis until specified AEL is attained for test period.
- .6 Correct defects when they occur and before resuming tests.
- .5 Commissioning Co-ordinator and/or Owner's Representative to verify reported results.

3.3 ADJUSTING

- .1 Final adjusting: upon completion of commissioning as reviewed by Owner's Representative set and lock devices in final position and permanently mark settings.

3.4 DEMONSTRATION

- .1 Demonstrate to Commissioning Manager and/or Owner's Representative operation of systems including sequence of operations in regular and emergency modes, under normal and emergency conditions, start-up, shut-down interlocks and lock-outs in accordance with Section 01 91 13 – General Commissioning (Cx) Requirements.

END OF SECTION

PART 1 **GENERAL**

1.1 **RELATED SECTIONS**

- .1 Section 01 11 00 – Summary of Work.
- .2 Section 01 73 00 – Execution Requirements.
- .3 Section 07 84 00 – Firestopping.
- .4 Section 21 05 01 – Common Work Results-Mechanical.
- .5 Section 21 07 19 – Thermal Insulation of Piping.
- .6 Section 22 13 17 – Drainage Waste and Vent Piping – Cast Iron and Copper.
- .7 Section 23 05 05 – Installation of Pipework.
- .8 Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment.
- .9 Section 23 07 13 – Duct Insulation.
- .10 Section 23 21 13.02 – Hydronic Systems:Steel.
- .11 Section 23 23 00 – Copper Tubing and Fittings Refrigerant.
- .12 Section 25 05 01 – EMCS: General Requirements.
- .13 Section 26 05 00 – Common Work Results-Electrical.

1.2 **REFERENCES**

- .1 American National Standards Institute (ANSI)
 - .1 ANSI/ASME B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
 - .2 ANSI C2, National Electrical Safety Code.
 - .3 ANSI/NFPA 70, National Electrical Code.
- .2 Canadian Standards Association (CSA)
 - .1 CSA C22.1, Canadian Electrical Code, Part 1.

- .2 CAN/CSA C22.3 No.1, Overhead Systems.
- .3 CSA C22.3 No. 7, Underground Systems.

1.3 SYSTEM DESCRIPTION

- .1 Electrical:
 - .1 Provide power wiring from emergency power panels where emergency power is provided to EMCS field panels. If no emergency power provided, install UPS Device. Circuits to be for exclusive use of EMCS equipment. Panel breakers to be identified on panel legends tagged and locks applied to breaker switches.
 - .2 Hard wiring between field control devices and EMCS field panels.
 - .3 Communication wiring between EMCS field panels and OWS's including main control centre BECC.
 - .4 Modify existing starters to provide for EMCS as indicated in I/O Summaries and as indicated.
 - .5 Refer to wiring diagrams included as part of flow diagrams. Trace existing control wiring installation and provide updated wiring schematics including additions and/or deletions to control circuits for approval by Owner's Representative before commencing work.
 - .6 All control wiring 50 V and less for equipment supplied by Division 25 will be the responsibility of Division 25- Integrated Automation Contractor. Conduit and wire associated with this is the responsibility of Division 25.
- .2 Pneumatic:
 - .1 Pneumatic tubing, valves and fittings for field control devices.
- .3 Mechanical:
 - .1 Pipe taps required for EMCS equipment will be supplied and installed by Mechanical Division.
 - .2 Wells and control valves shall be supplied by EMCS Contractor and installed by Mechanical.
 - .3 Installation of air flow stations, dampers, and other devices requiring sheet metal trades to be mounted by Mechanical. Costs to be carried by designated trade.
- .4 VAV Terminal Units.
 - .1 Air flow probe for VAV boxes to be supplied and installed under Mechanical Division. Air flow dp sensor, actuator and associated VAV controls to be supplied and installed by EMCS contractor. Tubing from air probe to dp sensor as well as installation and adjustment of air flow sensors and actuators to be the responsibility of EMCS contractor. Coordinate air flow adjustments with balancing trade.
- .5 Structural:

- .1 Special steelwork as required for installation of work.

1.4 PERSONNEL QUALIFICATIONS

- .1 Qualified factory trained supervisory personnel to:
 - .1 Continuously direct and monitor all work.
 - .2 Attend site meetings.

1.5 EXISTING CONDITIONS

- .1 Cutting and Patching: refer to Section 01 73 00 – Execution Requirements supplemented as specified herein.
- .2 Repair all surfaces damaged during execution of work.
- .3 Turn over to Owner's Representative existing materials removed from work not identified for re-use.

PART 2 PRODUCTS

2.1 PIPING

- .1 Domestic H&CWS: refer to Section 22 11 18-Domestic Water Piping Copper and Section 22 11 18.01 – Domestic Water Piping Plastic.
- .2 Sanitary, storm water: refer to Section 22 13 17- Drainage Waste, Vent Piping – Cast Iron and Copper and Section 22 13 18 – Drainage, Waste and Vent Piping – Plastic.
- .3 Hot water heating, chilled water: refer to Section 23 21 13.02 – Hydronic Systems: Steel and Section 23 20 12 Pressure Piping – Plastic.
- .4 Condenser water: refer to Section 23 21 13 02– Hydronic Systems: Steel.
- .5 Refrigeration: refer to Section 23 23 00 - Refrigerant Piping.
- .6 Sleeves, escutcheons: refer to Section 23 05 05 – Installation of Pipework.
- .7 Hangers and supports: refer to Section 23 05 29– Hangers and Supports for HVAC Piping and Equipment.
- .8 Insulation: refer to Section 21 07 19 – Thermal Insulation for Piping and 23 07 13 – Thermal Insulation for Ducting.

2.2 SPECIAL SUPPORTS

- .1 Structural grade steel, primed and painted after construction and before installation.

2.3 PIPING FOR PNEUMATIC CONTROL SYSTEMS

- .1 Copper:
 - .1 Tubing: Type L Hard Drawn
 - .1 Fittings: wrought copper solder type to ANSI/ASME B16.22, and 95.5 antimonial tin solder. At instruments use compression fittings.
 - .2 At panels and junction boxes where there is a transition from plastic to copper use bulkhead fittings.
- .2 Plastic:
 - .1 Flame retardant, black PVC with minimum burst strength 1.3 MPa at 23°C installed in conduit.
 - .2 Fittings: compression or barbed type as required.

2.4 WIRING

- .1 As per requirements of Electrical Divisions.
- .2 For 50V and above copper conductor with chemically cross-linked thermosetting polyethylene insulation rated RW90 and 600V. Colour code to CSA 22.1.
- .3 For wiring under 50 volts use FT6 rated wiring where wiring is not run in conduit. All other cases use FT4 wiring.
- .4 Sizes:
 - .1 120V Power supply: to match or exceed breaker, size #12 minimum.
 - .2 Wiring for safeties/interlocks for starters, motor control centres, to be stranded, #14 minimum.
 - .3 Field wiring to digital device: #18AWG or 20AWG stranded twisted pair.
 - .4 Analog input and output: shielded #18 minimum solid copper or #20 minimum stranded twisted pair. Wiring must be continuous without joints.
 - .5 More than 4 conductors: #22 minimum solid copper.
- .5 Terminations:
 - .1 Terminate wires with screw terminal type connectors suitable for wire size, and number of terminations.

2.5 CONDUIT

- .1 As per requirements of Electrical Division.
- .2 Electrical metallic tubing to CSA C22.2 No. 03. Flexible and liquid tight flexible metal conduit to CSA C22.2 No.56. Rigid steel threaded conduit to CSA C22.2 No. 45.
- .3 Junction and pull boxes: welded steel.
 - .1 Surface mounting cast FS: screw-on flat covers.
 - .2 Flush mounting: covers with 25 mm minimum extension all round.
- .4 Cabinets: sheet steel, for surface mounting, with hinged door, latch lock, 2 keys, complete with perforated metal mounting backboard. Panels to be keyed alike for similar functions and or entire contract as approved.
- .5 Outlet boxes: 100 mm minimum, square.
- .6 Conduit boxes, fittings:
 - .1 Bushings and connectors: with nylon insulated throats.
 - .2 With push pennies to prevent entry of foreign materials.
- .7 Fittings for rigid conduit:
 - .1 Couplings and fittings: threaded type steel.
 - .2 Double locknuts and insulated bushings: use on sheet metal boxes.
 - .3 Use factory "ells" where 90 degree bends required for 25 mm and larger conduits.
- .8 Fittings for thin wall conduit:
 - .1 Connectors and couplings: steel, set screw type.

2.6 WIRING DEVICES, COVER PLATES

- .1 Conform to CSA.
- .2 Receptacles:
 - .1 Duplex: CSA type 5-15R.
 - .2 Single: CSA type 5-15R.
 - .3 Cover plates and blank plates: finish to match other plates in area.

2.7 SUPPORTS FOR CONDUIT, FASTENINGS, EQUIPMENT

- .1 Solid masonry, tile and plastic surfaces: lead anchors or nylon shields.
 - .1 Hollow masonry walls, suspended drywall ceilings: toggle bolts.
- .2 Exposed conduits or cables:
 - .1 50 mm diameter and smaller: one-hole steel straps.
 - .2 Larger than 50 mm diameter: two-hole steel straps.
- .3 Suspended support systems:
 - .1 Individual cable or conduit runs: support with 6 mm diameter threaded rods and support clips.
 - .2 Two or more suspended cables or conduits: support channels supported by 6 mm diameter threaded rod hangers.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Install equipment, components so that manufacturer's and CSA labels are visible and legible after commissioning is complete.

3.2 PIPING

- .1 Domestic H&CWS: refer to Section 22 11 18 –Domestic Water Piping Copper.
- .2 Sanitary, storm water: refer to Section 22 13 17- Drainage Waste and Vent Piping – Cast Iron and Copper.
- .3 Hot water heating, chilled water: refer to Section 23 21 13.02 – Hydronic Systems:Steel.
- .4 Condenser water: refer to Section 23 21 13.02 – Hydronic Systems:Steel.
- .5 Refrigeration: refer to Section 23 23 00 - Copper Tubing and Fittings Refrigerant..
- .6 Insulation: refer to Section 21 07 19 – Thermal Insulation for Piping and 23 07 13 – Thermal Insulation for Ducting.

3.3 MECHANICAL PIPING

- .1 Install piping in accordance with Section 23 05 05 – Installation of Pipework.

3.4 SUPPORTS

- .1 Install special supports as required and as indicated.

3.5 PNEUMATIC CONTROL SYSTEMS

- .1 General:
 - .1 Install tubing in accessible concealed locations, straight, parallel and close to building structure with required grades for drainage and venting.
 - .2 Install drip legs and drains at low points.
 - .3 Tubing to be free from surface damage.
 - .4 Tubing NOT to pass through or touch unheated ducts or enclosures.
 - .5 Do not cover pneumatic tubing with insulation.
 - .6 Test tubing, check joints after connection to system.
- .2 Copper tubing:
 - .1 Not to come into contact with dissimilar metal. Use non-metallic stand-offs on air handling systems.
 - .2 Install dielectric couplings where dissimilar metals are connected.
 - .3 Plastic tubing:
 - .1 Inaccessible locations: install plastic tubing in conduit.
 - .2 Inside panels: install in tube trays or racks, or clip individually to back of panel.
 - .3 Multiple tube bundles: install in tube trays, conduit or armoured flexible cable.

3.6 ELECTRICAL GENERAL

- .1 Do complete installation in accordance with requirements of:
 - .1 Electrical Divisions, this specification.
 - .2 CSA 22.1 Canadian Electrical Code, latest edition.
 - .3 ANSI/NFPA 70.
 - .4 ANSI C2.
- .2 Fully enclose or properly guard electrical wiring, terminal blocks, high voltage (above 50 V) contacts and mark to prevent accidental injury.
- .3 Do underground installation to CAN/CSA C22.3 No.7, except where otherwise specified.
- .4 Conform to manufacturer's recommendations for storage, handling and installation.

- .5 Check factory connections and joints. Tighten where necessary to ensure continuity.
- .6 Install electrical equipment between 1000 and 2000 mm above finished floor wherever possible and adjacent to related equipment.
- .7 Protect exposed live equipment such as panel, mains, outlet wiring during construction for personnel safety.
- .8 Shield and mark live parts "LIVE 120 VOLTS" or other appropriate voltage.
- .9 Install conduits, and sleeves prior to pouring of concrete.
- .10 Holes through exterior wall and roofs: flash and make weatherproof.
- .11 Make necessary arrangements for cutting of chases, drilling holes and other structural work required to install electrical conduit, cable, pull boxes, outlet boxes.
- .12 Install cables, conduits and fittings which are to be embedded or plastered over, neatly and closely to building structure to minimize furring.

3.7 CONDUIT SYSTEM

- .1 Communication wiring shall be installed in conduit. Provide complete conduit system to link Building Controllers to BECC. Conduit sizes to suit wiring requirements and to allow for future expansion capabilities specified for systems. Maximum conduit fills not to exceed 40%. Design drawings do not show conduit layout.
- .2 Install conduits parallel or perpendicular to building lines, to conserve headroom and to minimize interference.
- .3 Do not run exposed conduits in normally occupied spaces unless otherwise indicated or unless impossible to do otherwise. Obtain approval from Owner's Representative before starting such work. Provide complete conduit system to link field panels and devices with main control centre. Conduit size to match conductors plus future expansion capabilities as specified.
- .4 Locate conduits at least 150 mm from parallel steam or hot water pipes and at least 50 mm at crossovers.
- .5 Bend conduit so that diameter is reduced by less than 1/10th original diameter.
- .6 Field thread on rigid conduit to be of sufficient length to draw conduits up tight.
- .7 Limit conduit length between pull boxes to less than 30 m.
- .8 Use conduit outlet boxes for conduit up to 32 mm diameter and pull boxes for larger sizes.
- .9 Fastenings and supports for conduits, cables, and equipment:

- .1 Provide metal brackets, frames, hangers, clamps and related types of support structures as indicated and as required to support cable and conduit runs.
- .2 Provide adequate support for raceways and cables, sloped vertically to equipment.
- .3 Use supports or equipment installed by other trades for conduit, cable and raceway supports only after written approval from Owner's Representative.
- .10 Install polypropylene fish cord in empty conduits for future use.
- .11 Where conduits become blocked, remove and replace blocked sections.
- .12 Pass conduits through structural members only after receipt of Owner's Representative's written approval.
- .13 Conduits may be run in flanged portion of structural steel.
- .14 Group conduits wherever possible on suspended or surface channels.
- .15 Pull boxes:
 - .1 Install in inconspicuous but accessible locations.
 - .2 Support boxes independently of connecting conduits.
 - .3 Fill boxes with paper or foam to prevent entry of construction material.
 - .4 Provide correct size of openings. Reducing washers not permitted.
 - .5 Mark location of pull boxes on record drawings.
 - .6 Identify AC power junction boxes, by panel and circuit breaker.
- .16 Install terminal blocks or strips indicated in cabinets to Electrical Division.
- .17 Install bonding conductor for 120 volt and above in conduit.

3.8 WIRING

- .1 Install multiple wiring in ducts simultaneously.
- .2 Do not pull spliced wiring inside conduits or ducts.
- .3 Use CSA certified lubricants of type compatible with insulation to reduce pulling tension.
- .4 Tests: use only qualified personnel. Demonstrate that:
 - .1 Circuits are continuous, free from shorts, unspecified grounds.
 - .2 Resistance to ground of all circuits is greater than 50 Megohms.

- .5 Provide Owner's Representative with test results showing locations, circuits, results of tests.
- .6 Remove insulation carefully from ends of conductors and install to manufacturer's recommendations. Accommodate all strands in lugs. Where insulation is stripped in excess, neatly tape so that only lug remains exposed.
- .7 Wiring in main junction boxes and pull boxes to terminate on terminal blocks only, clearly and permanently identified. Junctions or splices not permitted for sensing or control signal covering wiring.
- .8 Do not allow wiring to come into direct physical contact with compression screw.
- .9 Install ALL strands of conductor in lugs of components. Strip insulation only to extent necessary for installation.

3.9 WIRING DEVICES, COVER PLATES

- .1 Receptacles:
 - .1 Install vertically in gang type outlet box when more than one receptacle is required in one location.
- .2 Cover plates:
 - .1 Install suitable common cover plate where wiring devices are grouped.
 - .2 Use flush type cover plates only on flush type outlet boxes.

3.10 STARTERS, CONTROL DEVICES

- .1 Install and make control connections as indicated. Power connections above 50V by Electrical Division.
- .2 Install correct over-current devices.
- .3 Identify each control wire, terminal for external connections with permanent number marking identical to diagram.
- .4 Performance Verification:
 - .1 Operate switches and controls to verify functioning.
 - .2 Perform start and stop sequences of contactors and relays.
 - .3 Check that interlock sequences, with other separate related starters, equipment and auxiliary control devices, operate as specified.

3.11 GROUNDING

- .1 Install complete, permanent, continuous grounding system for equipment, including conductors,

connectors and accessories.

- .2 Install separate grounding conductors in conduit within building.
- .3 Install ground wire in all PVC ducts and in tunnel conduit systems.
- .4 Tests: perform ground continuity and resistance tests, using approved method appropriate to site conditions.

3.12 TESTS

- .1 General:
 - .1 Perform following tests in addition to tests specified Section 25 08 20 - EMCS: Warranty and Maintenance.
 - .2 Give 14 days written notice of intention to test.
 - .3 Conduct in presence of Owner's Representative and authority having jurisdiction.
 - .4 Conceal work only after tests satisfactorily completed.
 - .5 Report results of tests to Owner's Representative in writing.
 - .6 Preliminary tests:
 - .1 Conduct as directed to verify compliance with specified requirements.
 - .2 Make needed changes, adjustments, replacements.
 - .3 Insulation resistance tests:
 - .1 Megger all circuits, feeders, equipment for 120 - 600V with 1000V instrument. Resistance to ground to be more than required by Code before energizing.
 - .2 Test insulation between conductors and ground, efficiency of grounding system to satisfaction of Owner's Representative and authority having jurisdiction.

3.13 IDENTIFICATION

- .1 Refer to Section 25 05 54- EMCS: Identification.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 33 56 13 - Aboveground Fuel Storage Tanks.
- .2 Section 25 05 02 - EMCS: Submittals and Review Process.
- .3 Section 25 05 03 - EMCS: Project Records Documents.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)
 - .1 ANSI C12.7, Requirements for Watthour Meter Sockets.
 - .2 ANSI/IEEE C57.13, Requirements for Instrument Transformers.
- .2 Canadian Standards Association (CSA)
 - .1 CSA Type 1 Enclosure
 - .2 CSA Type 4X Enclosures
 - .3 CSA Type 12 Enclosures

1.3 SUBMITTALS

- .1 Submit shop drawings and manufacturer's installation instructions in accordance with Section 25 05 02 - EMCS: Submittals and Review Process.
- .2 Include:
 - .1 Information as specified for each device.
 - .2 Manufacturer's detailed installation instructions.
- .3 Pre-Installation Tests
 - .1 Submit samples at random from equipment shipped, as requested by Owner's Representative, for testing before installation. Replace devices not meeting specified performance and accuracy.
- .4 Manufacturer's Instructions
 - .1 Submit manufacturer's installation instructions for specified equipment and devices.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit operating and maintenance data for inclusion in operation and maintenance manual in accordance with Section 25 05 03 - EMCS: Project Records Documents.

PART 2 PRODUCTS

2.1 GENERAL

- .1 Control devices of each category to be of same type and manufacturer.
- .2 External trim materials to be corrosion resistant. Internal parts to be assembled in watertight, shockproof, vibration-proof, heat resistant assembly.
- .3 Operating conditions: 0 - 32 °C with 10 - 90 % RH (non-condensing) unless otherwise specified.
- .4 Terminations: use standard conduit box with slot screwdriver compression connector block unless otherwise specified.
- .5 Transmitters to be unaffected by external transmitters (eg. walkie talkies).
- .6 Account for hysteresis, relaxation time, maximum and minimum limits in applications of sensors and controls.
- .7 Outdoor installations: use weatherproof construction in CSA 4X enclosures.
- .8 Devices to be installed in user occupied space must not exceed Noise Criteria (NC) of 35. Noise generated by any device must not be detectable above space ambient conditions.

2.2 TEMPERATURE SENSORS

- .1 General: except for VAV box control to be resistance or thermocouple type to following requirements:
 - .1 Thermistors 10 K ohm, $\pm 0.2^{\circ}$ C accuracy, less than 0.1° C drift over 10 year span. Power supply 5 V dc, 10-35 Vdc, 24 Vac..
 - .2 RTD's: 1000 ohm at 0 °C (plus or minus 0.2 ohms) platinum element with strain minimizing construction, 3 integral anchored leadwires. Coefficient of resistivity: 0.00385 ohms/ohm°C.
 - .3 Immersion wells: NPS 3/4, stainless steel spring loaded construction, with heat transfer compound compatible with sensor. Insertion length 100 mm as indicated.
- .2 Sensors:
 - .1 Room type: wall mounting, in slotted type covers, LCD display °C or °F, with guard as indicated. Dual set point momentary push button, override switch.
 - .2 Room type for VAV boxes: as for room type, above. Include setpoint adjustment, local indication, push button override for night set back function.
 - .3 General purpose duct type: suitable for insertion into ducts at any angle, insertion length 460 mm.
 - .4 Averaging duct type: continuous filament with minimum immersion length 6000 mm. Bend probe at field installation time to 100 mm radius at any point along probe without degradation of performance.

- .5 Outside air type: complete with probe length 100 - 150 mm long, non-corroding shield to minimize solar and wind effects, threaded fitting for mating to 13 mm conduit, weatherproof construction in CSA 4X enclosure.
- .6 Immersion type: spring loaded probe, NPT ½ fitting insertion to suit pipe size.

2.3 TEMPERATURE TRANSMITTERS

- .1 Requirements:
 - .1 Input circuit: to accept 3-lead, 100 ohm at 0 deg C, platinum resistance detector type sensors.
 - .2 Power supply: 575 ohms at 24 V DC into load of 575 ohms. Power supply effect less than 0.01 deg C per volt change.
 - .3 Output signal: 4 - 20 mA into 500 ohm maximum load.
 - .4 Input and output short circuit and open circuit protection.
 - .5 Output variation: less than 0.2 % of full scale for supply voltage variation of plus or minus 10 %.
 - .6 Combined non-linearity, repeatability, hysteresis effects: not to exceed plus or minus 0.5 % of full scale output.
 - .7 Maximum current to 100 ohm RTD sensor: not to exceed 22.5 mA.
 - .8 Integral zero and span adjustments.
 - .9 Temperature effects: not to exceed plus or minus 1.0 % of full scale/ 50 °C.
 - .10 Long term output drift: not to exceed 0.25 % of full scale/ 6 months.
 - .11 Transmitter ranges: Select narrowest range to suit application from following:
 - .1 Minus 50 °C to plus 50 °C, plus or minus 0.5 °C.
 - .2 0 to 100 °C, plus or minus 0.5 °C.
 - .3 0 to 50 °C, plus or minus 0.25 °C.
 - .4 0 to 25 °C, plus or minus 0.1 °C.
 - .5 10 to 35 °C, plus or minus 0.25°C.

2.4 HUMIDITY SENSORS

- .1 Requirements:
 - .1 Range: 5 - 95 % RH minimum.
 - .2 Operating temperature range: -40°C to 85°C.
 - .3 Absolute accuracy:
 - .1 Duct sensors: plus or minus 5 %.
 - .2 Room sensors: plus or minus 2 % .
 - .4 Sheath: stainless steel with integral shroud for specified operation in air streams of up to 10 m/s.
 - .5 Maintenance: by simple field method such as washing with solvent or mild detergent solution so as to remove anticipated airborne contaminants.
 - .6 Maximum sensor non-linearity: plus or minus 0.5% RH with defined curves.
 - .7 Room sensors: wall mounted as indicated.

- .8 Duct mounted sensors: locate so that sensing element is between 1/3 and 2/3 distance across any duct dimension.
- .9 Sensors to be unaffected by external transmitters such as walkie-talkies. Demonstrate to Owner's Representative.
- .10 Power supply: 18-35 Vdc, 18-32 Vac with temperature sensor.

2.5 HUMIDITY TRANSMITTERS

- .1 Requirements:
 - .1 Input signal: from 1000 ohm RTD.
 - .2 Output signal: 4 - 20 mA into 1000 ohm maximum load, 0-5 Vdc, 0-10 Vdc.
 - .3 Input and output short circuit and open circuit protection.
 - .4 Output accuracy: not to exceed 0.1 % of full span.
 - .5 Output linearity error: plus or minus 1.0 % maximum of full scale output.
 - .6 Integral zero and span adjustment.
 - .7 Temperature range: 0-70°C, -40°C to 85°C for outside air.
 - .8 Long term output drift: not to exceed 0.25 % of full scale output/ 6 months.

2.6 PRESSURE/CURRENT (P/I) TRANSMITTERS

- .1 Requirements:
 - .1 Range: as indicated in I/O summaries.
 - .1 Pressure sensing elements: bourdon tube, bellows or diaphragm type.
 - .2 Internal materials: suitable for continuous contact with industrial standard instrument air, compressed air, water, steam, as applicable.
 - .2 Output signal: 4 - 20 mA, 0-5V, 0-10V.
 - .3 Output variations: ± 1 % full scale for supply voltage variations of plus or minus 10 %.
 - .4 Combined non-linearity, repeatability, and hysteresis effects: not to exceed plus or minus 1% of full scale output over entire range.
 - .5 Integral zero and span adjustment.
 - .6 Temperature effects: not to exceed plus or minus 1.5 % full scale/ 50 °C.
 - .7 Over-pressure input protection to at least twice rated input pressure.
 - .8 Output short circuit and open circuit protection.
 - .9 Pressure ranges: see I/O Summaries.
 - .10 Accuracy: plus or minus 1 % of full scale.
 - .11 LCD Display.

2.7 DIFFERENTIAL PRESSURE (KPA) TRANSMITTERS

- .1 Requirements:
 - .1 Internal materials: suitable for continuous contact with industrial standard instrument air, compressed air, water, steam, as applicable.
 - .2 Output signal: 4 - 20 mA, 0-5V, 0-10V.
 - .3 Output variations: ± 1 % full scale for supply voltage variations of plus or minus 10 %.

- .4 Combined non-linearity, repeatability, and hysteresis effects: not to exceed plus or minus 1 % of full scale output over entire range.
- .5 Integral zero and span adjustment.
- .6 Temperature effects: not to exceed plus or minus 1.5 % full scale/ 50 °C.
- .7 Over-pressure input protection to at least twice rated input pressure.
- .8 Output short circuit and open circuit protection.
- .9 The unit to have a NPT connections. The enclosure shall be an integral part of the unit.
- .10 LCD Display.

2.8 DIFFERENTIAL PRESSURE (PA) TRANSMITTERS

- .1 Requirements:
 - .1 Output signal: 4 - 20 mA in 400 ohms, 0-5V into 5K ohms minimum, 0-10 V into 10K ohms minimum.
 - .2 Output variations: \pm 1% full scale for supply voltage variations of plus or minus 10%.
 - .3 Integral zero and span adjustment.
 - .4 Temperature effects: not to exceed plus or minus 3% full scale/ 50 °C.
 - .5 Output short circuit and open circuit protection.
 - .6 The unit to have a NPT $\frac{1}{2}$ conduit connection. The enclosure shall be an integral part of the unit.
 - .7 Pressure ranges: see I/O Summaries.
 - .8 LCD Display.

2.9 FAN SYSTEM STATIC PRESSURE SENSORS

- .1 As per 2.10

2.10 FAN SYSTEM STATIC PRESSURE TRANSMITTERS

- .1 Requirements:
 - .1 Output signal: 4 - 20 mA in 400 ohms, 0-5V into 5K ohms minimum, 0-10 V into 10K ohms minimum.
 - .2 Output variations: \pm 1% full scale for supply voltage variations of plus or minus 10%.
 - .3 Integral zero and span adjustment.
 - .4 Temperature effects: not to exceed plus or minus 3% full scale/ 50 °C.
 - .5 Output short circuit and open circuit protection.
 - .6 The unit to have a NPT $\frac{1}{2}$ conduit connection. The enclosure shall be an integral part of the unit.
 - .7 Pressure ranges: see I/O Summaries.
 - .8 LCD Display.

2.11 DUCT SYSTEM VELOCITY PRESSURE SENSORS

- .1 Requirements:
 - .1 Multipoint static and total pressure sensing element with self-averaging manifold with integral air equalizer and straightener section.

- .2 Maximum pressure loss: 37 Pa at 1000 m/s.
- .3 Accuracy: plus or minus 1 % of actual duct velocity.

2.12 FAN SYSTEM VELOCITY PRESSURE TRANSMITTERS

- .1 Requirements:
 - .1 Output signal: 4 - 20 mA linear into 500 ohm maximum load.
 - .2 Calibrated span: not to exceed 25 % of duct velocity pressure at maximum flow.
 - .3 Accuracy: 0.4 % of span.
 - .4 Repeatability: within 0.1 % of output.
 - .5 Linearity: within 0.5 % of span.
 - .6 Deadband or hysteresis: 0.1 % of span.
 - .7 External exposed zero and span adjustment.
 - .8 The unit to have a NPT ½ conduit connection. The enclosure shall be an integral part of the unit.

2.13 TURBINE FLOW METERS

- .1 Requirements:
 - .1 Flow range: as specified in I/O summaries.
 - .2 Pressure rating: 1035 kPa (gauge) at 38 °C.
 - .3 Temperature rating: 5 to 260 °C.
 - .4 Repeatability: plus or minus 0.1 %.
 - .5 Accuracy and linearity: plus or minus 0.5 %.
 - .6 Flow rangability: at least 10:1.
 - .7 Output voltage: 30 to 300 mV peak-to-peak into 10 Kohm load.
 - .8 Body material: brass, bronze or cast iron.
 - .9 Ends:
 - .1 NPS 2 and under: screwed or flanged
 - .2 NPS 2 1/2 and over: flanged.

2.14 FREQUENCY-TO-DC TRANSMITTERS FOR TURBINE METERS

- .1 Requirements:
 - .1 Input: greater than 5000 ohm.
 - .1 Range: greater than 100 mV less than 20 V peak-to-peak, 200 through 400 Hz.
 - .2 Span adjustment: fully adjustable.
 - .3 Zero adjustment: 0 to 10% of output.
 - .4 Output: 4 to 20 mA into 500 ohm load.
 - .5 Load effect: plus or minus 0.1 % of span zero to maximum load resistance.
 - .6 Linearity and repeatability: plus or minus 0.05 % of span.
 - .7 Power input: 24 V DC plus or minus 10 %.
 - .8 Input, output and power input transformer isolated.
 - .9 Enclosure: general purpose CSA 1.

2.15 PRESSURE AND DIFFERENTIAL PRESSURE SENSORS AND SWITCHES

- .1 Requirements:
 - .1 Range: as indicated in I/O summaries.
 - .1 Pressure sensing elements: bourdon tube, bellows or diaphragm type.
 - .2 Adjustable setpoint and differential.
 - .3 Switch: snap action type, rated at 120V, 15 amps AC or 24 V DC.
 - .4 Sensor assembly: to operate automatically and reset automatically when conditions return to normal. Over-pressure input protection to at least twice rated input pressure.
 - .5 Accuracy: within 2% repetitive switching.
 - .6 Provide sensor pressure and accuracy ratings:
 - .1 Chilled and condenser water: 860 kPa.
 - .2 Hot water: 860 kPa.
 - .3 Low pressure steam, compressed air: 1050 kPa. Range: 0 to 200 kPa. Accuracy: plus or minus 3 kPa.
 - .4 Medium pressure steam, compressed air: 1050 kPa. Range: 0 to 700 kPa. Accuracy: plus or minus 7 kPa.
 - .5 High pressure steam: 2100 kPa. Range: 0 to 2100 kPa. Accuracy: plus or minus 14 kPa.
 - .6 High temperature water: 2700 kPa. Range: 0-2700 kPa. Accuracy: plus or minus 25 kPa.
 - .7 For fan operation: Range: 0 to 3000 Pa. Adjustable differential: 10 to 300 Pa.
 - .7 Provide sensors with isolation valve and snubber between sensor and pressure source on liquid service.
 - .8 Sensors on steam and high temperature hot water service: provide pigtail syphon.

2.16 TEMPERATURE SWITCHES

- .1 Requirements:
 - .1 Range: see I/O summaries.
 - .2 Temperature sensor: liquid, vapour or bimetallic type. Operate automatically. Reset automatically, except as follows:
 - .1 Freeze protection: manual reset. Optional if software does not auto restart.
 - .2 Fire detection: manual reset. Optional if software does not auto restart.
 - .3 Duct Heater: high limit manual reset in addition to automatic reset.
 - .3 Adjustable setpoint and differential.
 - .4 Accuracy: plus or minus 1 °C.
 - .5 Snap action rating: 120V, 15 amps or 24V DC as required. Switch to be DPST for hardwire and EMCS connections.
 - .6 Type as follows:
 - .1 Room: for wall mounting on standard electrical box with or without protective guard as indicated.
 - .2 Duct, general purpose: insertion length = 460 mm.

- .3 Thermowell: stainless steel, with compression fitting for NPS 3/4 thermowell. Immersion length: 100 mm.
- .4 Freeze detection: continuous element with 6000 mm insertion length, duct mounting, to detect coldest temperature in any 300 mm length.
- .5 Strap-on: with helical screw stainless steel clamp.

2.17 TANK LEVEL SWITCHES

- .1 Requirements:
 - .1 Indicate high/low water level and to alarm.
 - .2 For mounting on top of tank.
 - .3 Maximum operating temperature: 120 °C.
 - .4 Mechanical switch or snap action contacts rated 15 amp at 120 V.
 - .5 Adjustable setpoint and differential.

2.18 LIQUID LEVEL SWITCHES

- .1 Requirements:
 - .1 Liquid level activated switch sealed in waterproof and shockproof enclosure.
 - .2 Complete with float, flexible cord, weight. Instrument casing to be suitable for immersion in measured liquid.
 - .3 N.O./N.C. Contacts rated at 15 amps at 120V AC. CSA approval for up to 250 volt 10 amps AC.

2.19 WIND VELOCITY TRANSMITTERS

- .1 Requirements:
 - .1 3-cup anemometer and airfoil vane mounted on common vertical axis, designed for mast mounting.
 - .2 Anemometer:
 - .1 Range: 0-160 km/h.
 - .2 Threshold: 3.0 km/h.
 - .3 Accuracy: +/- 2%.
 - .3 Airfoil vane
 - .1 Anemometer range: 0-360° with infinite resolution potentiometer with no loss of reading at transition point.
 - .2 Starting threshold: 1.1 m/s.
 - .3 Accuracy: +/- 0.5%.
 - .4 Output signal: 4 to 20 mA into 500 ohm load.
 - .5 Provide two output signals: velocity, direction.
 - .6 Mast: aluminum, size and height as indicated. Provide at least 3 stainless steel guys, turnbuckles, anchor bolts. Follow manufacturers installation guidelines. Lightning protection as indicated on electrical drawings.

2.20 SOLAR SENSORS

- .1 Monitor solar irradiation as indicated.
- .2 Pyranometer, black and white, producing proportional 0-50 mV signal. Include converter for 4-20 mA signal.

2.21 CURRENT/PNEUMATIC (I/P) TRANSDUCERS

- .1 Requirements:
 - .1 Input range: 4 to 20 mA.
 - .2 Output range: proportional 20-104 kPa.
 - .3 Housing: dustproof or panel mounted.
 - .4 Internal materials: suitable for continuous contact with industrial standard instrument air.
 - .5 Combined non-linearity, repeatability, hysteresis effects: not to exceed plus or minus 2 % of full scale over entire range.
 - .6 Integral zero and span adjustment.
 - .7 Temperature effect: plus or minus 2.0 % full scale/ 50 °C or less.
 - .8 Regulated supply pressure: 206 kPa maximum.
 - .9 Air consumption: 16.5 ml/s maximum.
 - .10 Integral gauge manifold c/w gauge (0-206 kPa).

2.22 SOLENOID CONTROL AIR VALVES

- .1 Coil: 120V AC or 24V DC, as indicated.
- .2 Complete with manual over-ride.
- .3 Shall have the capacity to pass .07 l/s air at 104 kPa differential.

2.23 AIR PRESSURE GAUGES

- .1 Diameter: 38 mm minimum.
- .2 Range: zero to two times operating pressure of measured pressure media to nearest standard range.

2.24 ELECTRICAL RELAYS

- .1 Requirements:
 - .1 Double voltage, DPDT, plug-in type with termination base.
 - .2 Coils: rated for 120V AC or 24V DC. Other voltage: provide transformer.
 - .3 Contacts: rated at 5 amps at 120 V AC.
 - .4 Relay to have visual status indication

2.25 SOLID STATE RELAYS

- .1 Requirements:

- .1 CSA approved.
- .2 Suitable to the application as recommended by manufacturer.
- .3 Voltage range: 75-265 VAC
- .4 Panel mounting.
- .5 Suitable for AC or DC loads.
- .6 Output surge absorbing element for inductive on/off loads.
- .7 Input capacitor/resistor circuit for pulse noise absorption.
- .8 For input inductive noise use twisted-pair wires for electromagnetic noise and shielded cable for static noise.

2.26 CURRENT TRANSDUCERS

- .1 Requirements:
 - .1 Range: in accordance with Equipment Schedules.
 - .2 Purpose: measure line current and produce proportional signal in one of following ranges:
 - .1 4-20 mA DC.
 - .2 0-5 volt DC.
 - .3 0-10 volts DC.
 - .4 2-10 volts DC.
 - .3 Frequency insensitive from 10 - 80 hz.
 - .4 Accuracy to 0.5% full scale.
 - .5 Zero and span adjustments. Field adjustable range to suit motor applications.
 - .6 Adjustable mounting bracket to allow for secure/safe mounting inside the MCC or starter enclosure.

2.27 CURRENT SENSING RELAYS

- .1 Requirements:
 - .1 Complete with metering transformer ranged to match load, plug-in base and shorting shunt to protect current transformer when relay is removed from socket.
 - .2 Suitable for single or 3 phase metering into single relay.
 - .3 To have adjustable latch level, adjustable delay on latch and minimum differential of 10 % of latch setting between latch level and release level.
 - .4 3-Phase application: provide for discrimination between phases.
 - .5 To have adjustable latch level to allow detection of worst case selection. To be powered from control circuit of motor starter being metered. Relay and base to be mounted in adjacent auxiliary cabinet only if control circuit power to be brought into auxiliary cabinet. Adjustments to be acceptable from auxiliary cabinet.
 - .6 Relay contacts: capable of handling 10 amps at 240 V AC.

2.28 CONTROL DAMPERS

- .1 Construction: blades, 152 mm wide, 1219 mm long, maximum. Modular maximum size, 1219 mm wide x 2438 mm high. Multiple sections to have stiffening mullions and jack shafts.
- .2 Materials

- .1 Frame: 2.3 mm minimum thickness galvanized steel.
- .2 Blades: galvanized steel with two sheets 0.5 mm thick or otherwise reinforced to ensure specified low leakage when fully closed.
- .3 Bearings: oil impregnated sintered bronze. Provide thrust bearings for vertical blades.
- .4 Linkage and shafts: zinc plated steel.
- .5 Seals: replaceable neoprene or stainless steel spring on sides, top, bottom of frame, along all blade edges and blade ends.
- .3 Performance:
 - .1 Capacity: refer to I/O Summaries.
 - .2 0.02 L/s.m 2 maximum allowable leakage against 1000 Pa static pressure.
 - .3 Temperature range: minus 50°C to plus 100°C.
 - .4 Arrangements: dampers mixing warm and cold air to be parallel blade, mounted at right angles to each other, with blades opening to mix air stream.

