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Part 1 - General

1.1. General Requirements

1.1.1. Read and conform to:

- 1.1.1.1. CCDC 2 Stipulated Price Contract – 2020, as amended by Supplementary Conditions.
- 1.1.1.2. Division 01 requirements and documents referred to therein.

1.2. Available Information

1.2.1. Following Available Information is appended to this Section.

1.3. Reports

The following documents are provided for information purposes only and do not form part of the Contract Documents:

1.3.1. Hazardous Materials/Designated Substances:

- 1.3.1.1. "Designated Substances and Hazardous Materials Survey", dated April 4, 2024 and corresponding letter dated February 19, 2026, prepared by Ontario Environmental & Safety Network Ltd.

END OF SECTION

Part 1 - General

1.1. General Requirements

1.1.1. Read and conform to:

- 1.1.1.1. CCDC 2 Stipulated Price Contract - 2020, as amended by Supplementary Conditions.
- 1.1.1.2. Division 01 requirements and documents referred to therein.

1.2. Division of Work

- 1.2.1. Division of the Work among Subcontractors and Suppliers is solely the Contractor's responsibility. The Consultant and the Owner assume no responsibility to act as an arbiter to establish subcontract limits between Sections or divisions of the Work.

1.3. Specifications Language and Style

- 1.3.1. Specifications are addressed to the Contractor. Specifications are not intended to be a detailed description of installation methods but rather serve to indicate particular requirements in completing the Work.
- 1.3.2. Where the Contract Documents do not provide sufficient information for complete installation of an item, the Contractor shall comply with the manufacturer's written instructions regarding the quality of work.
- 1.3.3. These Specifications are written in the imperative mood and in streamlined form. The imperative language is directed to the Contractor, unless stated otherwise in the Contract Documents.
- 1.3.4. Syntax:
 - 1.3.4.1. Complete sentences by reading "shall", "Contractor shall", "shall be", and similar phrases by inference. Where a colon (:) is used within sentences and phrases, read the words "shall be" by inference.
 - 1.3.4.2. Where the words "accepted", "reviewed", "designated", "directed", "inspected", "instructed", "permitted", "required", and "selected" are used in standards or in the Contract Documents, they are deemed to be followed by the words "by the Consultant and the Owner", unless the context provides otherwise.
 - 1.3.4.3. Where the words "acceptable", "submit" and "satisfactory" are used in standards or in the Contract Documents, they are deemed to be followed by the words "to the Consultant and the Owner", unless the context provides otherwise.
 - 1.3.4.4. Where the masculine is used in the Contract Documents, it shall be read and interpreted as if the feminine or neuter had been used when the context of the statement so requires, and the rest of the sentence, clause, paragraph or item shall be interpreted as if all changes in grammar, gender or terminology thereby rendered necessary had been made.
 - 1.3.4.5. The words "include", "includes" or "including" mean "include without limitation", "includes without limitation" and "including without limitation", respectively, and the words following "include", "includes" or "including" shall not be considered to set forth an exhaustive list.
 - 1.3.4.6. Wherever words "indicated", "shown", "noted", "listed", "specified" or similar words are used in the Contract Documents they are understood, unless otherwise defined, to mean "indicated", "shown", "noted", "listed", or "specified" on the Contract Documents, unless the context provides otherwise.
 - 1.3.4.7. Reference to the word "Section" or "Sections" in the Contract Documents shall mean a Section or Sections of the Divisions of the Specifications, if applicable.
- 1.3.5. Fulfill and perform all indicated requirements whether stated imperatively or otherwise.
- 1.3.6. When used in the context of a Product, read the word "Provide" to mean "Supply and Install to result in a complete installation ready for its intended use".

- 1.3.7. Where items in the Contract Documents are referred to in singular, provide as many as required to complete the Work. Drawings, Lists or Schedules of Items are intended to show scope and arrangement of work. For location of item described refer to such Drawings, Lists or Schedules unless location stipulated in the Specifications.

1.4. Drawings

- 1.4.1. The Contractor shall carefully review and conform to all Drawings and Specifications. Where information is shown on one Drawing, it shall be interpreted as applicable to all relevant Drawings, regardless of discipline. Drawings shall be read in conjunction with those prepared by specialty consultants. In cases where a detail or requirement appears on one Drawing but is not repeated on others, it remains part of the Contract, and the Contractor shall be responsible for its provision.
- 1.4.2. The Drawings for the Project have been prepared in International System of Units (SI) metric units.
- 1.4.3. The Contractor shall prepare current As-Built Drawings during the course of the Work, which shall be maintained by the Contractor and made available to the Consultant for review with each application for payment.

1.5. Discrepancies/Conflicts/Omissions

- 1.5.1. If discrepancies or conflicts in, or omissions from the Drawings, the Specifications or the other Contract Documents are suspected, or if there is doubt as to meaning or intent thereof, notify the Consultant at once. Where there is conflict between the Contract Documents, the most stringent requirement shall prevail.
- 1.5.2. Drawings, Specifications and other Contract Documents are intended to be in compliance with federal, provincial and municipal laws, by-laws, regulations and other requirements of the Authorities Having Jurisdiction. Perform work in conformity with such requirements. If discrepancies, conflicts or omissions are suspected, notify the Consultant at once.
- 1.5.3. Comply with the Consultant's written instructions or explanations. The Consultant has final say when interpreting the Contract Documents, Building Inspector or another representative of the Authority Having Jurisdiction is not considered final say.
- 1.5.4. Promptly and not later than within 10 Working Days of becoming aware of circumstances which may require a change in the Work or other directions, give written notice to the Consultant outlining such circumstances and request written instructions. Do no work in affected area, or that would prevent the Consultant from properly assessing situation or evaluating change, without its prior written instructions. The Consultant will act promptly to give the Contractor instructions so the Work is not unreasonably delayed.

1.6. Description of the Work

- 1.6.1. The Work of this Contract includes supplying labour, materials, equipment, services and other related expenses to execute complete construction of the Project specified under the Contract Documents.
- 1.6.2. Term "NIC" means Work of this Project which is not being performed or provided under this Contract; term means "Not In this Contract" or "Not a Part of the Work to be Performed or Provided by the Contractor".
- 1.6.3. "NIC" work may be specified or indicated on the Drawings as an aid to the Contractor in scheduling amount of time and materials necessary for completion of the Work.

1.7. Contract Documents for Construction Purposes

- 1.7.1. The Owner will supply the Contractor with a complete set of the Contract Documents in electronic form before commencement of the Work. The Contractor shall print hard copies for construction purposes as required.

1.8. Documents at the Site

- 1.8.1. Keep the following documents at the Place of the Work, stored securely and in good order and available to the Owner and the Consultant in hard copy and electronic form:
 - 1.8.1.1. Current Contract Documents, including the Drawings, the Specifications and addenda.
 - 1.8.1.2. Change Orders, Change Directives, and Supplementary Instructions.
 - 1.8.1.3. Reviewed Shop Drawings, Product data and samples.
 - 1.8.1.4. Field test reports and records.
 - 1.8.1.5. Construction progress schedule.
 - 1.8.1.6. Meeting minutes.
 - 1.8.1.7. Manufacturer's certifications.
 - 1.8.1.8. Permits, inspection certificates, and other documents required by the Authorities Having Jurisdiction.
 - 1.8.1.9. Current As-Built Drawings.
 - 1.8.1.10. Safety Data Sheets (SDS) for all controlled Products.
- 1.8.2. The Contractor shall maintain and keep accurate Project records (which means all tangible records, daily reports, daily logs, documents, computer printouts, electronic information, books, plans, Drawings, Specifications, accounts or other information relating to the Work) in its office in Ontario in accordance with requirements of law, but in any event for not less than 6 years from the date of Substantial Performance of the Contract or until all claims have been settled, whichever time period is longer. The records shall include detailed records of all actions taken by the Contractor related to security and health and safety legislation in the Place of the Work. During this time, the Contractor shall allow the Owner access to the Project records during normal business hours upon the giving of reasonable notice. The Contractor shall ensure that equivalent provisions to those provided herein are made in each subcontract and shall require the Subcontractors and Suppliers to incorporate them into every level of contract thereunder for any part of the Work.
- 1.9. Contractor's Use of Premises**
 - 1.9.1. Except as otherwise specified in the Contract Documents, the Contractor has unrestricted use of the Place of the Work from the date specified in the Notice to Commence Work issued by the Owner until Substantial Performance of the Contract .
 - 1.9.2. Confine Construction Equipment, Temporary Work, storage of Products, waste products and debris, and all other construction operations to limits required by laws, ordinances, permits, and the Contract Documents, whichever is most restrictive. Do not unreasonably encumber the Place of the Work.
 - 1.9.3. The Contractor shall not load or permit to be loaded any part of the Work with a weight or force that will endanger the safety of the Work.
- 1.10. Scheduling**
 - 1.10.1. Base sequence and scheduling of construction on maintaining continuous operation and access to the Work during construction.
 - 1.10.2. Phase construction as described herein. Notify the Owner in writing 7 Days prior to beginning work in an occupied area. The Owner will accommodate request within 7 Days of notification. Co-ordination with the Owner is crucial. Submit a progress schedule before commencement of the Work. Coordinate any suggested changes to schedule with the Owner. Ensure schedule includes adequate time for Product delivery and Shop Drawing preparation, review and resubmission.
 - 1.10.3. Allow for un-scheduled interruption to schedule of the Work and suspend parts of the Work affected to permit the Owner to relocate furniture and equipment from the Place of the Work, into finished spaces. The Owner will coordinate this interruption.
 - 1.10.4. Completion Deadlines: Phase and schedule the Work to meet deadlines originally committed to by the Contractor.

1.10.5. Phasing of Project

- 1.10.5.1. Project is divided into distinct phases.
- 1.10.5.2. For reference purposes, each phase has been given following titles:
 - 1.10.5.2.1. Phase 1 - where indicated on Drawings.
 - 1.10.5.2.2. Phase 2 - where indicated on Drawings.
 - 1.10.5.2.3. Phase 3 - remainder of construction.

1.11. Occupancy Requirements Under Phased Work

- 1.11.1. Provide partial occupancy and full occupancy as required for each Phase or partial Phase of Work that has been completed and areas required by the Owner in order to maintain a functioning facility.
- 1.11.2. Complete the following requirements 2 weeks prior to scheduled turn over date and submit all required documentation to the Consultant for review and comments at that time:
 - 1.11.2.1. Provide Certificates from hydro, other utilities and the Authorities Having Jurisdiction.
 - 1.11.2.2. Provide confirmation in writing fire proofing and firestopping have been installed in area(s) scheduled to be occupied in accordance with requirements of the Contract Documents.
 - 1.11.2.3. Complete labeling of equipment and emergency power fixtures.
 - 1.11.2.4. Train staff in accordance with requirements of the Contract Documents and submit a video recording, and a list with name of attendees.
 - 1.11.2.5. Submit Record Drawings for area(s) to be occupied.
 - 1.11.2.6. Record and Provide fire alarm system complete with address on Record Drawings.
 - 1.11.2.7. Provide typed Panel Schedules and installed within panels.
 - 1.11.2.8. Test emergency lighting and provide data of lights levels.
 - 1.11.2.9. Test exit lighting.
 - 1.11.2.10. Provide thermo scan in accordance with requirements of the Contract Documents.
 - 1.11.2.11. Provide single line distribution diagram in main electrical and secondary electrical rooms that reflect modifications to Normal and Emergency Power distribution systems.
 - 1.11.2.12. Complete Protection and Short Circuit Study and submit results.
 - 1.11.2.13. Provide in writing that power distribution for both Normal and Emergency Power protection equipment has been adjusted to setting recommended in coordination study for Normal and Emergency Power distribution system.
 - 1.11.2.14. Provide lighting test reports for battery packs for areas covered by battery units.
 - 1.11.2.15. Provide completed fire alarm verification report with no deficiencies.
 - 1.11.2.16. Test flow switches as required in the Contract documents.
 - 1.11.2.17. Conduct audibility test and conform in writing that audibility requirements have been met in accordance with OBC requirements.
 - 1.11.2.18. Provide in writing that interface of fire alarm system to dimming system has been completed and tested.
 - 1.11.2.19. Provide confirmation and test results in writing regarding interface of fire alarm system to security system; fire alarm system to mechanical equipment; fire alarm system to facility management as applicable.
 - 1.11.2.20. Provide fire alarm graphic reviewed by Fire Department. Include in the Contract Price provision of temporary fire alarm graphic as required to meet phasing requirements of this Project.

- 1.11.2.21. Perform tests on Smoke Control System and Provide confirmation in writing that test results have been accepted by Fire Department.
- 1.11.2.22. Perform testing of equipment in accordance with requirements of the Contract Documents and equipment manufacturer's recommendations.
- 1.11.2.23. Complete Commissioning forms for equipment that serves area(s) to be occupied.
- 1.11.2.24. Provide temporary exit signs and ensure its operation prior to support phase of work being turned over.
- 1.11.2.25. Confirm in writing that the Owner has received spare parts as required by the Contract Documents.

1.12. Interruptions in the Work Schedule

- 1.12.1. Suspend parts of the Work affected as required to allow the Consultant to review mock-ups and to establish standards of workmanship for remainder of the Work. Provide 2 Working Days notice.

1.13. Inclement Weather and Cold Weather Work

- 1.13.1. Take precautions during inclement weather and Provide adequate protection.
- 1.13.2. Continue the Work, including winter months, if applicable, until the Work is completed and reviewed.
- 1.13.3. The Contractor shall be responsible for incorporating an appropriate buffer or float within the construction schedule to account for typical inclement weather conditions, based on historical weather data, risk assessment, and strategic scheduling for the Place of the Work. The Contractor shall also include provisions for any additional work required as a result of such weather conditions.
- 1.13.4. Prior to approving any requests for adjustments to the Contract Time due to inclement or adverse weather in accordance with GC 6.5.3 Delays, the Owner reserves the right to request a detailed quantification and justification of the buffer or float included within the schedule. If the Contractor fails to Provide sufficient and acceptable supporting data, including historical weather records and risk analysis, the request for an adjustment to the Contract Time shall not be considered.

1.14. Owner Occupancy

- 1.14.1. The Owner reserves right to occupy and use portions of premises, whether partially or entirely completed, or whether completed on schedule or not, provided such occupancy does not interfere with the Contractor's continuing work.
- 1.14.2. Partial occupancy or installation of equipment by the Owner does not imply acceptance of the Work in whole, or in part, nor shall it imply acknowledgment that terms of the Contract documents are fulfilled.

1.15. Place of the Work

- 1.15.1. Confine extent of construction activities to area indicated on Drawings as the Place of the Work and/or within area defined by property lines. Confine equipment, materials, debris, offices, storage sheds and storage areas to area previously defined.
- 1.15.2. The Contractor has complete and exclusive use of the Place of the Work for performance of the Work. Assume responsibility for premises assigned, for performance of the Work.
- 1.15.3. Should the Contractor require boundaries of the Place of the Work be temporarily extended, obtain instructions from the Consultant.
- 1.15.4. Certain restrictions are specified as to use by the Contractor of various portions of the Place of the Work. Become familiar with these restrictions and establish work plan to accommodate these restrictions. No claims for extra costs due to such restrictions will be considered by the Owner.
- 1.15.5. Assume responsibility for care, custody and control of property which is assigned for performance of the Work. Assume responsibility for and Make Good damage to existing property attributable to performance of the Work.

- 1.15.6. Provide required safety protection at fire exits at all times.

1.16. Existing Site Services

- 1.16.1. Before commencing the Work, establish location and extent of existing services in area of the Work and notify the Consultant of findings.
- 1.16.2. Consult public and service companies' records and become fully informed of locations and extent of buried and overhead services and utilities.
- 1.16.3. If disruption of services which affects operation of existing building is necessary, give a minimum of five (5) Working Days' notice to the Consultant and the Owner. Provide temporary services and obtain prior review from the Consultant and the Owner with regard to timing and methods for providing temporary services.
- 1.16.4. Be responsible for any damages caused to any existing Site services identified or which reasonably should have been identified.

1.17. Health Emergency

- 1.17.1. The parties acknowledge that from time to time, the Government of Canada, the Province of Ontario, the Region and other municipal authorities may respond with new legislative amendments, controls, and orders (collectively the "**Governmental Response**") to a public health emergency, including, but not limited to, communicable diseases, pandemics, epidemics or other health-related events) which was not reasonably foreseeable at the time of entering into the Contract (the "**Public Health Emergency**"). If the Contractor is delayed in the performance of the Work by a Public Health Emergency or a new Governmental Response (which was not reasonably foreseeable at the time of entering into the Contract), the parties agree it shall constitute a delay pursuant to GC 6.5.3 - Delays of CCDC 2 Stipulated Price Contract - 2020, as amended by the Owner in the Contract Documents. The Contractor shall not be entitled to any payment for costs incurred by such delays, save and except as provided for in GC 6.5.3. Nothing in this paragraph shall excuse the Contractor from complying with any notification requirements in the Contract including, without limitation, those contained in GC 6.5.4.
- 1.17.2. In the event of a delay to the Contractor's performance of the Work pursuant to GC 6.5.3, the Contractor shall be entitled to payment of the direct costs it reasonably incurs, without any mark-up, as a result of having to comply with new Governmental Response after the bid submission deadline in response to the Public Health Emergency associated with the following:
1. the Contractor being required to use additional tools or equipment, including PPE equipment, in its performance of the Work;
 2. the Contractor being required to purchase, use or Provide additional safety-related supplies in connection with its performance of the Work; or
 3. the Contractor being required to Install temporary facilities or structures, including hand washing stations.
- 1.17.3. Notwithstanding any other provision in the Contract, the Owner shall not be liable or deemed to be in breach of the Contract for any failure or delay in performance of its obligations under the Contract arising out of:
1. a Public Health Emergency;
 2. Governmental Response; or
 3. any impacts to the Owner's operations and performance of its obligations that are beyond its reasonable control and are caused by, relate to or arise out of the Public Health Emergency or the Governmental Response (including, without limitation, any delays in obtaining possession or access to the Place of the Work, or in obtaining permits from permitting offices or approvals from Authorities Having Jurisdiction).

END OF SECTION

Part 1 - General

1.1. General Requirements

1.1.1. Read and conform to:

- 1.1.1.1. CCDC 2 Stipulated Price Contract - 2020, as amended by Supplementary Conditions.
- 1.1.1.2. Division 01 requirements and documents referred to therein.

1.2. Working Hours

- 1.2.1. The Contractor shall only perform work at the Site between the hours 5:30 p.m. and 8:00 a.m., Monday through Friday and all day Saturday & Sunday (the "Working Hours"). If the Contractor is required to work at the Site outside of the Working Hours, it shall obtain prior written approval from the Owner.

1.3. Restrictions on Use of Premises

- 1.3.1. Confine the Work to the Site limits indicated on Drawings and/or within area defined by property lines. Carry out the Work in accordance with regulations of the Owner and the Authorities Having Jurisdiction including without any limitations any associated fees, permits, insurance or bonding required.
- 1.3.2. Bring following restrictions to attention of workers on the Work and enforce them:
 - 1.3.2.1. Restrict construction personnel to the Place of the Work and necessary access routes to it. Restrict non-construction personnel from the Site, except for the Contractor-authorized visitors.
 - 1.3.2.2. Noisy and disruptive work may require off hours scheduling and shall be coordinated with the Owner.
- 1.3.3. Restrict construction activities in public, in tenant areas, in locations noted to off-hours of 5:30 p.m. to 8:00 a.m. without additional cost to the Owner and return these areas to normal operations for hours of 8:00 a.m. to 5:30 p.m.
- 1.3.4. Do not load or permit to be loaded any part of the Work within a weight or force that will endanger the safety of the Work.

1.4. Use of Existing Facilities

- 1.4.1. Restrict access, parking, material deliveries, execution of work, operations and procedures to designated locations and times and do not deviate from designated procedures without prior acceptance by the Consultant in the presence of the Owner.
- 1.4.2. Periodically review proposed construction operations with the Consultant in the presence of the Owner and cooperate as required to ensure that Owner's interests and requirements are not unduly compromised with regard to the normal operation and function of occupied areas on the existing building.
- 1.4.3. Traffic through occupied areas of the existing building shall be kept to a minimum. Travel within occupied areas of the existing building shall be via the most direct route.
- 1.4.4. Noise, dust and debris, and odours shall be minimized to ensure building occupants in adjacent areas are disturbed as little as possible. Corrective action to cease or limit disagreeable annoyances to building occupants shall be implemented immediately upon notification by the Consultant or the Owner.
- 1.4.5. Use of existing laundry and garbage chutes shall not be permitted.
- 1.4.6. Use of existing containers and garbage bins shall not be permitted.
- 1.4.7. Use of existing public elevators shall not be permitted.
- 1.4.8. Existing Fire Protection Equipment:

- 1.4.8.1. Existing fire protection equipment shall only be used in an emergency situation.
- 1.4.8.2. Do not remove existing fire protection equipment.
- 1.4.8.3. If any existing fire protection equipment is used or interfered with in any way, the Owner's fire equipment inspector shall be retained to inspect, test, recharge, and otherwise repair such equipment at no additional cost to the Owner.

1.5. Work Sequence

- 1.5.1. Schedule and construct the Work in 3 stages to accommodate the Owner's use of premises during construction.
- 1.5.2. Schedule and construct the Work in stages to Provide for continuous public usage. Do not close off public usage of facilities until an alternative usage is available from a completed stage of the Work.

1.6. Owner Occupancy

- 1.6.1. The Owner will occupy the Place of Work during entire construction period and continue its business operations between 8:00 a.m. and 5:30 p.m.
- 1.6.2. The Contractor shall cooperate with the Owner in scheduling operations to minimize disruptions and to facilitate the Owner's usage.

1.7. Partial Owner Occupancy

- 1.7.1. Schedule designated portions of Work for the Owner's use prior to Substantial Performance of the Contract.
- 1.7.2. Designated Areas:
 - 1.7.2.1. Phase 1, completed within 34 Working Days from the Commencement Date.
 - 1.7.2.2. Phase 2, completed within 28 Working Days from completion of Phase 1.
 - 1.7.2.3. Phase 3, completed within 28 Working Days from completion of Phase 2.
- 1.7.3. The Owner will occupy designated areas once phased construction is complete..
- 1.7.4. Partial occupancy or installation of equipment by the Owner does not imply acceptance of the Work in whole, or in part, nor shall it imply acknowledgment that terms of the Contract are fulfilled.