2.29 PNEUMATIC CONTROL DAMPER OPERATORS

- .1 Requirements:
 - .1 Piston type with spring return for "fail-safe" in Normally Open or Normally Closed position, as indicated.
 - .2 Operator: size so as to control dampers against maximum pressure or dynamic closing pressure (whichever is greater).
 - .3 Adjustable spring and stroke external stops to limit strokes in either direction.
 - .4 Full relay type positioner with interconnecting linkage for mechanical feedback of actual damper position.
 - .5 Multiple section dampers over 1200 mm long: to be driven from both ends.

2.30 ELECTRONIC CONTROL DAMPER OPERATORS

- .1 Requirements
 - .1 Push-pull proportional type as indicated.
 - .2 Spring return for "fail-safe" in Normally Open or Normally Closed position as indicated.
 - .3 Operator: size so as to control dampers against maximum pressure or dynamic closing pressure (whichever is greater).
 - .4 Power requirements: 5 VA maximum at 24 V AC.
 - .5 Operating range: 4-20 mA, 0-10 V DC, 2-10 V DC.

2.31 CONTROL VALVES

- .1 Requirements:
 - .1 NPS 2 and under: bronze with screwed ends.
 - .2 NPS 2 1/2 and over: cast iron with flanged ends.
 - .3 Trim: type 316 stainless steel.
 - .4 Leakage: 0.5 % of rated flow maximum.
 - .5 Two or three port as indicated. Normally Open or Normally Closed, as indicated.

- .6 Flow characteristics: linear or equal percentage as indicated.
- .7 Rangeability: 50:1 minimum.
- .8 Performance: Capacity refer to I/O Summaries and Valve Schedule.

2.32 PNEUMATIC VALVE ACTUATORS

- .1 Requirements:
 - .1 Construction: steel, cast iron, aluminum.
 - .2 Diaphragm: moulded Buna-N rubber, nylon reinforced.
 - .3 Spring return to normal position.
 - .4 Spring range adjustment and position indicator.

2.33 ELECTRONIC/ELECTRIC VALVE ACTUATORS

- .1 Requirements:
 - .1 Construction: steel, cast iron, aluminum.
 - .2 Control voltage: 0-5, 0-10, 2-10V DC, or 4-20 mA.
 - .3 Positioning time: to suit application, 90 sec maximum.
 - .4 Spring return to normal position as indicated.

2.34 WATTHOUR METERS AND CURRENT TRANSFORMERS

- .1 Requirements:
 - .1 Include three phases, test and terminal blocks for watthour meter connections and connections to FID for monitoring of current. Provide three potentiometer transformers for 600 V 4 wire systems for watthour meter use. Accuracy: plus or minus 0.25 % of full scale. For chiller applications: To have instantaneous indicator with analog or digital display.
 - .2 Watthour meter sockets: to ANSI C12.7.
 - .3 Potentiometer and current transformers: to ANSI/IEEE C57.13.
 - .4 Potential transformers: provide two primary fuses.
 - .5 Demand meters: configure to measure demand at 15 minute intervals.

2.35 SURFACE WATER DETECTORS

- .1 Requirements:
 - .1 Provide alarm on presence of water on floor.
 - .2 Expendable cartridge sensor.
 - .3 Internal waterproof switch.
 - .4 One set of dry contacts 2 amps at 24 V.
 - .5 Unaffected by moisture in air.
 - .6 Self-powered.

2.36 PANELS

- .1 Either free-standing or wall mounted enameled steel cabinets with hinged and key-locked front door.

- .2 To be modular multiple panels as required to handle requirements with additional space to accommodate future capacity as required by Owner's Representative without adding additional cabinets.
- .3 Panels to be lockable with same key.

2.37 CONTROL AIR COMPRESSOR STATIONS

- .1 Requirements: Provide 2 high pressure, compressors, receiver mounted, base mounted, each complete with belts, guards, intake muffler, replaceable cartridge intake cleaner, starter, pressure switches, alternator.
- .2 Capacity: size to maintain air pressure, meet all control air requirements on 25 % maximum running time.
- .3 Receiver: size to suit running time. Complete with automatic drain, pressure relief valve, pressure gauge ASME code rated for 1400 kPa.
- .4 Vibration isolation: 5 % transmissibility.
- .5 Refrigerated air drier:
 - .1 2 continuous operating type, complete with refrigerant evaporator, mechanical condensate separator, installed with 2 isolating valves. Designed for 1400 kPa maximum operating pressure.
 - .2 Capacity: sized for full capacity of air compressors, to reduce dewpoint to minus 10°C when dehydrating at 700 kPa. Maximum pressure drop 19 kPa at rated capacity.
 - .3 Provide 2 filter and PRV assemblies, with isolating valves and filter element, having 99% efficiency in removal of 0.5 micron diameter solid particles and oil aerosols and with indication of degree of saturation. Piping to be such that one dryer is always in circuit and active.

2.38 ELECTRONIC VAV TERMINAL CONTROL BOX

- .1 Terminal box sized to deliver air quantities as per mechanical VAV Box Schedule.
- .2 Box complete with factory installed averaging air velocity sensor.
 - .1 Provide removable air flow sensor with minimum 4 point sensing with +/- 5% accuracy at 10 deg C to 35 deg C and 40 to 1000 l/s.
- .3 Box to include direct damper shaft mounted actuator, of the non stall, full linear with position feedback type. Actuator to de-energize when at desired position.
- .4 Box to be complete with power transformer and control wiring to damper actuator and termination terminals for room sensors and other specified sensors and auxiliary devices.

- .5 Box to include VAV Controller as described in Section 25 30 01-EMCS: Building Controllers with appropriate mounting plate and protective cover.

2.39 ELECTRONIC AIR FLOW MEASUREMENT STATIONS AND TRANSMITTERS

- .1 Each station to contain an array of velocity sensing elements and straightening vanes inside a flanged sheet metal casing. The velocity sensing elements to be of the thermal, temperature compensated thermistor type, with linearizing means. The sensing elements to be distributed across the duct cross section in the quantity and pattern set forth for measurements and instruments of ASHRAE and SMACNA for the traversing of ducted air flows. The resistance to air flow through the airflow measurement station not to exceed 20 Pa gauge at an airflow of 10 m/s. Station construction suitable for operation at airflows of up to 25 m/s over a temperature range of 5 to 50 degrees C, and accuracy plus or minus 3 percent over a range of 0.625 to 12.5 m/s scaled to air volume.
- .2 Transmitters to produce a linear, temperature compensated 4-20 mAdc output corresponding to the required velocity pressure measurement. The transmitter to be a 2-wire, loop powered device with local indication where indicated. The output error of the transmitter not to exceed 0.5 percent of the calibrated measurement.

2.40 FUEL TANK LEVEL SENSOR

- .1 Provide suitable electronic, ULC approved oil tank level sensor to measure product and water level in oil tank specified in Section 33 56 13 – Aboveground Fuel Storage Tanks. Components in oil tank to be of stainless steel construction, electrical enclosures CSA rated. Float type probes to be provided with riser to suit oil tank c/w suitable tapping adaptor and S.S. guide tube with foot.
- .2 Sensor to communicate with EMCS system for oil and water level in tank.

PART 3 EXECUTION.

3.1 INSTALLATION

- .1 Install field control devices, conduit and wire in accordance with manufacturers recommended methods, procedures and instructions. Wiring and conduit above 50 volts by electrical Division. Coordinate requirements with Electrical Contactor.
- .2 Temperature transmitters, humidity transmitters, current-to-pneumatic transducers, solenoid air valves, controllers, relays: install in CSA 2 enclosures or as required for specific applications. Provide for electrolytic isolation in all cases when dissimilar metals make contact.
- .3 Support field-mounted transmitters, sensors on pipe stands or channel brackets.
- .4 Install wall mounted devices on plywood panel properly attached to wall.

3.2 TEMPERATURE AND HUMIDITY SENSORS

- .1 Stabilize to ensure minimum field adjustments or calibrations.

- .2 To be readily accessible and adaptable to each type of application so as to allow for quick easy replacement and servicing without special tools or skills.
- .3 Outdoor installation:
 - .1 Protect from solar radiation and wind effects by stainless steel shields.
 - .2 Install in CSA 4X enclosures.
- .4 Duct installations
 - .1 Do not mount in dead air space.
 - .2 Location to be within sensor vibration and velocity limits.
 - .3 Securely mount extended surface sensor used to sense average temperature.
 - .4 Thermally isolate elements from brackets and supports so as to respond to air temperature only.
 - .5 Support sensor element separately from coils, filter racks.
- .5 Averaging duct type temperature sensors:
 - .1 Sensor length to be not less than 1000 mm per square metre of duct cross-sectional area.
 - .2 Use multiple sensors where single sensor does not meet minimum length ratio. Wire multiple sensors in series for freeze protection applications.
 - .3 Wire multiple sensors separately for temperature measurement.
 - .4 Use either software averaging algorithm to derive overall average for control purposes or separate inputs, based on site requirements.
- .6 Thermowells: install for piping installations. Where pipe diameter is less than well insertion length, locate well in elbow. Thermowell to restrict flow by less than 30%.

3.3 PANELS

- .1 Arrange for conduit and tubing entry from top, bottom or either side.
- .2 Use modular multiple panels if necessary to handle all requirements, with space for additional 20% PCU or FID if applicable without adding additional panels. Space to accommodate maximum capacity of associated controller (ECU, LCU, MCU, PCU, TCU).
- .3 Wiring and tubing within panels: locate in trays or individually clipped to back of panel.
- .4 Identify wiring and conduit clearly.

3.4 MAGNEHELIC PRESSURE INDICATORS

- .1 Install adjacent to fan system static pressure sensor and duct system velocity pressure sensors (as approved by the Owner's Representative).
- .2 Locations to be as indicated or specified.

3.5 PRESSURE AND DIFFERENTIAL PRESSURE SWITCHES

- .1 Install isolation valve and snubber on sensors between sensor and pressure source. In addition, protect sensing elements on steam and high temperature hot water service with pigtail syphon between valve and sensor.

3.6 I/P TRANSDUCERS

- .1 Install air pressure gauge on outlet.

3.7 PRESSURE GAUGES

- .1 Install on pneumatic systems only.
- .2 Install pressure gauges on pneumatic devices, I/P, pilot positioners, motor operators, switches, relays, valves, damper operators, valve actuators.
- .3 Install pressure gauge on output of controller and auxiliary cabinet pneumatic devices.

3.8 AIR PRESSURE GAUGES

- .1 Install on pneumatic systems only.
- .2 Install on pneumatic devices including I/P's, pilot positioners, motor operators.

3.9 PNEUMATIC VALVE ACTUATORS

- .1 Install full relay type positioner having interlocking linkage for mechanical feedback of actual valve position on all modulating valves except radiation and unit heaters.

3.10 TANK LEVEL SWITCHES

- .1 Mount in top of tank in threaded coupling.

3.11 LIQUID LEVEL SWITCHES

- .1 Suspend float in sump from flexible cord and with weight mounted not more than 50 mm above switch.

3.12 IDENTIFICATION

- .1 Identify field devices properly.
- .2 Refer to Section 25 05 54 - EMCS: Identification.

3.13 AIR FLOW MEASURING STATIONS

- .1 Cap manifold until cleaning of ducts is completed.

3.14 TESTING

- .1 Calibrate and test field devices for accuracy and performance. Submit report detailing tests performed, results obtained to Owner's Representative for approval. Owner's Representative will verify results at random. Provide testing equipment and manpower necessary for this verification.

3.15 COMMISSIONING

- .1 Refer to Section 25 08 20 - EMCS: Warranty and Maintenance.

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, Division 28, Division 33 and Division 34. Refer to Section 01 00 00 – Bid Depository Sections where applicable for bid depository.

1.2 REFERENCES

- .1 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 50,000 V.

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 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 shop drawings in accordance with Section 10 33 00 – Submittal Procedures.
- .2 Quality Control: in accordance with Section 01 45 00 - Quality Control.
 - .1 Provide CSA certified equipment and material. Where CSA certified equipment and material is not available, submit such equipment and material to authority having jurisdiction for approval before delivery to site.
 - .2 Submit test results of installed electrical systems and instrumentation.
 - .3 Submit, upon completion of Work, load balance report as described in sentence 3.4.6.
 - .4 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Owner's Representative.

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 120 VOLTS", or with appropriate voltage in English.
- .3 Arrange for installation of temporary doors for rooms containing electrical distribution equipment. Keep these doors locked except when under direct supervision of electrician.

1.10 RECORD DRAWINGS

- .1 Obtain and pay for three sets of white prints. As the job progresses, mark these prints to accurately indicate installed work. Have the white prints available for inspection at the site at all times and present for scrutiny at each job meeting.
- .2 Show on the record drawings the installed inverts of all services entering and leaving the building and the property. Dimension underground services at key points of every run in relation to the structure and building.
- .3 Indicate exact location of all services for future work. Show and dimension all work embedded in the structure.
- .4 Submit record drawings within 30 days prior to start of commissioning.

1.11 INSPECTION OF WORK

- .1 The Owner will make periodic visits to the site during construction to ascertain reasonable conformity to plans and specifications but will not execute quality control. The Contractor shall be responsible for the execution of his work in conformity with the construction documents and with the requirements of the inspection authority.

1.12 SCHEDULING OF WORK

- .1 Work shall be scheduled in phases as per other divisions of the architectural 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 Maintain fire ratings around conduits passing through floors, ceilings and fire rated walls.
- .2 Use 3M brand or equal fire barrier products at each penetration.
- .3 Acceptable products for fire barrier products shall be 3M #CP25 fire barrier caulk, #303 putty, #FS 195 wrap and #CS195 sheet.
- .4 Acceptable manufacturers: Nelson, Fire Stop Systems, 3M or approved equal. Material of same manufacturer to be used throughout project.

PART 2 PRODUCTS

2.1 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

- .1 Supplier and installer responsibility is indicated in Motor, Control and Equipment Schedule on electrical drawings and related mechanical responsibility is indicated on Mechanical Equipment Schedule on mechanical drawings, where applicable.
- .2 Control wiring and conduit is specified in Division 26 except for conduit, wiring and connections below 50 V which are related to control systems specified in Division 25 and shown on mechanical drawings. Division 25 – EMCS Controls Contractor is responsible for all conduit, wiring and connections below 50V which are related to control systems in Division 25 and shall comply with the requirements of Division 26 for standard of quality.

2.2 MATERIALS AND EQUIPMENT

- .1 Provide materials and equipment in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Equipment and material to be CSA certified. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Electrical Inspection Division.
- .3 Factory assemble control panels and component assemblies.

2.3 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.

2.4 WIRING TERMINATIONS

- .1 Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.

2.5 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

NAMEPLATE SIZES

Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

.2 Labels:

.1 Embossed plastic labels with 6 mm high letters unless specified otherwise.

.3 Wording on nameplates and labels to be approved by Owner's Representative prior to manufacture.

.4 Allow for average of twenty-five (25) letters per nameplate and label.

.5 Identification to be English (and French where applicable).

.6 Nameplates for terminal cabinets and junction boxes to indicate system name and voltage characteristics.

.7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

.8 Terminal cabinets and pull boxes: indicate system name and voltage.

.9 Transformers: indicate capacity, primary and secondary voltages and transformer number.

.10 All new panel boards in the work area to be painted as follows. Provide new lamicoid labels and arc flash labels for all panel boards.

<u>Equipment System</u>	<u>Color</u>	<u>Pantone</u>
12500+ V Normal	Bright Yellow	12-0752 Buttercup
4160 V Essential	Dark Orange	17-1461 Orangeade
480 to 600 V Normal	Light Blue	13-5410 Iced Aqua
480 to 600 V Essential	Dark Blue	17-4530 Barrier Reef
120 to 240 V Normal	Light Green	14-0425 Beachnut
120 to 240 V Essential	Dark Green	18-0430 Avocado
Fire Alarm	Bright Red	-

2.6 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour code: to CSA C22.1, Canadian Electrical Code.

.4 Use colour coded wires in communication cables, matched throughout system.

2.7 CONDUIT AND CABLE IDENTIFICATION

- .1 Colour code all new conduits, boxes and metallic sheathed cables using 25mm wide tape (minimum 2 full wraps)..
- .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.
- .3 Colours:

<u>Conduit System</u>	<u>Color</u>	<u>Pantone</u>
12500+ V Normal	Bright Yellow	12-0752 Buttercup
4160 V Essential	Dark Orange	17-1461 Orangeade
480 to 600 V Normal	Light Blue	13-5410 Iced Aqua
277 to 600 V Essential	Dark Blue	17-4530 Barrier Reef
120 to 240 V Normal	Light Green	14-0425 Beachnut
120 to 240 V Essential	Dark Green	18-0430 Avocado
Fire Alarm	Bright Red	-

PART 3 EXECUTION

3.1 NAMEPLATES AND LABELS

- .1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.2 LOCATION OF OUTLETS

- .1 Locate outlets in accordance with Section 26 27 26 – Wiring Devices.
- .2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.
- .3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.
- .4 Locate light switches on latch side of doors. Locate disconnect devices in mechanical and elevator machine rooms on latch side of door.

3.3 CONDUIT AND CABLE INSTALLATION

- .1 Install conduit and sleeves prior to pouring of concrete. Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm.
- .2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- .3 Install cables, conduits and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.

3.4 MOUNTING HEIGHTS

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.
- .3 Install electrical at following heights unless indicated otherwise.
 - .1 Local switches: 1200 mm.
 - .2 Wall receptacles:
 - .1 General: 406 mm.
 - .2 Above top of continuous baseboard heater: 200mm.
 - .3 Above top of counters or counter splash backs: 175 mm.
 - .4 In mechanical rooms: 1400 mm.
 - .3 Panelboards: as required by Code or as indicated.
 - .4 Telephone and interphone outlets: 400 mm.
 - .5 Wall mounted telephone and interphone outlets: 1400 mm.
 - .6 Fire alarm stations: 1200 mm.
 - .7 Fire alarm bells: 2400 mm.
 - .8 Wall mounted speakers: 2400 mm.
 - .9 Clocks: 2400 mm.
 - .10 Door bell pushbuttons: 1200 mm.
 - .11 Exit lights: 2400 mm.
 - .12 Emergency lighting heads: 2400 mm.

3.5 CO-ORDINATION OF PROTECTIVE DEVICES

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

3.6 FIELD QUALITY CONTROL

- .1 All electrical work to be carried out by qualified, licensed electricians or apprentices as per the conditions of the Provincial Act respecting manpower vocational training and qualification. Employees registered in a provincial apprentices program shall be permitted, under the direct supervision of a qualified licensed electrician, to perform specific tasks – the activities permitted shall be determined based on the level of training attained and the demonstration of ability to perform specific duties.
- .2 The work of this division to be carried out by a contractor who holds a valid Code 1 Electrical Contractor License as issued by the Province.
- .3 Perform tests in Accordance with this section as noted and Section 01 91 13 – Commissioning (Cx) Requirements.

- .4 Load Balance:
 - .1 Measure phase current to panelboard with normal loads (lighting) operating at time of acceptance. Adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
 - .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
 - .3 Submit, at completion of work, report listing phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load. State hour and date on which each load was measured, and voltage at time of test.
 - .5 Conduct and pay for following tests:
 - .1 Power generation and distribution system including phasing, voltage, grounding and load balancing.
 - .2 Circuits originating from branch distribution panels.
 - .3 Lighting and its control.
 - .4 Motors, heaters and associated control equipment including sequenced operations of systems where applicable.
 - .5 Systems: fire alarm system, communications.
 - .6 Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.
 - .7 Insulation resistance testing.
 - .1 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.
 - .8 Carry out tests in presence of Owner's Representative.
 - .9 Provide instruments, meters, equipment and personnel required to conduct tests during and conclusion of project.
 - .10 Submit test results for Owner's Representative's review and include in Commissioning Manuals specified in Section 01 91 13 – 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.

END OF SECTION

PART 1 **GENERAL**

1.1 **SECTION INCLUDES**

- .1 Materials and installation for wire and box connectors.

1.2 **RELATED SECTIONS**

- .1 Section 26 05 00 – Common Work Results - Electrical.

1.3 **REFERENCES**

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA-C22.2 No.18, Outlet Boxes, Conduit Boxes and Fittings.
 - .2 CAN/CSA-C22.2 No.65, Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
 - .1 EEMAC 1Y-2, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).
- .3 National Electrical Manufacturers Association (NEMA)

PART 2 **PRODUCTS**

2.1 **MATERIALS**

- .1 Pressure type wire connectors to: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.
- .2 Fixture type splicing connectors to: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.
- .3 Bushing stud connectors: to EEMAC 1Y-2 to consist of:
 - .1 Connector body and stud clamp for stranded copper conductors.
 - .2 Clamp for copper bar.
 - .3 Stud clamp bolts.
 - .4 Bolts for copper bar.
 - .5 Sized for conductors and bars as indicated.
- .4 Clamps or connectors for armoured cable, aluminum sheathed cable, mineral insulated cable, flexible conduit, non-metallic sheathed cable as required to: CAN/CSA-C22.2 No.18.

PART 3 **EXECUTION**

3.1 **INSTALLATION**

- .1 Remove insulation carefully from ends of conductors and:

- .1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No.65.
- .2 Install fixture type connectors and tighten. Replace insulating cap.
- .3 Install bushing stud connectors in accordance with EEMAC 1Y-2.

END OF SECTION

PART 1 **GENERAL**

1.1 **RELATED SECTIONS**

- .1 Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.
- .2 Refer to drawings for wiring type required under different applications.

1.2 **REFERENCES**

- .1 Canadian Standards Association (CSA)
 - .1 CSA C22.2 No .0.3, Test Methods for Electrical Wires and Cables.
 - .2 CAN/CSA-C22.2 No. 131, Type TECK 90 Cable.

PART 2 **PRODUCTS**

2.1 **BUILDING WIRES**

- .1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.
- .2 Copper: size as indicated, with 600 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE and RWU90 XLPE as indicated. Provide RWU90 XLPE rated cable for underground wiring. Related to new service entrance feeders and site lighting circuits. RWU90 XLPE not required under interior floor slabs.
- .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 Cross-linked polyethylene XLPE, rating – 600 V.
- .4 Inner jacket: polyvinyl chloride material.
- .5 Armour: interlocking aluminum, compliant to applicable Building Code classification for this project.
- .6 Overall covering: thermoplastic polyvinyl chloride material.
- .7 Fastenings:

- .1 One hole steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.
- .2 Channel type supports for two or more cables at 1500 mm centers.
- .3 Threaded rods: 6 mm dia. to support suspended channels.
- .8 Connectors:
 - .1 Watertight and/or type approved for TECK cable, as indicated.

2.3 MINERAL-INSULATED CABLES

- .1 Conductors: solid bare soft-annealed copper, size as indicated.
- .2 Insulation: compressed powdered magnesium oxide to form compact homogeneous mass throughout entire length of cable.
- .3 Overall covering: annealed seamless copper sheath, Type M1 rated 600 V, 250°C.
- .4 Overall jacket: PVC applied over the sheath and compliant to applicable Building Code classification for this project for direct buried and wet locations, as indicated.
- .5 Two hour fire rating.
- .6 Connectors: watertight, field installed, approved for MI cable.
- .7 Termination kits: field installed approved for MI cable.

2.4 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.

2.5 CONTROL CABLES

- .1 Type LVT: 2 soft annealed copper conductors, sized as indicated, with thermoplastic insulation, outer covering of thermoplastic jacket. Low energy 300 V control cable: stranded annealed copper conductors sized as indicated, with PVC insulation type TW -40° C polyethylene insulation with shielding of tape coated with paramagnetic material wire braid over each conductor and overall covering of PVC jacket.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

- .2 Perform tests using method appropriate to site conditions and to approval of Owner's Representative and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.
- .4 No splices permitted in panel board feeders in new construction. Splices in re-work or renovation projects only with pre-approval by Owner's Representative.

3.2 GENERAL CABLE INSTALLATION

- .1 Install cable in trenches in accordance with Section 33 71 73.02 - Underground Electrical Service.
- .2 Lay cable in cable trays in accordance with Section 26 05 36 - Cable Trays for Electrical Systems.
- .3 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1000 V).
- .4 Cable Colour Coding: to Section 26 05 00 Common Work Results for Electrical.
- .5 Conductor length for parallel feeders to be identical.
- .6 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.
- .7 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.
- .8 Branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment to be 2-wire circuits only, i.e. common neutrals not permitted.
- .9 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 cable troughs in accordance with Section 26 05 33.01- Cable Trays for Electrical Systems.
 - .3 In underground ducts in accordance with Section 26 05 43.01- Installation of Cables in Ducts.
 - .4 In trenches in accordance with Section 26 05 43.01- Installation of Cables in Trenches.
 - .5 In underfloor distribution system in accordance with Section 26 05 39- Underfloor Raceways for Electrical Systems
 - .6 In cellular floor raceways in accordance with Section 26 05 38 – Cellular Metal Floor Raceway Fittings.
 - .7 In surface and lighting fixture raceways in accordance with Section 26 50 00- Lighting.

- .8 In wireways and auxiliary gutters in accordance with Section 26 05 37 – Wireways and Auxiliary Gutters.
- .9 Overhead service conductors in accordance with Section 26 24 01 - Service Equipment.

3.4 INSTALLATION OF TECK CABLE 0 -1000 V

- .1 Install cables.
 - .1 Group cables wherever possible on channels.
- .2 Install cable concealed, securely supported by straps and hangers.

3.5 INSTALLATION OF MINERAL-INSULATED CABLES

- .1 Run cable exposed, securely supported by straps.
- .2 Support 2 h fire rated cables at 1m intervals.
- .3 Make cable terminations by using factory-made kits.
- .4 At cable terminations use thermoplastic sleeving over bare conductors.
- .5 Where cables are buried in cast concrete or masonry, sleeve for entry and exit of cables.
- .6 Do not splice cables.

3.6 INSTALLATION OF ARMOURED CABLES (AC-90)

- .1 Group cables wherever possible.
- .2 Use permitted only for work in movable partitions and vertical power supply drops to lighting fixtures.

3.7 INSTALLATION OF CONTROL CABLES

- .1 Install control cables in conduit as indicated.
- .2 Ground control cable shield.

END OF SECTION

PART 1 GENERAL (NOT APPLICABLE)

PART 2 PRODUCTS

2.1 SUPPORT CHANNELS

- .1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted suspended or set in poured concrete walls and ceilings as required.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Secure equipment to hollow or solid masonry, tile and plaster surfaces with lead anchors or nylon shields.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.
- .5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .6 Fasten exposed conduit or cables to building construction or support system using straps.
 - .1 One-hole steel straps to secure surface conduits and cables 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 m on centre spacing.
- .9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

- .11 Do not use wire lashing, wood blocking, plastic strap or perforated strap to support or secure raceways or cables.
- .12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Owner's Representative.
- .13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

END OF SECTION

PART 1 **GENERAL**

1.1 **REALTED SECTIONS**

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 91 13 – General Commissioning (Cx) Requirements.
- .3 Section 26 05 00 – Common Work Results – Electrical.

1.2 **SUBMITTALS**

- .1 Submit shop drawings and product data for cabinets.
- .2 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Provide drawings stamped and signed by professional engineer registered or licensed in the Province of Newfoundland and Labrador, Canada.

PART 2 **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 400 A.

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.

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.

PART 3 **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 m 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 m 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

PART 1 **GENERAL**

1.1 **RELATED SECTIONS**

- .1 Section 26 05 00 – Common Work Results – Electrical.
- .2 Section 26 05 29 – Hangers and Supports for Electrical Systems.
- .3 Section 26 05 34 – Conduits, Conduit Fastenings and Fittings.

1.2 **REFERENCES**

- .1 Canadian Standards Association (CSA)
 - .1 CSA C22.1, Canadian Electrical Code, Part 1.

PART 2 **PRODUCTS**

2.1 **OUTLET AND CONDUIT BOXES GENERAL**

- .1 Size boxes in accordance with CSA C22.1.
- .2 102 mm square or larger outlet boxes as required for special devices.
- .3 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.
- .5 347 V outlet boxes for 347 V switching devices.
- .6 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 **GALVANIZED STEEL OUTLET BOXES**

- .1 Electro-galvanized steel single and multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.
- .2 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 FLOOR BOXES

- .1 Concrete tight electro-galvanized sheet steel floor boxes with adjustable finishing rings to suit floor finish with brass faceplate. Device mounting plate to accommodate short or long ear duplex receptacles. Minimum depth: 28 mm for receptacles; 73 mm for communication equipment.
- .2 Adjustable, watertight, concrete tight, cast floor boxes with openings drilled and tapped for 12 mm and 19 mm conduit. Minimum size: 73 mm deep.

2.6 CONDUIT BOXES

- .1 Cast FS or FD aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacle.

2.7 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.

2.8 SERVICE FITTINGS

- .1 'High tension' receptacle fitting made of 2 piece die-cast aluminum with brushed aluminum housing finish for 1 duplex receptacles. Bottom plate with two knockouts for centered or offset installation.
- .2 Pedestal type 'low tension' fitting made of 2 piece die cast aluminum with brushed aluminum housing finish to accommodate two amphenol jack connectors.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Support boxes independently of connecting conduits.

- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.
- .3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.
- .4 Provide correct size of openings in boxes for conduit, mineral insulated 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

PART 1 GENERAL

1.1 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA C22.2 No. 18, Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware, a National Standard of Canada.
 - .2 CSA C22.2 No. 45, Rigid Metal Conduit.
 - .3 CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .4 CSA C22.2 No. 83, Electrical Metallic Tubing.
 - .5 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.
 - .1 Submit cable manufacturing data.
- .2 Quality assurance submittals:
 - .1 Test reports: submit certified test reports.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Instructions: submit manufacturer's installation instructions.

PART 2 PRODUCTS

2.1 CONDUITS

- .1 Rigid metal conduit: to CSA C22.2 No. 45, hot dipped galvanized steel threaded.
- .2 Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.
- .3 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.
- .4 Rigid PVC conduit: to CSA C22.2 No. 211.2.
- .5 Flexible metal conduit: to CSA C22.2 No. 56, aluminum liquid-tight flexible metal.
- .6 FRE conduit: to CSA C22.2.
- .7 Flexible PVC conduit: to CAN/CSA-C22.2 No. 227.3,

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 m oc.
- .4 Threaded rods, 6 mm dia., to support suspended channels.

2.3 CONDUIT FITTINGS

- .1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.
- .2 Factory "ells" where 90°, 45° or 22.5° bends are required for 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.

2.4 EXPANSION FITTINGS FOR RIGID CONDUIT

- .1 Weatherproof expansion fittings with internal bonding assembly suitable for 100 mm linear expansion.
- .2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection in all directions.
- .3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.5 FISH CORD

- .1 Polypropylene.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install all conduit, conduit fittings and accessories in accordance with the latest edition of the Canadian Electrical Code in a manner that does not alter, change or violate any part of the installed system components or the CSA/UL certification of these components.

- .2 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .3 Conceal conduits except in mechanical and electrical service rooms and in unfinished areas.
- .4 Surface mount conduits except in finished areas or as indicated.
- .5 Use rigid hot dipped galvanized steel threaded conduit for exposed work below 2.4 m above finished floor.
- .6 Use epoxy coated conduit underground in corrosive areas and where exposed to exterior elements. (ie: pole mounted service entrance conduits)
- .7 Use electrical metallic tubing (EMT) except in cast concrete and above 2.4 m not subject to mechanical injury, as well as concealed work in masonry construction.
- .8 Use rigid PVC conduit underground and buried in or under concrete slab on grade.
- .9 Use FRE conduit for encasement in concrete duct bank for service entrance feeders.
- .10 Use flexible metal conduit for connection to motors in dry areas connection to recessed incandescent fixtures without a prewired outlet box connection to surface or recessed fluorescent fixtures work in movable metal partitions.
- .11 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.
- .12 Use AC-90 for vertical power supply drops to light fixtures.
- .13 Use explosion proof flexible connection for connection to explosion proof motors.
- .14 Install conduit sealing fittings in hazardous areas. Fill with compound.
- .15 Minimum conduit size for lighting and power circuits: 19 mm. 12 mm conduit is acceptable for switch leg drops only where one two-wire circuit and ground is required.
- .16 Install EMT conduit from computer room branch circuit panel to outlet boxes located in sub floor.
- .17 Install EMT conduit from computer room branch circuit panel to junction box in sub-floor immediately below panel. Run flexible conduit from junction box to outlet boxes for each computer in sub-floor.
- .18 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .19 Mechanically bend steel conduit over 19 mm dia.
- .20 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .21 Install fish cord in empty conduits.

- .22 Run 2 - 25 mm spare conduits up to ceiling space and 2 - 25 mm spare conduits down to ceiling space from each flush panel. Terminate these conduits in 152 x 152 x 102 mm junction boxes in ceiling space or in case of an exposed concrete slab, terminate each conduit in flush concrete type box.
- .23 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.
- .24 Dry conduits out before installing wire.

3.3 SURFACE CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.
- .3 Run conduits in flanged portion of structural steel.
- .4 Group conduits wherever possible on suspended channels.
- .5 Do not pass conduits through structural members except as indicated.
- .6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 CONCEALED CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Do not install horizontal runs in masonry walls.
- .3 Do not install conduits in terrazzo or concrete toppings.

3.5 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. Use rigid steel conduit for stub-up and adapt to in floor rigid PVC conduit.
- .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 in 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

PART 1 **GENERAL**

1.1 **RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 91 13 - General Commissioning (Cx) Requirements.
- .3 Section 26 05 00 - Common Work Results - Electrical.
- .4 Section 26 50 00 - Lighting.

1.2 **REFERENCES**

- .1 Canadian Standards Association (CSA)
 - .1 CSA C22.2 No.184.1, Solid-State Dimming Controls (Bi-national standard with UL 1472).

1.3 **ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature and data sheets for lighting control devices and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 **DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect lighting devices from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse pallets, crates, padding and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 **PRODUCTS**

2.1 **DIMMING WALL SWITCH**

- .1 Single button, single scene.
- .2 Decora type wall plate. White Colour.
- .3 Customizable buttons with LED indicators.
- .4 Connections via RJ45 connectors and Category 5e cables.
- .5 Standard of Acceptance: Wattstopper LMSW-101-W Digital 1 Button Wall Switch.

2.2 **WIRELESS CONFIGURATION TOOL**

- .1 Handheld tool for configuration of system parameters.
- .2 Communication via Infrared Transceiver.
- .3 IR Range = 10 Metres.
- .4 Remotely configures and reports dimming parameters.
- .5 Manually adjusts light level of dimmed loads to facilitate scene setting.
- .6 Standard of Acceptance: Wattstopper time LMCT-100 Digital Wireless Configuration Tool.
(Provide one).

2.3 **CONTROLLER**

- .1 Series Digital ON/OFF/0-10V Dimming Room Controller.
- .2 Voltage: 120VAC, 60 Hz.
- .3 Maximum 120A load per Room Controller.
 - .1 Each relay rated for 20A ballast.
- .4 Class 2 dimming control signal: 0-10 VDC, sinks up to 100 mA per channel for control of compatible ballasts.
- .5 Class 2 output to DLM local network: 24VDC, 250 mA maximum across 4 RJ45 Ports.
- .6 DLM Local Network:
 - .1 Maximum current: 800 mA.
 - .2 Category 5e cable, up to 1000 ft.

- .3 Up to 64 loads.
- .4 Up to 48 communicating devices.
- .5 Max 4 LMRC-100 Series Room Controllers.
- .7 Operating Conditions: 32-158°F (0-70°C); 5-96% RH, non-condensing.
- .8 UL (88T9) and cUL listed.
- .9 Five year warranty.
- .10 ON/OFF/Dim local override button for each load.
- .11 LED to indicate status of each load.
- .12 Integral current monitoring of total connected load.
- .13 4 RJ45 parts with integral strain relief.
- .14 Zero-crossing.
- .15 UL 2043 plenum rated.
- .16 RoHS complaint.
- .17 Store load preset level and 16 scene preset levels for each load.
- .18 Standard of Acceptance: Wattstopper LMRC 212.

2.4 .1 ACCEPTABLE MANUFACTURERS

- Standard of Acceptance: Wattstopper.
- .2 Acceptable Alternates:
 - .3 Lutron.
 - .4 Sensor Switch.
 - .5 Lithonia.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Install components comprising dimming system in accordance with manufacturer's instructions, and as indicated.
- .2 Install wiring, shielding, grounding in accordance with manufacturer's instructions.

- .3 Ensure shielded leads between intensity selector potentiometer and intensity controls have outer insulating jackets and are connected to ground at one point only.
- .4 Keep radio, VCR, TV and intercom wiring a minimum of 1.8 m away from dimming circuitry. Where crossing of wiring is essential, ensure that grounded shields surround such intercom wiring, and that crossings take place at 90°.
- .5 Locate intensity controls and "on-off" switches as indicated.
- .6 Ensure positive, low resistance lamp to pin contact within lampholder.
- .7 Age lamps by operating at full intensity for 100 h prior to final inspection. Operate ballasts in ambient temperature above 18°C.
- .8 Ensure connections are correctly made and to same phase before energizing.

3.2 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 – Common work Results - Electrical and Section 01 91 13 – General Commissioning (Cx) Requirements.
- .2 Demonstrate that dimming systems are installed as indicated.
- .3 Demonstrate that dimming systems operate as intended and that there are no problems in starting lamps, nor in keeping them lit, and free of perceptible flicker at any setting of dimming intensity control.
- .4 Demonstrate that no radio, VCR or TV interference is carried by system and that there is no interference between dimming system and locally used infrared-based remote/integral controls.

3.3 ADJUSTING

- .1 Adjust lighting control devices for correct function and operation in accordance with manufacturer's written instructions.
- .2 Include in the tender price for the manufacturer's representative to set up and program the system on site as per the Owner's instructions. At the end of the project, provide a letter signed by the manufacturer's representative instructing that the system has been programmed as per the Owner's requirements and that training as per Clause 3.6 has been completed.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.5 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by lighting control devices installation.

3.6 TRAINING

- .1 Provide on site training to the Owner's staff. Training shall include system description, features and operating instructions.

END OF SECTION

PART 1 **GENERAL**

1.1 **SECTION INCLUDES**

- .1 Switches, receptacles, wiring devices, cover plates and their installation.

1.2 **RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 91 13 – General Commissioning (Cx) Requirements.
- .3 Section 26 05 00 – Common Work Results - Electrical.

1.3 **REFERENCES**

- .1 Canadian Standards Association (CSA)
 - .1 CSA-C22.2 No.42, General Use Receptacles, Attachment Plugs and Similar Devices.
 - .2 CSA-C22.2 No.42.1, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
 - .3 CSA-C22.2 No.55, Special Use Switches.
 - .4 CSA-C22.2 No.111, General-Use Snap Switches (Bi-national standard, with UL 20, twelfth edition).