1.8. Noisy Work Restrictions in Occupied Facilities

- 1.8.1. Schedule excessively noisy work to avoid disturbance to building occupants. Perform excessive noise generating work outside of the Owner's operating hours.
- 1.8.2. Use powder actuated devices only with Consultant's written permission.

1.9. Maintaining Life Safety Systems in Occupied Facilities

- 1.9.1. Maintain operational life safety systems and public access to exits in occupied areas during all stages of the Work.
- 1.9.2. Determine nature and exact locations of existing fire and smoke sensors prior to the commencement of the Work. Avoid direct or indirect jarring while working in adjacent areas and exercise caution to avoid triggering these devices.
- 1.9.3. Be responsible for costs incurred by the Owner on account of false fire alarms activated as a result of the execution of the Work without adequate precautions.

1.10. Provision for Traffic

- 1.10.1. All roads shall be kept open to through traffic and all lanes of traffic shall be maintained in each direction at all times.

1.10.2. Access shall be maintained at all times to all businesses and residences presently having access to the roads.

1.10.3. Closure of any driveways and parking spaces on Site must be agreed to by the property owner.

1.11. Other Contractors

1.11.1. Other work may be in progress within, and/or adjacent to, the Site, including the following:

1.11.1.1. Local Development Projects

1.11.2. The Contractor shall keep itself informed of any current, or new, local development projects which may impact construction activities and services and shall coordinate its activities with the developers.

1.11.3. The Contractor shall coordinate its work with the work of Other Contractors and shall not restrict access to the working areas or operations of the Other Contractors.

1.11.4. The Contractor shall maintain a separation of time and space from Other Contractors to ensure that the Owner is not placed in the position of "Constructor" within the meaning prescribed in the *Occupational Health and Safety Act*, RSO 1990, c O.1 and shall comply with all other requirements stipulated in GC 3.2 – CONSTRUCTION BY OWNER OR OTHER CONTRACTORS. No extension of the Contract Time and/or an increase to the Contract Price will be granted for delays resulting from this construction coordination.

1.12. Permits and Approvals

1.12.1. The Contractor shall adhere to all requirements, conditions and restrictions as specified in the permits and approvals required for the completion of the Work.

1.12.2. Pending Permits/Approvals

1.12.2.1. The Contractor is advised that the Owner is in the process of obtaining the following permits/approvals for the work described below:

1.12.2.1.1. Building Permit from the Town of Newmarket

1.12.3. Copies of the permits and approvals will be Provided to the Contractor once they have been obtained. The permits and approvals will form part of the Contract Documents and the Contractor shall comply with the requirements of all permits and approvals at no additional cost to the Owner.

1.12.4. The Contractor shall not commence any work for which a permit or approval is required until such time as the permit or approval has been obtained by the Owner and Provided to the Contractor.

1.12.5. In the event that the Owner encounters delays in obtaining the permits and approvals, any work for which a permit or approval is required may be deleted from the scope of Work under the Contract, or the Contract may be terminated in its entirety. The Contractor shall not have any claims for delays, on the part of the Owner, in obtaining the permits or approvals, or any claims in the event that any work is deleted from the Contract or the Contract is terminated because a required permit or approval has not been obtained by the Owner.

1.13. Security Regulations

1.13.1. Execute the Work in accordance with following security requirements and regulations.

1.13.2. Ensure only necessary tools and equipment are brought to each work area where access by public is possible. Keep constant check on these items and, at end of each work shift, bring all tools and equipment to storage room as directed.

1.13.3. The Owner will Provide security escort for the Work in locations it deems necessary.

1.13.4. The Owner may issue suitable keys or access cards to the Contractor, where possible. The Contractor shall sign receipt for keys or access cards issued and shall be responsible for admittance of its authorized personnel only to areas for which keys Provide access. Return keys to the Owner immediately upon request.

1.13.5. Direct enquiries regarding security regulations to the Owner, who will advise the Contractor of any additional requirements.

1.13.6. Execute the Work taking into consideration movement of occupants.

1.14. Security Clearance of Employees

1.14.1. Where Site is designated by the Owner as a secure location, workers on Site may be subject to security checks and may be required to obtain security clearance before commencing the Work.

1.14.2. Security checks shall be arranged by the Owner which has designated Site as secure location. The Contractors shall provide to the Owner names, addresses, social insurance numbers and consents of all of its workers and those Subcontractors employed in the Work.

1.14.3. Any worker who is unable to obtain security clearance, or who refuses to consent to such security checks, upon notice by the Consultant, is not permitted to work on Site.

1.14.4. During the course of the Work, new workers not included in original submission may be subject to security check. Such new workers are not allowed on Site until clearance is given.

1.14.5. Workers employed on site shall sign "Daily Register" Provided, showing "IN" and "OUT" times and number of hours worked on each shift.

1.15. Temporary Shut Downs of Construction Operations

1.15.1. The Contractor shall be aware at all times that ongoing functions and activities of the Site will continue. The Owner may at any given time request that any Work be temporarily ceased.

1.15.2. Temporary reasonable shut downs and interference are for emergency and/or sensitive health and security reasons and they shall not be construed as cause of elimination or restriction of the Contractor's Working Schedule, claims for delay of the Work, nor additional costs.

1.15.3. The Contract Price shall include and allow for such temporary shut downs.

1.16. No Smoking Policy

1.16.1. Cooperate, respect and comply with smoke free workplace policy requirements of the Place of the Work. This policy applies to everyone who visits and works on this Project.

1.16.2. Ensure the Contractor's staff, Subcontractors and Suppliers performing work on the Site on the Contractor's behalf are instructed to comply with Smoke Free Workplace policy requirements.

1.17. Signs, Advertising and Publications

1.17.1. Do not erect or display devices, signs or advertisements of labour, materials or services Provided to the Work. Signs relative to fire, danger and safety are exempted from this requirement.

1.17.2. The Contractor is not permitted and must not permit Subcontractors:

1.17.2.1. to display any advertising of their Work, of any kind, without the Owner's written acceptance, or

1.17.2.2. to mention the Work in any advertising or articles in any publication relating to the Work, without approval of copy and written permission from Owner.

END OF SECTION

Part 1 - General

1.1. General Requirements

1.1.1. Read and conform to:

- 1.1.1.1. CCDC 2 Stipulated Price Contract - 2020, as amended by Supplementary Conditions, and, in particular, PART 4 ALLOWANCES AND PROVISIONAL ITEMS of the Contract Documents.
- 1.1.1.2. Division 01 requirements and documents referred to therein.

1.2. Cash Allowances

1.2.1. The Owner, through the Consultant:

- 1.2.1.1. Will Provide the Contractor with documentation required to permit pricing of a cash allowance item.
- 1.2.1.2. May request the Contractor to identify potential Suppliers or Subcontractors, as applicable, and to obtain at least three competitive prices for each cash allowance item.
- 1.2.1.3. May request the Contractor to disclose originals of all Bids, quotations, and other price related information received from potential Suppliers or Subcontractors.
- 1.2.1.4. Will determine by whom and for what amount each cash allowance item will be performed. Obtain the Owner's prior written approval in the form of a Cash Allowance Disbursement Authorization before entering into a subcontract, amending an existing subcontract, or performing own forces work included in a cash allowance. Upon issuance of the Change Order, the Contractor's responsibilities for a cash allowance item shall be the same as for other work of the Contract.

1.2.2. Unexpended amounts of cash allowances shall be deducted from the Contract Price at completion of the Work. The Contractor shall have no claim on any unexpended Cash Allowances.

1.2.3. Cash Allowances include Supply and installation unless otherwise indicated.

1.2.4. The Contractor shall extend to the Owner refunds, trade and quantity discounts which may be received in purchasing under Cash Allowances, except cash discounts for prompt payment.

1.2.5. Cash Allowances exclude VAT.

1.3. Cash Allowances for Supply Only of Products

1.3.1. Amount of each cash allowance includes:

- 1.3.1.1. Cost of Products as invoiced by the Supplier, including delivery and applicable taxes but excluding VAT.

1.3.2. Amount of each cash allowance does not include costs of the following items, which costs shall be included in the Contract Price and not in the cash allowance:

- 1.3.2.1. Unloading, handling and storage on Site.
- 1.3.2.2. Installation and all other related costs.
- 1.3.2.3. Overheads and profits related to the cash allowance.

1.4. Cash Allowances for Supply and Installation of Products

1.4.1. Amount of each cash allowance includes:

- 1.4.1.1. Costs to Provide the specified Products, including Supply, Installation, and related costs, excluding VAT.

- 1.4.1.2. Subcontractor's and sub-Subcontractor's overheads and profits related to the cash allowance.
- 1.4.2. Amount of each cash allowance does not include the Contractor's overhead and profit, and other related costs, which shall be included in the Contract Price and not in the cash allowance.

1.5. Cash Allowances for Services

- 1.5.1. Amount of each cash allowance includes:
 - 1.5.1.1. Costs related to the services, excluding VAT.
 - 1.5.1.2. Subcontractor's and sub-Subcontractor's overheads and profits related to the cash allowance.
- 1.5.2. Amount of each cash allowance does not include the Contractor's overhead and profit, and other related costs, which shall be included in the Contract Price and not in the cash allowance.

1.6. Summary of Cash Allowances

- 1.6.1. Cash Allowance No. 1:
 - 1.6.1.1. For: Inspection and testing services provided by independent Inspection and Testing Companies and Consultants.
 - 1.6.1.2. Include the sum of \$15,000.00.

END OF SECTION

Part 1 - General

1.1. General Requirements

1.1.1. Read and conform to:

- 1.1.1.1. CCDC 2 Stipulated Price Contract - 2020, as amended by Supplementary Conditions.
- 1.1.1.2. Division 01 requirements and documents referred to therein.

1.2. Definition

- 1.2.1. In this Section "Substitution" means a Product, a manufacturer, or both, not originally specified in the Contract Documents by proprietary name but proposed for use by the Contractor in place of a Product, a manufacturer, or both, specified by proprietary name.

1.3. Substitution Procedures

- 1.3.1. The Contractor may propose a Substitution wherever a Product or manufacturer is specified by proprietary name(s), unless there is accompanying language indicating that Substitutions will not be considered.
- 1.3.2. The Contractor may propose a Substitution wherever a Product or manufacturer is specified by proprietary name(s) and accompanied by language such as "or Equivalent", or other similar words. Do not construe such language as an invitation to unilaterally Provide a Substitution without the Consultant's prior acceptance in writing.
- 1.3.3. The Contractor shall not include Substitutions in the Contract Price until such time the Substitution is approved by the Owner and/or the Consultant. Do not order or Install any Substitution without a Supplemental Instruction or Change Order.
- 1.3.4. Provided a proposed Substitution submission includes all of the information specified in this Section under Submission Requirements for Proposed Substitutions, the Consultant will promptly review and accept or reject the proposed Substitution.
- 1.3.5. The Consultant may accept a Substitution if satisfied that:
 - 1.3.5.1. the proposed substitute Product is the same type as, is capable of performing the same functions as, interfaces with adjacent work the same as, and meets or exceeds the standard of quality, performance and, if applicable, appearance and maintenance considerations, of the specified Product,
 - 1.3.5.2. the proposed substitute manufacturer has capabilities comparable to the specified manufacturer, and
 - 1.3.5.3. the Substitution Provides a cost and/or schedule benefit to the Owner.
- 1.3.6. If the Contractor fails to order a specified Product or order a Product by a specified manufacturer in adequate time to meet the Contractor's construction schedule, the Consultant will not consider that a valid reason to accept a Substitution.
- 1.3.7. If the Consultant accepts a Substitution and subject to the Owner's agreement, the Change in the Work will be documented in the form of either a Supplemental Instruction or Change Order as specified in Section 01 26 00 – Contract Modification Procedures.
- 1.3.8. If a Substitution is accepted in the form of a Supplemental Instruction or Change Order, the Contractor shall not revert to an originally specified Product or manufacturer without the Consultant's prior written acceptance.
- 1.3.9. The Contractor shall assume responsibility for delays as a result of the review of the Substitution by the Owner and/or the Consultant.

- 1.3.10. The Contractor shall assume responsibility for liabilities and additional costs that may subsequently arise as a result of the proposed Substitution being accepted by the Consultant and/or the Owner, including any delays in the completion of the Work as a result of Substitutions.
- 1.3.11. The Consultant requires 15 Working Days for review of Substitutions from time of the Consultant's receipt to time of the Consultant's return to the Contractor. Should the Substitution Review require specialty consultant reviews, allow for 5 Working Days per specialty consultant. Substitution submission meet and/or exceed the requirements of this Section. Failure to meet the requirements of this Section shall result in a rejected Substitution submission.

1.4. Submission Requirements for Proposed Substitutions

- 1.4.1. Include with each proposed Substitution the following information:
 - 1.4.1.1. Identification of the Substitution, including Product name and manufacturer's name, address, telephone numbers, and website.
 - 1.4.1.2. Reason(s) for proposing the Substitution.
 - 1.4.1.3. A statement verifying that the Substitution will not affect the Contract Price and the Contract Time or, if applicable, the amount and extent of a proposed increase or decrease in the Contract Price and the Contract Time on account of the Substitution.
 - 1.4.1.4. A statement verifying that the Substitution will not affect the performance or warranty of other parts of the Work.
 - 1.4.1.5. Manufacturer's Product literature for the Substitution, including material descriptions, compliance with applicable codes and reference standards, performance and test data, compatibility with contiguous materials and systems, and environmental considerations.
 - 1.4.1.6. Product samples as applicable.
 - 1.4.1.7. A summarized comparison of the physical properties and performance characteristics of the specified Product and the Substitution, with any significant variations clearly highlighted.
 - 1.4.1.8. Availability of maintenance services and sources of replacement materials and parts for the Substitution, as applicable, including associated costs and time frames.
 - 1.4.1.9. If applicable, estimated life cycle cost savings resulting from the Substitution.
 - 1.4.1.10. Details of other projects and applications where the Substitution has been used.
 - 1.4.1.11. Identification of any consequential Changes in the Work to accommodate the Substitution and any consequential effects on the performance of the Work as a whole. A later claim for an increase to the Contract Price or the Contract Time for other Changes in the Work attributable to the Substitution will not be considered.
- 1.4.2. Failure to Provide aforementioned information shall result in Substitution not being reviewed and being rejected by the Consultant.

END OF SECTION

Part 1 - General

1.1. General Requirements

1.1.1. Read and conform to:

- 1.1.1.1. CCDC 2 Stipulated Price Contract - 2020, as amended by Supplementary Conditions.
- 1.1.1.2. Division 01 requirements and documents referred to therein.

1.2. Supplemental Instructions

- 1.2.1. The Consultant may issue Supplemental Instructions to Provide clarifications to the Contract Documents, Provide additional information, or make minor variations in the Work not involving adjustment in the Contract Price or the Contract Time.
- 1.2.2. If the Contractor considers a Supplemental Instruction to require an adjustment in the Contract Price or the Contract Time, the Contractor shall promptly notify the Consultant and the Owner in writing within 5 Working Days of receipt of a Supplemental Instruction and shall not proceed with any work related to the Supplemental Instruction pending receipt of a Change Order, a Change Directive, or, in accordance with the dispute resolution provisions of the Contract Documents, a Notice in Writing of a dispute and instructions to proceed. Failure to provide the Notice in Writing shall be a deemed acceptance of the Supplemental Instruction by the Contractor without adjustment in the Contract Price or Contract Time.

1.3. Contemplated Change Order

1.3.1. Owner-Initiated Contemplated Change Order:

- 1.3.1.1. The Consultant will issue a detailed description of proposed Changes in the Work that may require adjustment to the Contract Price or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
- 1.3.1.2. Proposal Requests issued by the Consultant are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
- 1.3.1.3. Within five (5) Days after receipt of Contemplated Change Order, the Contractor shall submit a quotation outlining cost adjustments to the Contract Price and the Contract Time necessary to execute the change.
- 1.3.1.4. Include a list of quantities of Products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
- 1.3.1.5. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
- 1.3.1.6. Include costs of labor and supervision directly attributable to the change.
- 1.3.1.7. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

1.3.2. Contractor-Initiated Change Notices:

- 1.3.2.1. If latent or unforeseen conditions require modifications to the Contract Documents, the Contractor may propose changes by submitting a request for a change to the Consultant.
- 1.3.2.2. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Price and the Contract Time.

- 1.3.2.3. Include a list of quantities of Products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
- 1.3.2.4. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
- 1.3.2.5. Include costs of labor and supervision directly attributable to the change.
- 1.3.2.6. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- 1.3.2.7. Comply with requirements if the proposed change requires substitution of one Product or system for Product or system specified.

1.4. Change Order Procedures

- 1.4.1. Unless otherwise agreed, the adjustment of the Contract Price on account of a proposed change in the Work shall be based on a quotation for a fixed price increase or decrease to the Contract Price regardless of the Contractor's actual expenditures and savings.
- 1.4.2. If unit prices included in the stipulated price Contract Documents are applicable to the proposed change, the adjustment of the Contract Price shall be based on those unit prices, to the extent they apply.
 - 1.4.2.1. Fees, not exceeding the applicable percentages for overhead and profit as specified in this Section.
 - 1.4.2.2. Where applicable, Subcontractor quotations, also including a detailed breakdown of all of the above.
- 1.4.3. Include in the quotation the increase or decrease to the Contract Time, if any, for the proposed change, stated in number of Days.
- 1.4.4. Quotations shall be valid for acceptance by the Owner, ten (10) Business Days after receipt of quotation.
- 1.4.5. The quotation will be evaluated by the Consultant and the Owner and, if accepted by the Owner, be documented in the form of a signed Change Order.

1.5. Change Directive Procedures

- 1.5.1. If a Change Directive is issued for a change in the Work for which a proposed change was previously issued, but no Change Order has yet been signed, the Change Directive shall cancel the proposed change and any of the Contractor quotations related to that change in the Work.
- 1.5.2. When proceeding with a change in the Work under a Change Directive, keep accurate records of daily time sheets for labour and Construction Equipment, and invoices for Product and Construction Equipment costs. Submit such records to the Consultant weekly, until the Change Order superseding the Change Directive is issued.
- 1.5.3. Unless the Owner and the Contractor reach an earlier agreement on the adjustment to the Contract Price by means of a Change Order that cancels the Change Directive, the adjustment in the Contract Price for change carried out by way of a Change Directive shall be determined as specified in the Contract Documents after the change in the Work is completed.

1.6. Valuation of Changes Based on Agreed Unit Prices

- 1.6.1. The Consultant may, at the outset of the Contract Documents or at any time during the course of the Work, request the Contractor to submit unit prices for items reasonably anticipated to be required in the valuation of Changes in the Work. These unit prices shall be fair, current, and reflective of competitive market conditions, and shall not be unreasonably inflated. The Consultant and the Owner reserve the right to reject any unit prices deemed excessive, unbalanced, or not in keeping with industry standards.

Failure to submit acceptable unit prices may result in valuation by other means at the Consultant's or the Owner's discretion.

1.6.2. The Contractor shall submit such unit prices promptly upon request.

1.6.3. The unit prices shall be valid for the duration of the Contract.

1.7. Schedule of Equipment Rates

1.7.1. Prior to the first application for payment, submit for the Consultant's review a schedule of equipment rates for the Contractor owned Construction Equipment.

1.7.2. Equipment rates shall reflect the rates that will be used when:

1.7.2.1. preparing price quotations for Change Orders, and

1.7.2.2. determining the cost of work attributable to Change Directives.

1.7.3. Equipment rates stated in the schedule shall be consistent with local equipment rental market rates and shall not include any additional overhead and profit component.

1.7.4. Obtain the Owner's written acceptance of the schedule of equipment rates before submitting the first Change Order quotation.

1.7.5. Accepted schedule of equipment rates will be used solely for evaluating Change Order quotations and cost of performing work attributable to Change Directives.

1.7.6. The Contractor may request amendments to the accepted schedule of equipment rates if changes in local equipment rental market rates can be demonstrated. Obtain the Owner's written acceptance of such changes.

1.8. Schedule of Labour Rates

1.8.1. Prior to the first application for payment, submit for the Consultant's review a schedule of labour rates for all trades and classifications of trades, such as journeymen, apprentices, and foremen that will be employed in the Work. Provide a breakdown of payroll burden component of labour rates.

1.8.2. Labour rates shall reflect the salaries, wages, and benefits paid to personnel in the direct employ of the Contractor, Subcontractors, and sub-Subcontractors, stated as hourly rates, that will be used when:

1.8.2.1. preparing price quotations for Change Orders, and

1.8.2.2. determining the cost of work attributable to Change Directives.

1.8.3. Labour rates stated in the schedule of labour rates shall be consistent with rates that will actually be paid, and payroll burden costs that will actually be incurred, in the normal performance of the Work, during regular working hours. Labour rates shall not include any additional overhead and profit component.

1.8.4. Where collective agreements apply, the labour rates shall not exceed those established by collective agreement.

1.8.5. Obtain the Owner's written acceptance of the schedule of labour rates before submitting the first Change Order quotation.

1.8.6. Accepted schedule of labour rates will be used solely for evaluating Change Order quotations and cost of performing work attributable to Change Directives.

1.8.7. The Contractor may request amendments to the accepted schedule of labour rates if changes in the labour rates that will actually be paid, or payroll burden cost that will actually be incurred, in the normal performance of the Work can be demonstrated. Obtain the Owner's written acceptance of such changes.

1.9. Change Proposals After Contract Award

1.9.1. 'Change Proposal' means a proposal by the Contractor, after the Contract award, for a modification to the Contract Documents that will result in design improvement benefits and/or a reduction in costs.