PART 2 **PRODUCTS**

2.1 **SWITCHES**

- .1 Single pole, double pole, three-way, four-way switches to: CSA-C22.2 No.55 and CSA-C22.2 No.111.
- .2 Manually-operated general purpose ac switches with following features:
 - .1 Terminal holes approved for No. 10 AWG wire.
 - .2 Silver alloy contacts.
 - .3 Urea or melamine moulding for parts subject to carbon tracking.
 - .4 Suitable for back and side wiring.
 - .5 White toggle.
 - .6 Specification grade.
 - .7 Hospital grade as indicated.
- .3 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.
- .4 Single pole, double pole, three way, four way switches as indicated on drawings.

- .5 Switches to be of one manufacturer throughout project.
- .6 Standard of Acceptance:
 - .1 Hubbell HBL 1201W (120 V) and Hubbell 18201-W (347 V)
- .7 Acceptable alternates:
 - .1 Leviton.
 - .2 Pass and Seymour.
 - .3 Cooper.

2.2 RECEPTACLES

- .1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, to: CSA-C22.2 No.42 with following features:
 - .1 White thermoplastic moulded housing.
 - .2 Suitable for No. 10 AWG for back and side wiring.
 - .3 Break-off links for use as split receptacles.
 - .4 Eight back wired entrances, four side wiring screws.
 - .5 Triple wipe contacts and rivetted grounding contacts.
 - .6 Specification grade.
 - .7 Hospital grade as indicated.
- .2 Single receptacles CSA type 5-15 R, 125 V, 15 A, U ground with following features:
 - .1 White thermoplastic moulded housing.
 - .2 Suitable for No. 10 AWG for back and side wiring.
 - .3 Four back wired entrances, 2 side wiring screws.
- .3 Other receptacles with ampacity and voltage as indicated.
- .4 Receptacles to be of one manufacturer throughout project.
- .5 Standard of Acceptance:
 - .1 Hubbel 5262-W.
- .6 Acceptable alternates:
 - .1 Leviton.
 - .2 Pass and Seymour.
 - .3 Copper.

2.3 GROUND FAULT INTERRUPTER (GFI) RECEPTACLES

- .1 CSA Type 5-20R, 125 V, 20A, U-ground.
- .2 Tamper resistant, weather resistant.

- .3 White urea molded housing.
- .4 10 kA short circuit current rating.
- .5 Suitable for #10 AWG wiring.
- .6 Double wide contacts and riveted grounding contacts.
- .7 Specification grade.
- .8 Trip level: 4 to 6 mA. Trip time: 0.25 seconds.
- .9 Meets UL 498 and UL 943 for Class A GFCI's. CSA certified.
- .10 Standard of Acceptance: Hubbell GFR5362WTR.
- .11 Acceptable Alternates:
 - .1 Pass and Seymour.
 - .2 Cooper.
 - .3 Leviton.

2.3 SPECIAL WIRING DEVICES

- .1 Special wiring devices:
 - .1 Clock hanger outlets, 15 A, 125 V, 3 wire, grounding type, suitable for No. 10 AWG for installation in flush outlet box.
 - .2 Pilot lights as indicated, with neon type 0.04 W, 125 V lamp and red plastic jewel lense, flush type.

2.4 WIRING DEVICES FOR COMPUTER ROOMS

- .1 As indicated.

2.5 COVER PLATES

- .1 Cover plates for wiring devices to: CSA-C22.2 No.42.1.
- .2 Cover plates from one manufacturer throughout project.
- .3 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.
- .4 Stainless steel cover plates, thickness 2.5 mm for wiring devices mounted in flush-mounted outlet box.
- .5 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.
- .6 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.

- .7 Weatherproof spring-loaded cast aluminum cover plates complete with gaskets for single receptacles or switches.
- .8 All wiring device cover plates to be labeled using clear adhesive strips with black type identifying panel and circuit number for each device.

PART 3 **EXECUTION**

3.1 **INSTALLATION**

- .1 Switches:
 - .1 Install single throw switches with handle in "UP" position when switch closed.
 - .2 Install switches in gang type outlet box when more than one switch is required in one location.
 - .3 Mount toggle switches at height in accordance with Section 26 05 00 – Common Work Results - Electrical.
- .2 Receptacles:
 - .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
 - .2 Mount receptacles at height in accordance with Section 26 05 00 – Common Work Results - Electrical.
 - .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.
- .3 Cover plates:
 - .1 Protect cover plate finish with paper or plastic film until painting and other work is finished.
 - .2 Install suitable common cover plates where wiring devices are grouped.
 - .3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

END OF SECTION

PART 1 **GENERAL**

1.1 **RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 11 - Cleaning.
- .3 Section 01 91 13 - General Commissioning (Cx) Requirements.
- .4 Section 26 05 00 - Common Work Results – Electrical.

1.2 **REFERENCES**

- .1 Atomic Energy Control Board Regulations
- .2 Canadian Code for Preferred Packaging
- .3 Canadian Standards Association (CSA)
 - .1 CSA C22.2 No.141, Unit Equipment for Emergency Lighting.
 - .2 CSA C860, Performance of Internally-Lighted Exit Signs.
- .4 National Fire Protection Association (NFPA)
 - .1 NFPA 101, Life Safety Code.

1.3 **SUBMITTALS**

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheets and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Manufacturer's Instructions: Provide to indicate special handling criteria, installation sequence, cleaning procedures and disposal.

PART 2 **PRODUCTS**

2.1 **STANDARD UNITS**

- .1 Exit lights: to CSA C22.2 No.141 and CSA C860, packaged in accordance with the Canadian Electrical Code for Preferred Packaging guidelines.
- .2 Housing: extruded aluminum, satin finish
- .3 Lamps: LED.
- .4 Operation: designed for 25 years of continuous operation without relamping.

- .5 Edge lit design with acrylic panels for single or double face application. Green ISO pictogram c/w chevrons to indicate direction of travel as required.
- .6 Input voltage: 120/347 Vac.
- .7 Mounting: wall or ceiling mount as indicated.

2.2 SELF-POWERED UNITS

- .1 Exit lights: to CSA C22.2 No.141 and CSA C860, packaged in accordance with the Canadian Code for Preferred Packaging guidelines.
- .2 Housing: extruded aluminum, satin finish
- .3 Lamps: LED.
- .4 Operation: designed for 25 years of continuous operation without relamping.
- .5 Edge lit design with acrylic panels for single or double face application. Green ISO pictogram c/w chevrons to indicate direction of travel as required.
- .6 Self-powered units with integral batteries and charger. Unit to remain operational for 90 minutes upon power failure.
- .7 Input voltage: 120/347 Vac.
- .8 Mounting: wall or ceiling mount as indicated.
- .9 Recharge time: 12 hours
- .10 Battery: sealed, maintenance free, warranty to Section 26 52 00 – Emergency Lighting, 1.5 – Emergency Lights.
- .11 Charger: solid state, voltage/current regulated, inverse temperature compensated, short circuit protected, with regulated output of plus or minus 0.01 V for plus or minus 10% V input variation.
- .12 Signal lights: solid state, for 'AC Power ON'.
- .13 Auxiliary equipment:
 - .1 Lamp disconnect switch.
 - .2 Test switch.
 - .3 AC/DC output terminal blocks inside cabinet.
 - .4 RFI suppressor.
 - .5 Cord and single twist-lock plug connection for AC power supply.

PART 3 **EXECUTION**

3.1 **INSTALLATION**

- .1 Install exit lights to manufacturer's recommendations, listing requirements, NFPA standard and local regulatory requirements.
- .2 Connect fixtures to exit light circuits using RW90 wire in EMT conduit.
- .3 Connect emergency lamp sockets to emergency circuits.
- .4 Ensure that exit light circuit breaker is locked in on position.
- .5 Provide tests in accordance with Section 26 05 00 – Common Work Results - Electrical and Section 01 91 13 – General Commissioning (Cx) Requirements.

3.2 **CLEANING**

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE OF WORK

- .1 Testing and commissioning are called for throughout the individual specifications. This does not relieve this trade from providing all testing and commissioning necessary to ensure that systems and equipment operate as required and that they interface with other systems and equipment as required.

1.2 SECTION INCLUDES

- .1 Commissioning of all building electrical systems and component including:
 - .1 Testing and adjustment.
 - .2 Demonstrations and Training.
 - .3 Instructions of all procedures for Owner's personnel.
 - .4 Updating as-built data.
 - .5 Co-ordination of Operation and Maintenance material.

1.3 RELATED SECTION

- .1 Section 01 77 00 – Closeout Procedures.
- .2 Section 01 91 13 – General Commissioning (Cx) Requirements.
- .3 Section 26 05 00 – Common Work Results - Electrical.

1.4 REFERENCES

- .1 CSA (Canadian Standards Association).
- .2 Underwriters Laboratories of Canada.

1.5 QUALITY ASSURANCE

- .1 Provide qualified trades persons, certified testing agencies, factory trained and approved by the Commissioning Team Leader.
- .2 Submit the names of all personnel to be used during the Commissioning activities for Owner Approval.

1.6 COMMISSIONING

- .1 The purpose of the commissioning process is to fully test all building systems including architectural, mechanical and electrical components and operating procedures by challenging these systems to realistic operation conditions.
- .2 The Commissioning activities shall be co-ordinated by the General Contractor.

- .3 Commissioning activities for the electrical systems must have available up to date as-built drawing information and accurate Operations and Maintenance Manuals. These documents shall be a major part of this activity.
- .4 Contractor shall be responsible to update all documentation with information and any changes duly noted during the Commissioning exercise.
- .5 Contractor shall arrange for all outside suppliers, equipment manufacturers, test agencies and others as identified in the commissioning sections of this specification. The cost associated with this requirement shall be included as part of the tender price.

1.7 SUBMITTALS

- .1 A commissioning document shall be prepared by the Owner's Representative prior to conducting these activities for use by the Commissioning Team.
- .2 The electrical sub-contractor shall be responsible for ensuring all activities are properly documented in this manual and co-ordinated through the General Contractor.
- .3 As-built drawings and data books must be available two weeks prior to commissioning for review and use by the consultant and Commissioning Team prior to the start of the commissioning activities.

1.8 PREPARATION

- .1 Provide test instruments required for all activities as defined in the commissioning documents.
- .2 Verify all systems are in compliance with the requirements of the commissioning documents prior to the precommissioning check out operation.
- .3 Confirm all scheduled activities have identified personnel available.
- .4 Where systems or equipment do not operate as required, make the necessary corrections or modifications, re-test and re-commission.

1.9 SYSTEM DESCRIPTION

- .1 Perform all start up operations, control adjustment, trouble shooting, servicing and maintenance of each item of equipment as defined in the commissioning documentation.
- .2 Owner will provide list of personnel to receive instructions and will co-ordinate their attendance at agreed upon times.
- .3 Prepare and insert additional data in the operations and maintenance manuals and update as-built drawings when need for additional data becomes apparent during the commissioning exercise.
- .4 Where instruction is specified in the commissioning manual, instruct personnel in all phases of operation and maintenance using operation and maintenance manuals as the basis of instruction.
- .5 Conduct presentation on Owner's premises. Owner will provide space.

1.10 FINAL REPORT

- .1 This trade shall assemble all testing data and commissioning reports and submit them to the Owner.
- .2 Each form shall bear signature of recorder, and that of supervisor of reporting organizer.

1.11 SCHEDULE OF ACTIVITIES

- .1 Commissioning activities shall be conducted based on pre-established schedule with all members of the commissioning team, refer to Section 01 91 13 – General Commissioning (Cx) Requirements.
- .2 In addition, there will be two meetings held through the contract duration to introduce the parties of the commissioning team, establish the schedules and deadlines for the various activities and review the Commissioning Manual.
- .3 Adhering to the established schedule is very important as the co-ordination and scheduling of the participants will be difficult to alter once this is established. Close co-ordination of this schedule is important.
- .4 In the event project cannot be commissioned in the allotted time slot, the contractor shall pay for all costs associated with assembling the Commissioning Team at a later date. If the contractor has not performed his duties to reach commissioning stage as outlined earlier, he will incur all expenses of other trades and the Commissioning Team due to his non-compliance.

END OF SECTION

PART 1 GENERAL

1.1 GENERAL

- .1 This section describes the extent of services to be provided for wiring of equipment supplied by others.
- .2 Within the context of this section, Others means:
 - .1 Other divisions of this specification (i.e.: Division 25 – Integrated Automation).
 - .2 The Owner, as defined in the Contract.
 - .3 Other contractors supplying and installing equipment to the contract.

1.2 EXTENT OF SERVICES PROVIDED

- .1 The work of this contract is to include all power and control wiring of equipment which is provided by Division 26.
- .2 All power and control wiring above 50 V for equipment supplied by Division 25 will be the responsibility of this contractor. Coordinate with Integrated Automation contractor for exact requirements.
- .3 All control wiring 50 V and less for equipment supplied by Division 25 will be the responsibility of Division 25- Integrated Automation Contractor. Conduit and wire associated with this is the responsibility of Division 25.
- .4 All power and control wiring associated with equipment supplied by Division 01 will be the responsibility of this contractor. Coordinate with general contractor for exact requirements. See Section 26 27 97 – Door Hardware Wiring for exceptions for wiring of door lock systems.
- .5 Final connection of all wiring to equipment provided by others (except control wiring below 50 V associated with Division 25 equipment) will be by division 26. Coordinate with the provider for connection instructions.

1.3 RESPONSIBILITY OF DIVISION 26

- .1 It is the responsibility of the Division 26 subcontractor to verify final requirements for wiring of all equipment noted. Verification of wiring requirements to include:
 - .1 Confirmation of electrical characteristics.
 - .2 Location of connection point.
 - .3 Method of connection (i.e. direct or plug-in etc.)
- .2 Obtain and become familiar with shop drawings for all relevant equipment.
- .3 No claim for extra will be entertained for wiring equipment which has been indicated, or changes to installed wiring where installation proceeded prior to verification of electrical requirements.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 91 13 - General Commissioning (Cx) Requirements.
- .2 Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets.
- .3 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
- .4 Section 27 20 00 - Data Communications.
- .5 Section 27 31 00 - Voice Communications Switching and Routing Equipment.
- .6 The MUNet specifications shall be followed and are part of this contract. Refer to the appendix. The Division 27 communications sections and MUNet section are intended to be read in conjunction with one another, where discrepancies occur, contractor shall follow the most stringent requirement. If any contractual requirements are unclear, the contractor is required to submit all clarification requests during the tender and in accordance with the tender requirements.

1.2 SYSTEM DESCRIPTION

- .1 Telecommunications raceway system for telecommunications and A/V consists of outlet boxes, cover plates, terminal and distribution cabinets, conduits, pull boxes, sleeves and caps, fish wires, service poles, service fittings, as indicated.
- .2 Data system provided as a complete operational system as per Section 27 20 00 – Data Systems.

PART 2 PRODUCTS

2.1 MATERIAL

- .1 Conduits: EMT type, in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
- .2 Pull boxes, cabinets type E: in accordance with Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets.
- .3 Outlet boxes flush mounted type, conduit boxes size, and fittings: in accordance with Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets.
- .4 Fish wire: polypropylene.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Install raceway system, including distribution system, fish wire, terminal cabinets, outlet boxes, floor boxes, pull boxes, cover plates, conduit, sleeves and caps, miscellaneous and positioning material to constitute complete system, as indicated.
- .2 For each data drop there shall be a dedicated 21 mm conduit from the outlet box to the respective system zone conduit pull box or system rack.

END OF SECTION

Memorial University of Newfoundland ENGINEERING BUILDING, RENOVATIONS TO EN-4033

ST. JOHN'S
APRIL 3, 2025

ISSUED FOR TENDER

LIST OF DRAWINGS

- A-0 - GENERAL NOTES & SYMBOL LEGEND
- A-0.1 - SITE ACCESS PLANS
- A-0.2 - SITE ACCESS & PANEL LOCATION PLANS
- A-1.0 - DEMOLITION FLOOR PLAN & ARCHITECTURAL CONDUIT PLAN
- A-2.0 - DEMOLITION REFLECTED CEILING PLAN
- A-3.0 - NEW FLOOR PLAN & ARCHITECTURAL CONDUIT PLAN
- A-4.0 - NEW REFLECTED CEILING PLAN
- A-5.0 - NEW FINISH PLAN & DETAILS
- A-5.1 - NEW FLOOR FINISH PLAN
- A-6.0 - DOOR ELEVATIONS, SCHEDULE & DETAILS

F-0 - NEW FURNITURE PLAN

- E-0 - ELECTRICAL SYMBOL LEGEND & PANEL SCHEDULES
- E-1.0 - DEMOLITION ELECTRICAL PLAN & ELECTRICAL CONDUIT PLAN
- E-2.0 - DEMOLITION ELECTRICAL CEILING PLAN
- E-3.0 - NEW ELECTRICAL PLAN & ELECTRICAL CONDUIT PLAN
- E-4.0 - NEW ELECTRICAL CEILING PLAN
- E-5.0 - ELECTRICAL DETAILS

EM-1.0 - DEMOLITION & NEW EMCS FLOOR PLAN

EN-110-23 ISSUED FOR TENDER

*This University was raised by the people of Newfoundland as a memorial
to the fallen in the great wars, 1914-1918, 1939-1945, that in freedom of learning,
their cause and sacrifice might not be forgotten.*

- Dedication plaque, Arts & Administration Building, St. John's Campus



FACILITIES
MANAGEMENT

GENERAL NOTES: (APPLY TO ALL DWG SHEETS)

1. ALL WORK TO BE DONE IN ACCORDANCE WITH LATEST EDITION OF THE NATIONAL BUILDING CODE AND APPLICABLE LOCAL BUILDING CODES.
2. ALL CONTRACTORS AND SUBCONTRACTORS PERFORMING WORK ON THE PROJECT ARE TO PROVIDE UTMOST QUALITY WORKMANSHIP. THEY MUST ALSO ADHERE TO ALL SCHEDULES AS SET OUT IN THE CONTRACT DOCUMENTS.
3. CONTRACTOR TO ENSURE A HAZARD ASSESSMENT IS DONE ONSITE PRIOR TO THE START OF WORK TO IDENTIFY POTENTIAL HAZARDS AND RECOMMENDED CONTROLS.
4. CONTRACTOR SHALL BE AWARE THAT ASBESTOS CONTAINING MATERIAL (ACM) EXISTS THROUGHOUT THE CAMPUS. COORDINATE ALL CUTTING, DRILLING, AND DEMOLITION OF VINYL TILE, DRYWALL JOINT COMPOUND, AND PARGING CEMENT AT PIPE ELBOWS IN THE ENGINEERING BUILDING BY ALL TRADES WITH MUN PROJECT COORDINATOR AND MUN ASBESTOS COORDINATOR.
5. CONTRACTOR SHALL BE AWARE THAT LEAD CONTAINING MATERIAL EXISTS THROUGHOUT THE CAMPUS. COORDINATE ALL CUTTING, DRILLING, AND DEMOLITION OF PAINTED SURFACES IN THE ENGINEERING BUILDING BY ALL TRADES WITH MUN PROJECT COORDINATOR AND MUN ASBESTOS COORDINATOR.
6. THE AREA OF WORK MAY BE OCCUPIED BY THE CLIENT STAFF FOR THE DURATION OF THE PROJECT. THE MUN PROJECT COORDINATOR AND GENERAL CONTRACTOR SHALL COORDINATE RENOVATING SMALL AREAS OF THE SPACE AT A TIME TO MINIMIZE DUST, DEBRIS, AND NOISE LEVELS. THE PROJECT COORDINATOR SHALL COORDINATE WITH THE CLIENT AND GENERAL CONTRACTOR TO ESTABLISH A SCHEDULE OF WORK.
7. ALL TEMPORARY HOARDING AND ACCESSSES REQUIRED IN EGRESS CORRIDORS, ATRIUMS, FOYERS AND STAIRWELLS TO BE OF NON-COMBUSTABLE FIRE RATED CONSTRUCTION AS PER NBC.
8. CONTRACTOR IS TO HOARD WORK AS NECESSARY AND PROTECT REMAINING PREMISES IN THE WORK AREA AND ADJACENT TENANT SPACES FROM DAMAGE AND MAKE GOOD ANY DAMAGES THAT MAY OCCUR DURING THE WORK. CONTRACTOR TO SEAL ALL AFFECTED DUCT SYSTEMS FOR DUST CONTROL WITHIN THE WORK AREA AND ADJACENT SPACES. ALL MATERIALS TO BE PROTECTED & COVERED DURING PAINTING.
9. CONCRETE BLOCK REMOVAL AND WORK CREATING EXCESSIVE NOISE SHALL BE SCHEDULED FOR AFTER NORMAL BUSINESS HOURS 8:30AM – 5:00PM, MONDAY – FRIDAY. TO LIMIT NOISE AND DISRUPTIONS TO SURROUNDING OCCUPANTS OF BUILDING.
10. CONTRACTOR TO CAREFULLY REMOVE EXISTING SIGNAGE FROM WALL LOCATIONS AT INTERIOR AND EXTERIOR OF CONSTRUCTION SPACE PRIOR TO DEMOLITION. TURN OVER TO PROJECT COORDINATOR.
11. ALL DEMOLISHED MATERIAL BECOMES THE PROPERTY OF THE CONTRACTOR. WORK SITE TO BE LEFT IN SAFE CONDITION AT THE END OF EACH WORK DAY.
11. PROVIDE FIRE STOPPING AT ALL PENETRATIONS THROUGH FLOOR SLABS AND CONCRETE BLOCK WALLS.
12. READ IN CONJUNCTION WITH MECHANICAL AND ELECTRICAL PLANS AND SPECIFICATIONS, COORDINATE ALL WORK WITH OTHER TRADES.
13. ALL CIRCUIT BREAKER / PANEL SHUTDOWNS WILL REQUIRE MUN ELECTRICIAN PRESENT TO PROVIDE LOCK OUT/TAG OUT. CONTRACTOR SHALL CONTACT PROJECT COORDINATOR MIN. 48Hrs IN ADVANCE TO SCHEDULE MUN ELECTRICIAN. LIVE ELECTRICAL WORK IS NOT PERMITTED.
14. CONTRACTOR TO OBTAIN AND PAY FOR ANY PERMITS REQUIRED BY LOCAL CODES AND REGULATIONS.
15. CONTRACTOR TO REVIEW EXISTING SITE CONDITIONS, VERIFY ALL DIMENSIONS AND SCOPE OF WORK AND REPORT ANY DISCREPANCIES TO THE MUN PROJECT COORDINATOR PRIOR TO SUBMISSIONS OF TENDER.
16. WHERE DRAWINGS INDICATE TO MATCH EXISTING, NO CHARGES AFTER TENDER ACCEPTANCE FOR MINIMUM QUANTITIES OR SPECIAL SHIPPING COSTS WILL BE CONSIDERED.
17. NO CHANGES OR REVISIONS TO THE WORK ARE TO BE EXECUTED WITHOUT THE PRIOR APPROVAL OF THE OWNER.
18. CONTRACTORS SHALL AWAIT WRITTEN APPROVAL FOR ANY CHANGE ORDERS BY THE OWNER'S REPRESENTATIVE PRIOR TO COMMENCING ANY WORK OR ORDER OF ANY MATERIALS RELATING TO A CHANGE.
19. PROVIDE CERTIFICATE OF GUARANTEE OF WORKMANSHIP AND MATERIAL FOR A PERIOD OF ONE YEAR FROM DATE OF ACCEPTANCE BY OWNER.
20. ISOLATION OF WORK AREAS IN OCCUPIED FACILITIES:

20.1. MATERIALS:

20.1.1. POLYETHYLENE SHEET: REINFORCED, FIRE-RESISTIVE SHEET, 0.25mm MINIMUM THICKNESS, WITH FLAME-SPREAD RATING OF 15 OR LESS PER ASTM E 84.

20.1.2. DUST CONTROL ADHESIVE-SURFACE WALK-OFF MATS: PROVIDE MATS MINIMUM 914 X 1624mm.

20.2. INSTALLATION:

20.2.1. PREVENT DUST, FUMES, AND ODOURS FROM ENTERING OCCUPIED AREAS.

20.2.2. PRIOR TO COMMENCING WORK, ISOLATE THE HVAC SYSTEM IN AREA WHERE WORK IS TO BE PERFORMED. ENCLOSE ALL REGISTERS/DIFFUSERS WITH REINFORCED FIRE RESISTIVE SHEET THROUGHOUT AREA OF WORK. COORDINATE WITH OWNER WHERE SYSTEM REQUIRES BLANKING AT DUCTWORK.

20.2.3. DISCONNECT SUPPLY AND RETURN DUCTWORK IN WORK AREA FROM HVAC SYSTEMS SERVICING OCCUPIED AREAS WHERE REPAIRS ARE TO BE COMPLETED TO THE HVAC SYSTEM.

20.2.4. MAINTAIN NEGATIVE AIR PRESSURE WITHIN WORK AREA USING HEPA-EQUIPPED AIR FILTRATION UNITS, STARTING WITH COMMENCEMENT OF TEMPORARY PARTITION CONSTRUCTION, AND CONTINUING UNTIL REMOVAL OF TEMPORARY PARTITIONS IS COMPLETE. AT THE DISCRETION OF THE PROJECT COORDINATOR.

20.2.4.1. NON-DUCTED, SELF-CONTAINED AIR FILTRATION UNITS ARE PERMITTED TO BE USED FOR DUST CONTROL

20.2.4.2. WHERE DUCTED AIR FILTRATION UNITS ARE USED; CONTRACTOR TO EXHAUST DUCT TO EN-4C01 WINDOWS; ALL DUCT MUST BE FASTENED AND SECURED OVERHEAD. NO DUCT PERMITTED THROUGH EXIT DOORS, OR ADJACENT SUITES.

20.2.5. MAINTAIN DUST PARTITIONS DURING THE WORK. USE VACUUM COLLECTION ATTACHMENTS ON DUST-PRODUCING EQUIPMENT. ISOLATE LIMITED WORK WITHIN OCCUPIED AREAS USING PORTABLE DUST CONTAINMENT DEVICES.





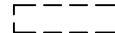

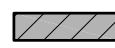
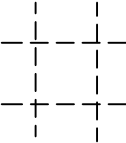
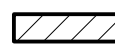
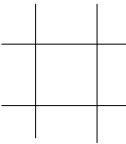
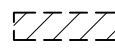
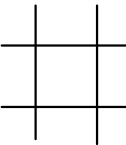
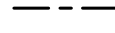
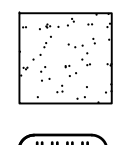
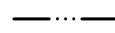





20.2.6. PERFORM DAILY CONSTRUCTION CLEANUP AND FINAL CLEANUP USING APPROVED, HEPA-FILTER-EQUIPPED VACUUM EQUIPMENT.
21. GENERAL CONTRACTOR MUST REFER TO ARCHITECTURAL AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR EXTENT OF WORK AND COORDINATE WITH OTHER TRADES PRIOR TO THE COMMENCEMENT OF ANY WORK.
22. MAINTAIN FIRE RATINGS BETWEEN FLOOR AND WALL ASSEMBLIES. FILL AND PATCH HOLES IN FLOORS AND WALLS AS A RESULT OF DEMOLITION WORK. COORDINATE OPENINGS REQUIRED IN EXISTING FIRE RATED CONCRETE BLOCK WALLS AND FLOORS WITH MECHANICAL AND ELECTRICAL SUB-TRADES. APPROPRIATELY FIRE SEAL PENETRATIONS TO MAINTAIN 1 HOUR FIRE RESISTANCE RATING. SUBMIT PRODUCT DATA SHEETS FOR REVIEW AND APPROVAL.
23. REMOVE AND SALVAGE LOCKSETS, CLOSURES, AND OPERATOR SYSTEMS UNLESS OTHERWISE NOTED. TURN OVER TO OWNER.
24. REFER TO SECTION 01 10 00 FOR WORK RESTRICTIONS.
25. PERFORM DEMOLITION WORK SHOWN AND/OR REQUIRED TO COMPLETE THE WORK. DO NOT ASSUME DEMOLITION DRAWINGS SHOW THE FULL EXTENT OF DEMOLITION WORK REQUIRED.
26. PROVIDE CUTTING, FITTING, HOLE CORING, PATCHING, FRAMING, FURRING, BLOCKING AND MISCELLANEOUS RELATED COMPONENTS REQUIRED TO EXECUTE THE WORK OF THIS CONTRACT, INCLUDING WORK REQUIRED BY ELECTRICAL AND OTHER TRADES. REINSTATE AND/OR MAKE GOOD ALL EXISTING SURFACES AFFECTED BY THE WORK. TO BE PREPARED TO RECEIVE NEW FINISHES OR FINISH TO MATCH ADJACENT CONDITIONS. COORDINATE EXTENT WITH SUB-TRADES.
27. WHEREVER EXCESSIVE DEMOLITION OCCURS OR IF DAMAGE OCCURS TO ADJACENT SURFACES NOT INTENDED FOR DEMOLITION OR REMOVAL, REINSTATE ALL AFFECTED SURFACES AND PREPARE THEM TO RECEIVE NEW FINISHES IF SPECIFIED, OTHERWISE REFINISH TO MATCH EXISTING ADJACENT CONDITIONS.

28. ALL DATA DROPS NOTED TO BE REMOVED SHALL BE DISCONNECTED BY MUN FORCES PRIOR TO DEMOLITION WORK BY ELECTRICAL SUB-TRADE. CONTRACTOR SHALL CONTACT PROJECT COORDINATOR 48hrs IN ADVANCE TO NOTIFY / SCHEDULE DATA DROP DISCONNECTION. DO NOT CUT OR DISCONNECT DATA CABLES.
29. REMOVE ALL WIRING AND CONDUIT BACK TO NEAREST JUNCTION BOXES FOR RECEPTACLES, SWITCHES, ETC. THAT ARE INDICATED TO BE REMOVED OR RELOCATED.
30. ELECTRICAL CONTRACTOR IS RESPONSIBLE TO VERIFY INDICATED CIRCUITS AND TRACE OUT ANY UNKNOWN POWER AND LIGHTING CIRCUITS PRIOR TO ANY WORK TAKING PLACE.
31. REUSE EXISTING LIGHTING POWER CIRCUITS AS INDICATED. RE-ROUTE, EXTEND, OR MODIFY POWER FEEDS AS REQUIRED TO FACILITATE ALL NEW LOCATIONS OF LIGHT FIXTURES, ILLUMINATED EXIT SIGNS, LINE VOLTAGE DIMMER SWITCHES, AND LOW VOLTAGE SWITCHES.
32. ALL ELECTRICAL ISOLATIONS SHALL BE PERFORMED IN ACCORDANCE WITH MUN ZERO ENERGY ISOLATION PROGRAM (ZEIP). ELECTRICAL CONTRACTORS ARE REQUIRED TO HAVE COMPLETED MUN ZEIP TRAINING PRIOR TO PERFORMING ELECTRICAL WORK.

**** CONTRACTOR'S ARE TO TAKE NOTE THAT ASBESTOS CONTAINING MATERIALS (ACMs) ARE PRESENT IN VARIOUS BUILDING MATERIALS IN THE ENGINEERING BUILDING. AN ASBESTOS SURVEY HAS BEEN INCLUDED IN THE SPECIFICATION SECTION 02 26 00 OUTLINING SPECIFIC INFORMATION. REMOVAL/DEMOTION OF/TO THE VINYL TILE IN EN-4033 AND THE SURROUNDING AREAS OF THE ENGINEERING BUILDING ARE TO BE REMOVED/CARRIED OUT USING APPROPRIATE ABATEMENT PROCEDURES AS PER THE PROVINCIAL REGULATIONS AND THOSE OUTLINED IN SECTION 02 82 00.02. ****

**** SUBSTANTIAL COMPLETION OF THE PROJECT SHALL BE AUGUST 4, 2025 TO ALLOW CLASSROOM TO BE OPEN WHEN CLASSES RESUME FOR FALL SEMESTER. MEMORIAL HAS NO ABILITY TO RESCHEDULE CLASSES BEYOND AUGUST 4. 2025, AS SUCH CONTRACTORS SHOULD BID PROJECT WITH THE SUBSTANTIAL COMPLETION DATE IN MIND. ****

ARCHITECTURAL SYMBOL LEGEND:

	NEW WALL CONSTRUCTION, SEE WALL TYPE		NEW DOOR NUMBERS
	EXISTING GYPSUM BOARD WALL CONSTRUCTION TO REMAIN		REFER TO CONSTRUCTION NOTE
	EXISTING GYPSUM BOARD WALL CONSTRUCTION TO BE REMOVED		REFER TO DEMOLITION NOTE
	NEW CONCRETE BLOCK WALL CONSTRUCTION, SEE WALL TYPE		= LAT CEILING SYSTEM TO BE REMOVED
	EXISTING CONCRETE BLOCK WALL CONSTRUCTION TO REMAIN		= LAT CEILING SYSTEM TO REMAIN
	EXISTING CONCRETE BLOCK WALL CONSTRUCTION TO BE REMOVED		= NEW LAT CEILING SYSTEM, SEE SPEC
	NEW TEMP HOARDING WALL: <ul style="list-style-type: none">FIRE RETARDENT RIP PROOF TARP (WHITE)92mm METAL STUDS @ 400 O.C.		= EXISTING GYPSUM CEILING SYSTEM 16mm GYPSUM BOARD CEILING SYSTEM
	NEW TEMP HOARDING WALL: <ul style="list-style-type: none">6mil POLYETHYLENE SHEETING		= NEW CEILING INSTALLATION HEIGHT ABOVE FINISH FLOOR
	NEW 25mm CONDUIT		
	EXISTING DOOR TO REMAIN		
	EXISTING DOOR TO BE REMOVED		
	NEW DOOR		

WALL TYPES: (EXISTING FLOOR TO U/S OF STRUCTURE IS APPROX. 4400mm)

1 WALL TYPE 1:

- 16mm GYPSUM BOARD
- 92mm METAL STUD FRAMING @ 400 O.C.
- 16mm GYPSUM BOARD

WALL CONSTRUCTION TO EXTEND 150mm ABOVE FINISHED CEILING. METAL STUDS TO EXTEND TO U/S OF STRUCTURE FOR STABILITY AS REQ'D

2 WALL TYPE 2:

- 150mm CONCRETE MASONRY BLOCK UNIT
- INSTALL USING TOOTHED TECHNIQUE
- APPROPRIATELY FIRE SEAL GAPS BETWEEN CONCRETE MASONRY BLOCK AND UNDERSIDE OF BEAM, OR METAL DECKING TO MAINTAIN 1 HOUR FIRE RESISTANCE RATING

INSTALL CONCRETE BLOCK LENTIL OVER NEW DOORS C/W 2-15M REBAR, OR STRUCTURAL STEEL ANGEL AS SPECIFIED

WALL CONSTRUCTION TO EXTEND TO U/S OF BEAM, OR METAL DECKING

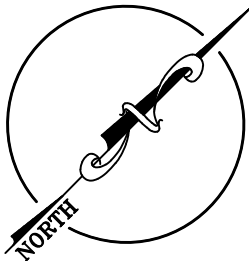
LIST OF SUBSCRIPTS:

W	INDICATES WALL MOUNTED
P	INDICATES PEDESTAL MOUNTED
N	INDICATES NEW DEVICE
C	INDICATES CEILING MOUNTED
E	INDICATES EXISTING TO REMAIN
ER	INDICATES EXISTING TO BE REMOVED
RL	INDICATES EXISTING TO BE RELOCATED
NL	INDICATES EXISTING IN NEW LOCATION

No.	REVISION	DATE
RO	ISSUED FOR TENDER	APRIL 3, 2025

GENERAL NOTES

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3. THE CONTRACTOR IS TO VERIFY ALL DIMENSIONS AND SITE CONDITIONS. PRIOR TO SUBMISSION OF TENDERS.
4. ALL DISCREPANCIES FOUND IN THESE DRAWINGS TO BE BROUGHT TO THE ATTENTION OF FACILITIES MANAGEMENT PRIOR TO SUBMISSION OF TENDERS.