- 1.9.2. The Contractor's Bid shall be based on the Bid Documents and the Contract will be awarded on that basis.
- 1.9.3. After the award of the Contract, the Contractor may propose a cost-reducing Change Proposal(s) and, if accepted by the Owner, gain a financial reward by receiving 50% of the net savings resulting from the Change Proposal(s), as may be determined in the sole discretion of the Owner. The calculation of the net savings shall take into account any additional costs incurred by the Owner resulting from the implementation of the Change Proposal. The Owner shall not be obligated, under any circumstances, to accept a Change Proposal, and reserves the right to reject any Change Proposal at its sole discretion.
- 1.9.4. If a Change Proposal is accepted by the Owner, the Contractor may:
 - 1.9.4.1. be reimbursed for 100% of the design/redesign cost which was agreed to by the Owner at the time of acceptance of the Change Proposal;
 - 1.9.4.2. receive payment for the construction costs under the Change Proposal, as agreed to by the Owner at the time of acceptance of the Change Proposal; and
 - 1.9.4.3. receive payment of 50% of the net construction cost savings resulting from the Change Proposal, as agreed to by the Owner at the time of acceptance of the Change Proposal.
- 1.9.5. The Contractor shall not be entitled to payment in connection with a Change Proposal, including design/redesign costs under paragraph .1 above, until the Change Proposal has been approved by the Owner, in writing.
- 1.9.6. If a Change Proposal is acceptable to the Owner, the Contractor shall construct the work affected by the Change Proposal for the price set out in the Change Proposal and agreed to by the Owner. The agreement of the Contractor shall constitute a full and final release with respect to any claims for loss of profits with respect to the work affected by the Change Proposal.
- 1.9.7. The Contractor shall be responsible for all costs resulting from any errors or assumptions made in the Change Proposal including, but not limited to, estimates as to quantities, time, materials, labour or design in any way related to the Change Proposal.
- 1.9.8. The Contractor shall obtain, at its own expense, all regulatory approvals, permits, licences and certificates required as a result of a Change Proposal.
- 1.9.9. Any aspect of a Change Proposal that involves, or may involve, doing work/an act that is within the practice of professional engineering shall be designed by a Professional Engineer and shall bear the seal and signature of the Professional Engineer. Whatever the Contract Documents specifies regarding stamp occurrences for such design work, the same requirement shall apply to designs/redesigns for a Change Proposal.
- 1.9.10. No extension of the Contract Time will be permitted as a result of a Change Proposal unless detailed in the Change Proposal accepted by the Owner.
- 1.9.11. Change Proposal(s) shall not alter the terms and conditions of the disincentive clauses in the Contract Documents.
- 1.9.12. The Owner shall not be liable to the Contractor, under any circumstances, for the Owner's failure to accept, consider or act upon a Change Proposal, nor for any delays attributable to a Change Proposal whether accepted or not.
- 1.9.13. The Contractor shall have no claim against the Owner for any costs, damages, expenses or delays due to the Owner's rejection of a Change Proposal including, but not limited to, review for approval of designs, development costs, design/redesign costs, anticipated profits or increased material or labour costs resulting from delays in the review of such Change Proposals.

END OF SECTION

Part 1 - General

1.1. General Requirements

1.1.1. Read and conform to:

- 1.1.1.1. CCDC 2 Stipulated Price Contract - 2020, as amended by Supplementary Conditions.
- 1.1.1.2. Division 01 requirements and documents referred to therein.

1.2. Requests for Interpretation (RFI)

1.2.1. A request for interpretation (RFI) is a formal process used during the Work to obtain an interpretation of the Contract Documents.

1.2.2. An RFI shall not constitute notice of claim for delay or cumulative schedule impact.

1.2.3. RFI Submittal Procedure:

1.2.3.1. RFI Form:

- 1.2.3.1.1. Submit RFIs to the Consultant in writing or via a Contractor Initiated Project Management System. The Consultant shall not respond to RFIs submitted using alternative means.
- 1.2.3.1.2. Where RFI Form does not have sufficient space to Provide complete request thereon, attach additional sheets as required.
- 1.2.3.1.3. Submit with RFI Form necessary supporting documentation and suggest possible solution for the Consultant review.

1.2.3.2. RFI Log:

- 1.2.3.2.1. Maintain log of RFIs sent to and responses received from the Consultant, complete with corresponding dates.
- 1.2.3.2.2. Submit updated RFI log with each application for payment submission.

1.2.3.3. Number RFIs consecutively in one sequence in order submitted.

1.2.3.4. Submit RFIs sufficiently in advance of affected parts of the Work so as not to cause delay in the performance of the Work. Costs resulting from failure to do so will not be paid by the Owner.

1.2.3.5. Submit one RFI in accordance with RFI Form. Multiple RFIs on a single form is not permitted.

1.2.4. The Consultant shall review RFIs in accordance with this Section with the following understandings:

- 1.2.4.1. The Consultant's response shall not authorize Changes in the Work or allow for adjustment to the Contract Price or extension of the Contract Time.
- 1.2.4.2. The Consultant requires four (4) Working Days to review and respond to RFI. Where RFI requires more than one round of review by the Consultant, add two (2) Working Days for each additional round of review.
- 1.2.4.3. The Consultant's review commences on date of receipt by the Consultant of the RFI.
- 1.2.4.4. When RFI is received by the Consultant before noon, review period commences that Day; when RFI Submittal is received by the Consultant after noon, review period begins on the next Working Day.

1.2.5. If, at any time, a large enough number of RFIs is submitted or the Consultant considers the RFI to be of such complexity that the Consultant cannot process these RFI's within 5 Working Days, the Consultant, will confer with the Contractor within 2 Working Days of receipt of such RFIs, and the Consultant and the Contractor will jointly prepare an estimate of the time necessary for processing same as well as an

order of priority among the RFIs submitted. The Contractor shall accommodate such necessary time at no increase in the Contract Time and at no additional cost to the Owner.

- 1.2.6. Contractor shall satisfy itself that an RFI is warranted by undertaking a thorough review of the Contract Documents to determine that the RFI cannot be resolved by direct reference to the Contract Documents. Contractor shall describe in detail this review on the RFI form as part of the RFI submission. RFI Submittals that lack such detailed review description, or where the detail Provided is, in the opinion of the Consultant, insufficient, shall not be reviewed by the Consultant and shall be rejected

END OF SECTION

Part 1 - General

1.1. General Requirements

1.1.1. Read and conform to:

- 1.1.1.1. CCDC 2 Stipulated Price Contract – 2020, as amended by Supplementary Conditions.
- 1.1.1.2. Division 01 requirements and documents referred to therein.

1.2. Schedule of Values

- 1.2.1. The Contractor shall submit to the Owner and the Consultant, within 15 Days of receipt of the Owner's notice to commence the Work and prior to the first Pre-Invoice Submission Meeting, a schedule of values for the parts of the Work, aggregating the total amount of the Contract Price, so as to facilitate evaluation of applications for payment. The schedule of values shall be made out in such form and supported by such evidence as the Consultant may reasonably direct and when accepted by the Consultant, shall be used as the basis for applications for payment, unless it is found to be in error. Modify the initial schedule of values if and as requested by the Consultant. Obtain the Consultant's written acceptance of the initial schedule of values ("Schedule of Values") prior to the first application for payment.
- 1.2.2. Together with the first and all subsequent applications for payment, submit updated versions of the Schedule of Values to indicate the values, to the date of application for payment, of work performed and Products delivered to Place of the Work.
- 1.2.3. Provide the Schedule of Values in an electronic spreadsheet format. Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
- 1.2.4. Division 01 requirements shall be broken out as follows and shall be the minimum percentage of the Contract Price:
 - 1.2.4.1. Mobilization and start-up (including but not limited to bonding and insurances at cost (with backup provided), site hoarding, signage, construction equipment delivery to site, site office, etc.).
 - 1.2.4.2. General Site expenses (including but not limited to overhead, administrative costs, temporary requirements not related to the direct construction, health and safety supplies, site office supplies, equipment rentals utilities, office supplies, staff costs, insurance, etc.).
 - 1.2.4.3. Cash Allowances in accordance with Section 01 21 00.
 - 1.2.4.4. As-Built Drawings (all disciplines) (5%).
 - 1.2.4.5. Closeout Documents (operations and maintenance manuals, training, demonstration, etc.) (1%).
 - 1.2.4.6. Sustainability documentation (2%).
 - 1.2.4.7. Deficiencies (5%).
 - 1.2.4.8. Demobilization.
- 1.2.5. All costs associated with obtaining bonding and insurance coverage must be included in the costs of mobilization/demobilization and shall be made as follows:
 - 1.2.5.1. Sixty percent (60%) upon commencement of construction, after full mobilization has been completed. The payment for mobilization shall be included in the first payment certificate issued for the Contract subject to the Consultant being satisfied that full mobilization has been carried out. If the Consultant is not so satisfied, the Consultant shall allow a payment in an amount which, in the Consultant's opinion, reflects the degree of mobilization effected to date.
 - 1.2.5.2. Progressively from 60% at the commencement of construction to 85% at Substantial Performance of the Contract (a total of 25% prorated over the Contract).

- 1.2.5.3. The remaining 15% is to be paid upon total performance of the work subject to the Consultant being satisfied that full demobilization has been carried out. If the Consultant is not so satisfied, the Consultant shall allow a payment in an amount which, in the Consultant's opinion, reflects the degree of demobilization effected to date.
- 1.2.6. The total price entered for mobilization and demobilization shall be consistent with the costs involved but should not, in any event, exceed three percent (3%) of the Contract Price. In the event that this item exceeds three percent (3%) of the Contract Price the Owner reserves the right, in its sole discretion, to apportion some or all of the value of this item to the demobilization component, which will be paid upon the completion of demobilization.
- 1.2.7. Schedule of Values that are front-end loaded will not be accepted and shall be returned.
- 1.2.8. A work breakdown structure that is sufficiently detailed and comprehensive to facilitate the Consultant's evaluation of applications for payment at an appropriate level of detail.
- 1.2.9. Provisions for approved Change Orders allowances, unit price work and, assignable contracts so that the breakdown amounts indicated in the schedule of values aggregate to the current total Contract Price. Also Provide for indicating the estimated value of Change Directives within the schedule of values, separately from the current total Contract Price.
- 1.2.10. For each item in the work breakdown structure, Provide the following information, under headings as indicated, at minimum:
 - 1.2.10.1. Breakdown Amount: A dollar amount, including an appropriate pro rata portion of Contactor's overhead and profit.
 - 1.2.10.2. Performed to Date: The value of Work performed and Products delivered to Place of the Work up to the date of the application for payment, stated as a percentage of the Contract Price and in dollars.
 - 1.2.10.3. Previously Performed: The value of Work performed and Products delivered to the Place of the Work for which payment has been previously certified, stated in dollars.
 - 1.2.10.4. Current Period: The value of Work performed and Products delivered to Place of the Work for which the Contractor is currently applying for payment, stated in dollars.
 - 1.2.10.5. Balance to Complete: The value of Work not yet performed and Products not yet delivered to Place of the Work, stated in dollars.
- 1.3. Cash Flow Projections**
 - 1.3.1. Prior to the first application for payment submit, for the Consultant's review, a forecast of approximate monthly progress payments for each month of the Contract Time.
 - 1.3.2. Submit revised cash flow forecasts when requested by the Consultant.
- 1.4. Workers' Compensation Clearance Certificates**
 - 1.4.1. Submit proof of workers' compensation clearance with each application for payment.
- 1.5. Statutory Declarations**
 - 1.5.1. Submit a statutory declaration in the form of CCDC 9A – Statutory Declaration of Progress Payment Distribution by the Contractor with each application for payment except the first.
- 1.6. Payment for Products and Materials Stored Off-Site**
 - 1.6.1. The Owner may, due to extraordinary circumstances and at the Owner's sole discretion, make payments for Products delivered to and stored at a location other than Place of the Work, subject to:
 - 1.6.1.1. a request submitted by the Contractor in writing, with appropriate justification, and
 - 1.6.1.2. whatever conditions the Owner or the Consultant may establish for such payments, as required to protect the Owner's interests.