FACILITIES MANAGEMENT

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- Dedication plaque, Arts & Administration Building, St. John's Campus

PROJECT NAME:

ENGINEERING BUILDING RENOVATIONS TO EN-4033
Project #: EN-110-23

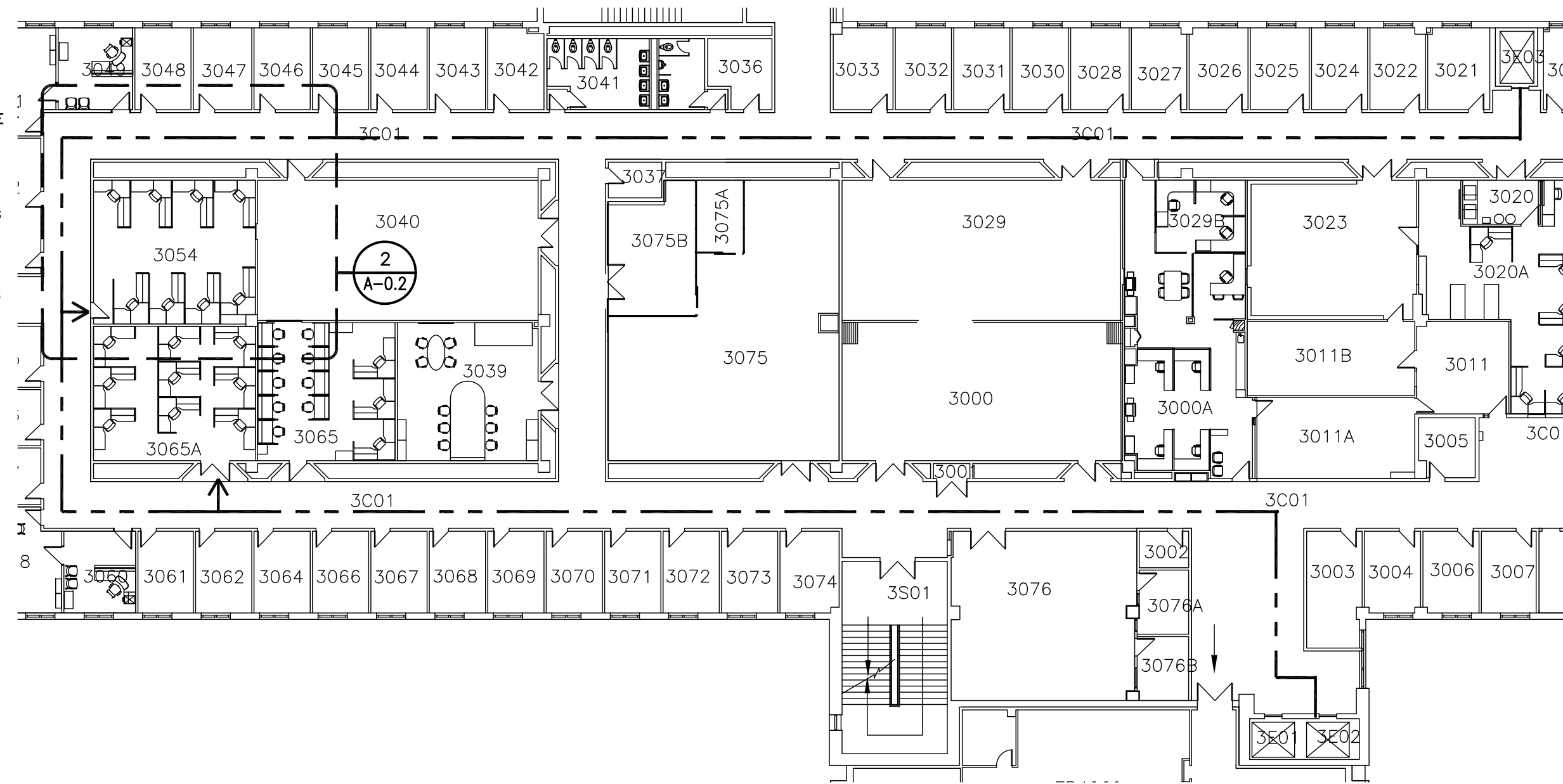
DRAWING TITLE:

GENERAL NOTES & SYMBOL LEGEND

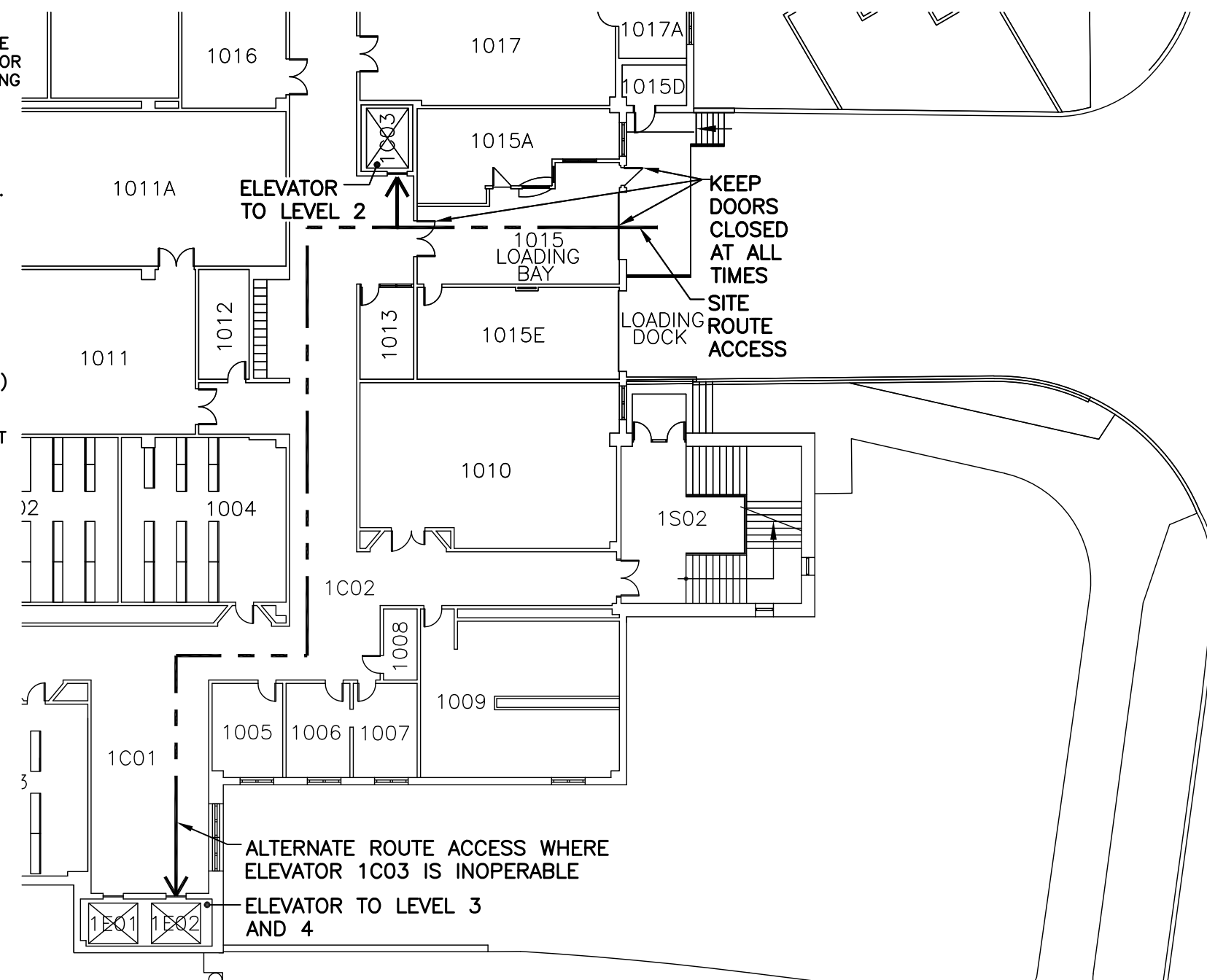
REVIEWED: M.F.	DRAWN: E.B.
SCALE: AS SHOWN	DATE: APRIL, 2025
MUN PROJECT No. EN-110-23	DRAWING No. A-0

GENERAL CONSTRUCTION NOTES –
APPLIES TO ALL SHEETS:

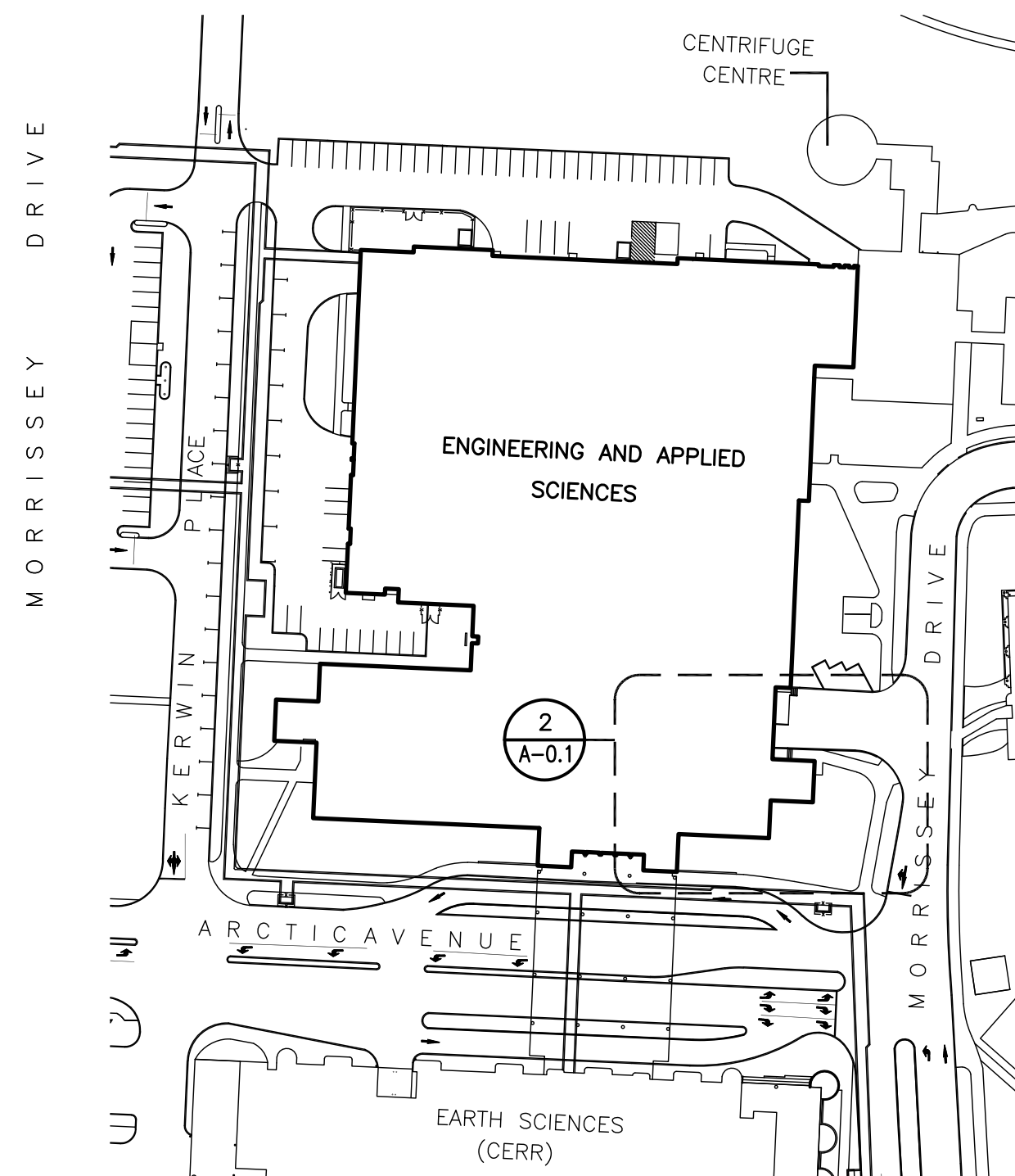
3. EXIT DOORS THROUGH LOADING BAY TO LOADING DOCK SHALL NOT BE PROPPED OR HELD OPEN OR LEFT UNATTENDED WHILE OPENED.
 2. CONTRACTOR SHALL OBTAIN PARKING PERMITS FROM CAMPUS ENFORCEMENT PATROL (CEP) FOR THE DURATION OF THE PROJECT. PARKING IS NOT PERMITTED IN LOADING ZONES OR MATERIAL DROP OFF AREA.
 3. CONTRACTORS SHALL BE RESPONSIBLE FOR PAYING ALL PARKING TICKETS ISSUED BY CAMPUS ENFORCEMENT PATROL. CONTESTED OR DISPUTED TICKETS SHALL BE BETWEEN THE CONTRACTOR AND CAMPUS ENFORCEMENT PATROL.
 4. ALL SCOPE OF WORK LOCATED OUTSIDE CONSTRUCTION AREAS AND ABOVE CEILING SYSTEMS ON LEVEL 3 SHALL BE DONE AFTER REGULAR BUSINESS HOURS OF 8:30AM TO 5:00PM EACH DAY TO ENSURE THE SAFETY OF BUILDING OCCUPANTS. THE EXACT DATE AND TIME OF WORK TO BE SCHEDULED WITH PROJECT COORDINATOR TO PROVIDE BUILDING OCCUPANTS NOTICE OF WORK TO BE DONE IN CORRIDORS AND ADJACENT SPACES AND TO ENSURE WORK IS NOT CARRIED OUT DURING EVENING CLASSES.
 5. THE GENERAL CONTRACTOR IS TO SUPPLY A DUMP TRAILER FOR MATERIAL REMOVAL. DUMPSTER BINS ARE NOT PERMITTED IN THE LOADING BAY AREA. THIS IS REQUIRED SO AS NOT TO INTERFERE WITH DAILY DELIVERIES TO THE BUILDING. DUMP TRAILER TO BE RELOCATED, OR REMOVED AS REQUIRED THROUGHOUT THE DAY FOR BUILDING DELIVERIES. CONFIRM SITE LOCATION WITH PROJECT COORDINATOR.
 6. CONTRACTOR SHALL KEEP GRASS, SIDEWALKS, AND PAVED AREAS CLEAN OF DEBRIS AND MATERIALS. DUMP TRAILER TO BE COVERED AT ALL TIMES.
 7. GENERAL CONTRACTOR MUST REFER TO ARCHITECTURAL AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR EXTENT OF WORK AND COORDINATE WITH OTHER TRADES PRIOR TO COMMENCEMENT OF ANY WORK.
 8. REFER TO SECTION 01 10 00 FOR WORK RESTRICTIONS.
 9. PERFORM DEMOLITION WORK SHOWN AND/OR REQUIRED TO COMPLETE WORK. DO NOT ASSUME DEMOLITION DRAWINGS SHOW THE FULL EXTENT OF DEMOLITION WORK REQUIRED.
 10. REFER TO SHEET A-0 AND SECTION 02 41 19 FOR ADDITIONAL REQUIREMENTS AND INSTRUCTIONS FOR DEMOLITION WORK.
 11. PROVIDE CUTTING, FITTING, HOLE CORING, PATCHING, FRAMING, FURRING, BLOCKING, AND MISCELLANEOUS RELATED COMPONENTS REQUIRED TO EXECUTE THE WORK OF THIS CONTRACT; INCLUDING WORK REQUIRED BY MECHANICAL, ELECTRICAL AND OTHER TRADES. REINSTATE AND/OR MAKE GOOD ALL EXISTING SURFACES AFFECTED BY THE WORK. PREPARE SURFACES TO RECEIVE NEW FINISHES, OR FINISH TO MATCH ADJACENT CONDITIONS. COORDINATE EXTENT WITH SUB-TRADES.
 12. WHEREVER EXCESSIVE DEMOLITION OCCURS, OR, IF DAMAGE OCCURS TO ADJACENT SURFACES NOT INTENDED FOR DEMOLITION, OR REMOVAL, CONTRACTOR IS RESPONSIBLE TO REINSTATE ALL AFFECTED SURFACES AND PREPARE THEM TO RECEIVE NEW FINISHES IF SPECIFIED, OTHERWISE REFINISH TO MATCH ADJACENT CONDITIONS.
 13. REVIEW DEMOLITION PLAN IN CONJUNCTION WITH ALL OTHER PLANS AND DETAILS. FURTHER DEMOLITION REQUIRED FOR NEW MECHANICAL AND ELECTRICAL BASED ON NEW FLOOR PLAN LAYOUT AND SITE CONDITIONS. CHECK SITE DIMENSIONS AND CONDITIONS AND REPORT UNACCEPTABLE CONDITIONS TO PROJECT COORDINATOR FOR REMEDIAL INSTRUCTIONS PRIOR TO PROCEEDING WITH THE WORK.
 14. PATCH AND REPAIR WALLS AND FLOORS AS A RESULT OF MECHANICAL AND ELECTRICAL DEMOLITION AND NEW WORK.
 15. WHERE REMOVING FLOORING DOWN TO CONCRETE FLOOR SLAB, PREPARE EXISTING CONCRETE FLOOR SLAB FOR NEW FLOORING INSTALLATION INCLUDING BUT NOT LIMITED TO SKIM COATING, LEVELING, FILLING, PATCHING, ETC. TO FACILITATE INSTALLATION OF NEW FLOORING.
 10. NEW PAINT FINISH ON ALL NEW AND EXISTING WALLS, DOORS, FRAMES, HEATER CABINETS, ETC. PREPARE SURFACES TO RECEIVE NEW FINISH; INCLUDING BUT NOT LIMITED TO PATCH AND REPAIR, SCRAPING, SANDING, ETC. PAINT FINISH TO BE MINIMUM OF ONE (1) COAT PRIMER AND TWO (2) FINISH. SEE DWG 1/A-5.0 FOR FINISH SELECTIONS. REFER TO SECTION 09 91 23 FOR ADDITIONAL INFO.
 11. PATCH (REPAIR) ANY DAMAGE TO EXISTING SPRAY-APPLIED FIRE RESISTIVE MATERIAL (SFRM) ON STEEL STRUCTURE AS A RESULT OF WORK CARRIED OUT UNDER THIS CONTRACT. CONTRACTOR TO REQUEST REVIEW WITH PROJECT COORDINATOR OF EXISTING CONDITION OF SFRM ON STRUCTURE PRIOR TO START OF WORK TO CONFIRM EXISTING CONDITIONS.
-



SITE ACCESS LVL 3 – LOCATION PLAN
SCALE: N.T.S.



SITE ACCESS LVL 1 – LOCATION PLAN
SCALE: N.T.S.

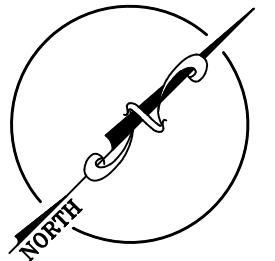


SITE / BUILDING LOCATION PLAN
SCALE: N.T.S.

No.	REVISION	DATE
RO	ISSUED FOR TENDER	APRIL 3, 2025

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FACILITIES MANAGEMENT

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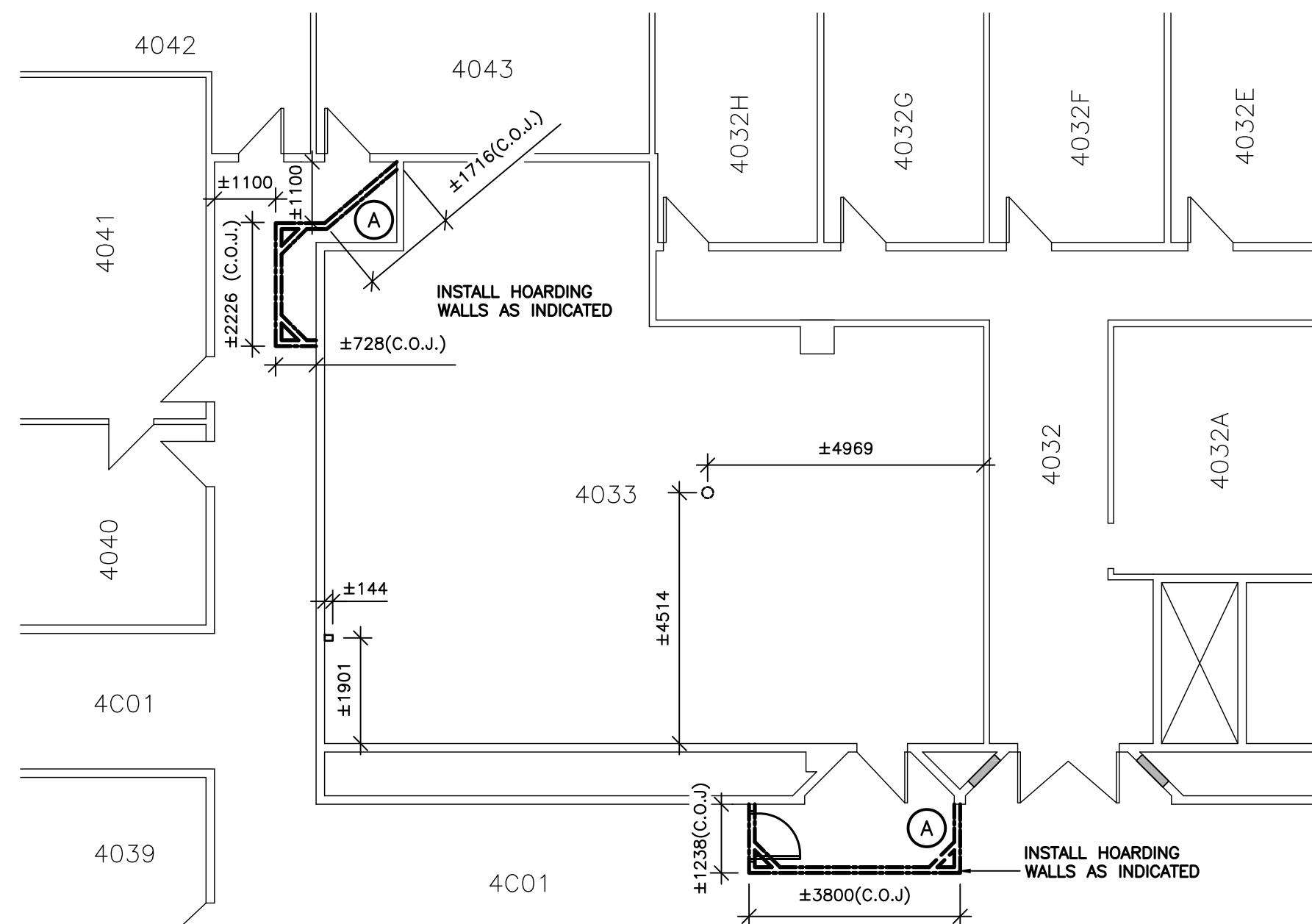
PROJECT NAME:

ENGINEERING BUILDING
RENOVATIONS TO EN-4033
Project #: EN-110-23

DRAWING TITLE:

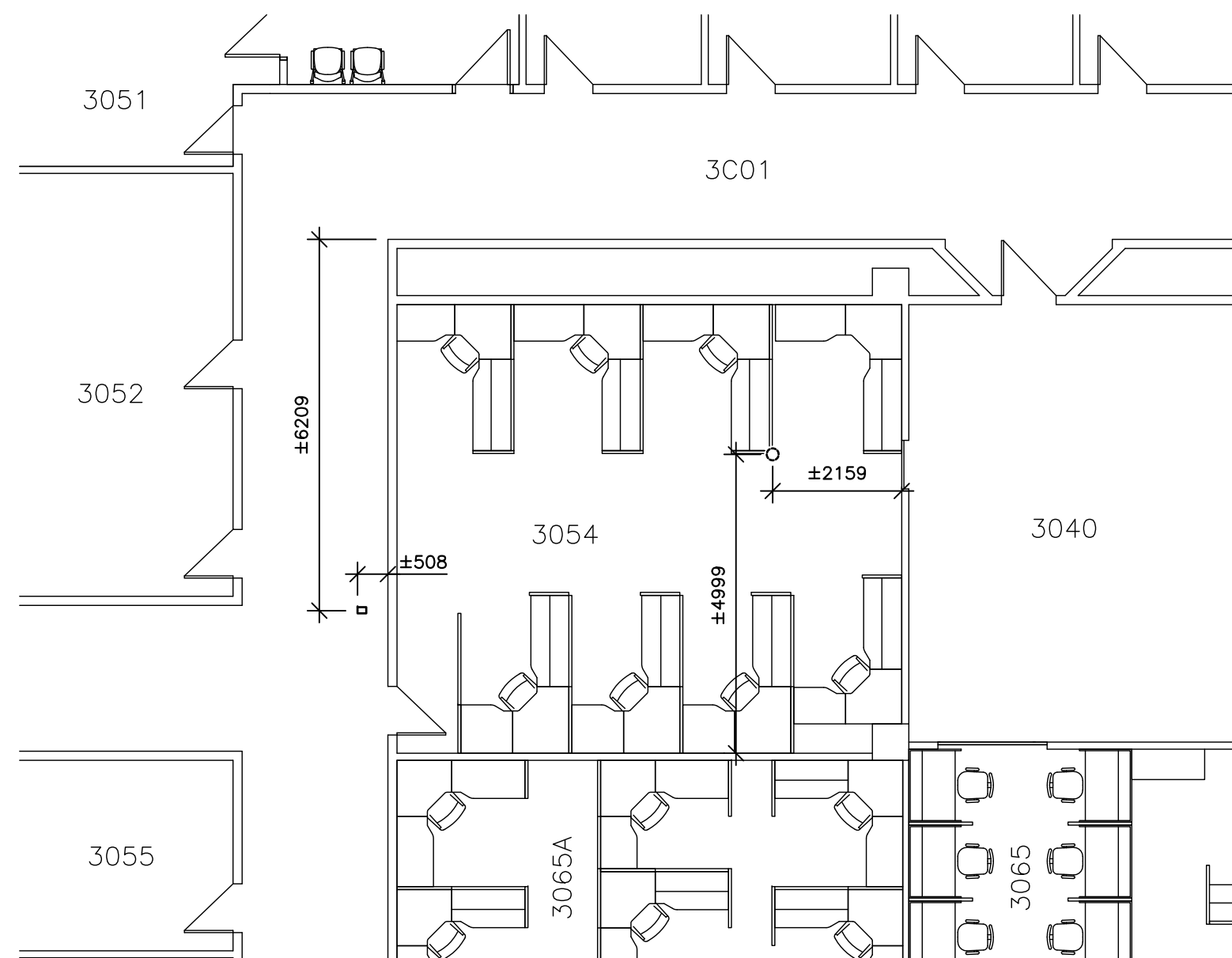
SITE ACCESS PLANS

REVIEWED: M.F.	DRAWN: E.B.
SCALE: AS SHOWN	DATE: APRIL, 2025
MUN PROJECT No. EN-110-23	DRAWING No. A-0.1



HOARDING & CORE LOCATIONS LEVEL 4

SCALE: N.T.S.



CORE LOCATIONS LEVEL 3

SCALE: N.T.S.

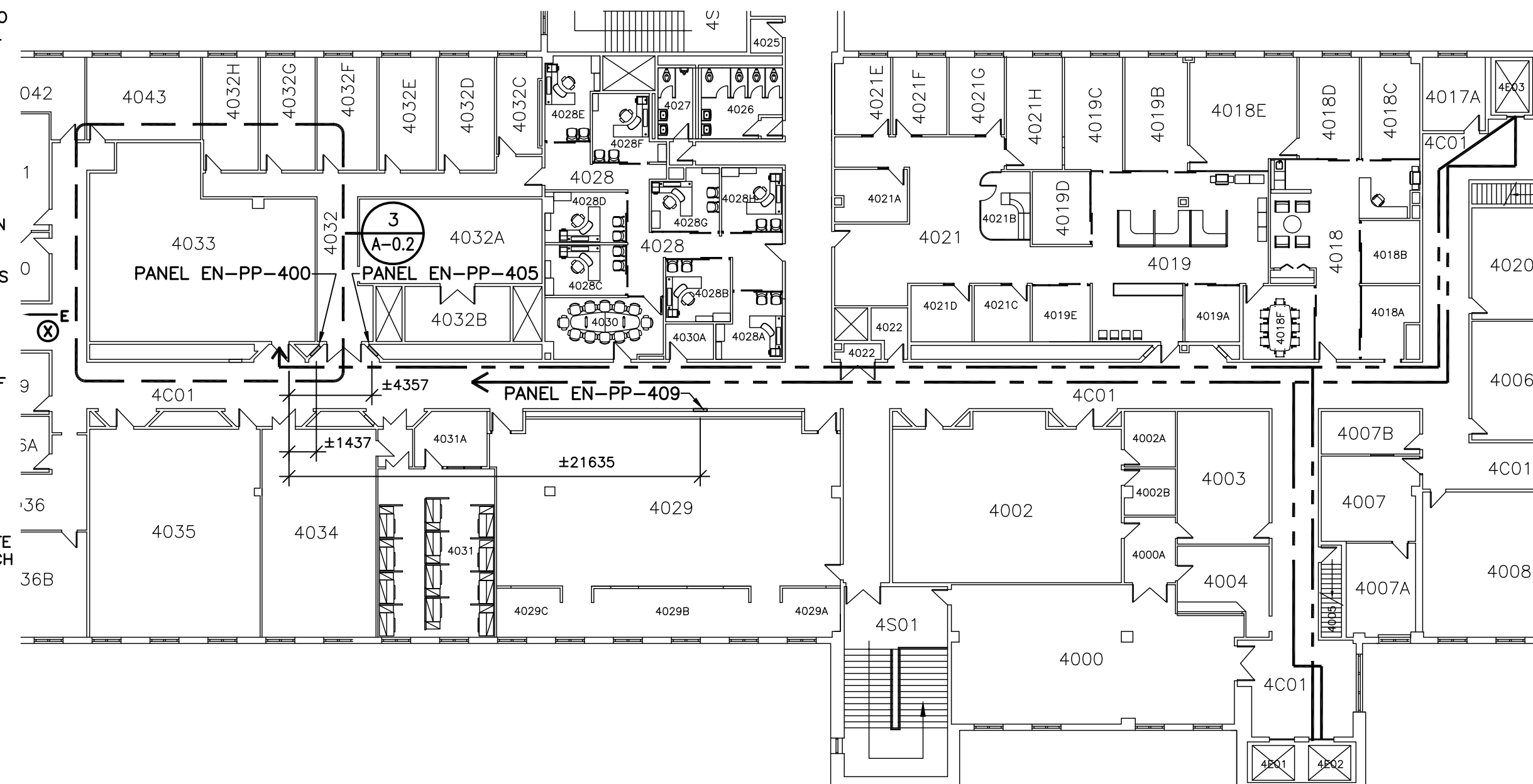
SYMBOL LEGEND: (A)

HOARDING WALL CONSTRUCTED USING FIRE RETARDENT RIP PROOF TARP (WHITE), 92mm STEEL STUDS @ 600 O.C. ALL TARP JOINTS TO BE TAPED TO PREVENT DUST AND DEBRIS MOVEMENT THROUGH WALL CONSTRUCTION. CARE TO BE TAKEN TO ENSURE NO DAMAGE TO EXISTING/SURROUNDING FINISHES.

NOTE A: 2450mm HIGH GYPSUM BOARD WALL. INSTALL TARP FROM U/S OF DROPPED CEILING TO FINISHED FLOOR.

GENERAL CONSTRUCTION NOTES –
APPLIES TO ALL SHEETS:

1. CONTRACTOR SHALL NOT USE ANY INTERIOR SPACES, OTHER THAN CONSTRUCTION AREAS INSIDE HOARDING WALLS, FOR STORAGE OR LAY-DOWN AREAS.
2. INSTALL PROTECTIVE COVERING OVER EXISTING FLOORING AS REQUIRED IN ACCESS ROUTES AND IN HOARDING AREA. MAINTAIN COVERINGS FOR DURATION OF THE PROJECT OR UNTIL AGREED TO WITH THE CONTRACTOR AND OWNER.
3. CONSTRUCT HOARDING WALLS TO UNDERSIDE OF EXISTING DROPPED CEILINGS TO PREVENT DUST MOVEMENT THROUGH WALL CONSTRUCTION. CONTRACTOR TO REPAIR/REPLACE DAMAGED CEILING, WALL AND FLOOR FINISHES IN THE EVENT OF DAMAGE INCURRED THROUGH THIS SCOPE OF WORK.
4. MAINTAIN FIRE RATINGS BETWEEN FLOOR AND WALL ASSEMBLIES. FILL AND PATCH HOLES IN FLOORS AND WALLS AS A RESULT OF DEMOLITION WORK. COORDINATE OPENINGS REQUIRED IN EXISTING FIRE RATED CONCRETE BLOCK WALLS AND FLOORS WITH MECHANICAL AND ELECTRICAL SUB-TRADES. APPROPRIATELY FIRE SEAL PENETRATIONS TO MAINTAIN 1 HOUR FIRE RESISTANCE RATING.
5. ALL WORK REQUIRED TO BE PERFORMED OUTSIDE HOARDING/ CONSTRUCTION SITE SHALL BE DONE AFTER 5PM TO 8AM. PROVIDE 24 HOURS NOTICE PRIOR TO EACH WORK SHIFT.



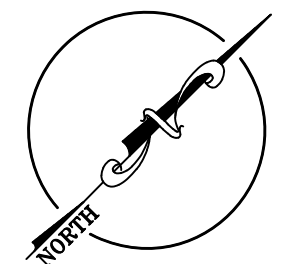
SITE ACCESS LVL 4 – LOCATION PLAN

SCALE: N.T.S.

No.	REVISION	DATE
RO	ISSUED FOR TENDER	APRIL 3, 2025

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PROJECT NAME:

ENGINEERING BUILDING
RENOVATIONS TO EN-4033
Project #: EN-110-23

DRAWING TITLE:

SITE ACCESS & PANEL LOCATION PLANS

REVIEWED:

M.F.

DRAWN:

E.B.

SCALE:

AS SHOWN

DATE:

APRIL, 2025

MUN PROJECT No.

EN-110-23

DRAWING No.

A-0.2

ARCHITECTURAL DEMOLITION NOTES: [7]

1. RELOCATE EXISTING FURNITURE AND WALL MOUNTED ITEMS AS INDICATED:

1.1. x2 WOOD LOCKERS (66x19½") TO EN-2C02A

1.2. x2 WOOD LOCKERS (83x19½") TO EN-2C02A

1.3. x1 FAN TO EN-4029

1.4. x10 CHAIR (18x16") TO EN-2050

1.5. x2 WOOD LOCKERS (83x19½") TO EN-4032

1.6. x2 WOOD LOCKERS (33½"x19½") TO EN-4032

1.7. x1 DRAFTING TABLE (32"x84") TO EN-4029
2. REMOVE AND DISPOSE OF EXISTING FURNITURE AS INDICATED:

2.1. x1 TABLE (24x36")

2.2. x8 DESK (40x29½")

2.3. x1 INSTRUCTOR'S PODIUM (72x37")

2.4. x1 WALL CABINET (47x39")

2.5. x1 WALL CABINET (70x39")

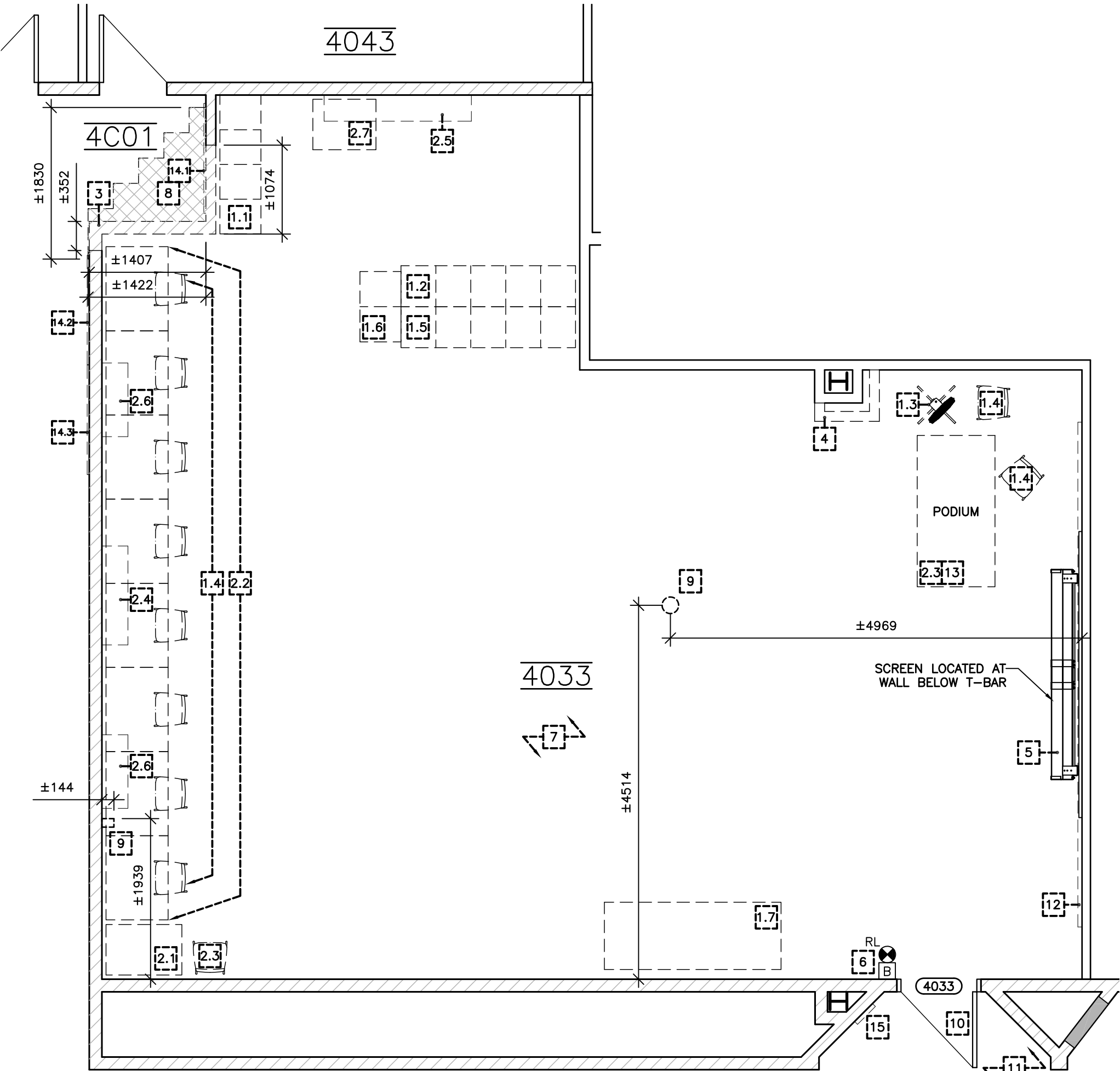
2.6. x2 WALL CABINET (35x39")

2.7. x1 DESK (30x24")
3. REMOVE CONCRETE BLOCK WALL AS INDICATED FOR NEW LAYOUT USING TOOTHED TECHNIQUE. INFILL AND PATCH CMU BLOCK AT CORNERS AND WALL JOINS. CARE TO BE TAKEN WHERE REMOVING PORTIONS OF WALL INTERSECTING WITH REMAINING CONCRETE BLOCK WALLS. REMOVE CONCRETE BLOCK FULL HEIGHT. WALL CONSTRUCTED OF 150mm CMU. ASSUME PAINT IS LEAD CONTAINING.
4. REMOVE EXISITNG GYPSUM BOARD PARTITION WALLS AS INDICATED FOR NEW LAYOUT. ASSUME PAINT IS LEAD CONTAINING.
5. REMOVE AND DISPOSE OF EXISTING PROJECTOR SCREEN AND WOOD BLOCKING. FILL HOLES AT GYPSUM WALL.
6. REMOVE AND RELOCATE FIRE EXTINGUISHER AS NOTED ON DWG 2/A-3.0.
7. REMOVE EXISTING VCT, VINYL BASE, AND ASSOCIATED COMPONENTS TO CONCRETE SLAB. SLAB TO BE PREPPED AS REQUIRED TO ACCEPT NEW FLOORING, INCLUDING BUT NOT LIMITED TO SKIM COATING, LEVELING, FILLING, PATCHING, ETC. TYPICAL THROUGHOUT. ASSUME FLOOR TILE IS ASBESTOS CONTAINING.
8. REMOVE EXISTING VCT, VINYL BASE, AND ASSOCIATED COMPONENTS TO CONCRETE SLAB TO FACILITATE WALL REMOVAL. SLAB TO BE PREPPED AS REQUIRED TO ACCEPT NEW FLOORING, INCLUDING BUT NOT LIMITED TO SKIM COATING, LEVELING, FILLING, PATCHING, ETC. ASSUME FLOOR TILE IS ASBESTOS CONTAINING.
9. CORE HOLES IN FLOOR SLAB TO FACILITATE THE INSTALLATION OF NEW FLOOR BOX AND NEW ELECTRICAL CONDUIT FOR HEIGHT ADJUSTABLE WORKSTATIONS. SEAL WITH FIRE CAULK. COORDINATE HOLE SIZE W/ ELECTRICAL SUBTRADE FOR EACH LOCATION. LEVEL 3 ACCESS LOCATED IN EN3040 AND 3054 HAVING ACOUSTIC CEILING SYSTEMS. REFER TO DWGS 2, AND 3/A-0.2 FOR CORE LOCATIONS.
10. EXISTING DOOR TO REMAIN. PREP DOOR TO RECEIVE NEW DOOR HARDWARE. FILL HOLES WHERE HARDWARE IS NOT REINSTATED. REMOVE AND SALVAGE LOCKSETS. TURN OVER TO PROJECT COORDINATOR.
11. REMOVE FLOOR MOUNTED DOOR STOP. FILL FASTENER HOLES.
12. REMOVE WHITEBOARD AND RETAIN FOR RELOCATION AS PER DWG 2/A-3.0.
13. CONTRACTOR TO COORDINATE WITH ELECTRICAL SUBTRADE TO ISOLATE AND REMOVE ELECTRICAL FEEDS PRIOR TO DISPOSAL OF INSTRUCTOR'S PODIUM. NOTIFY PROJECT COORDINATOR IN ADVANCE TO ALLOW MUN FORCES/CITL TO REMOVE ALL EXISTING EQUIPMENT AND CABLING.
14. REMOVE AND RETAIN THE FOLLOWING ITEMS FOR RELOCATION AS PER DWG 2/A-3.0:

14.1. x1 CORK BOARD

14.2. x1 FRAMED MAP

14.3. x1 CORK BOARD
15. REMOVE SIGNAGE AND TURN OVER TO PROJECT COORDINATOR.

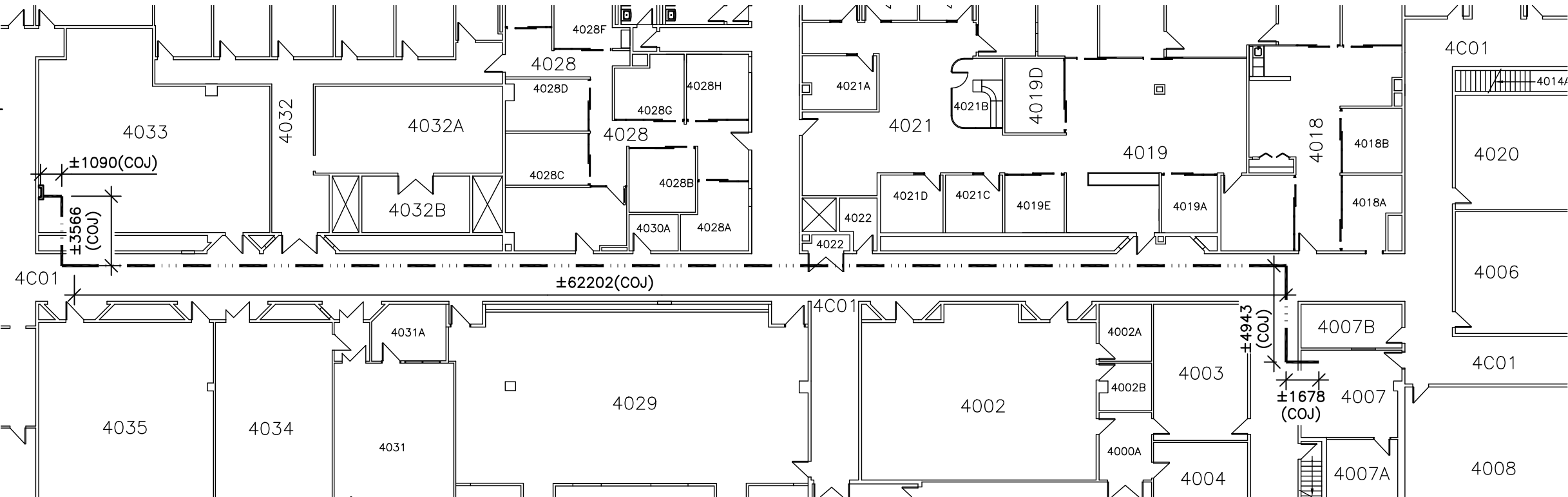


DEMOLITION FLOOR PLAN

SCALE: 1:50

ARCH CONDUIT PLAN CONSTRUCTION NOTES:

1. CONTRACTOR IS RESPONSIBLE TO CORE THROUGH CMU BLOCK WALL AT CORRIDOR FOR CONDUIT TRANSFER AS REQUIRED. COORDINATE CONDUIT PENETRATIONS WITH ELECTRICAL SUBTRADE. CMU BLOCK REMOVAL MUST BE COMPLETED WITH MANUAL TOOLS. WORK CREATING EXCESSIVE NOISE SHALL BE SCHEDULED FOR AFTER NORMAL BUSINESS HOURS 8:30AM – 5:00PM, MONDAY – FRIDAY, TO LIMIT NOISE AND DISRUPTIONS TO SURROUNDING OCCUPANTS OF THE BUILDING. CONTRACTOR IS RESPONSIBLE TO NOTIFY PROJECT COORDINATOR 24HRS IN ADVANCE OF AFTER HOURS WORK.
2. ALL WORK REQUIRED TO BE PERFORMED OUTSIDE HOARDING/ CONSTRUCTION SITE (EN-4033) SHALL BE DONE AFTER 5PM TO 8AM. PROVIDE 24 HOURS NOTICE PRIOR TO EACH WORK SHIFT. ALL CEILING TILES MUST BE IN PLACE IN LAT CEILING SYSTEM FOR NORMAL BUSINESS HOURS. CONTRACTOR SHALL NOT USE ANY INTERIOR SPACES, OTHER THAN CONSTRUCTION AREAS INSIDE HOARDING WALLS (EN-4033), FOR STORAGE OR LAY-DOWN AREAS.
3. LEVEL 4 ACCESS LOCATED IN EN4033, 4C01 AND 4007 HAVING ACOUSTIC CEILING SYSTEMS. EXISTING CONDITION OF CEILING TILE WILL BE DOCUMENTED PRIOR TO START OF WORK. CONTRACTOR IS RESPONSIBLE FOR REPLACEMENT OF DETERIORATED, OR BROKEN CEILING TILE AS A RESULT OF CONSTRUCTION.



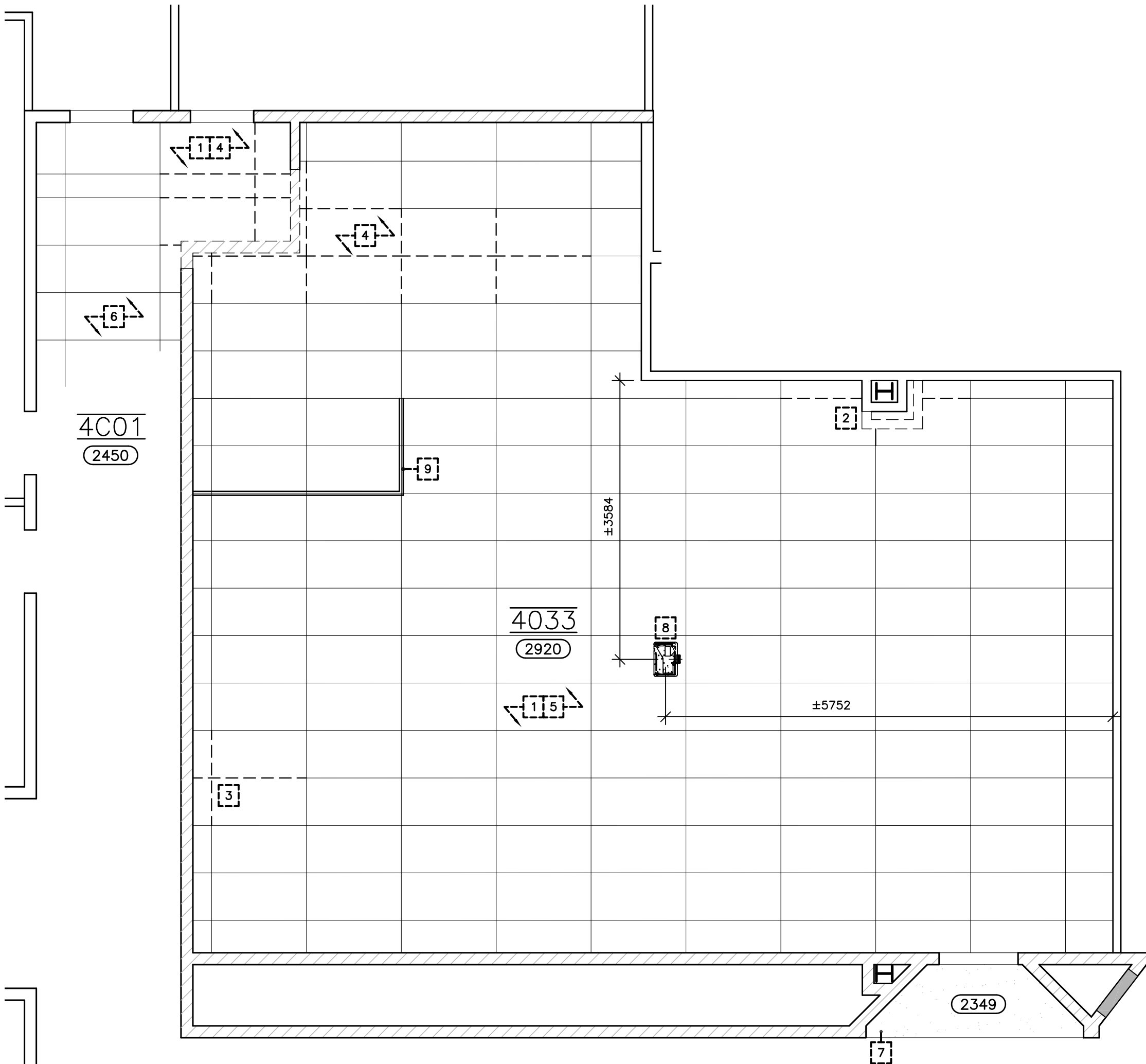
CEILING PLAN DEMOLITION NOTES: [7]

1. REMOVE AND DISPOSE OF ALL EXISTING CEILING TILE AS INDICATED.
2. REMOVE AND STORE PORTION OF T-BAR CEILING GRID AS INDICATED TO FACILITATE DEMOLITION OF CONDUIT WALL CHASE. SAVE T-BAR CEILING GRID FOR REINSTATEMENT.
3. REMOVE AND STORE PORTION OF T-BAR CEILING GRID AS INDICATED TO FACILITATE NEW CONDUIT WALL CHASE. SAVE T-BAR CEILING GRID FOR REINSTATEMENT.
4. REMOVE AND STORE PORTION OF T-BAR CEILING GRID AS INDICATED TO FACILITATE DEMOLITION OF CMU BLOCK PARTITION AND INSTALLATION OF NEW PARTITION WALL. SAVE T-BAR CEILING GRID FOR REINSTATEMENT.
5. EXISTING T-BAR CEILING GRID TO REMAIN UNLESS OTHERWISE INDICATED.
6. EXISTING TILE AND T-BAR CEILING GRID TO REMAIN UNLESS OTHERWISE INDICATED.
7. REMOVE PORTION OF GYPSUM BOARD CEILING AS REQUIRED TO ACCESS/RUN WIREMOLD FOR NEW PUSH BUTTON ACTUATOR/PROX AS PER DWGS 1/A-3.0 AND 1/E-5.0. ASSUME DRYWALL JOINT COMPUND IS ASBESTOS CONTAINING.
8. REMOVE EXISTING PROJECTOR MOUNT FROM ABOVE EXISTING LAT CEILING SYSTEM. CONTRACTOR TO NOTIFY PROJECT COORDINATOR 48 HRS IN ADVANCE OF HOT WORK REQUIRED FOR REMOVAL OF STEEL ANGLES AND METAL CONDUIT. CONTRACTOR MUST BE IN RECEIPT OF PERMIT FROM ENVIRONMENTAL HEALTH AND SAFETY FOR HOT WORK PRIOR TO START OF WORK. AV CABLING, DATA CABLING AND EQUIPMENT TO BE DISCONNECTED AND REMOVED BY MUN FORCES. DO NOT REMOVE PROJECTOR MOUNT UNTIL ALL CABLING AND EQUIPMENT HAS BEEN REMOVED. SEE 2/A-2.0 FOR PHOTOS OF EXISTING PROJECTOR MOUNT.
9. REMOVE AND DISPOSE OF ALUMINUM CURTAIN TRACK AS INDICATED.



EXISTING PROJECTOR MOUNT
SCALE: NTS

2
A-2.0



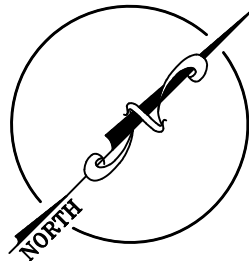
DEMOLITION REFLECTED CEILING PLAN
SCALE: 1:50

1
A-2.0

No.	REVISION	DATE
R0	ISSUED FOR TENDER	APRIL 3, 2025

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MEMORIAL UNIVERSITY
FACILITIES MANAGEMENT

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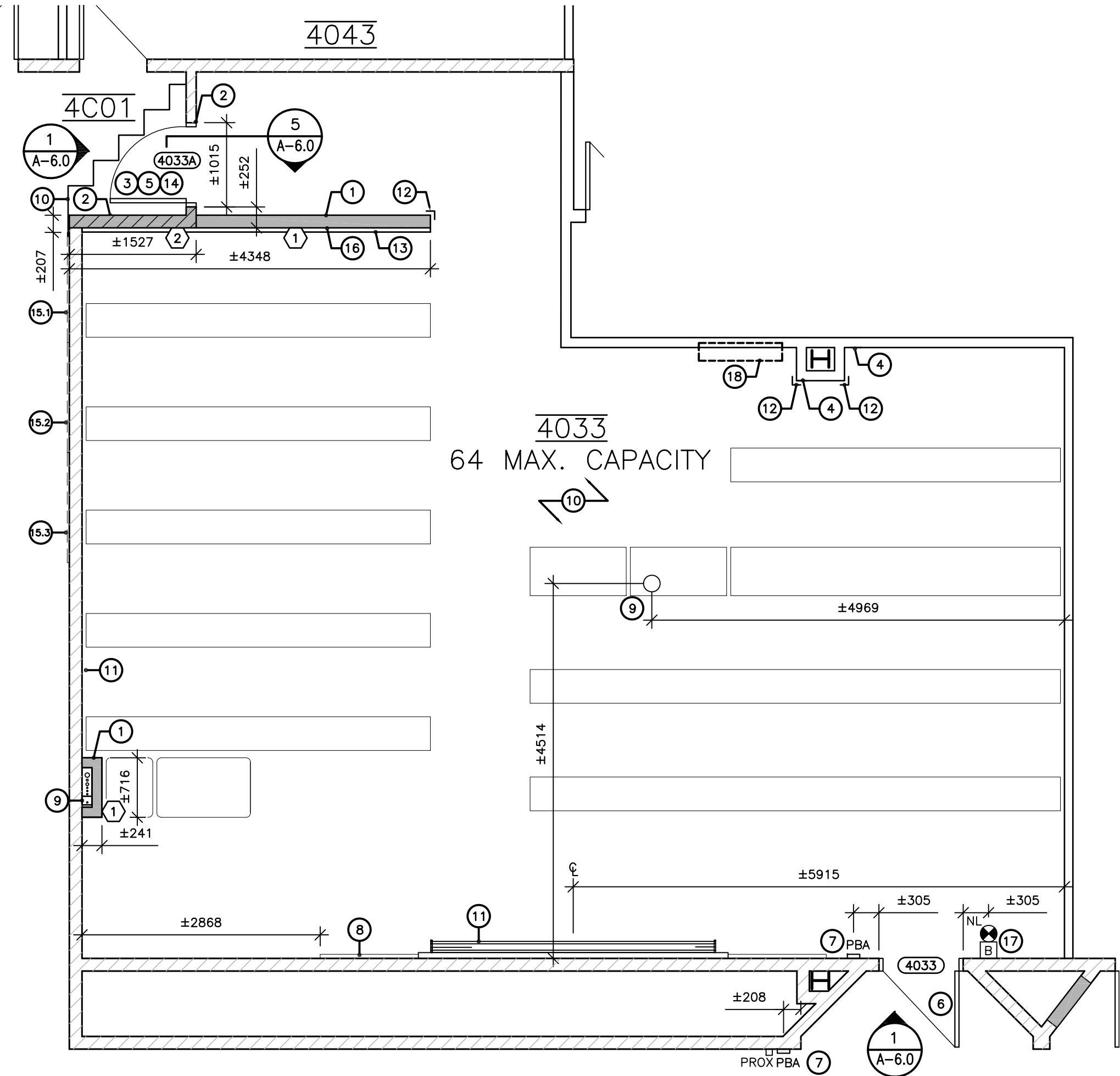
PROJECT NAME:
ENGINEERING BUILDING RENOVATIONS TO EN-4033
Project #: EN-110-23

DRAWING TITLE:
DEMOLITION REFLECTED CEILING PLAN

REVIEWED: M.F.	DRAWN: E.B.
SCALE: AS SHOWN	DATE: APRIL, 2025
MUN PROJECT No. EN-110-23	DRAWING No. A-2.0

FLOOR PLAN CONSTRUCTION NOTES: (F)

1. CONSTRUCT NEW PARTITIONS AS INDICATED AND PREPARE TO RECEIVE NEW FINISHES AS SPECIFIED. FURRING TO BE AS TIGHT AS POSSIBLE AROUND CONDUIT.
2. CONSTRUCT NEW CMU BLOCK WALL INFILL USING TOOTHED TECHNIQUE AS PER NOTED WALL TYPE. NEW INFILL PORTION OF WALL TO EXTEND TO UNDERSIDE OF BEAM, AND/OR METAL DECKING. CONSTRUCT NEW CMU BLOCK FLUSH END WHERE PORTION OF WALL REMOVED USING TOOTHED TECHNIQUE AT OPENING. APPROPRIATELY FIRE SEAL GAPS BETWEEN CONCRETE MASONRY BLOCK AND UNDERSIDE OF BEAM, AND/OR METAL DECKING TO MAINTAIN 1 HOUR FIRE RESISTANCE RATING.
3. INSTALL NEW CONCRETE BLOCK BOND BEAM OVER NEW DOOR C/W 2-15M REBAR. BOND BEAM TO EXTEND 150mm EACH SIDE OF OPENING.SEE DWG 5/A-6.0 FOR ADDITIONAL INFO.
4. FILL AREAS WHERE EXISTING WALLS WERE REMOVED WITH NEW 16mm TYPE 'X' GYPSUM BOARD SHEATHING. TAPE AND MUD JOINS WHERE NEW GYPSUM BOARD SHEATHING ABUTS EXISTING.
5. INSTALL NEW DOOR AND FRAME. INSTALL HARDWARE PROVIDED BY OWNER. REFER TO DOOR ELEVATIONS AND SCHEDULE ON DWG A-6.0. COORDINATE WITH PROJECT COORDINATOR FOR HARDWARE SUPPLIED BY MUN.
6. EXISTING DOOR TO REMAIN. PREP SOLID CORE WOOD DOOR TO RECEIVE NEW HARDWARE. INSTALL HARDWARE PROVIDED BY OWNER. REFER TO DOOR ELEVATIONS AND SCHEDULE ON DWG A-6.0.
7. SUPPLY AND INSTALL NEW CAMDEN PUSH BUTTON ACTUATORS FOR AUTOMATIC DOOR OPERATOR CONTROL IN CONJUNCTION WITH NEW HORTON AUTOMATIC DOOR OPERATOR. INSTALL NEW CONDUIT/WIREMOLD TO RECEIVE OWNER SUPPLIED PROX. SEE DWG 2/A-6.0 FOR DOOR ELEVATIONS, DOOR SCHEDULE AND HARDWARE GROUPS. SEE DWG 1/E-5.0 FOR EQUIPMENT AND CONDUIT ELEVATIONS.
8. REINSTATE EXISTING WHITEBOARD AS INDICATED. CONTRACTOR IS RESPONSIBLE TO PROVIDE ALL REQUIRED FASTENERS AND BLOCKING TO COMPLETE WORK. INSTALL 915mm A.F.F.
9. APPROXIMATE LOCATION OF NEW FLOOR BOX AND ELECTRICAL/DATA CONDUIT. VERIFY LOCATION OF CORE WITH ELECTRICAL AND GENERAL CONTRACTOR. SEAL WITH FIRE CAULK. REFER TO DWGS 2, AND 3/A-0.2 FOR CORE LOCATIONS.
10. NEW FLOOR FINISH; SEE FINISH PLAN AND NOTES ON DWG A-5.1.
11. INSTALL OWNER SUPPLIED PROJECTOR SCREEN AND MOUNT AS INDICATED IN DWG 6/A-6.0. PROVIDE REQUIRED FASTENERS TO FACILITATE INSTALLATION. PROVIDE 38x203mm BLOCKING TO MOUNT PROJECTOR SCREEN. PAINT MOUNT WITH TWO (2) COATS FINISH TO MATCH NEW WALL PAINT COLOUR. UNDERSIDE OF PROJECTOR SCREEN HOUSING TO BE LOCATED 2750mm ABOVE FINISHED FLOOR.
12. ENDWALL/CORNER GUARDS: STAINLESS STEEL MOUNTED AS PER MANUFACTURER'S INSTRUCTIONS (WHERE INDICATED ON DRAWINGS):
 - 12.1. SIZE: 50mm X 50mm X 1220mm
 - 12.2. TYPE: STAINLESS STEEL 18 GAUGE PRE-DRILLED WITH OVAL HEAD SHEET METAL SCREWS AND WASHERS
 - 12.3. ACCEPTABLE PRODUCT: WALLGUARD, OR APPROVED ALTERNATE.
13. NEW CHAIR RAIL AS PER DWG 2 & 3/A-5.0.
14. INSTALL NEW WALL MOUNTED DOOR STOP AT NEW DOOR LOCATION. NEW DOOR STOP TO BE "CONVEX CAST WALL STOP S120" BY STANDARD METAL HARDWARE, OR APPROVED ALTERNATE.
15. REINSTATE SALVAGED WALL MOUNTED ITEMS, CONTRACTOR TO PROVIDE ALL REQUIRED FASTENERS AND BLOCKING. INSTALL ITEMS 915mm A.F.F. EXACT LOCATION TO BE DETERMINED ON SITE:
 - 15.1. x1 CORK BOARD (1220x915)
 - 15.2. x1 FRAMED MAP (1575x1295)
 - 15.3. x1 CORK BOARD (1830x1220)
16. PROVIDE CONTINUOUS SOLID WOOD BLOCKING AT EXTERIOR OF CMU BLOCK AND GYPSUM BOARD WALLS/PARTITIONS TO FACILITATE SCREEN INSTALLATIONS. REFER TO DETAIL 2/A-5.0 FOR ADDITIONAL INFO.
17. REINSTATE FIRE EXTINGUISHER AS INDICATED. INSTALL 1070mm A.F.F.
18. FILL AREAS WHERE EXISTING DATA AND RECEPTACLE WERE REMOVED WITH NEW 16mm TYPE 'X' GYPSUM BOARD SHEATHING. TAPE AND MUD JOINS WHERE NEW GYPSUM BOARD SHEATHING ABUTS EXISTING.



NEW FLOOR PLAN

SCALE: 1:50

ARCH CONDUIT PLAN CONSTRUCTION NOTES:

1. CONTRACTOR IS RESPONSIBLE TO CORE THROUGH CMU BLOCK WALL AT CORRIDOR FOR CONDUIT TRANSFER AS REQUIRED. CMU BLOCK REMOVAL MUST BE COMPLETED WITH MANUAL TOOLS. WORK CREATING EXCESSIVE NOISE SHALL BE SCHEDULED FOR AFTER NORMAL BUSINESS HOURS 8:30AM - 5:00PM, MONDAY - FRIDAY, TO LIMIT NOISE AND DISRUPTIONS TO SURROUNDING OCCUPANTS OF THE BUILDING. CONTRACTOR IS RESPONSIBLE TO NOTIFY PROJECT COORDINATOR 24HRS IN ADVANCE OF AFTER HOURS WORK.
2. CONTRACTOR TO INSTALL FIRE CAULK AT ALL CONDUIT PENETRATIONS THROUGH CMU BLOCK CORRIDOR WALLS TO MAINTAIN MINIMUM 1HR FIRE RATING.
3. LEVEL 4 ACCESS LOCATED IN EN4033, 4C01 AND 4007 HAVING ACOUSTIC CEILING SYSTEMS. EXISTING CONDITION OF CEILING TILE WILL BE DOCUMENTED PRIOR TO START OF WORK. CONTRACTOR IS RESPONSIBLE FOR REPLACEMENT OF DETERIORATED, OR BROKEN CEILING TILE AS A RESULT OF CONSTRUCTION.



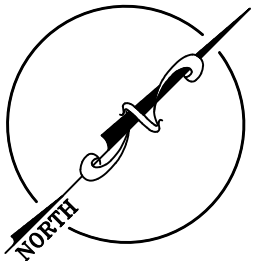
ARCHITECTURAL CONDUIT PLAN

SCALE: N.T.S.

No.	REVISION	DATE
R0	ISSUED FOR TENDER	APRIL 3, 2025

GENERAL NOTES

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FACILITIES MANAGEMENT

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- Dedication plaque, Arts & Administration Building, St. John's Campus

PROJECT NAME:

ENGINEERING BUILDING RENOVATIONS TO EN-4033
Project #: EN-110-23

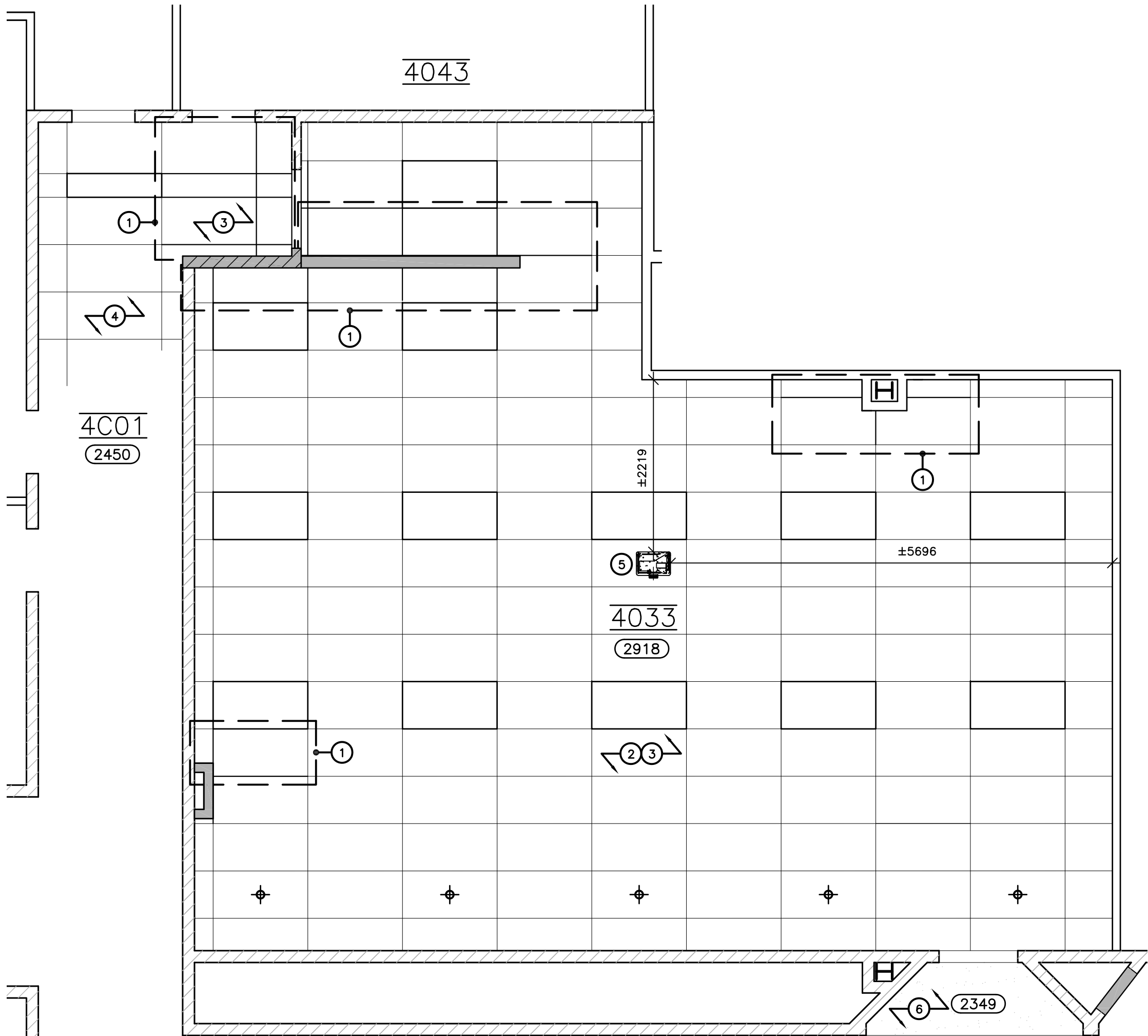
DRAWING TITLE:

NEW FLOOR PLAN & ARCHITECTURAL CONDUIT PLAN

REVIEWED: M.F.	DRAWN: E.B.
SCALE: AS SHOWN	DATE: APRIL, 2025
MUN PROJECT No. EN-110-23	DRAWING No. A-3.0

NEW CEILING PLAN NOTES: (#)

1. REINSTATE EXISTING T-BAR CEILING GRID WHERE REMOVED. MODIFY EXISTING SALVAGED GRID PIECES AS REQUIRED TO TIE INTO EXISTING GRID. PROVIDE NEW CEILING GRID AS REQUIRED TO TIE INTO EXISTING GRID WHERE SALVAGED PORTIONS ARE NOT ADEQUATE. NEW T-BAR CEILING GRID TO BE 'DOWN BRAND DX/DXL' BY 'CGC', OR APPROVED ALTERNATE.
2. PAINT ENTIRE T-BAR CEILING GRID SYSTEM W/ MINIMUM ONE (1) COAT APPROPRIATE METAL PRIMER AND MINIMUM ONE (1) COAT FINISH PAINT. COLOUR TO BE OC-53 HORIZON BY BENJAMIN MOORE. MATTE FINISH.
3. SUPPLY AND INSTALL NEW 600x1200x15mm ACOUSTICAL CEILING TILES THROUGHOUT 'RADAR BASIC BY CGC', ITEM NO. 2310, SQUARE EDGE 'SQ'. COLOUR TO BE 'FLAT WHITE 050'.
4. EXISTING T-BAR GRID AND ACOUSTICAL TILE TO REMAIN.
5. INSTALL NEW PROJECTOR MOUNT COMPRISED OF P1000 SERIES UNISTRUT AND 9.5mm THREADED ROD TO UNDERSIDE OF METAL DECK IN LOCATION SHOWN; SEE DWG 3/A-6.0 FOR DETAIL.
6. PATCH, FILL, AND PAINT GYPSUM BOARD CEILING AT CORRIDOR WHERE CUT TO PROVIDE WIREMOLD FOR DOOR OPERATORS. PREPARE SURFACES AS REQUIRED TO RECEIVE NEW PAINT FINISH INCLUDING BUT NOT LIMITED TO PATCH AND REPAIR, SCRAPING, SANDING, ETC. PAINT FINISH ON NEW MATERIALS TO BE MINIMUM OF ONE COAT APPROPRIATE PRIMER AND MINIMUM TWO COATS FINISH. PAINT FINISH ON EXISTING MATERIALS TO BE MINIMUM TWO COATS FINISH. COLORS TO BE SELECTED BY OWNER. SEE DWG A-5.0 FOR ADDITIONAL INFO.



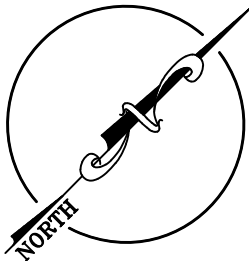
NEW REFLECTED CEILING PLAN
SCALE: 1:50

1
A-4.0

No.	REVISION	DATE
R0	ISSUED FOR TENDER	APRIL 3, 2025

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FACILITIES
MANAGEMENT

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- Dedication plaque, Arts & Administration Building, St. John's Campus

PROJECT NAME:

ENGINEERING BUILDING
RENOVATIONS TO EN-4033
Project #: EN-110-23

DRAWING TITLE:

NEW REFLECTED
CEILING PLAN

REVIEWED: M.F.	DRAWN: E.B.
SCALE: AS SHOWN	DATE: APRIL, 2025
MUN PROJECT No. EN-110-23	DRAWING No. A-4.0

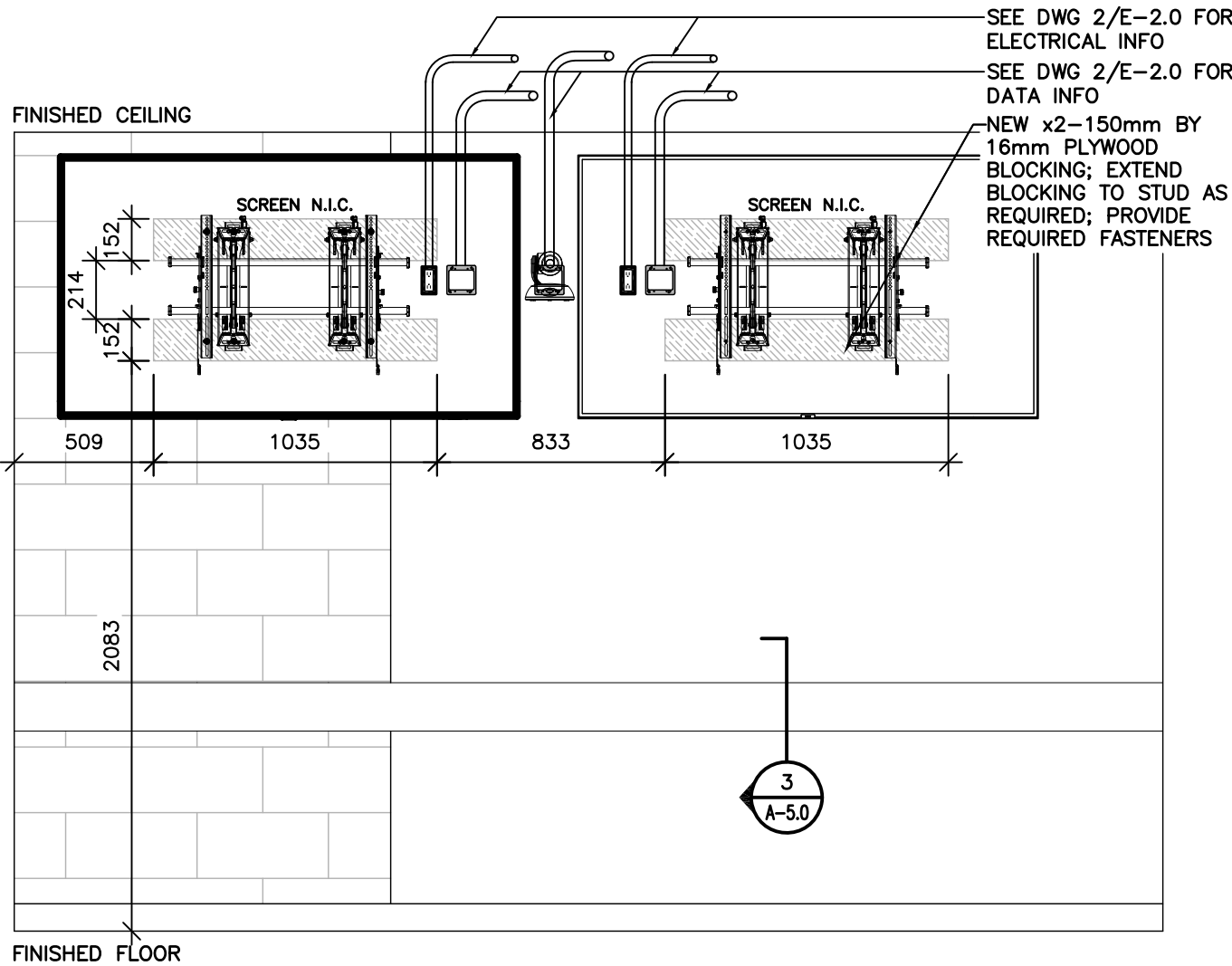
GENERAL FINISH PLAN CONSTRUCTION NOTES:

1. MAINTAIN FIRE RATINGS BETWEEN FLOOR AND WALL ASSEMBLIES. FILL AND PATCH HOLES IN FLOORS AND WALLS AS A RESULT OF DEMOLITION WORK. COORDINATE OPENINGS REQUIRED IN EXISTING FIRE RATED CONCRETE BLOCK WALLS AND FLOORS WITH MECHANICAL AND ELECTRICAL SUB-TRADES. APPROPRIATELY FIRE SEAL PENETRATIONS TO MAINTAIN 1 HOUR FIRE RESISTANCE RATING.
2. PERFORM DEMOLITION WORK SHOWN AND/OR REQUIRED TO COMPLETE THE WORK. DO NOT ASSUME DEMOLITION DRAWINGS SHOW FULL EXTENT OF DEMOLITION WORK REQUIRED.
3. WHEREVER EXCESSIVE DEMOLITION OCCURS, OR IF DAMAGE OCCURS TO ADJACENT SURFACES NOT INTENDED FOR DEMOLITION, OR REMOVAL, REINSTATE ALL AFFECTED SURFACES AND PREPARE THEM TO RECEIVE NEW FINISHES IF SPECIFIED, OTHERWISE REFINISH TO MATCH EXISTING ADJACENT CONDITIONS.
3. NEW PAINT FINISH ON ALL NEW AND EXISTING WALLS, NEW AND EXISTING DOORS AND FRAMES, NEW AND EXISTING BULKHEADS, EXPOSED MECHANICAL, ELECTRICAL, AND PLUMBING FIXTURES. PREPARE SURFACES AS REQUIRED TO RECEIVE NEW PAINT FINISH INCLUDING BUT NOT LIMITED TO PATCH AND REPAIR, SCRAPING, SANDING, ETC. PAINT FINISH ON NEW MATERIALS TO BE MINIMUM OF ONE COAT APPROPRIATE PRIMER AND MINIMUM TWO COATS FINISH. PAINT FINISH ON EXISTING MATERIALS TO BE MINIMUM TWO COATS FINISH. COLORS TO BE SELECTED BY OWNER. SEE SPEC FOR MORE PAINTING INFORMATION.
4. REMOVE ALL RECEPTACLE, SWITCH RELAYS, DATA DROPS, AND OTHER SIMILAR COVER PLATES TO FACILITATE WALL PAINTING. REINSTATE ALL EXISTING COVER PLATES THAT ARE NOT BEING REPLACED ONCE PAINTING HAS BEEN COMPLETED.
5. WALL PAINTING OUTSIDE OF HOARDING WALL TO BE COMPLETED AFTER 5:00 PM, OR BEFORE 8:00AM TO LIMIT DISRUPTIONS TO SURROUNDING BUILDING OCCUPANTS. CONTRACTOR IS RESPONSIBLE TO NOTIFY PROJECT COORDINATOR 24HRS IN ADVANCE OF AFTER HOURS WORK.

PAINT LEGEND:

- PT-1 – MAIN WALL AND ALL EXPOSED SURFACES COLOUR OF MECHANICAL AND ELECTRICAL SERVICES LOCATED ON THIS WALL. CC-30 OXFORD WHITE BY BENJAMIN MOORE. SEMI-GLOSS FINISH.
- PT-2 – ACCENT WALLS AND ALL EXPOSED SURFACES COLOUR OF MECHANICAL AND ELECTRICAL SERVICES LOCATED ON THIS WALL. 2132-10 BLACK BY BENJAMIN MOORE. SEMI-GLOSS FINISH.
- PT-3 – ACCENT WALLS AND ALL EXPOSED SURFACES COLOUR OF MECHANICAL AND ELECTRICAL SERVICES LOCATED ON THIS WALL. PPG1009-4 ANTIQUE MOSS BY BENJAMIN MOORE. SEMI-GLOSS FINISH.
- PT-4 – EXISTING AND NEW CORRIDOR DOOR COLOUR 2057-30 NAPLES BLUE BY BENJAMIN MOORE. FINISH TO MATCH EXISTING.
- PT-5 – EXISTING AND NEW CORRIDOR DOOR TRIM COLOUR CSP-150 WINDY CITY BY BENJAMIN MOORE. FINISH TO MATCH EXISTING.
- PT-6 – EXISTING AND NEW CORRIDOR WALL AND CEILING COLOUR TO MATCH EXISTING. CONFIRM DRY-OUT COLOUR PAINT SAMPLE WITH PROJECT COORDINATOR PRIOR TO USE.
- PT-7 – PREPARE SURFACES, INCLUDING BUT NOT LIMITED TO PATCH AND REPAIR, SCRAPING, SANDING, ETC. APPLY MINIMUM OF ONE COAT APPROPRIATE PRIMER.
- PT-8 – EXISTING AND NEW T-BAR CEILING GRID COLOUR OC-53 HORIZON BY BENJAMIN MOORE. MATTE FINISH.