1.7. Applications for Payment

- 1.7.1. Applications for Payment must be made in accordance with GC 5.2 - Applications for Payment of the CCDC 2 Stipulated Price Contract – 2020, as amended by Supplementary Conditions.
- 1.7.2. Formal application for payment shall be in accordance with the Construction Act, RSO 1990, c C.30. Be responsible for submitting a “Proper Invoice” in accordance with the Construction Act, RSO 1990, c C.30. The Owner shall be under no obligation to consider or review submissions that fail to meet the requirements noted in the Contract Documents and those that do not meet the requirements of a “Proper Invoice”.
- 1.7.3. Proper Invoice shall be submitted substantially in the form attached as Form 2 to the CCDC 2 Stipulated Price Contract – 2020, as amended by Supplementary Conditions, unless otherwise agreed upon between the Owner and the Contractor.
- 1.7.4. Proper Invoices must contain, in addition to the information prescribed by section 6.1 of the Construction Act, the following:
 - 1.7.4.1. Proper Invoice application number
 - 1.7.4.2. Contract number and brief description of the Contract
 - 1.7.4.3. purchase order number
 - 1.7.4.4. references to item number(s) and item description(s) when describing the services and materials supplied
 - 1.7.4.5. a breakdown of approved Change Orders or Change Directives and percentage completed of each
 - 1.7.4.6. a valid WSIB Certificate of Clearance
 - 1.7.4.7. a critical path schedule if requested by the Owner
 - 1.7.4.8. contemplation, and reflection in the amount payable, of all of the following to the extent they are applicable:
 - (1) statutory holdback;
 - (2) statutory lien holdbacks;
 - (3) maintenance security;
 - (4) applicable taxes.
- 1.7.5. Each Application for Payment shall be consistent with previous applications and payments as certified by the Consultant and paid for by the Owner.
- 1.7.6. Initial Application for Payment: Administrative actions and Submittals that must precede or coincide with Submittal of first Application for Payment include the following:
 - 1.7.6.1. “Proper Invoice”.
 - 1.7.6.2. List of Subcontractors.
 - 1.7.6.3. Schedule of Values.
 - 1.7.6.4. Cash Allowances.
 - 1.7.6.5. The Contractor's Construction Schedule (preliminary if not final).
 - 1.7.6.6. Schedule of unit prices.
 - 1.7.6.7. Submittals Schedule (preliminary if not final).
 - 1.7.6.8. List of the Contractor's staff assignments.
 - 1.7.6.9. Copies of authorizations and licenses from Authorities Having Jurisdiction for performance of the Work.

- 1.7.6.10. Report of preconstruction conference.
- 1.7.7. Subsequent Application for Payment: Administrative actions and Submittals that must be included:
- 1.7.7.1. "Proper Invoice"
- 1.7.7.2. Schedule of Values updated to reflect progress, including Change Orders.
- 1.7.7.3. Workers' Compensation Certificates.
- 1.7.7.4. Statutory Declarations in one of the following forms:
- (1) a declaration, in the form contained in the form of Proper Invoice attached as Form 2 to the CCDC 2 Stipulated Price Contract – 2020, as amended by Supplementary Conditions, that all accounts for labour, subcontracts, Products, construction machinery and equipment and other indebtedness which may have been incurred by the Contractor in performing the Work, and for which the Owner may in any way be held responsible, have been paid in full as of the last payment made to the Contractor, except for statutory holdback monies properly retained; or
 - (2) a declaration by the Contractor as to the distribution made of the amounts received using document CCDC 9A – Statutory Declaration of Progress Payment Distribution by Contractor
- 1.7.7.5. Earned value report correlated with construction schedule.
- 1.7.7.6. Required back-up documentation required by the Contract Documents.
- 1.7.8. For application for payment submission requirements refer to GC 5.2 - Applications for Payment the CCDC 2 Stipulated Price Contract – 2020, as amended
- 1.8. Residency Requirements**
- 1.8.1. If the Contractor is non-resident in Ontario or Canada, it shall obtain the required VAT registration number(s) prior to commencement of the Work and prior to submitting the first Application for Payment.
- 1.9. TARIFFS**
- 1.9.1. All costs associated with tariffs that were in effect at the Bid closing date are deemed to be included in the Contract Price.
- 1.9.2. If new or additional tariffs come into force after the Bid closing date that increase the Contractor's costs of performing the Work, the Contractor shall notify the Owner in writing within 15 Days of the enactment of the additional tariffs. Such notice shall include a detailed description of the tariffs, including the rates and amounts of the tariffs and the specific products or components thereof that are affected. The Contractor shall take commercially reasonable steps to mitigate the costs and damages it may incur as a result of such tariffs by consulting with the Owner to determine whether:
- the goods can be sourced from countries to which the additional tariffs do not apply; and/or
 - the goods can be shipped and imported into Canada prior to effective date of the additional tariffs.
- 1.9.3. If the goods can only be sourced from a country subject to the additional tariffs and cannot be shipped before the tariff's effective date, the Owner will reimburse the Contractor, and the Contract Price shall be adjusted accordingly, for the reasonable direct costs the Contractor incurs as a direct result of the additional tariffs, provided sufficient documentary evidence is submitted that substantiates such costs. No claims for costs the Contractor incurs as an indirect result of the tariffs (such as, without limitation, due to fluctuations in the cost of materials caused by general market conditions, supply chain disruptions, or geopolitical events – even if such factors are influenced by the tariffs at issue), markups, or administrative charges will be considered. The Owner must approve the submitted documentary evidence before any Contract Price adjustment may be authorized. Examples of documentary evidence which may be acceptable to the Owner includes:
- Official manufacturer notice outlining the price increase and reason (e.g. tariff changes).

- Updated price list from the manufacturer showing the revised rates and effective date.
 - Government-issued tariff documentation (for example, Canadian Border Services Agency notice).
 - Contractor or distributor correspondence with supporting manufacturer documentation.
 - Third-party market reports or industry publications confirming tariff-related cost increases.
 - Customs documentation showing applicable tariff rates and their impact on costs.
- 1.9.4. This entitlement to a potential increase in the Contract Price does not apply to price increases for factors that the Contractor could have reasonably anticipated, accounted for or avoided as of the Bid closing date. Such factors include, but are not limited to, fluctuations in the cost of fuel, delivery costs or inflation.
- 1.9.5. The Owner reserves the right to deny the Contractor's claim for a Contract Price adjustment if the documentary evidence provided by the Contractor does not meet the Owner's requirements, as determined by the Owner in its sole discretion. The Owner may refuse the Contractor's claim for an adjustment to the Contract Price or approve an amount less than what was requested if the Owner, in its sole discretion, determines that the price adjustment request is unreasonable or exceeds the Owner's budgetary limits.
- 1.9.6. This price adjustment is the Contractor's sole and exclusive remedy in relation to the imposition of additional tariffs. For clarity, the Contractor shall not be entitled to an extension of Contract Time on account of the additional tariffs (including, without limitation, on account of any delays, disruptions, cost increases, economic or market conditions, or supply chain impacts arising directly or indirectly from the additional tariffs). Upon receiving payment for the price adjustment, the Contractor agrees to waive its entitlement to, and release the Owner from, any claims for additional compensation, schedule extensions, or other relief (including, without limitation, an increase in the Contract Price and/or an extension of Contract Time) arising out of the imposition of the additional tariffs.
- 1.9.7. If a tariff that was in effect at the Bid closing date is subsequently reduced or eliminated, resulting in a decrease of the Contractor's costs of performing the Work, the Contract Price shall be adjusted downward to reflect the reduction or elimination of the tariff and the associated decrease in the Contractor's costs.
- 1.9.8. The Owner shall have the right to audit, inspect, and examine the Contractor's records necessary to verify any required Contract Price adjustment pursuant to this Supplementary Condition, including without limitation invoices, receipts, purchase orders, customs documentation, supplier quotations, supplier payment terms, and any other relevant financial or transactional records. The Contractor shall cooperate fully with any such audit, inspection, or examination and provide access to such records promptly upon request.

END OF SECTION

Part 1 - General

1.1. General Requirements

1.1.1. Read and conform to:

- 1.1.1.1. CCDC 2 Stipulated Price Contract - 2020, as amended by Supplementary Conditions.
- 1.1.1.2. Division 01 requirements and documents referred to therein.

1.2. General

- 1.2.1. Study Contract Documents to determine extent of work required by each Specification Section and upon which work of other Specification Sections depend and coordinate scope and extent of work to be performed by each Subcontractor.
- 1.2.2. Study Contract Documents to determine extent of work required by each Drawing and upon which work of other Drawings depend and the coordinate scope and extent of work to be performed by each Subcontractor.
- 1.2.3. Neither organization of Specifications into Divisions and CSC/CSI 3-part Section Format nor arrangements of Drawings, Schedules and standard Drawings shall affect in any way the Contractor's control in, or diminish its responsibility for, dividing the Work or establishing each Subcontractor's scope of work. Claims for additional compensation arising from disputes between Subcontractors due to lack of coordination by the Contractor shall not be considered.
- 1.2.4. Coordinate work of each Specification Section as required for satisfactory and expeditious completion of the Work. Take field dimensions required. Take into account existing installations to assure best arrangements of components in available space. Consult before commencing Work in critical locations. Fabricate and erect Work to suit field dimensions and field conditions.
- 1.2.5. Provide forms, templates, anchors, sleeves, inserts and accessories or other components required to be fixed to or inserted in Work. As applicable set them in place or instruct related Sections as to their location.
- 1.2.6. Pay cost of extra work caused by and make up time lost as result of failure to comply with these requirements at proper time.
- 1.2.7. Coordinate work of all Subcontractors including construction sequence, schedule and interfacing of all work. Coordinate work as required to incorporate metric modular components. Coordinate work of each Subcontractor as required for satisfactory and expeditious completion of Work. Ensure components to be built in are supplied in time with setting Drawings and other related information. Fabricate and erect the Work to suit field dimensions and field conditions.
- 1.2.8. Ensure the Work of the Contract Documents are fully coordinated with respect to architectural, structural, mechanical, electrical and other specialty requirements.
- 1.2.9. Cooperate and coordinate with the Consultant for moving the Owner's equipment into building when Work or substantial part thereof is ready for use for purpose intended.

1.3. Contractor's Personnel

- 1.3.1. The Contractor shall furnish competent and adequate staff, who shall be in attendance at the Place of the Work at all times, as necessary, for the proper administration, co-ordination, supervision and superintendence of the Work; organize the procurement of all materials and equipment so that they will be available at the time they are needed for the Work; and keep an adequate force of skilled workers on the job to complete the Work in accordance with all requirements of the Contract Documents.
- 1.3.2. Prior to commencement of the Work, the Contractor shall select a competent and experienced full time project manager (the "**Project Manager**") who shall be engaged in the Work at all times, and a competent and experienced full time site supervisor (the "**Site Supervisor**") who shall be in attendance at the Place of the Work at all times.