OWNER RESERVES THE RIGHT TO CHOOSE UP TO NINE (9) DIFFERENT PAINT SELECTIONS TO BE APPLIED THROUGHOUT THE SPACE; SEE SPECIFICATION 09 01 90.63 AND 09 91 23.



BLOCKING DETAIL – LED SCREENS

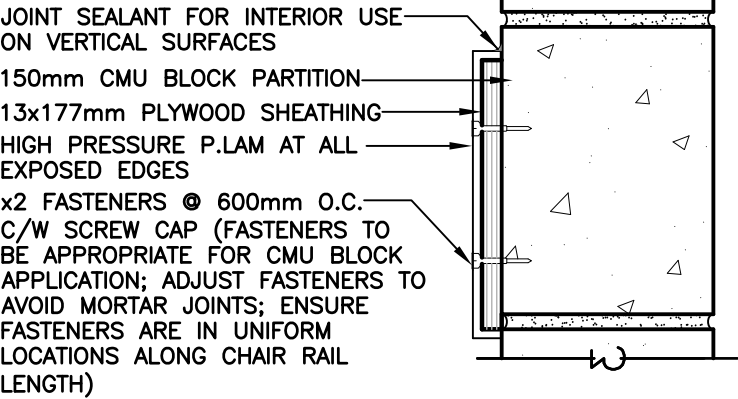
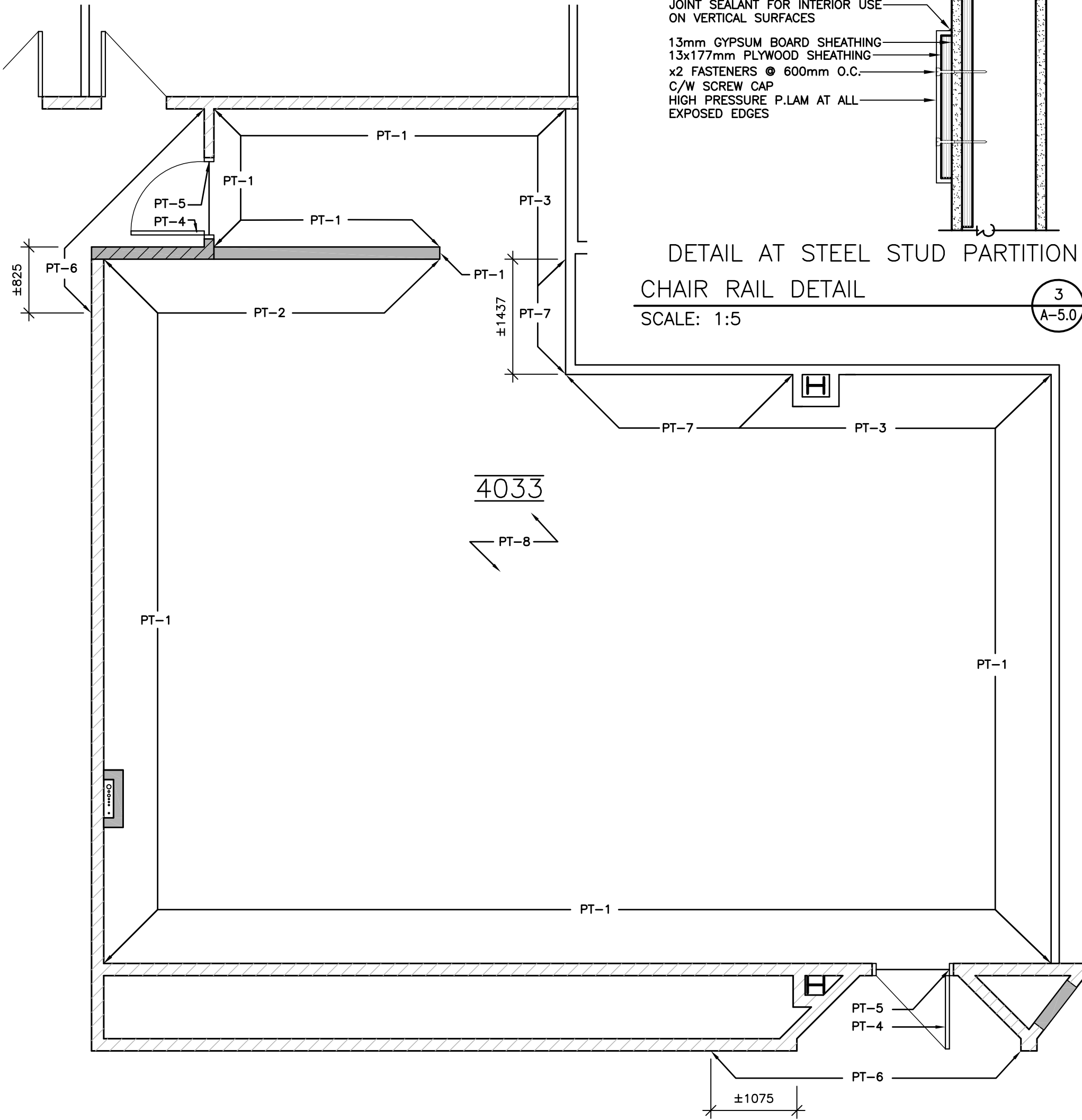
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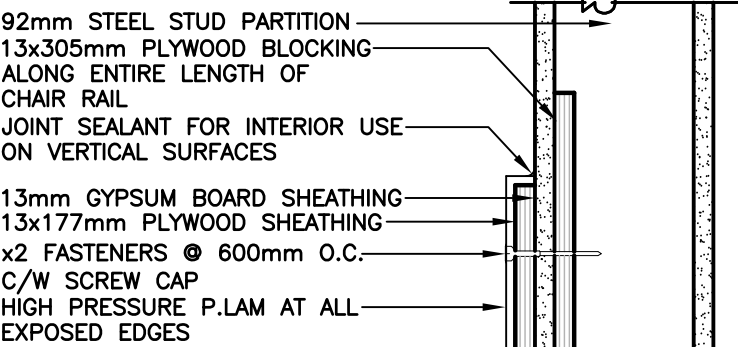
A-5.0

NEW FINISH PLAN

SCALE: 1:50



DETAIL AT CMU BLOCK PARTITION



DETAIL AT STEEL STUD PARTITION

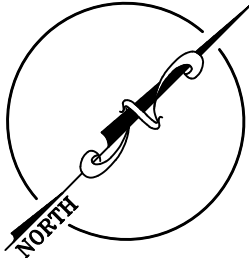
CHAIR RAIL DETAIL

SCALE: 1:5

No.	REVISION	DATE
R0	ISSUED FOR TENDER	APRIL 3, 2025

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- Dedication plaque, Arts & Administration Building, St. John's Campus

PROJECT NAME:

ENGINEERING BUILDING RENOVATIONS TO EN-4033

Project #: EN-110-23

DRAWING TITLE:

NEW FINISH PLAN & DETAILS

REVIEWED: M.F.	DRAWN: E.B.
SCALE: AS SHOWN	DATE: APRIL, 2025
MUN PROJECT No. EN-110-23	DRAWING No. A-5.0

GENERAL FINISH PLAN CONSTRUCTION NOTES:

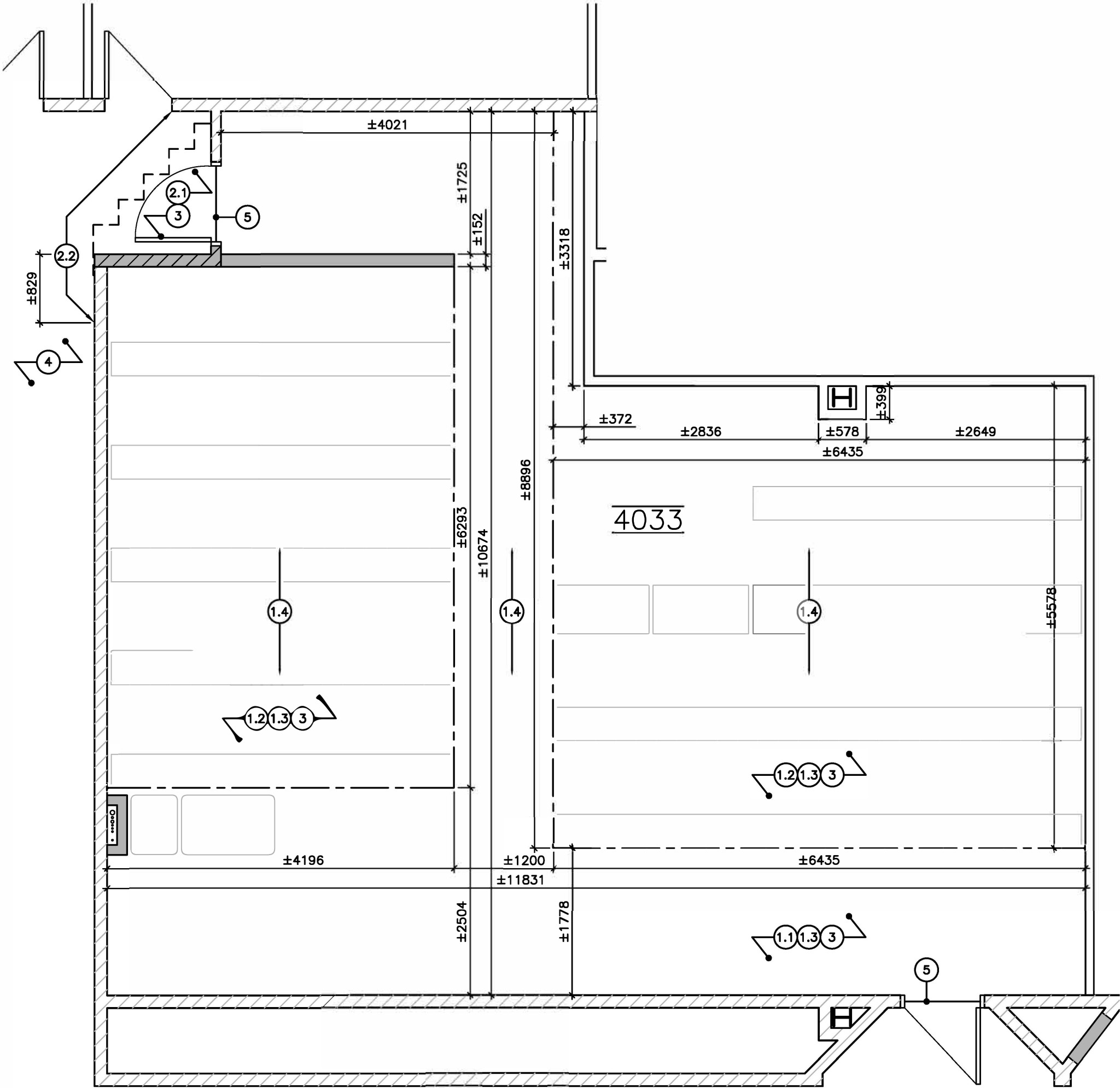
1. MAINTAIN FIRE RATINGS BETWEEN FLOOR AND WALL ASSEMBLIES. FILL AND PATCH HOLES IN FLOORS AND WALLS AS A RESULT OF DEMOLITION WORK. COORDINATE OPENINGS REQUIRED IN EXISTING FIRE RATED CONCRETE BLOCK WALLS AND FLOORS WITH MECHANICAL AND ELECTRICAL SUB-TRADES. APPROPRIATELY FIRE SEAL PENETRATIONS TO MAINTAIN 1 HOUR FIRE RESISTANCE RATING.
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3. WHEREVER EXCESSIVE DEMOLITION OCCURS, OR IF DAMAGE OCCURS TO ADJACENT SURFACES NOT INTENDED FOR DEMOLITION, OR REMOVAL, REINSTATE ALL AFFECTED SURFACES AND PREPARE THEM TO RECEIVE NEW FINISHES IF SPECIFIED, OTHERWISE REFINISH TO MATCH EXISTING ADJACENT CONDITIONS..

FINISH PLAN CONSTRUCTION NOTES: #

1. INSTALL NEW TILE CARPET FLOORING AND CARPET BASE:
 - 1.1. "CONTINUUM 11328" BY TANDUS CENTIVA, POWERBOND INSTALLATION, COLOUR TO BE 'AZUL 31302'.
 - 1.2. "METRI II 04654" BY TANDUS CENTIVA, POWERBOND INSTALLATION, COLOUR TO BE 'JET BLACK 62108'.
 - 1.3. INSTALL NEW CARPET BASE AROUND PERIMETER OF ROOM, BASE C/W STITCHED EDGING. BASE CARPET TRANSITIONS TO MATCH WITH FLOOR CARPET TRANSITIONS.
 - 1.4. FLOORING TO BE INSTALLED IN DIRECTION AS SHOWN.
2. INSTALL NEW VINYL COMPOSITE TILE FLOORING AND VINYL BASE:
 - 2.1. "STANDARD EXCELRON IMPERIAL TEXTURE" BY ARMSTRONG FLOORING, FINISH TO BE CHOSEN FROM MANUFACTURER'S FULL COLOUR RANGE.
 - 2.2. 100mm COVED RUBBER BASE AT AREAS OF WALL AND DOOR FRAME REMOVAL, "BENGUARD", OR APPROVED ALTERNATE. BASE FINISH TO BE CHOSEN FROM MANUFACTURER'S FULL COLOUR RANGE.
 - 2.3. INCLUDE FOR APPROPRIATE AMOUNT OF COMPATIBLE ADHESIVE FOR TILE AND BASE.
3. PREPARE AND LEVEL EXISTING CONCRETE FLOOR SLAB FOR NEW FLOORING INSTALLATION; INCLUDING, BUT NOT LIMITED TO SKIM COATING, LEVELING, FILLING, PATCHING, ETC. TO FACILITATE INSTALLATION OF NEW FLOORING.
4. EXISTING FLOORING AND VINYL BASE TO REMAIN.
5. INSTALL NEW VINYL TRANSITION STRIP FOR NEW CARPET TO VINYL COMPOSITE TILE TRANSITION AT DOOR OPENINGS, MODEL "CTA-XX-HT" BY JOHNSONITE. FINISH TO BE SELECTED FROM MANUFACTURER'S FULL COLOUR RANGE.

LEGEND:

- EDGE OF CARPET TYPES
- EDGE OF VINYL COMPOSITE TILE

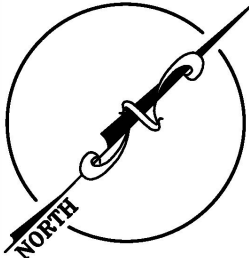


NEW FLOOR FINISH PLAN
SCALE: 1:50

No.	REVISION	DATE
R0	ISSUED FOR TENDER	APRIL 3, 2025

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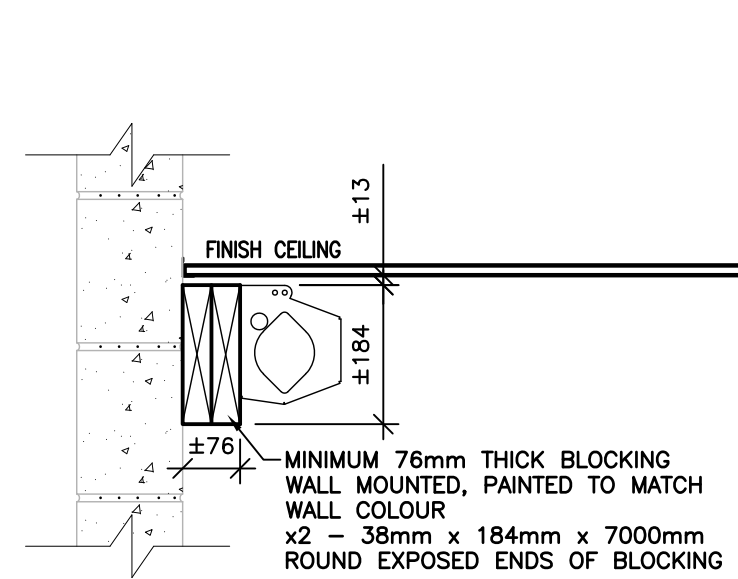
PROJECT NAME:

ENGINEERING BUILDING
RENOVATIONS TO EN-4033
Project #: EN-110-23

DRAWING TITLE:

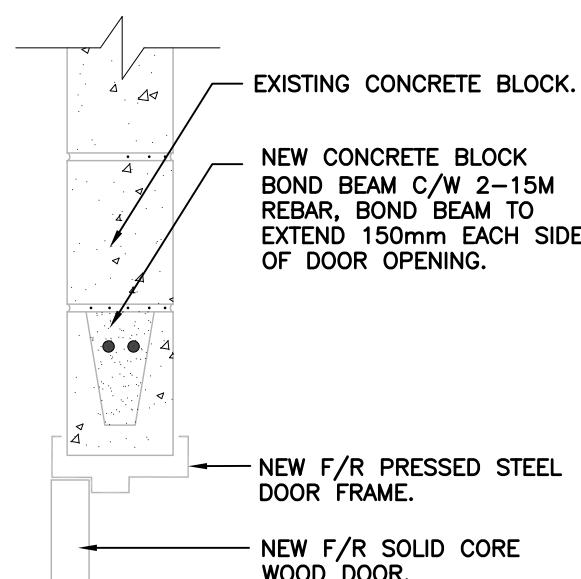
NEW FLOOR FINISH
PLAN

REVIEWED: M.F.	DRAWN: E.B.
SCALE: AS SHOWN	DATE: APRIL, 2025
MUN PROJECT No. EN-110-23	DRAWING No. A-5.1



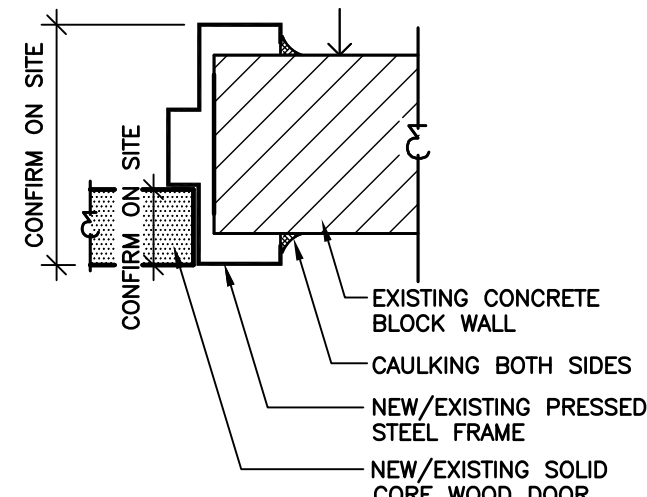
SCREEN MOUNT DETAIL

SCALE: 1:10



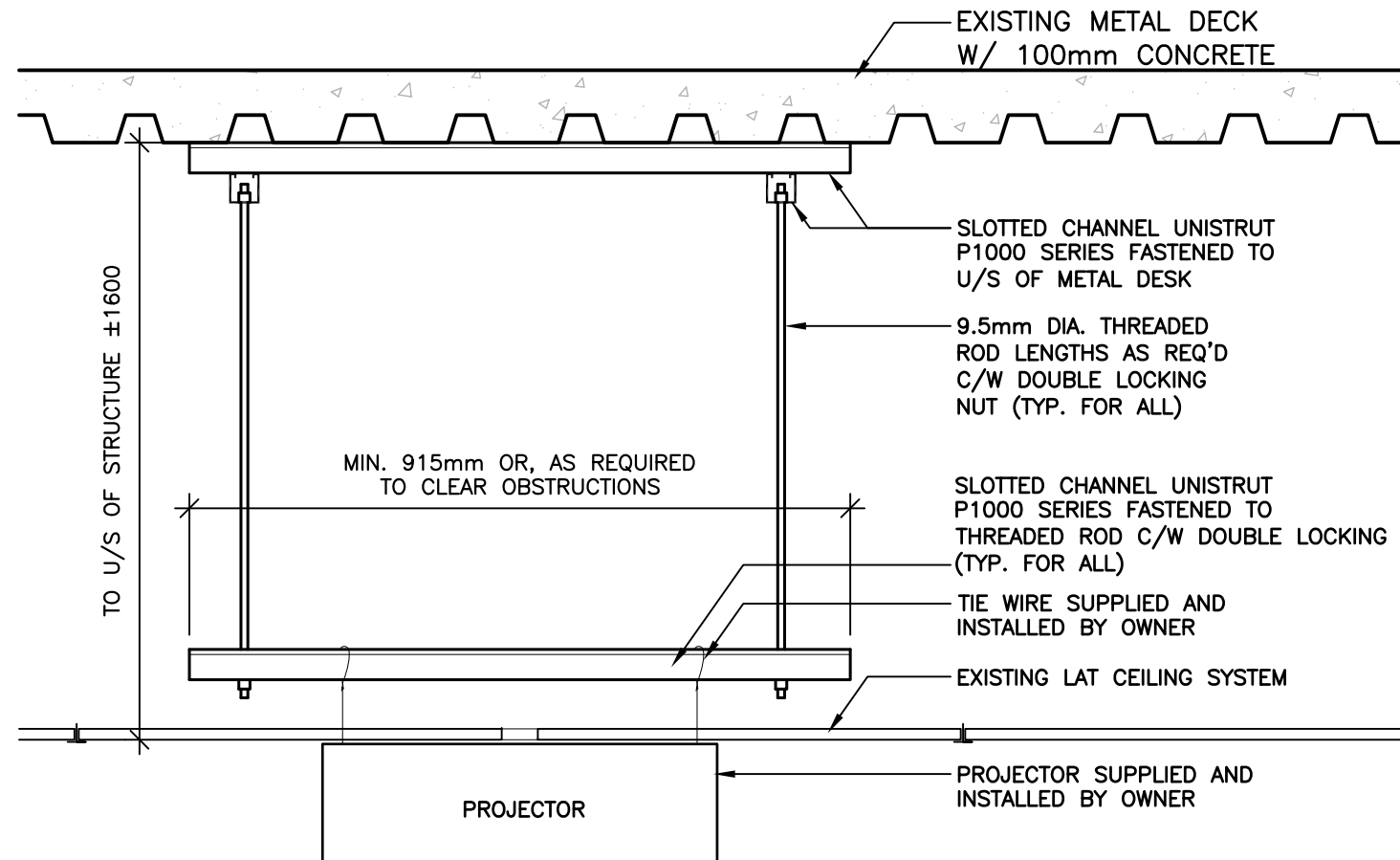
NEW LINTEL SECTION

SCALE: 1:10



DOOR JAMB DETAIL

SCALE: 1:5



PROJECTOR MOUNT DETAIL

SCALE: 1:10

DOOR SCHEDULE														
NEW DOOR NUMBER	QUANTITY	SIZE		ELEVATION TYPE	MATERIAL	FINISH	GLAZING	FRAME	FINISH	WALL TYPE	FIRE RATING (min)	HARDWARE GROUP	REMARKS	LEGEND:
		WIDTH	HEIGHT											
		NEW 915mm	EXISTING 915mm											
4033	1	●		A	●	●	●	PSF	●	CMU	EX	HG1	EXISTING DOOR AND FRAME TO REMAIN	EX = EXISTING PSF = PRESSED STEEL FRAME CMU = CONCRETE MASONRY UNIT HG# = HARDWARE GROUP #
4033A	1	●	●	B	●	●	●	PSF	●	CMU	45	HG2	SEE NOTES	

DOOR SCHEDULE NOTES:

- REMOVE AND SALVAGE EXISTING LOCKSETS, CLOSURES, AND OPERATOR SYSTEMS UNLESS OTHERWISE NOTED. TURN OVER HARDWARE TO OWNER.
- EXISTING DOOR FRAME TO BE PREPARED ON LATCH SIDE BY ELECTRICAL CONTRACTOR FOR PROXIMITY CARD READER AND ELECTRIC STRIKE, WIREMOLD TO BE STUBBED FROM CEILING SPACE AND SURFACE MOUNTED DOWN ALONG DOOR FRAME.
- ELECTRICAL CONTRACTOR TO SUPPLY AND INSTALL WIREMOLD TO SURFACE MOUNT MOUNTING BOX AT NEW PUSH BUTTON ACTUATORS; LOCATIONS AS PER DWG 2/A-3.0 AND 1/E-5.0.
- COORDINATE AUTOMATIC DOOR OPERATOR INSTALLATION WITH ELECTRICAL CONTRACTOR.
- NOTCH EXISTING FRAME AS REQUIRED TO RECEIVE ELECTRIC STRIKE.

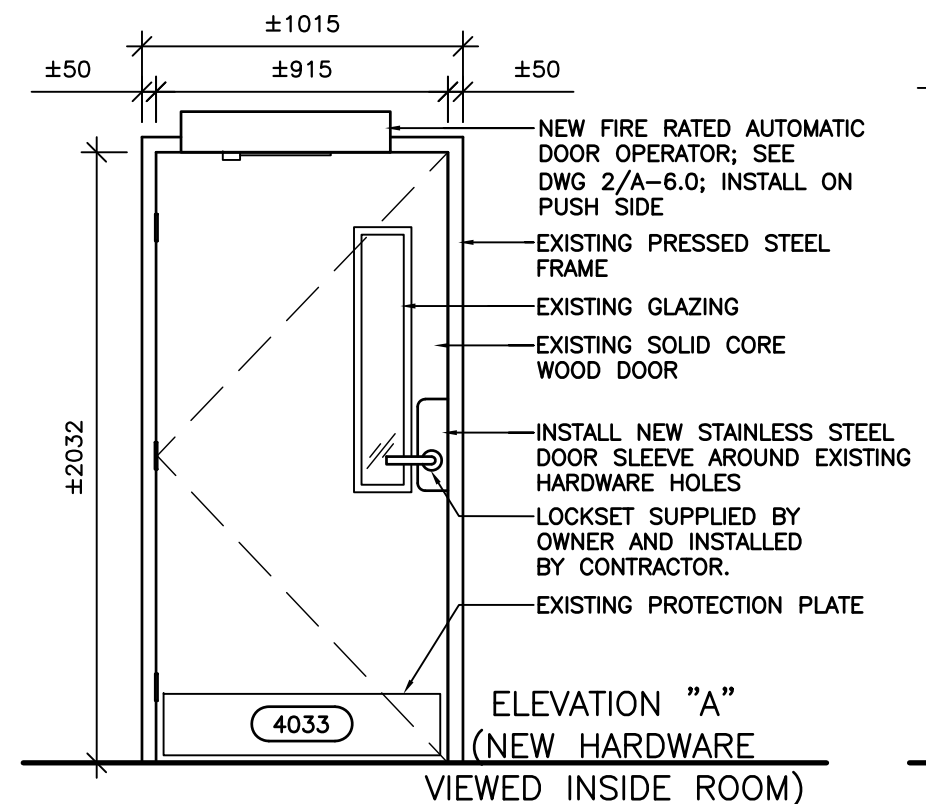
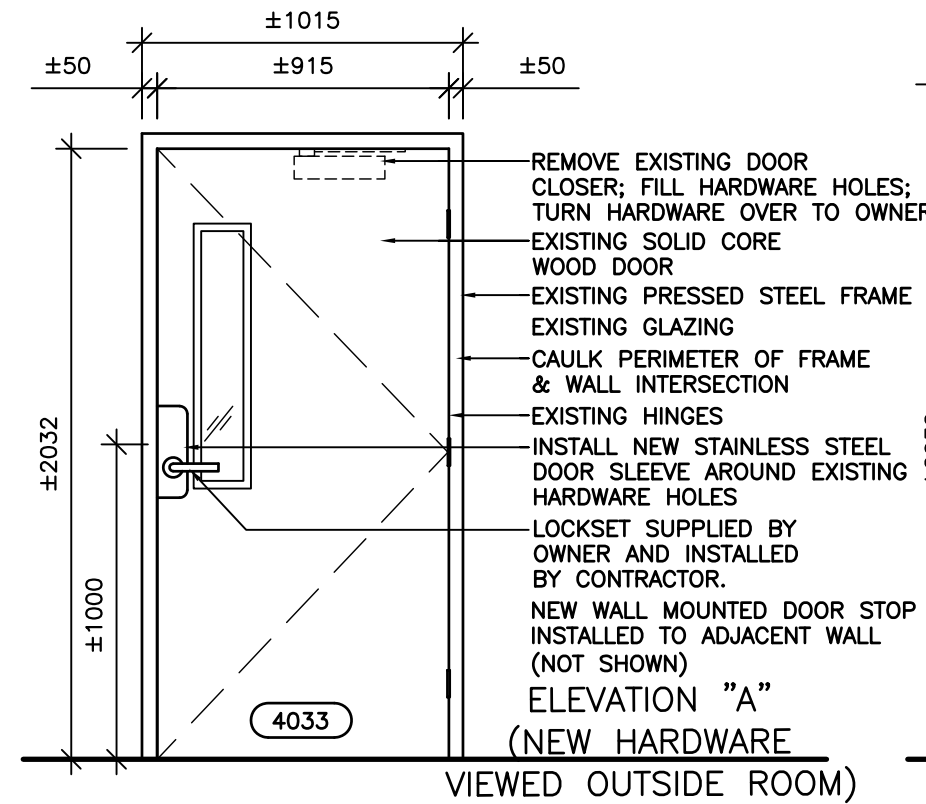
HARDWARE GROUPS:

1. HG1:

- 1.1. NEW HORTON 7100 SERIES DOOR OPERATOR TO EXISTING DOOR. OPERATOR TO BE INSTALLED ON THE PUSH SIDE OF THE DOOR.
- 1.2. NEW AUTOMATIC DOOR CONTROL ITEMS BELOW BY CAMDEN DOOR CONTROLS, OR APPROVED ALTERNATE:
- 1.3. (x2) NEW CM-7536/40 36" HARDWIRED LOW VOLTAGE WALL MOUNTED PUSH BUTTON ACTUATORS HAVING LONG ANODIZED ALUMINUM COLUMN PLATE W/ ENGRAVED BLUE FILLED HANDICAP GRAPHIC, 'PUSH TO OPEN' LETTERING, AND SHOE GRAPHIC. SEE DWG 2/A-3.0 AND 1/E-5.0 FOR PUSH BUTTON LOCATIONS.
- 1.4. (x2) CM-755B SURFACE MOUNT BOXES FOR 36" COLUMN SWITCHES.
- 1.5. (x1) NEW CX-12 PLUS DOOR INTERFACE RELAY TO BE LOCATED INSIDE DOOR OPERATOR.
- 1.6. (x1) NEW CX-MDA MAGNETIC CONTACT, SURFACE, SPST, WHITE.
- 1.7. NEW STAINLESS STEEL DOOR SLEEVE; GRAINGER ITEM # GGH2MDG7; CONTRACTOR TO CORE HOLE FOR LOCKSET AT SLEEVE ENSURING EXISTING HOLES FROM PREVIOUS HARDWARE ARE CONCEALED BY SLEEVE. MODIFY DOOR SLEEVE TO FIT FLUSH TO DOOR LITE FRAME AS REQUIRED.
- 1.8. NEW LOCKSET SUPPLIED BY OWNER AND INSTALLED BY CONTRACTOR
- 1.9. **PROXIMITY CARD READER AND SURFACE MOUNTED ELECTRIC STRIKE BY MUN FORCES

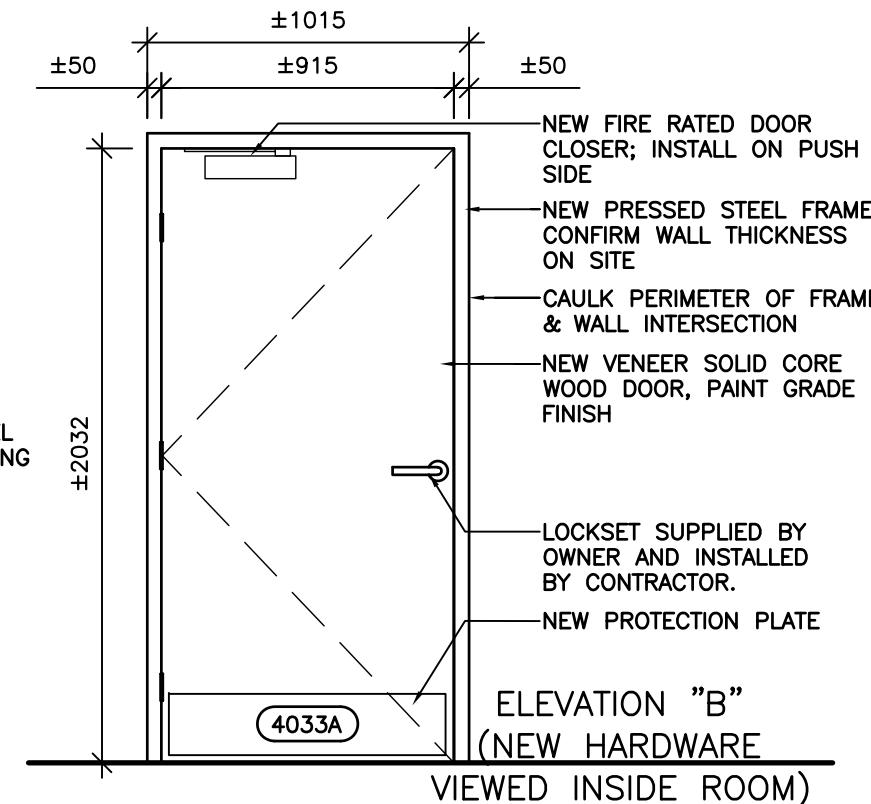
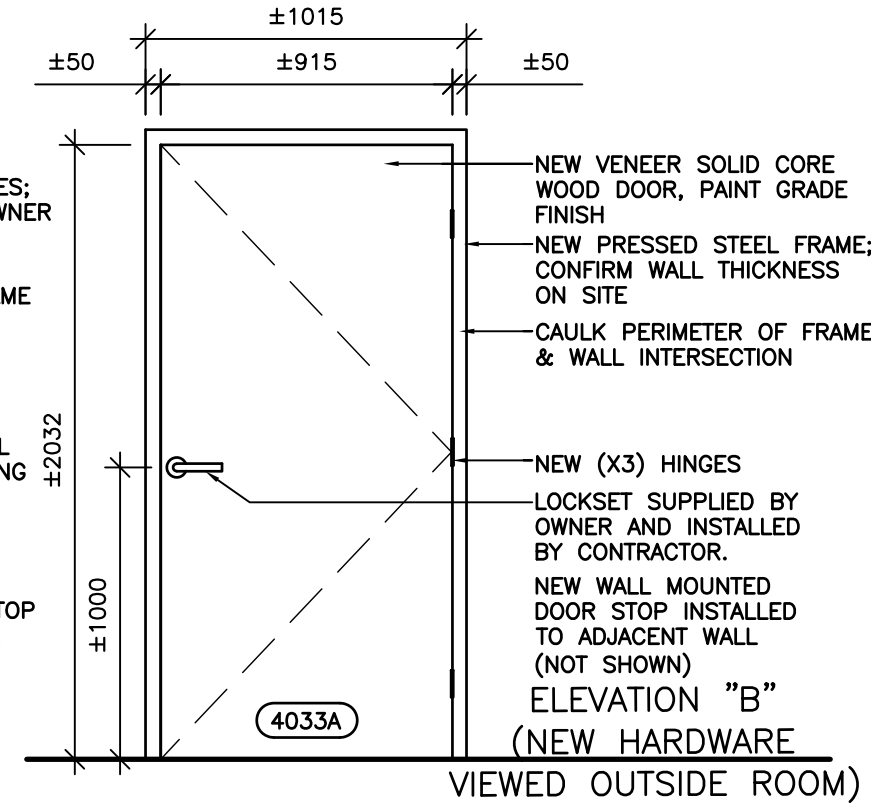
2. HG2:

- 2.1. NEW WALL MOUNTED DOOR STOP INSTALLED TO ADJACENT WALL, MODEL 'S120', BY STANDARD METAL HARDWARE, OR APPROVED ALTERNATE.
- 2.2. NEW LOCKSET SUPPLIED BY OWNER AND INSTALLED BY CONTRACTOR
- 2.3. NEW FIRE RATED DOOR CLOSER TO PUSH SIDE, MODEL '4040XP' BY LCN, OR APPROVED ALTERNATE.
- 2.4. (x3) NEW STANLEY HINGES FBB 179, 114x101, NRP
- 2.5. (x1) NEW IVES 8400 COMMERCIAL PROTECTION PLATE, SATIN STAINLESS STEEL, BEVELED EDGES, B-CS INSTALLED TO PUSH SIDE OF DOOR



DOOR ELEVATIONS

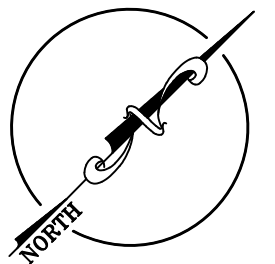
SCALE: 1:25

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A-6.0

No.	REVISION	DATE
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GENERAL NOTES

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- THE CONTRACTOR IS TO VERIFY ALL DIMENSIONS AND SITE CONDITIONS. PRIOR TO SUBMISSION OF TENDERS.
- ALL DISCREPANCIES FOUND IN THESE DRAWINGS TO BE BROUGHT TO THE ATTENTION OF FACILITIES MANAGEMENT PRIOR TO SUBMISSION OF TENDERS.



FACILITIES MANAGEMENT

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- Dedication plaque, Arts & Administration Building, St. John's Campus

PROJECT NAME:

ENGINEERING BUILDING RENOVATIONS TO EN-4033
Project #: EN-110-23

DRAWING TITLE:

DOOR ELEVATIONS, SCHEDULE & DETAILS

REVIEWED: M.F.	DRAWN: E.B.
SCALE: AS SHOWN	DATE: APRIL, 2025
MUN PROJECT No. EN-110-23	DRAWING No. A-6.0

DOOR SCHEDULE & NOTES

SCALE: NTS

2
A-6.0

FURNITURE PLAN NOTES: (#)

PLEASE NOTE: ITEMS A AND B MUST BE FROM SAME MANUFACTURER. OR DIFFERING MANUFACTURER’S MUST BE CAPABLE OF MATCHING LAMINATES. EDGE BAND AND LEG FINISH OF NEW SEMINAR AND HEIGHT ADJUSTABLE TABLES.

1. NEW SEMINAR TABLES (SIZE AS PER DWG): QUANTITY (X9) (A)

SUPPLY AND INSTALL NEW SEMINAR TABLES

- TABLE TYPE AS NOTED BELOW, OR APPROVED ALTERNATE:
 - "SEMINAR TABLE" BY KI
 - "MANHATTAN TABLE" BY SPEC
 - "FISSO" BY BORGO
- NEW TABLES TO HAVE THE FOLLOWING ITEMS:
 - TOP: 16" DEEP, UNLESS OTHERWISE NOTED, LENGTHS AS PER DRAWING, C/W HIGH PRESSURE PLASTIC LAMINATE SURFACE FINISH AND "74P" VINYL EDGES. PLASTIC LAMINATE AND VINYL EDGING COLOURS TO BE CHOSEN FROM MANUFACTURER’S FULL COLOUR RANGE.
 - BASE:TO BE SIMINAR BASIC BASE FOR ALL LEGS ON EACH ROW OF TABLES. BASE COLOUR TO BE CHOSEN FROM MANUFACTURER’S FULL COLOUR RANGE.
 - MODESTY PANEL: TO BE ACRYLIC WRAP, OR PERFORATED METAL. COLOUR TO BE SELECTED FROM MANUFACTURER’S FULL COLOUR RANGE.

2. NEW HEIGHT ADJUSTABLE TABLES (24x47"): QUANTITY (X2) (B)

SUPPLY AND INSTALL NEW ELECTRIC HEIGHT ADJUSTABLE TABLE

- TABLE TYPE AS NOTED BELOW, OR APPROVED ALTERNATE:
 - "GENESIS ELECTRIC HEIGHT ADJUSTABLE TABLE" BY KI
 - "MANHATTAN ELECTRIC HEIGHT ADJUSTABLE" BY SPEC
 - "ASCENT SIT–STAND DESK SERIES" BY WORKRITE
 - OR APPROVED ALTERNATE
- NEW TABLES TO HAVE THE FOLLOWING ITEMS:
 - TOP: HIGH PRESSURE PLASTIC LAMINATE W/ 54B ROUND VINYL BULLNOSE EDGES. PLASTIC LAMINATE AND BULLNOSE EDGING COLOURS TO BE CHOSEN FROM MANUFACTURER’S FULL COLOUR RANGE. 330LB BASE LIFTING CAPACITY
 - BASE:EXTENDED RANGE ELECTRIC SWITCH FOR DESK HEIGHT POWER; RANGE BETWEEN 24–51" AFF. DIGITAL KEYPAD W/ FOUR MEMORY SETTINGS. FLOOR MOUNT BASKETS. BASE COLOUR TO BE CHOSEN FROM MANUFACTURER’S FULL COLOUR RANGE.
 - MODESTY PANEL: TO BE ACRYLIC WRAP, OR PERFORATED METAL. COLOUR TO BE SELECTED FROM MANUFACTURER’S FULL COLOUR RANGE.
 - POWER AND ACCESSORIES:MINIMUM 12" HORIZONTAL CABLE MANAGER MOUNTED TO UNDERSIDE OF TABLE TOP. MINIMUM 10’ POWER CORD. VERTICAL MAGNETIC CABLE MANAGER MOUNTED AT UNDERSIDE OF TABLE TOP AND LEG ADJACENT TO POWER CONNECTION.VERTICAL CABLE MANAGER FINISH TO BE SELECTED FROM MANUFACTURER’S FULL COLOUR RANGE

PLEASE NOTE: ITEMS C. D. AND E MUST BE FROM THE SAME MANUFACTURER.

3. NEW STACKABLE GUEST CHAIR W/ CASTERS: QUANTITY (X62) (C)

SUPPLY AND INSTALL NEW STACKABLE ARMLESS CHAIR

- CHAIR TYPE AS NOTED BELOW, OR APPROVED ALTERNATE:
 - "TUCK GUEST" BY ALLSEATING
 - "STREAM" BY GLOBAL
 - "VERY SIDE AND SEMINAR" BY HAWORTH
- NEW CHAIR TO HAVE THE FOLLOWING ITEMS:
 - UPHOLSTERED BACK AND SEAT
 - UPHOLSTERED SEAT SELECTION TO BE MINIMUM 100,000 DOUBLE RUBS, SUPPLIER MUST PRESENT MINIMUM OF SEVEN (7) SELECTIONS OF DIFFERENT PATTERNS
 - FRAME FINISH TO BE SELECTED FROM MANUFACTURER’S FULL FINISH RANGE
 - ARMS
 - GLIDES

NEW COUNTER STOOL WITH ARMS: QUANTITY (x1) (D)

SUPPLY AND INSTALL NEW COUNTER STOOL WITH ARMS

- STOOL TYPE AS NOTED BELOW:
 - "TUCK COUNTER STOOL FULLY UPHOLSTERED" BY ALLSEATING
 - "STREAM COUNTER STOOL WITH ARMS" BY GLOBAL
 - "VERY COUNTER HEIGHT WIRE STOOL" BY HAWORTH
- NEW STOOL TO HAVE THE FOLLOWING ITEMS:
 - 25.5"W x 23.5"D x 39.5"H
 - UPHOLSTERED BACK SELECTION TO BE MINIMUM 100,000 DOUBLE RUBS, SUPPLIER MUST PRESENT A MINIMUM OF SEVEN (7) SELECTIONS OF DIFFERENT PATTERNS
 - UPHOLSTERY SEAT SELECTION TO BE MINIMUM 100,000 DOUBLE RUBS, SUPPLIER MUST PRESENT A MINIMUM OF SEVEN (7) SELECTIONS OF DIFFERENT PATTERNS
 - FRAME FINISH TO BE SELECTED FROM MANUFACTURER’S FULL FINISH RANGE
 - FELT PAD ON POLYCARBONATE GLIDE (FG)

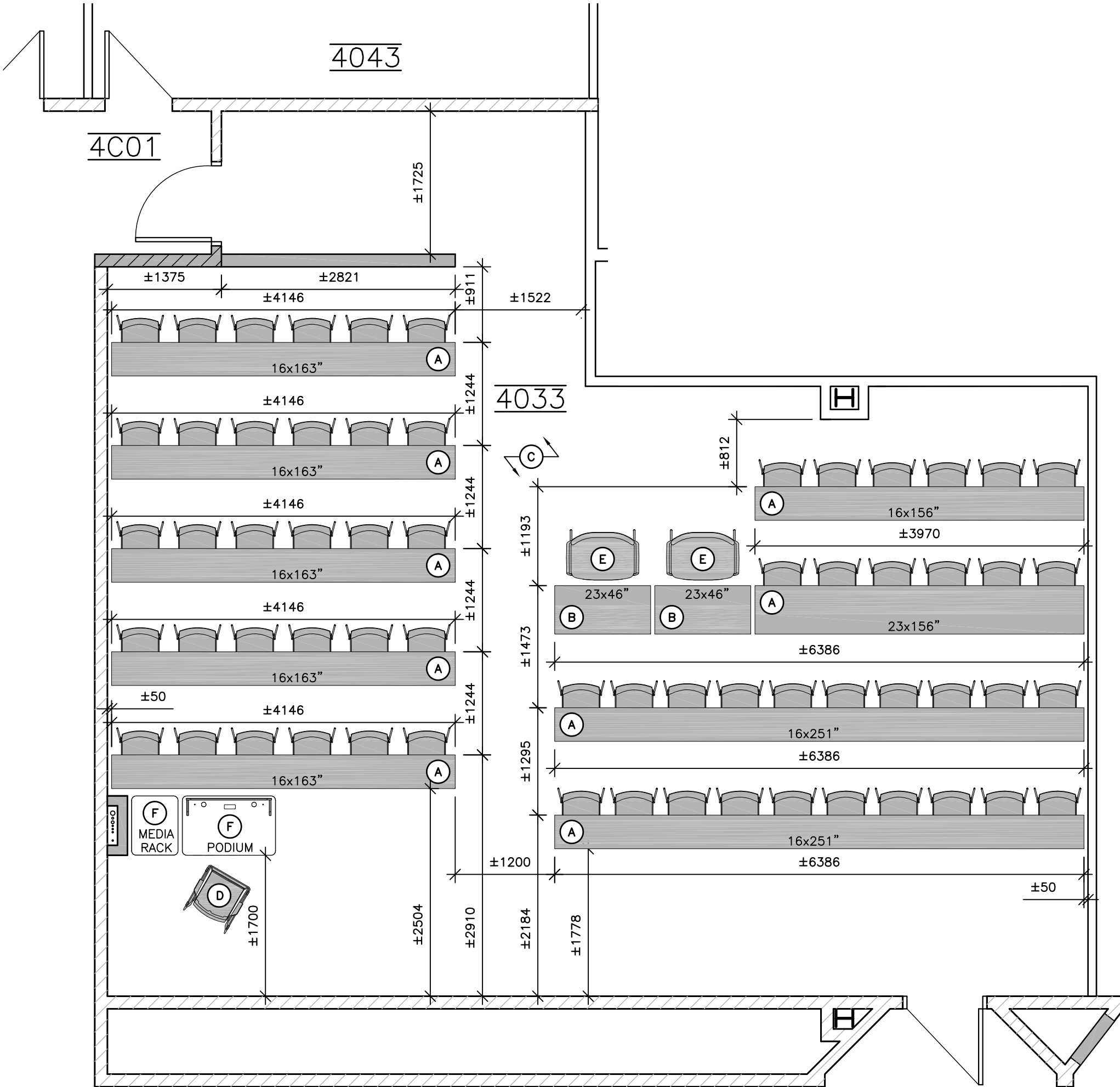
4. NEW GUEST CHAIR WITH ARMS: QUANTITY (x2) (E)

SUPPLY AND INSTALL NEW BARIATRIC CHAIR

- CHAIR TYPE AS NOTED BELOW:
 - "RAINBOX PLUS" BY ALLSEATING
 - "GC SIDERO LOW SINGLE PIECE BACK BARIATRIC ARMCHAIR" BY GLOBAL

5. INSTRUCTOR’S PODIUM & AV CART: (F)

- INSTRUCTOR’S PODIUM AND AV CART SHOWN FOR REFERENCE ONLY. NOT IN CONTRACT.



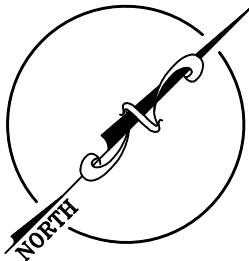
NEW FURNITURE PLAN


SCALE: 1:50

No.	REVISION	DATE
R0	ISSUED FOR TENDER	APRIL 3, 2025

GENERAL NOTES

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PROJECT NAME:

ENGINEERING BUILDING RENOVATIONS TO EN-4033

Project #: EN-110-23

DRAWING TITLE:

NEW FURNITURE PLAN

REVIEWED: M.F.	DRAWN: E.B.
SCALE: AS SHOWN	DATE: APRIL, 2025
MUN PROJECT No. EN-110-23	DRAWING No. F-0

GENERAL ELECTRICAL NOTES (ALL SHEETS):

1. ALL ELECTRICAL ISOLATIONS SHALL BE PERFORMED IN ACCORDANCE WITH MUN ZERO ENERGY ISOLATION PROGRAM (ZEIP). ELECTRICAL CONTRACTORS ARE REQUIRED TO HAVE COMPLETED MUN ZEIP TRAINING PRIOR TO PERFORMING ELECTRICAL WORK.
2. CONTRACTORS SHALL PROVIDE ADVANCED NOTICE TO THE PROJECT COORDINATOR TO COORDINATE DE-ENERGIZING & RE-ENERGIZING OF ELECTRICAL EQUIPMENT WITH MUN ELECTRICAL SHOP. 48Hrs NOTICE FOR CIRCUIT BREAKERS. 72Hrs NOTICE FOR PANELS.
3. BOTH THE ELECTRICAL CONTRACTOR AND MUN ELECTRICAL SHALL BE PRESENT TO PERFORM LOCK OUT / TAG OUT AND VERIFY ZERO ENERGY STATE BEFORE WORK BEGINS. ENERGIZED ELECTRICAL WORK IS STRICTLY PROHIBITED.
4. PERFORM DEMOLITION WORK SHOWN AND/OR REQUIRED TO COMPLETE THE WORK. DO NOT ASSUME DEMOLITION DRAWINGS SHOW THE FULL EXTENT OF DEMOLITION WORK REQUIRED.
5. ELECTRICAL CONTRACTOR MUST REFER TO ARCHITECTURAL, MECHANICAL, AND ELECTRICAL DRAWINGS AND SPECIFICATIONS FOR EXTENT OF WORK AND COORDINATE OTHER TRADES AND GENERAL CONTRACTOR PRIOR TO THE COMMENCEMENT OF ANY WORK.
6. REVIEW DEMOLITION PLAN IN CONJUNCTION WITH ALL OTHER PLANS AND DETAILS. FURTHER DEMOLITION REQUIRED FOR NEW MECHANICAL AND ELECTRICAL CAN BE DETERMINED BASED ON NEW FLOOR PLAN LAYOUT AND SITE CONDITIONS. CHECK SITE DIMENSIONS AND CONDITIONS AND REPORT UNACCEPTABLE CONDITIONS TO PROJECT COORDINATOR FOR REMEDIAL INSTRUCTIONS PRIOR TO PROCEEDING WITH THE WORK.
7. ALL CIRCUIT BREAKER/PANEL SHUTDOWNS WILL REQUIRE MUN ELECTRICIAN PRESENT TO PROVIDE LOCK OUT/TAG OUT. CONTRACTOR SHALL CONTACT PROJECT COORDINATOR 48hrs IN ADVANCE TO SCHEDULE MUN ELECTRICIAN. LIVE ELECTRICAL WORK IS NOT PERMITTED. CONTRACTOR TO VERIFY ELECTRICAL CIRCUITS PRIOR TO START OF WORK.
8. ALL DATA DROPS NOTED TO BE REMOVED SHALL BE DISCONNECTED BY MUN FORCES PRIOR TO DEMOLITION WORK BY ELECTRICAL SUB-TRADE. CONTRACTOR SHALL CONTACT PROJECT COORDINATOR 48hrs IN ADVANCE TO NOTIFY/SCHEDULE DATA DROP DISCONNECTION. DO NOT CUT, OR DISCONNECT DATA CABLES.
9. REMOVE ALL WIRING AND CONDUIT BACK TO NEAREST JUNCTION BOXES FOR RECEPTACLES, SWITCHES, ETC. THAT ARE INDICATED TO BE REMOVED, OR RELOCATED.
10. ELECTRICAL CONTRACTOR IS RESPONSIBLE TO VERIFY INDICATED CIRCUITS AND TRACE OUT ANY UNKNOWN POWER AND LIGHTING CIRCUITS PRIOR TO START OF WORK.
11. REUSE EXISTING POWER AND LIGHTING CIRCUITS AS INDICATED. RE-ROUTE, EXTEND, OR MODIFY POWER FEEDS AS REQUIRED TO FACILITATE ALL NEW LOCATIONS OF LIGHT FIXTURES, ILLUMINATED EXIT SIGNS, LINE VOLTAGE DIMMER SWITCHES, AND LOW VOLTAGE SWITCHES.
12. REUSE EXISTING POWER CIRCUITS AND RELAY CIRCUITS TO ENSURE SEPERATE LIGHT SWITCHING CONTROL IN INDIVIDUAL ROOMS, OR MULTIPLE SWITCHING CONTROL AS INDICATED.
13. CONTRACTOR TO ENSURE THAT ALL EXISTING, OR NEW CONDUIT PENETRATIONS THROUGH THE FLOOR AND WALLS ARE APPROPRIATELY FIRE STOPPED.
14. SUPPLY AND INSTALL NEW STAINLESS STEEL TYPE COVER PLATES THROUGHOUT FOR ALL NEW AND EXISTING RECEPTACLES, SWITCHES, AND JUNCTION BOXES.

VARIOUS ELECTRICAL SYMBOLS

▶	NEW TELEPHONE OUTLET
▷	NEW DATA OUTLET
-----	EXISTING DATA AND POWER WIREMOLD
Ⓢ	DIMMER SWITCH – LETTERS DENOTE FIXTURES CONTROLLED
Ⓢ	4-WAY TOGGLE SWITCH – LETTER DENOTES FIXTURE CONTROLLED
Ⓢ	SINGLE POLE TOGGLE SWITCH – LETTER DENOTES FIXTURE CONTROLLED
Ⓢ	15amp DUPLEX CONVENIENCE RECEPTACLE
Ⓢ	120V QUADPLEX RECPETACLE
Ⓢ	120V DUPLEX RECPETACLE MOUNTED IN CEILING SPACE
Ⓢ	FIRE RATED 4" FLOOR BOX
Ⓢ	DIRECT CONNECTION TO ELECTRICAL EQUIPMENT
Ⓢ	JUNCTION OR OUTLET BOX

LIST OF SUBSCRIPTS

α	LOWER CASE LETTERS INDICATE SWITCHING ARRANGEMENT
3	INDICATES 3-WAY
4	INDICATES 4-WAY
DIM	INDICATES DIMMER
EM	INDICATES EMERGENCY POWER SUPPLY
N	INDICATES NEW DEVICE
E	INDICATES EXISTING TO REMAIN
ER	INDICATES EXISTING TO BE REMOVED
RL	INDICATES EXISTING TO BE RELOCATED
NL	INDICATES EXISTING IN NEW LOCATION
SM	INDICATES SURFACE MOUNTED

HEATING

TS	TEMPERATURE SENSOR
TH/C	HEATING AND COOLING THERMOSTAT

SECURITY SYSTEM AND DOOR CONTROL

□	PROX	PROX CARD READER
□	PBA	PUSH BUTTON ACTUATOR DEVICE

FIRE SUPPRESSION

Ⓢ	FIRE EXTINGUISHER
---	-------------------

LIGHTING

E	EXISTING LAY-IN LIGHTING – LETTER DENOTES CONTROL TYPE
N	NEW LED LAY-IN LIGHTING – LETTER DENOTES CONTROL TYPE
E	EXISTING POT LIGHTING – LETTER DENOTES CONTROL TYPE
N	NEW WAFER LIGHTING – LETTER DENOTES CONTROL TYPE
⊗	CEILING MOUNTED EXIT LIGHTING LUMINAIRE
LEM	EMERGENCY LIGHTING BATTERY UNIT 2 HEADS C/W A/C & DC OUTLETS

PANEL FM-PP-409 TYPE CIRCUIT BREAKER RATING 120/208V, 3ø, 4W, 225A STANDARD OF ACCEPTANCE EATON/WESTINGHOUSE MINIMUM INTERRUPTING CAPACITY R.M.S. SYMM AMPERES NOTES * LOCK ON DEVICE FLUSH MOUNT				
CIRCUIT DESCRIPTION	BRKR. SIZE	CIRCUIT NO.	BRKR. SIZE	CIRCUIT DESCRIPTION
WALL TRACK REC. RM 4029	15	1 2	20	OUTLETS SE WALL RM 4029C
WALL TRACK REC. RM 4029	15	3 4	20	OUTLETS NE & W WALL RM 4029C
DESK SCREENS 4034	15 MINIS	5 6	20	OUTLETS SW WALL RM 4029C
REC. RM 4001 & 4029	15	7 8	15	REC. RM 4029, 4029B, & 4031
REC. RM 4029C	15	9 10	20	REC. RM 4029B
REC. RM 4029C	15	11 12	20	REC. IN CORR.
REC. RM 4029	15	13 14	15	REC. RM 4029
REC. RM 4029	15	15 16	15	REC. RM 4029
SPARE	15	17 18	15	REC. RM 4023
EMERG. LTS RM 4029 & 4031	15	19 20	15	REC. RM 4029
PROJECTOR AND DOORS 4029	15	21 22	15	REC. RM 4029
TRACK REC. RM 4029A	15	23 24	15	SPARE
208 VOLT REC. 4029B		25 26	15	SPACE
208 VOLT REC. 4029B	30	27 28		SPACE
208 VOLT REC. 4029B		29 30	15	REC RM 4029
LTS RM 4026 & 4027	15	31 32	20	FLOOR BOX REC 4029
SPACE		33 34	20	FLOOR BOX REC 4029
ASSISTIVE LISTENING REC. 4029	15	35 36	20	FLOOR BOX REC 4029
SPACE		37 38		SPACE
REC. RM 4020	15 MINIS	39 40	15 MINIS	REC. RM 4008
REC. RM 4006	15 MINIS	41 42	15 MINIS	REC. RM 4035
FED FROM (ROOM & PANEL): ROOM:4022 PANEL: EN-DP-18				

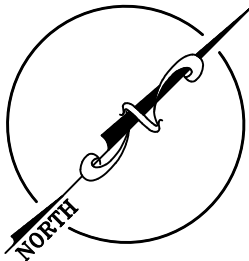
PANEL FM-PP-405 TYPE CIRCUIT BREAKER RATING 347/600V, 3ø, 4W, 100A STANDARD OF ACCEPTANCE EATON/WESTINGHOUSE MINIMUM INTERRUPTING CAPACITY R.M.S. SYMM AMPERES NOTES * LOCK ON DEVICE FLUSH MOUNT				
CIRCUIT DESCRIPTION	BRKR. SIZE	CIRCUIT NO.	BRKR. SIZE	CIRCUIT DESCRIPTION
LTS RM 4031 & 4031A	20	1 2	20	LTS RM 4033
LTS RM 4034	20	3 4	20	LTS RM 4032A,C
LTS RM 4035	20	5 6	20	LTS RM 4032A
LTS RM 4044-4046 & 4046A	20	7 8	20	LTS RM 4029 & 4029A
LTS RM 4040-4046	20	9 10	20	LTS RM 4029
LTS RM 4036A,B & 4039	20	11 12	20	LTS RM 4001 & 4029B,C
	20	13 14		SPARE
	20	15 16		SPARE
	20	17 18		SPARE
SPARE		19 20		SPARE
SPARE		21 22		SPARE
SPARE		23 24		SPARE
		25 26		
		27 28		
		29 30		
		31 32		
		33 34		
		35 36		
		37 38		
		39 40		
		41 42		
FED FROM (ROOM & PANEL): ROOM:3037 PANEL: EN-DP-14				

PANEL FM-PP-400 TYPE CIRCUIT BREAKER RATING 120/208V, 3ø, 4W, 225A STANDARD OF ACCEPTANCE EATON/WESTINGHOUSE MINIMUM INTERRUPTING CAPACITY R.M.S. SYMM AMPERES NOTES * LOCK ON DEVICE FLUSH MOUNT				
CIRCUIT DESCRIPTION	BRKR. SIZE	CIRCUIT NO.	BRKR. SIZE	CIRCUIT DESCRIPTION
REC. RM 4045 & 4046	15	1 2	15	REC. RM 4032
REC. RM 4046	15	3 4	15	REC. RM 4032
REC. RM 4041, 4042, 4043, 4044, & 4045	15	5 6	15	REC. RM 4032
REC. RM 4033	15	7 8	15	REC. RM 4033 DESK
REC. RM 4033	15 GFCI	9 10	15	REC. RM 4033
REC. RM 4033	15	11 12	15	REC. RM 4043, 4044, 4045 & 4046
REC. TRACK RM 4032A	15	13 14	15	REC. RM 4040, 4041, & 4042
REC. RM 4032	15	15 16	30	REC. IN CORR
REC. RM 4032 & 4032A	15	17 18	15 GFCI	REC. TRAC RM 4033
208 VOLT REC. 4033	15 GFCI	19 20	15 GFCI	REC. TRAC RM 4033
4032B GFI REC	20	21 22	15	REC. RM 4043
REC. RM 4032	15	23 24	15	REC. RM 4043
REC. RM 4033	15	25 26	15 GFCI	REC. RM 4033
POT LTS RM 4032A	15 GFCI	27 28	15 GFCI	REC. TRAC RM 4033
AC RM 4033	50	29 30	15 GFCI	POTS RM 4033
AC RM 4033		31 32	15	PROJECTOR RM 4032A
AC RM 4033		33 34	15	POTS RM 4033
REC. TRAC RM 4033	15 GFCI	35 36	15	SPARE
		37 38		
		39 40		
		41 42		
FED FROM (ROOM & PANEL): ROOM:4022 PANEL: EN-DP-18				

No.	REVISION	DATE
RO	ISSUED FOR TENDER	APRIL 3, 2025

GENERAL NOTES

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2. DO NOT SCALE FROM DRAWINGS.
3. THE CONTRACTOR IS TO VERIFY ALL DIMENSIONS AND SITE CONDITIONS. PRIOR TO SUBMISSION OF TENDERS.
4. ALL DISCREPANCIES FOUND IN THESE DRAWINGS TO BE BROUGHT TO THE ATTENTION OF FACILITIES MANAGEMENT PRIOR TO SUBMISSION OF TENDERS.



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PROJECT NAME:

ENGINEERING BUILDING RENOVATIONS TO EN-4033
Project #: EN-110-23

DRAWING TITLE:

ELECTRICAL SYMBOL LEGEND & PANEL SCHEDULES

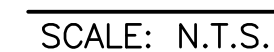
REVIEWED: M.F.	DRAWN: E.B.
SCALE: AS SHOWN	DATE: APRIL, 2025
MUN PROJECT No. EN-110-23	DRAWING No. E-0

1. EXISTING POWER FOR RECEPTACLES AND SWITCHES IN INSTRUCTOR'S DESK TO BE DISCONNECTED. PULL BACK WIRING TO NEAREST JUNCTION BOX ABOVE CEILING. AV AND DATA CABLEING TO BE DISCONNECTED AND REMOVED BY MUN FORCES.
2. ALL EXISTING CONDUIT SUPPLYING INSTRUCTOR'S DESK AT FLOOR AND WALL TO BE REMOVED BACK TO CEILING SPACE ABOVE:

x4 CONDUIT IN TOTAL:
 - x1 64mm CONDUIT (DATA CABLEING)
 - x1 25mm CONDUIT (POWER)
 - x2 19mm CONDUIT (POWER)
3. DISCONNECT EXISTING POWER THROUGHOUT AS INDICATED. PULL BACK WIRING TO NEAREST JUNCTION BOX ABOVE CEILING.
4. REMOVE EXISTING RECEPTACLES AND FACE PLATES. WIRING TO REMAIN.
5. DATA CABLEING TO BE DISCONNECTED AND REMOVED BY MUN FORCES AS INDICATED.
6. REMOVE AND DISPOSE OF EXISTING WIREMOLD.
7. REMOVE OBSOLETE DATA DROP. REMOVE AND DISPOSE OF DEVICE BOX AND CONDUIT TO ABOVE CEILING. DATA CABLEING TO BE DISCONNECTED AND REMOVED BY MUN FORCES.
8. EXISTING JUNCTION BOX TO REMAIN.
9. REMOVE DATA CABINET AND ASSOCIATED WIREMOLD.
10. DISCONNECT POWER TO EXISTING PROJECTOR SCREEN.
11. SPEAKERS TO BE DISCONNECTED AND REMOVED BY MUN FORCES AS INDICATED.
12. DISCONNECT EXISTING POWER FOR RECEPTACLE. PULL BACK WIRING TO NEAREST JUNCTION BOX ABOVE CEILING. REMOVE AND DISPOSE OF DEVICE BOX AND CONDUIT TO ABOVE CEILING.
13. ELECTRICAL CONTRACTOR IS RESPONSIBLE TO TRACE ALL UNKNOWN CIRCUITS PRIOR TO DISCONNECTION.



1. COORDINATE CONDUIT PENETRATIONS THROUGH CORRIDOR WALLS FROM EN-4033 TO EN-4007 WITH GENERAL CONTRACTOR.
2. LEVEL 4 ACCESS LOCATED IN EN4033, 4C01 AND 4007 HAVING ACOUSTIC CEILING SYSTEMS. EXISTING CONDITION OF CEILING TILE WILL BE DOCUMENTED PRIOR TO START OF WORK. CONTRACTOR IS RESPONSIBLE FOR REPLACEMENT OF DETERIORATED, OR BROKEN CEILING TILE AS A RESULT OF CONSTRUCTION. ALL CEILING TILES MUST BE IN PLACE IN LAT CEILING SYSTEM FOR NORMAL BUSINESS HOURS. CONTRACTOR SHALL NOT USE ANY INTERIOR SPACES, OTHER THAN CONSTRUCTION AREAS INSIDE HOARDING WALLS (EN-4033), FOR STORAGE OR LAY-DOWN AREAS.



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E-1.0

1. DISCONNECT, REMOVE, AND DISPOSE OF EXISTING LIGHT FIXTURES. PULL BACK WIRING TO NEAREST JUNCTION BOX ABOVE CEILING.
2. DISCONNECT, REMOVE, AND DISPOSE OF EXISTING SWITCH. PULL BACK WIRING TO NEAREST JUNCTION BOX ABOVE CEILING.
3. DISCONNECT POWER TO EXIT SIGN. PULL BACK WIRING TO NEAREST JUNCTION BOX ABOVE CEILING. RETAIN SIGN FOR INSTALLATION TO NEW LOCATION.
4. EXISTING LIGHT FIXTURE TO REMAIN.
5. RELOCATE EXISTING PROJECTOR RECEPTACLE; SEE DWG 1/E-4.0.
6. SEE DWG 2/E-1.0 FOR REMOVAL OF SWITCHING AT INSTRUCTOR'S PODIUM.



GENERAL NOTES

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- Dedication plaque, Arts & Administration Building, St. John's Campus

ENGINEERING BUILDING
RENOVATIONS TO EN-4033
Project #: EN-110-23

DEMOLITION
ELECTRICAL CEILING
PLAN

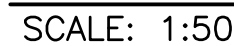
REVIEWED: M.F.	DRAWN: E.B.
SCALE: AS SHOWN	DATE: APRIL, 2025
MUN PROJECT No. EN-110-23	DRAWING No. E-2.0

1. SUPPLY AND INSTALL WIREMOLD FROM DOOR ACTUATORS TO OPERATOR/JUNCTION BOX AND RUN ABOVE CEILING. NEW 19mm CONDUIT FROM TIE-IN TO WIREMOLD ABOVE CEILING AND RUN BACK TO PANEL. SEE DWG 1/E-5.0 AND SPECIFICATIONS. COORDINATE PUSH BUTTON ACTUATOR INSTALLATION WITH GENERAL CONTRACTOR. HARDWARE SUPPLIED BY GENERAL CONTRACTOR. WIRING SUPPLIED AND INSTALLED BY ELECTRICAL CONTRACTOR.
2. INSTALL 800 SERIES WIREMOLD FROM DOOR FRAME AND PUSH BUTTON ACTUATOR MOUNTING BOX TO SITE CONTROLLER FOR PROX ROUGH-IN. CORE MOUNTING BOX AS REQUIRED. PROX WIRING BY MUN FORCES.
3. INSTALL NEW DUPLEX RECEPTACLE AT EXISTING DEVICE BOX.
4. NEW CONDUIT LOCATION FOR AV, DATA, AND POWER SUPPLYING INSTRUCTOR'S PODIUM AND MEDIA CART. PROVIDE 305x305x76mm GALVANIZED ELECTRICAL BOX WITH KNOCKOUTS RECESSED INTO METAL STUD WALL CAVITY; SEE DWG 3/E-5.0 FOR ADDITIONAL INFO. RE-ROUTE CONDUIT AS REQUIRED TO TIE INTO NEW MEDIA CART LOCATION:

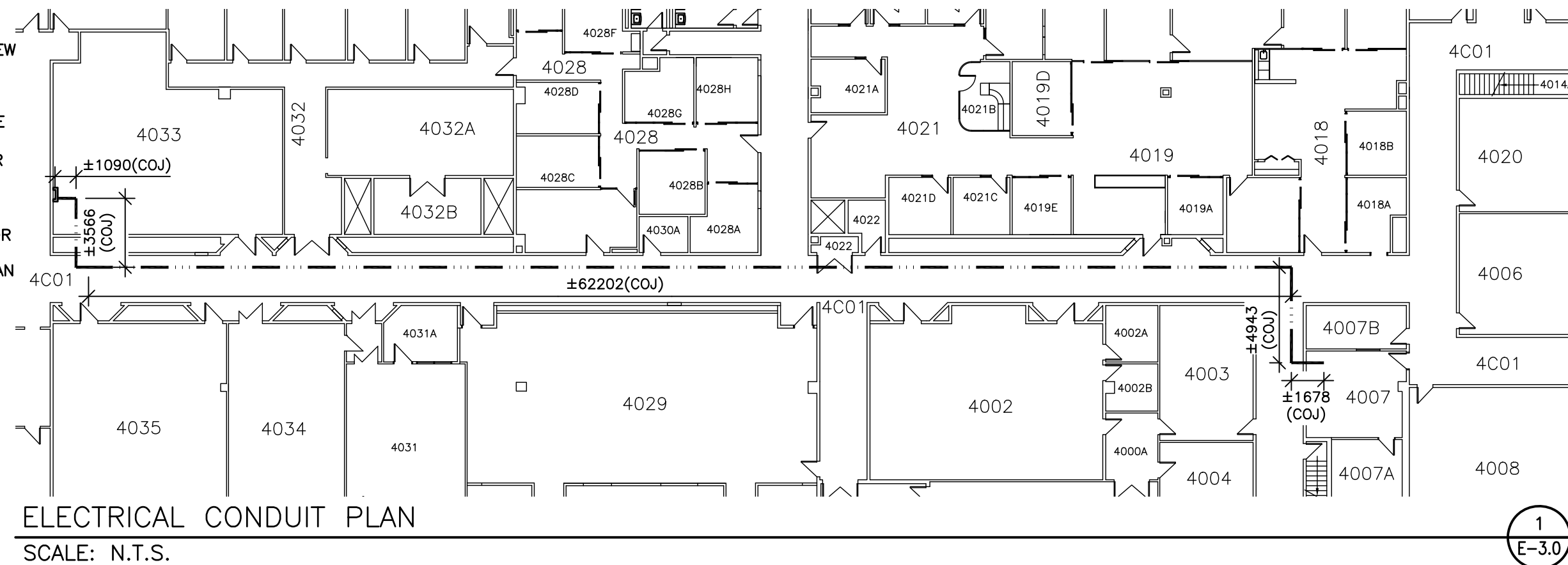
x3 CONDUIT IN TOTAL:
 - x1 - 64mmØ CONDUIT STUBBED 150mm ABOVE CEILING (PROJECTOR, PROJECTOR SCREEN, AUDIO RELAYS)
 - x1 - 19mmØ CONDUIT C/W NEW DEVICE BOX AND COVER PLATE RUN BACK TO PANEL (x2 NEW DUPLEX RECEPTACLES FOR INSTRUCTOR'S PODIUM AND MEDIA CART)
 - x1 - 25mmØ CONDUIT STUBBED 150mm ABOVE CEILING (DATA CABLING)
5. NEW CONDUIT LOCATION FOR CONVENIENCE RECEPTACLE AT INSTRUCTOR'S PODIUM; SEE DWG 3/E-5.0 FOR ADDITIONAL INFO:

x1 CONDUIT IN TOTAL:
 - x1 - 19mmØ CONDUIT C/W NEW DEVICE BOX AND COVER PLATE RUN BACK TO PANEL (x1 NEW LEGRAND RADIANT 15AMP TAMPER-RESISTANT USB TYPE A/C COMBINATION RECEPTACLE, OR APPROVED ALTERNATE FOR CONVENIENCE RECEPTACLE AT INSTRUCTOR'S PODIUM)
6. INSTALL NEW FIRE RATED FLOOR BOX TO PROVIDE POWER TO HEIGHT ADJUSTABLE TABLES. NEW DEVICE TO BE 'LEGRAND EVOLUTION 4" POKE-THRU DEVICE', OR APPROVED ALTERNATE. MODEL 4ATCP4RBK AS SHOWN ON DWG 2/E-5.0. PROVIDE ALL ACCESSORIES AND CONDUIT FEEDS REQUIRED FOR FLOOR BOX INSTALLATION. INSTALL NEW 20AMP BREAKER IN BLANK CIRCUIT LOCATION #35 IN PANEL EN-PP-400 TO FACILITATE INSTALLATION OF POKE-THRU DEVICE. INSTALL NEW WIRING AS REQUIRED BACK TO PANEL. WESTINGHOUSE TYPE PANEL. INSTALL NEW CONDUIT AND JUNCTION BOX AS REQUIRED.
7. INSTALL NEW STAINLESS STEEL BLANK PLATE TO EXISTING DATA DEVICE BOX.
8. INSTALL NEW STAINLESS STEEL BLANK PLATE TO EXISTING JUNCTION BOX.
9. NEW CONDUIT LOCATION FOR AV AND POWER SUPPLYING SCREEN DISPLAY; SEE DWG 4/E-5.0 FOR ADDITIONAL INFO. SCREENS AND MOUNTS OWNER SUPPLIED AND INSTALLED.

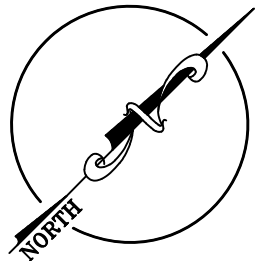
x2 CONDUIT IN TOTAL:
 - x1 - 25mmØ CONDUIT STUBBED 150mm ABOVE CEILING C/W NEW 100x100mm SQ. DEEP DEVICE BOX AND DOUBLE PLASTER RING (AV CABLING FOR SCREEN DISPLAY)
 - x1 - 19mmØ CONDUIT C/W NEW DEVICE BOX AND COVER PLATE RUN BACK TO PANEL (x1 NEW DUPLEX RECEPTACLE FOR SCREEN DISPLAY)
10. NEW 25mmØ CONDUIT STUBBED 150mm ABOVE CEILING C/W NEW 100x100mm SQ. DEEP DEVICE BOX AND DOUBLE PLASTER RING (AV CABLING FOR CAMERA). CAMERA OWNER SUPPLIED AND INSTALLED.
11. INSTALL NEW STAINLESS STEEL BLANK PLATE TO EXISTING DEVICE BOX.
12. SEE DWG 1/A-0.2 FOR PANEL LOCATIONS.
13. COORDINATE EXACT LOCATIONS ON SITE WITH GENERAL CONTRACTOR, FURNITURE SUPPLIER AND PROJECT COORDINATOR.



1. INSTALL NEW 35mm CONDUIT FOR FIBRE CONNECTION. CONTRACTOR TO INSTALL NEW PULL BOXES ALONG ENTIRE LENGTH OF CONDUIT RUN IN ACCORDANCE WITH APPENDIX F – MUNET SPECIFICATION, SECTION 2.4.2.6 PULL BOXES. INSTALL FISH LINE FOR FIBRE CONDUIT ALONG ENTIRE LENGTH OF CONDUIT RUN. NEW CONDUIT TO TIE-INTO 305x305x76mm BOX AT INSTRUCTOR'S PODIUM AND TERMINATE ABOVE CEILING IN EN-4007. CONTRACTOR SHALL NOT USE ANY INTERIOR SPACES, OTHER THAN CONSTRUCTION AREAS INSIDE HOARDING WALLS (EN-4033), FOR STORAGE OR LAY-DOWN AREAS.
2. ALL WORK REQUIRED TO BE PERFORMED OUTSIDE HOARDING/ CONSTRUCTION SITE (EN-4033) SHALL BE DONE AFTER 5PM TO 8AM. PROVIDE 24 HOURS NOTICE PRIOR TO EACH WORK SHIFT. ALL CEILING TILES MUST BE BACK IN PLACE FOR NORMAL BUSINESS HOURS. CONTRACTOR SHALL NOT USE ANY INTERIOR SPACES, OTHER THAN CONSTRUCTION AREAS INSIDE HOARDING WALLS (EN-4033), FOR STORAGE OR LAY-DOWN AREAS.
3. LEVEL 4 ACCESS LOCATED IN EN4033, 4C01 AND 4007 HAVING ACOUSTIC CEILING SYSTEMS. EXISTING CONDITION OF CEILING TILE WILL BE DOCUMENTED PRIOR TO START OF WORK. CONTRACTOR IS RESPONSIBLE FOR REPLACEMENT OF DETERIORATED, OR BROKEN CEILING TILE AS A RESULT OF CONSTRUCTION.