- 1.3.3. The Project Manager and Site Supervisor shall represent the Contractor at the Place of the Work.
- 1.3.4. The Project Manager and the Site Supervisor shall be satisfactory to the Owner. The Contractor may not change its Project Manager or its Site Supervisor without the Owner's prior written approval which shall not be unreasonably withheld. Further, the Contractor shall not employ or continue to employ on the Work anyone to whom the Owner may reasonably object.
- 1.3.5. The Contractor shall provide the Owner and the Consultant with the names, addresses and telephone numbers of the Project Manager, the Site Supervisor and other responsible field persons who may be contacted for emergency and other reasons during non-working hours.
- 1.3.6. The Project Manager shall attend site meetings in order to render reports on the progress of the Work, have full responsibility for the prosecution of the Work, and serve as the primary representative with full authority to:
 - 1.3.6.1. Act in all matters as may be necessary for the proper co-ordination, supervision, direction and technical administration of the Work;
 - 1.3.6.2. Commit to construction methods, sequencing, and schedules;
 - 1.3.6.3. Actively participate in the development and maintenance of the construction schedule;
 - 1.3.6.4. Provide regular updates and relevant progress information as requested by the Consultant or the Owner;
 - 1.3.6.5. Bind the Contractor in all matters related to this Contract.
- 1.3.7. Site Supervisor:
 - 1.3.7.1. Provide a full-time Site Supervisor dedicated to the Project, with a minimum of five (5) years of experience managing Projects of similar type and complexity. The Site Supervisor shall:
 - 1.3.7.1.1. Be qualified, skilled, and efficient;
 - 1.3.7.1.2. Have full authority to direct the Work and represent the Contractor in all Site matters;
 - 1.3.7.1.3. Be authorized to receive and respond to any notices, decisions, directives, or other communications from the Owner or the Consultant.
- 1.3.8. Provide the Owner and the Consultant with complete contact information for key personnel including, but not limited to:
 - 1.3.8.1. Full names and roles;
 - 1.3.8.2. Mobile phone numbers;
 - 1.3.8.3. Email addresses.
- 1.3.9. This information shall include personnel who may be contacted in the event of emergencies during both working and non-working hours.
- 1.3.10. The Contractor shall not replace any of the assigned key personnel without prior written approval of the Owner, which approval shall not be unreasonably withheld. The Owner reserves the right to request the replacement of any personnel for just cause by providing written notice to the Contractor. The Contractor shall provide a suitable replacement within ten (10) Working Days of such notice.

END OF SECTION

Part 1 - General

1.1. General Requirements

1.1.1. Read and conform to:

- 1.1.1.1. CCDC 2 Stipulated Price Contract - 2020, as amended by Supplementary Conditions.
- 1.1.1.2. Division 01 requirements and documents referred to therein.

1.2. Summary

1.2.1. Section Includes: Project Meetings including but not limited to:

- 1.2.1.1. Construction Start-Up Meeting.
- 1.2.1.2. Construction Progress Meetings.
- 1.2.1.3. Pre-Installation Meetings.
- 1.2.1.4. Other Meetings.

1.3. Construction Start-Up Meeting

1.3.1. Promptly after Contract award, Consultant will establish the time and location of a construction start-up meeting to review and discuss administrative procedures and responsibilities. Consultant shall notify the Contractor at least seven (7) Working Days before the meeting.

1.3.2. Consultant's representative will chair the meeting and record and distribute the minutes.

1.3.3. Agenda will include following:

- 1.3.3.1. Appointment of official representatives of the Owner, the Contractor, Subcontractors, Consultant, and subconsultants.
- 1.3.3.2. Project communications.
- 1.3.3.3. The Contract Documents for construction purposes.
- 1.3.3.4. Bonds and insurances.
- 1.3.3.5. Documents at the Site.
- 1.3.3.6. The Contractor's use of premises.
- 1.3.3.7. The Owner-supplied Products.
- 1.3.3.8. Work restrictions.
- 1.3.3.9. Cash allowances.
- 1.3.3.10. Substitution procedures.
- 1.3.3.11. The Contract Documents modification procedures.
- 1.3.3.12. Payment procedures.
- 1.3.3.13. Construction progress meetings.
- 1.3.3.14. Construction progress schedule, including long lead time items.
- 1.3.3.15. Submittals schedule and procedures.
- 1.3.3.16. Special procedures.
- 1.3.3.17. Quality requirements, including testing and inspection procedures.
- 1.3.3.18. The Contractor's mobilization.
- 1.3.3.19. Temporary utilities.

- 1.3.3.20. Existing utility services.
- 1.3.3.21. Construction facilities.
- 1.3.3.22. Temporary barriers and enclosures.
- 1.3.3.23. Temporary controls.
- 1.3.3.24. Field engineering and layout of work.
- 1.3.3.25. Health and safety.
- 1.3.3.26. Site security.
- 1.3.3.27. Cleaning and waste management.
- 1.3.3.28. Closeout procedures and Submittals.
- 1.3.3.29. Sustainability requirements.
- 1.3.3.30. Commissioning.
- 1.3.3.31. Other items.
- 1.3.4. Attendees shall include at minimum: Senior representatives of the Owner, the Consultant, subconsultants, and the Contractor, including the Contractor's Project Manager and Site superintendent, and major Subcontractors.

1.4. Construction Progress Meetings

- 1.4.1. Schedule regular bi-weekly construction progress meetings for the duration of the Work. The Contractor shall prepare meeting agendas, chair the meetings, and record and distribute the minutes.
- 1.4.2. Arrange for and provide physical space for meetings.
- 1.4.3. The Contractor shall record in the meeting minutes significant decisions and identify action items and action dates by attendees or the parties they represent.
- 1.4.4. The Contractor shall distribute copies of minutes within 5 Working Days after each meeting to meeting attendees and any affected parties who may not be in attendance.
- 1.4.5. Ensure that Subcontractors attend as and when appropriate to the progress of the Work.
- 1.4.6. Agenda for each meeting shall include the following, as a minimum:
 - 1.4.6.1. Approval of minutes of previous meeting.
 - 1.4.6.2. Work progress since previous meeting.
 - 1.4.6.3. Field observations, including any problems, difficulties, or concerns.
 - 1.4.6.4. Construction progress schedule.
 - 1.4.6.5. Submittals schedule.
 - 1.4.6.6. Proposed Changes in the Work.
 - 1.4.6.7. Requests for information.
 - 1.4.6.8. Site safety issues.
 - 1.4.6.9. Other business.
- 1.4.7. Attendees shall include at minimum: the Owner Representative, the Consultant, subconsultants, and the Contractor, including the Contractor's Project Manager and Site superintendent.

1.5. Preinstallation Meetings

- 1.5.1. If a Subcontractor requires a meeting prior to starting work, arrange for such meeting of all parties associated with Subcontractor as designated in the Contract Documents or as requested by the Consultant. Presided over by the Contractor shall include the Consultant and the Owner who may

attend, include Subcontractor performing work of trade involved, Testing Company's Representative and the Construction Manager's consultants of applicable discipline. Review the Contract Documents for work included under Subcontract and determine complete understanding of requirements and responsibilities relative to work included, storage and handling of materials, materials to be used, installation of materials, sequence and quality control, Project staffing, restrictions on areas of concrete placement and other matters affecting construction, to permit compliance with intent of trade under consideration.

1.6. Other Meetings

- 1.6.1. The Owner and/or the Consultant reserve the right to require other meetings which may be held on short notice and at which attendance by the Contractor and representatives of affected Subcontractors and Suppliers is mandatory. The Contractor shall keep detailed and accurate meeting notes and distribute copies within 3 Days to all in attendance and those affected by agreements and decisions made at such meetings.

END OF SECTION

Part 1 - General

1.1. General Requirements

1.1.1. Read and conform to:

- 1.1.1.1. CCDC 2 Stipulated Price Contract - 2020, as amended by Supplementary Conditions.
- 1.1.1.2. Division 01 requirements and documents referred to therein.

1.2. Submittal Procedures

- 1.2.1. Submittal Schedule: Submit a "Submittal Schedule" with the dates for provision, review and return of Submittals. Provide such schedule within 30 Working Days of award of the Contract and prior to the first Application for Payment submission. The dates for submission and return of Shop Drawings and Submittals must be approved by the Consultant.
- 1.2.2. The Contractor shall provide Shop Drawings and Submittals in the forms specified, or if not specified, as directed by the Consultant.
- 1.2.3. Provide Shop Drawings required by the Contract Documents in accordance with the Submittal Schedule.
- 1.2.4. Submit with reasonable promptness and in orderly sequence so as to not cause delay in the Work. Failure to submit in ample time is not considered sufficient reason for an extension of the Contract Time or for Product substitutions or other deviations from the Drawings and Specifications.
- 1.2.5. Where required by authorities having jurisdiction, provide Submittals to such authorities for review and approval.
- 1.2.6. Do not proceed with Work affected by a submittal until review is complete.
- 1.2.7. Present Shop Drawings, Product data, and samples in SI metric units. Where items or information is not produced in SI Metric units, converted values are acceptable.
- 1.2.8. Review Submittals, provide verified field measurements where applicable, and affix the Contractor's review stamp prior to submission to the Consultant. The Contractor's review stamp represents that necessary requirements have been determined and verified, and that the submittal has been checked and coordinated with requirements of the Work and the Contract Documents.
- 1.2.9. Verify field measurements and that affected adjacent work is coordinated.
- 1.2.10. Submittals not meeting specified requirements will be returned with comments.
- 1.2.11. Reproduction of Drawings to serve as background for Shop Drawings is not permitted. If Drawings must be used for this purpose, remove references to the Consultant.
- 1.2.12. Do not propose Substitutions or deviations from the Contract Documents via Shop Drawing, Product data and sample Submittals.
- 1.2.13. Determine which Shop Drawings the local Building Department will require for its approval and submit final copy of each Shop Drawing to local Building Department. Obtain approval and pay associated charges and fees.

1.3. Consultants Review of Submittals

- 1.3.1. The Consultant's review of Submittals is for sole purpose of ascertaining conformance with general design concept only and does not in any way constitute review of the design of engineering elements which form part of the Contract Documents.
- 1.3.2. The Consultant's review does not provide approval of items which remain the Contractor's responsibility.
- 1.3.3. The Consultant's review does not relieve the Contractor for errors and omissions in Submittals.
- 1.3.4. The Consultant's review does not relieve the Contractor for deviations in Submittals from requirements of the Contract Documents, unless the Consultant gives written acceptance of specific deviations.

1.3.5. The Consultant shall review Shop Drawings no more than twice. Should three or more reviews be required due to reasons of the Contractor omissions causing resubmission requests, then the Contractor shall reimburse the Consultant for time expended in these reviews. Time shall be invoiced to the Owner (to be deducted from monies due to the Contractor and paid to the Consultant by the Owner) at the Consultant's standard hourly rates in effect at the time of review. Be responsible for obtaining the Consultant's standard hourly rate schedule at the onset of the Project.

1.3.6. The Consultant will stamp each submittal as "REVIEWED", "REVIEWED AS NOTED", "REVISE AND RESUBMIT" or "NOT REVIEWED". Do not change Shop Drawings after they have been "Reviewed" or "Reviewed as Noted" and stamped.

1.4. Shop Drawings and Product Data

1.4.1. Without limitation, among other things, the Contractor remains responsible for:

1.4.1.1. detail design inherent in Shop Drawings.

1.4.1.2. errors and omissions in Shop Drawings.

1.4.1.3. meeting requirements of the Contract Documents.

1.4.1.4. confirmed and correlated Site dimensions.

1.4.1.5. information that pertains solely to fabrication processes, techniques of construction and installation.

1.4.1.6. co-ordination of work of all trades.

1.4.2. Shop Drawing Requirements:

1.4.2.1. Indicate following minimum requirements as applicable:

1.4.2.1.1. plans, sections and details.

1.4.2.1.2. verified Site dimensions.

1.4.2.1.3. materials thicknesses and finishes.

1.4.2.1.4. methods of setting and sealing.

1.4.2.1.5. methods of securing, fastening and anchoring including field connections.