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- Dedication plaque, Arts & Administration Building, St. John's Campus

ENGINEERING BUILDING
RENOVATIONS TO EN-4033
Project #: EN-110-23

NEW
ELECTRICAL PLAN
&
ELECTRICAL CONDUIT
PLAN

M.F.

AS SHOWN

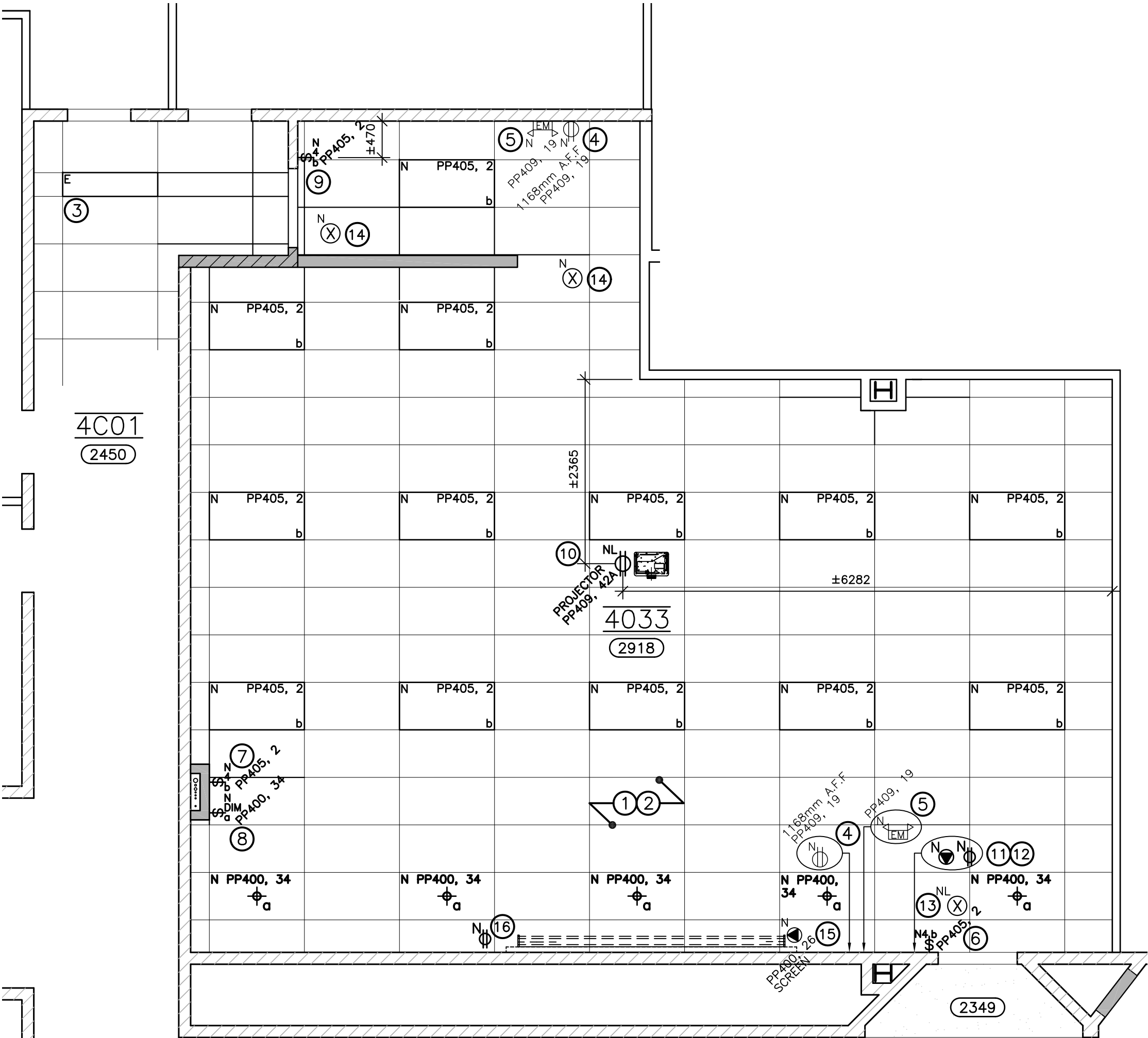
EN-110-23

APRIL, 2025

E-3.0

NEW ELECTRICAL CEILING PLAN NOTES: (#)

1. INSTALL THIRTEEN (x13) NEW 610x1220mm LED FLAT PANEL LIGHT FIXTURE, 'CPX LED SERIES' BY 'LITHONIA LIGHTING' OR APPROVED ALTERNATE. TO BE 4000 LUMENS, 80CRI, SWITCHABLE COLOUR TEMP BETWEEN 3500 AND 5000K, 347V.
2. INSTALL FIVE (x5) NEW 203mm SWITCHABLE ULTRATHIN PRODIGY WAFER LIGHT FIXTURE, 'UTP-R8686 MATTE WHITE 20WSCCTA-120347V-DIM-CRI80' BY 'EELIGHTING', OR APPROVED ALTERNATE. TO BE 1400 LUMENS, 80CRI, SWITCHABLE COLOUR TEMP BETWEEN 2700 AND 5000K, 347V.
3. EXISTING LIGHT FIXTURE TO REMAIN.
4. SUPPLY AND INSTALL NEW DUPLEX RECEPTACLE FOR EMERGENCY LIGHTING UNIT. INSTALL JUST BELOW T-BAR CEILING. CONNECT TO EXISTING LIGHTING CIRCUIT. PROVIDE 19mm CONDUIT AT WALL AND RUN BACK TO PANEL.
5. SUPPLY AND INSTALL NEW EMERGENCY LIGHTING BATTERY UNIT, 'LDXC SERIES - LDXC1244', OR APPROVED ALTERNATE, C/W TWO (2) MR16 LED, 12V-6W LAMP HEADS, MAINTENANCE FREE SEALED LEAD ACID BATTERY W/ 120 MINUTES RUNTIME, STEEL HOUSING W/ ANTI-CORROSION UNDERCOATING, 120/347 VAC WITHOUT LINE CORD, FACTORY WHITE. CONNECT TO EXISTING LIGHTING CIRCUIT.
6. SUPPLY AND INSTALL NEW SWITCH TO EXISTING DEVICE BOX. PROVIDE NEW WRING AS REQUIRED. NEW SWITCH TO BE 4-WAY TOGGLE TYPE AND COMPATIBLE WITH NEW LIGHT FIXTURES.
7. SUPPLY AND INSTALL NEW SWITCH W/ DEVICE BOX RECESSED INTO GYPSUM BOARD WALL. LOCATION AS PER DWG 3/E-5.0. PROVIDE 19mm CONDUIT IN WALL AND RUN BACK TO PANEL. NEW SWITCH TO BE 4-WAY TOGGLE TYPE AND COMPATIBLE WITH NEW LIGHT FIXTURES. NEW SWITCH TO BE LOCATED 1200mm A.F.F.
8. SUPPLY AND INSTALL NEW SWITCH W/ DEVICE BOX RECESSED INTO GYPSUM BOARD WALL. LOCATION AS PER DWG 3/E-5.0. PROVIDE 19mm CONDUIT IN WALL AND RUN BACK TO PANEL. NEW SWITCH TO BE DIMMER TYPE AND COMPATIBLE WITH NEW LIGHT FIXTURES. NEW SWITCH TO BE LOCATED 1200mm A.F.F.
9. SUPPLY AND INSTALL NEW SWITCH W/ DEVICE BOX SURFACE MOUNTED TO CMU BLOCK WALL. PROVIDE 19mm CONDUIT AT WALL AND RUN BACK TO PANEL. NEW SWITCH TO BE 4-WAY TOGGLE TYPE AND COMPATIBLE WITH NEW LIGHT FIXTURES. NEW SWITCH TO BE LOCATED 1200mm A.F.F.
10. NEW LOCATION FOR PROJECTOR RECEPTACLE. RE-ROUTE, EXTEND, OR MODIFY POWER FEEDS AS REQUIRED TO FACILITATE RELOCATION.
11. SUPPLY AND INSTALL NEW DIRECT POWER CONNECTION FOR NEW AUTOMATIC DOOR OPERATOR. INSTALL SURFACE MOUNTED JUNCTION BOX ABOVE CEILING, EXTEND SURFACE MOUNTED CONDUIT DOWN TO DOOR OPERATOR AND BACK TO PANEL. COORDINATE INSTALLATION WITH GENERAL CONTRACTOR.
12. SUPPLY AND INSTALL NEW DUPLEX RECEPTACLE W/ DEVICE BOX MOUNTED ABOVE CEILING SPACE FOR PROX CARD SYSTEM. PROVIDE 19mmØ CONDUIT RUN BACK TO PANEL.
13. REINSTATE EXISTING EXIT SIGN USING SAME CIRCUIT. CENTER SIGN OVER DOOR.
14. SUPPLY AND INSTALL TWO (x2) NEW CEILING MOUNTED EXIT SIGN 'ES SERIES', ALL-METAL PICTOGRAM EXIT SIGN, OR APPROVED ALTERNATE. NEW SIGN TO BE TWO WIRE UNIVERSAL AC INPUT: 120 TO 347Vac; TWO-WIRED DC INPUT: 6 TO 24Vac. COLOUR TO BE FACTORY WHITE. CONNECT TO EXISTING EMERGENCY LIGHTING CIRCUIT. CONTRACTOR TO CONFIRM LIGHTING CIRCUIT. CENTER SIGN OVER DOOR, OR OPENING.
15. DIRECT POWER CONNECTION FOR OWNER SUPPLIED PROJECTOR SCREEN. REUSE EXISTING CIRCUIT. PROVIDE NEW WIRING AS REQUIRED. NEW PROJECTOR SCREEN HAVING 120V, 60Hz, 1.1 AMP CURRENT DRAW. NEW SCREEN TO BE WALL MOUNTED BELOW EXISTING LAT CEILING SYSTEM. CABLE EXIT AND JUNCTION BOX IS LOCATED AT THE LEFT ENDCAP.
16. NEW DUPLEX RECEPTACLE MOUNTED ABOVE CEILING FOR ASSISTIVE LISTENING DEVICE. ASSISTIVE LISTENING DEVICE OWNER SUPPLIED AND INSTALLED.
17. ALL LIGHT FIXTURES CONNECTED TO 347V POWER LIGHTING CIRCUITS.



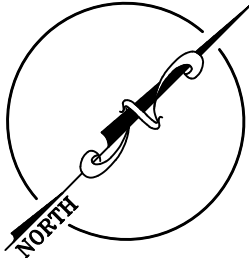
NEW ELECTRICAL CEILING PLAN

SCALE: 1:50

No.	REVISION	DATE
RO	ISSUED FOR TENDER	APRIL 3, 2025

GENERAL NOTES

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FACILITIES MANAGEMENT

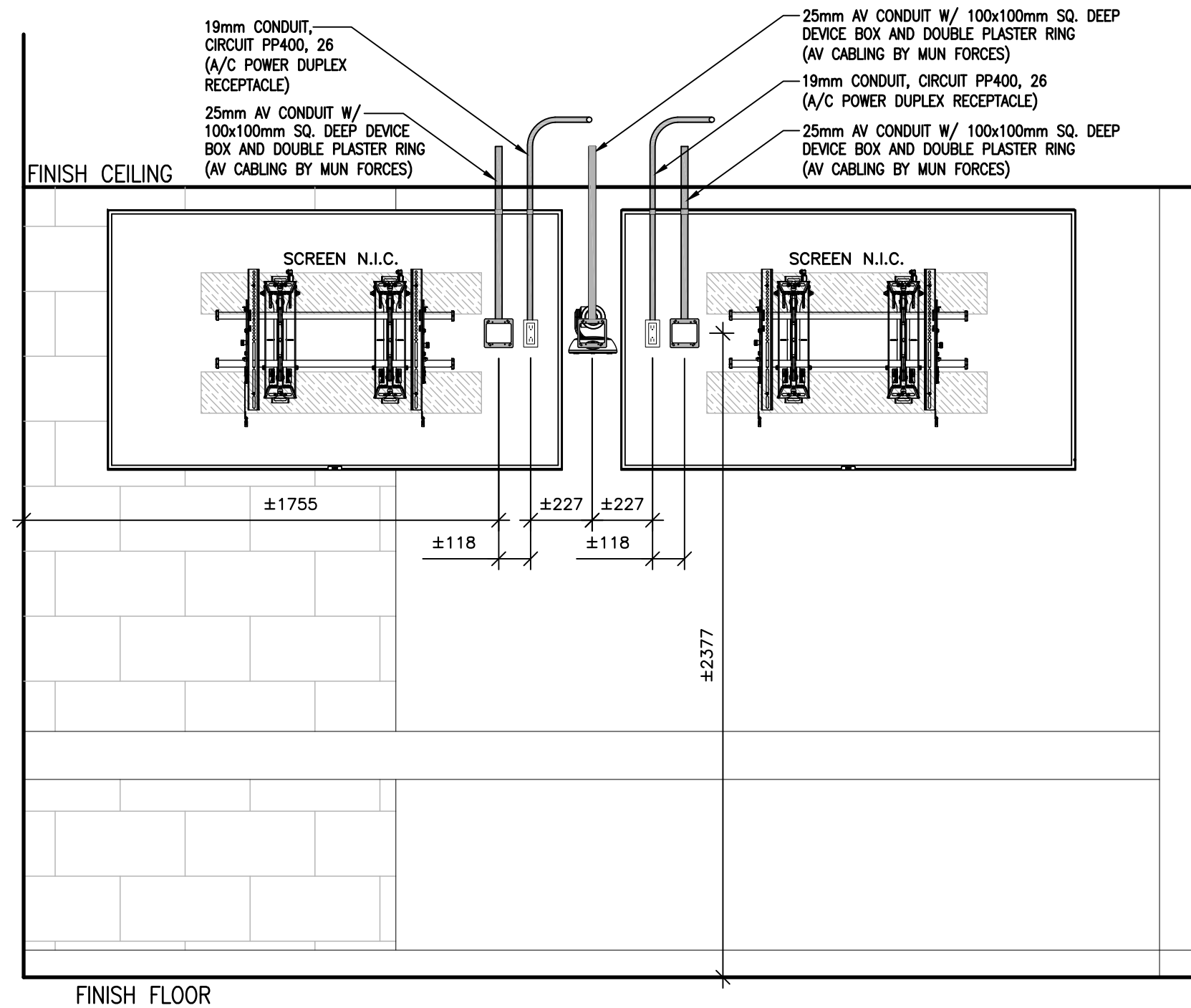
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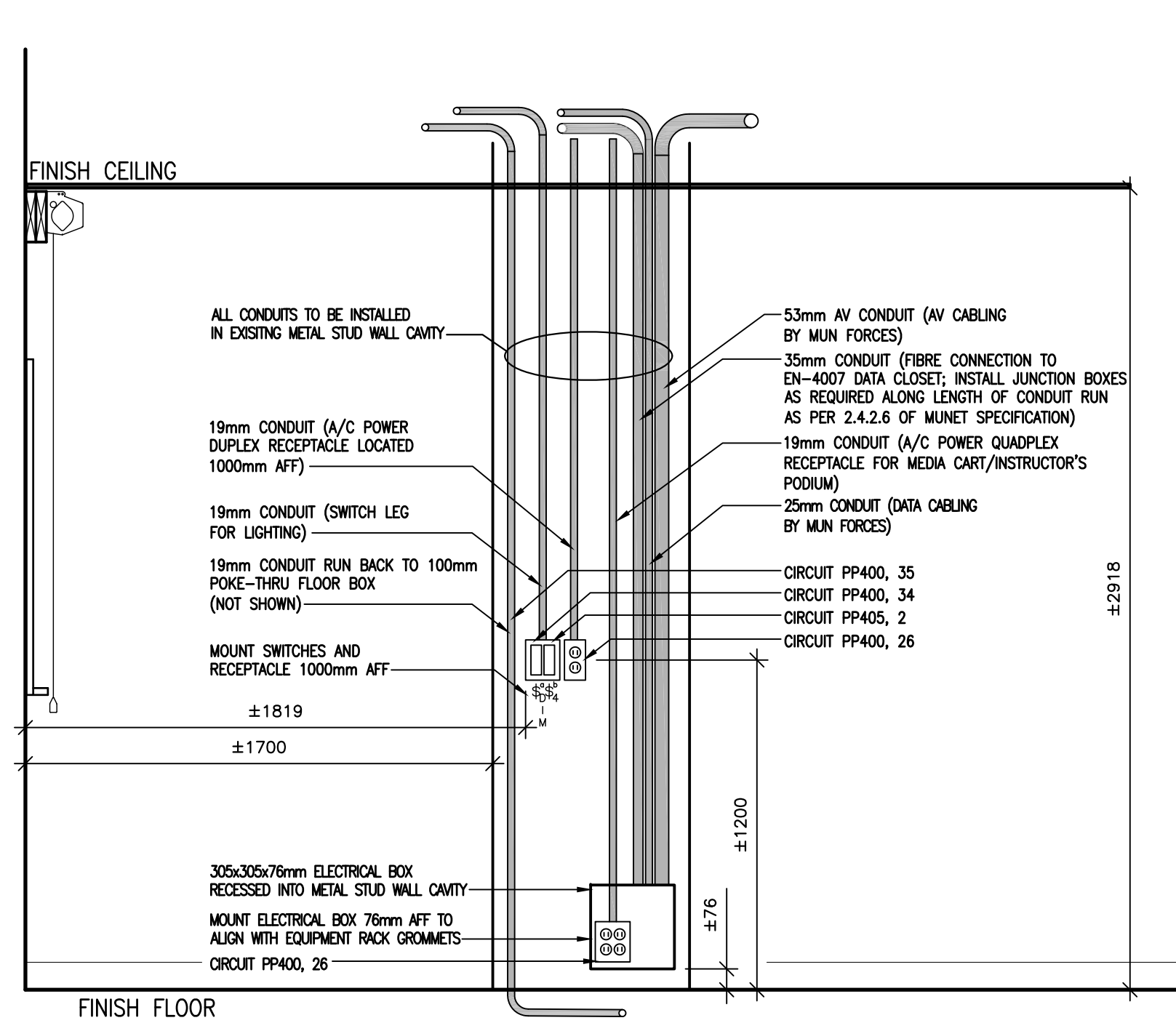
PROJECT NAME:
ENGINEERING BUILDING RENOVATIONS TO EN-4033
Project #: EN-110-23

DRAWING TITLE:
NEW ELECTRICAL CEILING PLAN

REVIEWED: M.F.	DRAWN: E.B.
SCALE: AS SHOWN	DATE: APRIL, 2025
MUN PROJECT No. EN-110-23	DRAWING No. E-4.0



CONDUIT ELEVATION – LED SCREENS
SCALE: 1:20



CONDUIT ELEVATION – INSTRUCTOR'S PODIUM
SCALE: 1:20

HARDWARE NOTES:

1. PROVIDE NEW 800 SERIES WIREMOLD RACEWAY (BY LEGRAND, OR APPROVED ALTERNATE):
 - 1.1. EXTEND RACEWAY FROM ABOVE FINISHED CEILING TO DOOR OPERATORS AND FROM OPERATORS TO SURFACE MOUNT BOXES FOR ACTUATORS
 - 1.2. 800BAC RACEWAY
 - 1.3. INCLUDE BLANK END FITTING, ENTRANCE END FITTING, COVER CLIP, AND OTHER REQUIRED COMPONENTS TO COMPLETE FULL INSTALLATION

BOTTOM FEED PLATES AND HOUSING ASSEMBLIES

- STANDARD BOTTOM FEED W/
 - x1 19mm TRADE SIZE CONDUIT STUB, LOCATED BELOW RECEPTACLE
 - x1 38mm TRADE SIZE CONDUIT STUB, LOCATED BELOW OPEN GANG

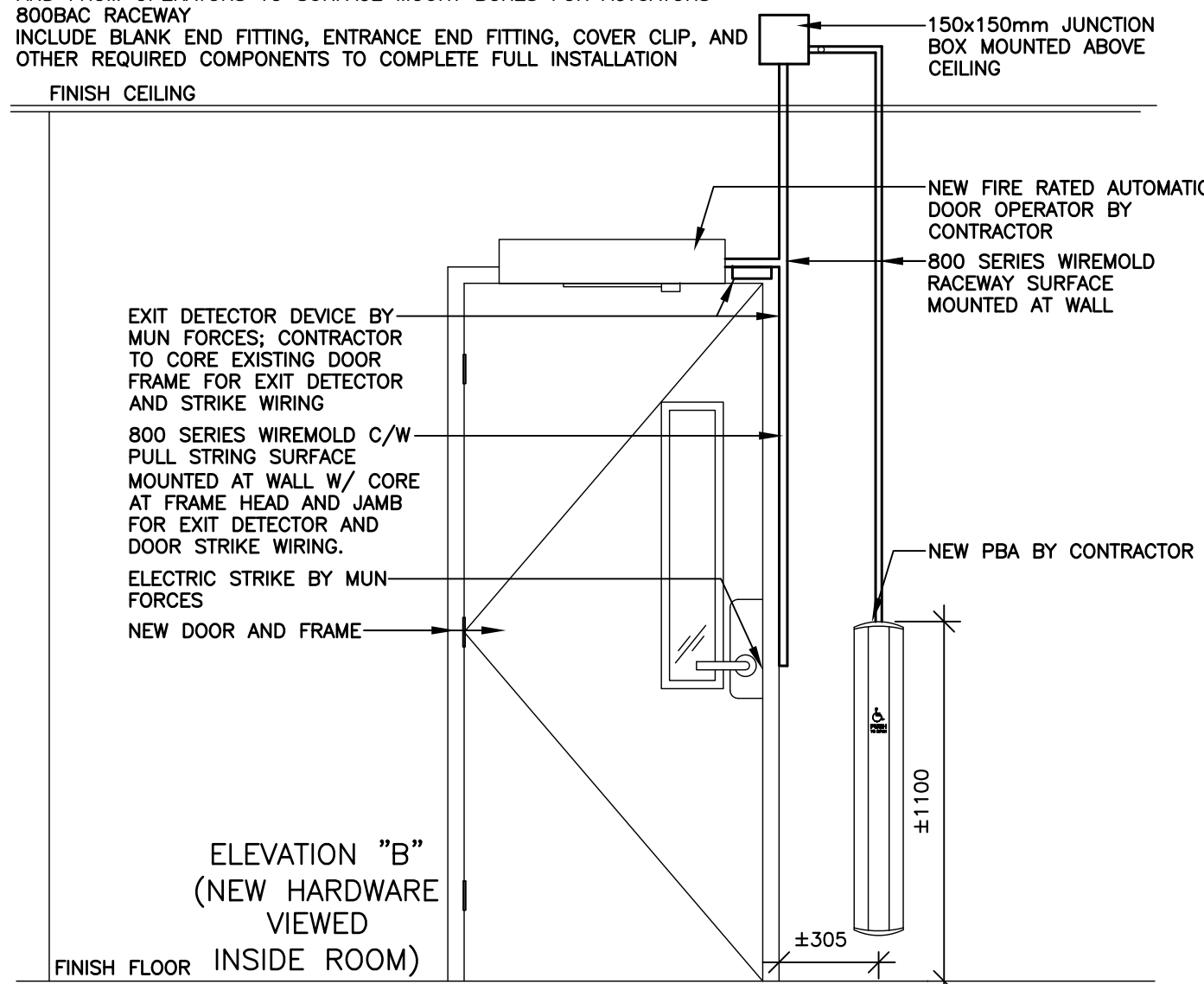
TOP FEED PLATES AND HOUSING ASSEMBLIES

- x2 LEGRAND 4REC MOUNTING PLATE W/
 - x2 TR 20AMP GFCI DUPLEX RECEPTACLE FOR WORKSTATIONS

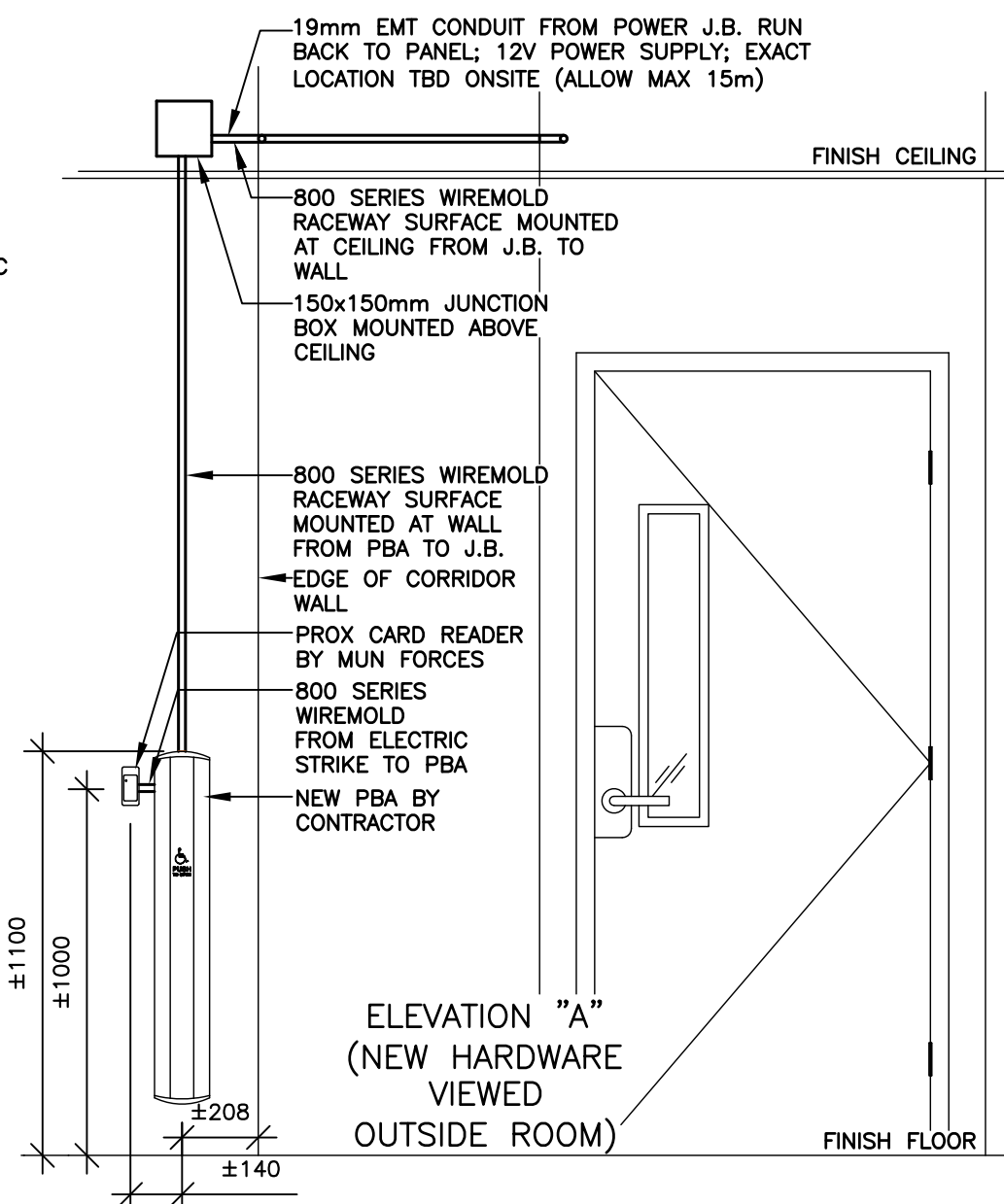
CONTRACTOR TO SUPPLY AND INSTALL 'LEGRAND EVOLUTION SERIES 4" POKE-THRU DEVICE'; MODEL NUMER 4ATCP4RGY. SUBMIT SHOP DRAWINGS FOR APPROVAL.

DEVICE TO COME COMPLETE WITH THE COVER AND STEM PRE-ASSEMBLED TOGETHER. CONTRACTOR TO SUPPLY AND INSTALL ALL MOUNTING PLATES, HOUSING ASSEMBLIES, RECEPTACLES, CONDUIT, FASTENERS, AND HARDWARE UNLESS NOTED OTHERWISE.

DEVICE TO BE UL FIRE RATED FOR UP TO 2HR RATED FLOORS.



PUSH BUTTON ACTUATOR EQUIPMENT & CONDUIT ELEVATION
SCALE: 1:20

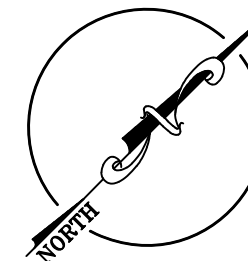


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PROJECT NAME:

ENGINEERING BUILDING RENOVATIONS TO EN-4033
Project #: EN-110-23

DRAWING TITLE:

ELECTRICAL DETAILS

REVIEWED: M.F.	DRAWN: E.B.
SCALE: AS SHOWN	DATE: APRIL, 2025
MUN PROJECT No. EN-110-23	DRAWING No. E-5.0

WORKSTATION POKE-THRU DEVICE
SCALE: NTS

2
E-5.0

GENERAL EMCS NOTES:

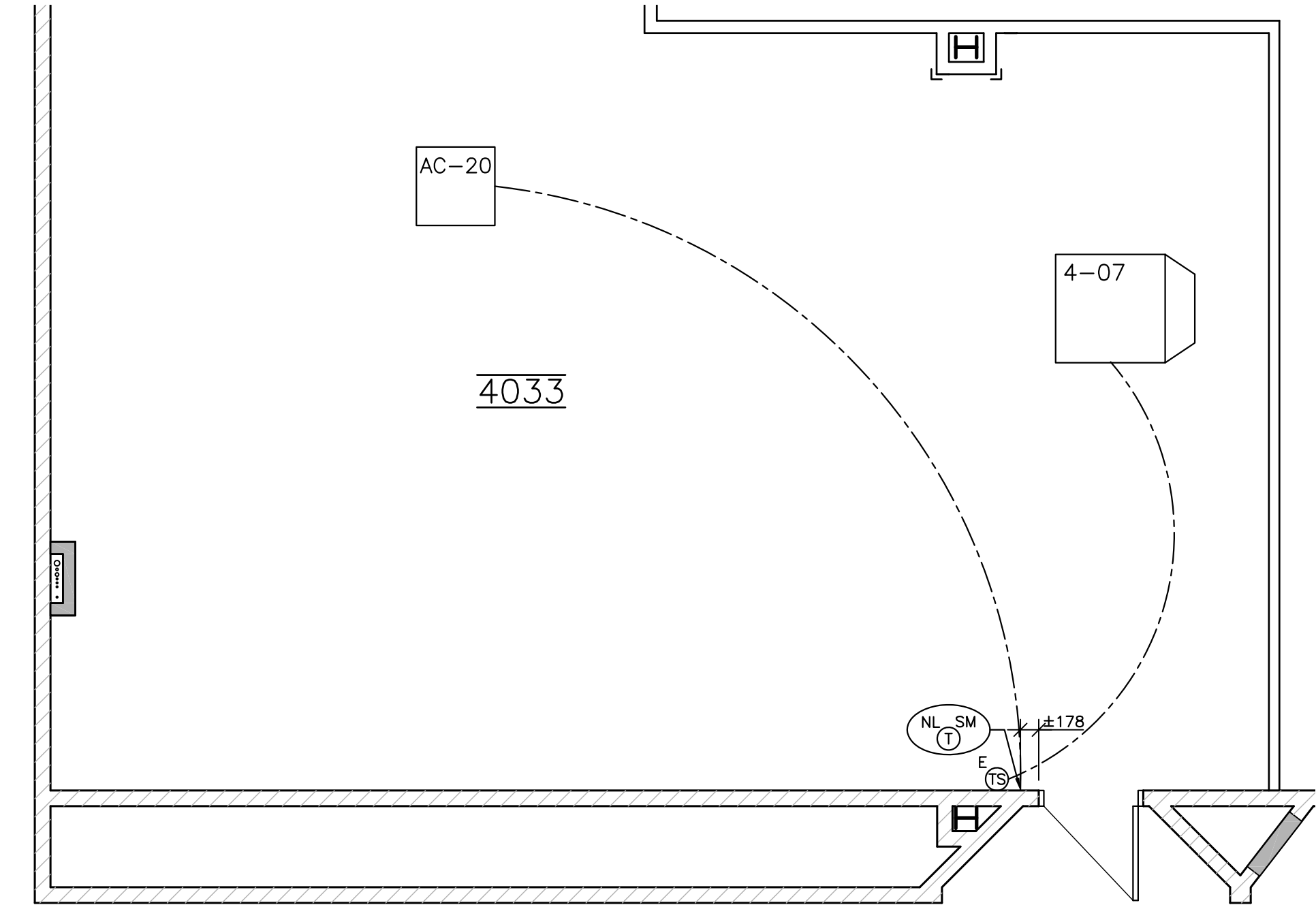
DIVISION 25: SCOPE OF WORK TO BE INCLUDED IN CASH ALLOWANCE

1. ALL CONTROLS TO BE FULLY INTEGRATED INTO EXISTING HONEYWELL DDC SYSTEM. INCLUDE ALL COSTS FOR TESTING, COMMISSIONING, CONTROL INTEGRATION, AND ALL OTHER SCOPE AS PER DIVISION 25 SPECIFICATIONS.

DIVISION 26:

SCOPE OF WORK TO BE INCLUDED IN CONTRACT PRICE

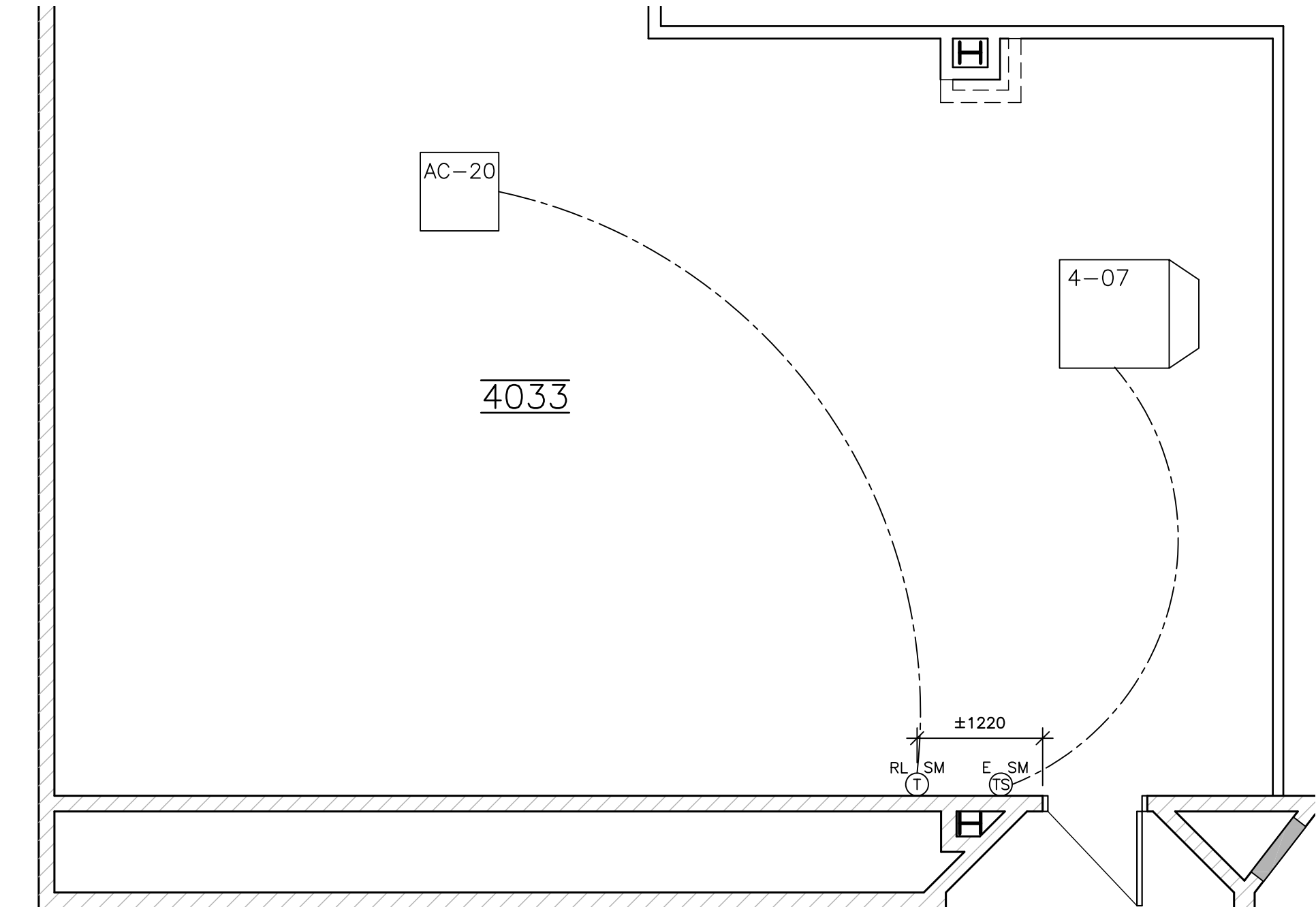
1. RELOCATE EXISTING THERMOSTAT AS SHOWN. RE-ROUTE, EXTEND, OR MODIFY POWER FEED AS REQUIRED TO FACILITATE RELOCATION. LABEL RELOCATED DEVICE. INCLUDE ALL COSTS FOR REMOVAL AND RELOCATION OF DEVICE. REPLACE EXISTING DEVICE BOX W/ NEW MODEL COMPATIBLE WITH EXISTING THERMOSTAT.
2. EXISTING TEMPERATURE SENSOR TO REMAIN.
3. INCLUDE ALL CONTROL WIRING, CONDUIT, JUNCTION BOXES, AND ALL OTHER ASSOCIATED COMPONENTS REQUIRED FOR RELOCATED DEVICE.



NEW ELECTRICAL FLOOR PLAN

SCALE: 1:50

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EM-1.0



DEMOLITION ELECTRICAL FLOOR PLAN

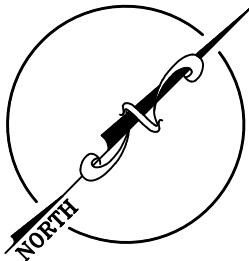
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No.	REVISION	DATE
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PROJECT NAME:

ENGINEERING BUILDING
RENOVATIONS TO EN-4033
Project #: EN-110-23

DRAWING TITLE:

DEMOLITION & NEW
EMCS
FLOOR PLAN

REVIEWED:

M.F.

DRAWN:

E.B.

SCALE:

AS SHOWN

DATE:

APRIL, 2025

MUN PROJECT No.

EN-110-23

DRAWING No.

EM-1.0