1.4.2.1.6. signed and sealed Shop Drawings and calculations where specifically required herein.

1.4.3. Submit following for the Consultant's review: One stamped Adobe PDF of Shop Drawing/Submittal.

1.4.4. Shop Drawings submitted without specified licensed engineer's design and stamp will be automatically returned without review. Any resulting delays will be the Contractor's responsibility.

1.4.5. Do not resubmit Shop Drawings indicated as "REVIEWED" and "REVIEWED AS NOTED".

1.4.6. Resubmit Shop Drawings indicated as "REVISE AND RESUBMIT" with required changes and comments addressed. Insert letter "R" after Shop Drawing number on resubmitted Shop Drawings, re-date and re-sign. Identify revisions from earlier submissions graphically on revised Shop Drawings.

1.4.7. The Consultant requires five (5) Working Days for review of Shop Drawing from time of the Consultant's receipt to time of the Consultant's return to the Contractor. Should the Submittal Review require specialty consultant reviews, allow for 5 Working Days per specialty consultant. The Contractor shall establish a steady flow of Shop Drawings for review and avoid accumulation of an excessive quantity of Shop Drawings in a single submission.

1.4.8. Shop Drawings not conforming to above criteria will be automatically returned without review. Any resulting delays will be the Contractor's responsibility.

1.5. Samples

1.5.1. Provide samples required by the Contract Documents.

- 1.5.2. Deliver samples to the Consultant as directed with charges prepaid and allow for 1 of samples to be kept by the Consultant.
- 1.5.3. Prior to fabrication or supply of Products, submit samples for the Consultant's review. Remove and discard Products whose samples have not been reviewed and accepted by the Consultant.
- 1.5.4. Unless otherwise specified, submit samples in duplicate.
- 1.5.5. Identify each sample with:
 - 1.5.5.1. Project name and Project number.
 - 1.5.5.2. date of sample submission.
 - 1.5.5.3. component name using the Specification's terminology.
 - 1.5.5.4. material (including alloy).
 - 1.5.5.5. finish including colour, sheen, texture.
 - 1.5.5.6. dimensions including thickness.
- 1.5.6. Exhibit each of following for each sample:
 - 1.5.6.1. Materials.
 - 1.5.6.2. Finishes:
 - 1.5.6.2.1. Material.
 - 1.5.6.2.2. Colour including maximum colour range within each specified colour.
 - 1.5.6.2.3. Sheen, tone.
 - 1.5.6.2.4. Texture.
 - 1.5.6.2.5. Range of blemishes and other markings.
- 1.5.7. Alter, refinish or provide additional samples until they are reviewed and accepted by the Consultant.
- 1.5.8. Fabricate samples using same tools and techniques to be employed in actual installation of the Work.
- 1.5.9. Provide Products in the Work which are identical to accepted samples.
- 1.5.10. Reviewed and accepted samples will establish the standard against which installed Work will be reviewed.
- 1.5.11. The Consultant requires five (5) Working Days for review of samples from time of Consultant's receipt to time of the Consultant's return to the Contractor.

END OF SECTION

Part 1 - General

1.1. General Requirements

1.1.1. Read and conform to:

- 1.1.1.1. CCDC 2 Stipulated Price Contract - 2020, as amended by Supplementary Conditions.
- 1.1.1.2. Division 01 requirements and documents referred to therein.

1.2. Submittal Procedures

- 1.2.1. Submittal Schedule: Submit a "Submittal Schedule" with the dates for provision, review and return of Submittals. Provide such schedule within 30 Working Days of award of the Contract and prior to the first Application for Payment submission. The dates for submission and return of Shop Drawings and Submittals must be approved by the Consultant.
- 1.2.2. The Contractor shall provide Shop Drawings and Submittals in the forms specified, or if not specified, as directed by the Consultant.
- 1.2.3. Provide Shop Drawings required by the Contract Documents in accordance with the Submittal Schedule.
- 1.2.4. Submit with reasonable promptness and in orderly sequence so as to not cause delay in the Work. Failure to submit in ample time is not considered sufficient reason for an extension of the Contract Time or for Product substitutions or other deviations from the Drawings and Specifications.
- 1.2.5. Where required by authorities having jurisdiction, provide Submittals to such authorities for review and approval.
- 1.2.6. Do not proceed with Work affected by a submittal until review is complete.
- 1.2.7. Present Shop Drawings, Product data, and samples in SI metric units. Where items or information is not produced in SI Metric units, converted values are acceptable.
- 1.2.8. Review Submittals, provide verified field measurements where applicable, and affix the Contractor's review stamp prior to submission to the Consultant. The Contractor's review stamp represents that necessary requirements have been determined and verified, and that the submittal has been checked and coordinated with requirements of the Work and the Contract Documents.
- 1.2.9. Verify field measurements and that affected adjacent work is coordinated.
- 1.2.10. Submittals not meeting specified requirements will be returned with comments.
- 1.2.11. Reproduction of Drawings to serve as background for Shop Drawings is not permitted. If Drawings must be used for this purpose, remove references to the Consultant.
- 1.2.12. Do not propose Substitutions or deviations from the Contract Documents via Shop Drawing, Product data and sample Submittals.
- 1.2.13. Determine which Shop Drawings the local Building Department will require for its approval and submit final copy of each Shop Drawing to local Building Department. Obtain approval and pay associated charges and fees.

1.3. Consultants Review of Submittals

- 1.3.1. The Consultant's review of Submittals is for sole purpose of ascertaining conformance with general design concept only and does not in any way constitute review of the design of engineering elements which form part of the Contract Documents.
- 1.3.2. The Consultant's review does not provide approval of items which remain the Contractor's responsibility.
- 1.3.3. The Consultant's review does not relieve the Contractor for errors and omissions in Submittals.
- 1.3.4. The Consultant's review does not relieve the Contractor for deviations in Submittals from requirements of the Contract Documents, unless the Consultant gives written acceptance of specific deviations.

1.3.5. The Consultant shall review Shop Drawings no more than twice. Should three or more reviews be required due to reasons of the Contractor omissions causing resubmission requests, then the Contractor shall reimburse the Consultant for time expended in these reviews. Time shall be invoiced to the Owner (to be deducted from monies due to the Contractor and paid to the Consultant by the Owner) at the Consultant's standard hourly rates in effect at the time of review. Be responsible for obtaining the Consultant's standard hourly rate schedule at the onset of the Project.

1.3.6. The Consultant will stamp each submittal as "REVIEWED", "REVIEWED AS NOTED", "REVISE AND RESUBMIT" or "NOT REVIEWED". Do not change Shop Drawings after they have been "Reviewed" or "Reviewed as Noted" and stamped.

1.4. Shop Drawings and Product Data

1.4.1. Without limitation, among other things, the Contractor remains responsible for:

1.4.1.1. detail design inherent in Shop Drawings.

1.4.1.2. errors and omissions in Shop Drawings.

1.4.1.3. meeting requirements of the Contract Documents.

1.4.1.4. confirmed and correlated Site dimensions.

1.4.1.5. information that pertains solely to fabrication processes, techniques of construction and installation.

1.4.1.6. co-ordination of work of all trades.

1.4.2. Shop Drawing Requirements:

1.4.2.1. Indicate following minimum requirements as applicable:

1.4.2.1.1. plans, sections and details.

1.4.2.1.2. verified Site dimensions.

1.4.2.1.3. materials thicknesses and finishes.

1.4.2.1.4. methods of setting and sealing.

1.4.2.1.5. methods of securing, fastening and anchoring including field connections.

1.4.2.1.6. signed and sealed Shop Drawings and calculations where specifically required herein.

1.4.3. Submit following for the Consultant's review: One stamped Adobe PDF of Shop Drawing/Submittal.

1.4.4. Shop Drawings submitted without specified licensed engineer's design and stamp will be automatically returned without review. Any resulting delays will be the Contractor's responsibility.

1.4.5. Do not resubmit Shop Drawings indicated as "REVIEWED" and "REVIEWED AS NOTED".

1.4.6. Resubmit Shop Drawings indicated as "REVISE AND RESUBMIT" with required changes and comments addressed. Insert letter "R" after Shop Drawing number on resubmitted Shop Drawings, re-date and re-sign. Identify revisions from earlier submissions graphically on revised Shop Drawings.

1.4.7. The Consultant requires five (5) Working Days for review of Shop Drawing from time of the Consultant's receipt to time of the Consultant's return to the Contractor. Should the Submittal Review require specialty consultant reviews, allow for 5 Working Days per specialty consultant. The Contractor shall establish a steady flow of Shop Drawings for review and avoid accumulation of an excessive quantity of Shop Drawings in a single submission.

1.4.8. Shop Drawings not conforming to above criteria will be automatically returned without review. Any resulting delays will be the Contractor's responsibility.

1.5. Samples

1.5.1. Provide samples required by the Contract Documents.

- 1.5.2. Deliver samples to the Consultant as directed with charges prepaid and allow for 1 of samples to be kept by the Consultant.
- 1.5.3. Prior to fabrication or supply of Products, submit samples for the Consultant's review. Remove and discard Products whose samples have not been reviewed and accepted by the Consultant.
- 1.5.4. Unless otherwise specified, submit samples in duplicate.
- 1.5.5. Identify each sample with:
 - 1.5.5.1. Project name and Project number.
 - 1.5.5.2. date of sample submission.
 - 1.5.5.3. component name using the Specification's terminology.
 - 1.5.5.4. material (including alloy).
 - 1.5.5.5. finish including colour, sheen, texture.
 - 1.5.5.6. dimensions including thickness.
- 1.5.6. Exhibit each of following for each sample:
 - 1.5.6.1. Materials.
 - 1.5.6.2. Finishes:
 - 1.5.6.2.1. Material.
 - 1.5.6.2.2. Colour including maximum colour range within each specified colour.
 - 1.5.6.2.3. Sheen, tone.
 - 1.5.6.2.4. Texture.
 - 1.5.6.2.5. Range of blemishes and other markings.
- 1.5.7. Alter, refinish or provide additional samples until they are reviewed and accepted by the Consultant.
- 1.5.8. Fabricate samples using same tools and techniques to be employed in actual installation of the Work.
- 1.5.9. Provide Products in the Work which are identical to accepted samples.
- 1.5.10. Reviewed and accepted samples will establish the standard against which installed Work will be reviewed.
- 1.5.11. The Consultant requires five (5) Working Days for review of samples from time of Consultant's receipt to time of the Consultant's return to the Contractor.

END OF SECTION

Part 1 - General

1.1. General Requirements

1.1.1. Read and conform to:

- 1.1.1.1. CCDC 2 Stipulated Price Contract - 2020, as amended by Supplementary Conditions.
- 1.1.1.2. Division 01 requirements and documents referred to therein.

1.2. General Procedures

1.2.1. For the purposes of this section:

- 1.2.1.1. The words "worker" or "workers" shall mean the Contractor, the Contractor's staff or employees, Subcontractors, Subcontractor's staff or employees, Suppliers, Supplier's staff or employees, or anyone engaged for the Work, directly or indirectly, by the Contractor, unless otherwise indicated in the Contract Documents.
- 1.2.1.2. The words "Make Good" or "making good" shall mean that, when a finish or material has been altered, the material or finish shall be repaired or replaced, and refinished to match existing quality and appearance to acceptance of the Consultant, and that repaired or replaced and refinished Work shall not be discernible from existing materials or finishes when judged by the Consultant from a viewing distance of 1830 mm (6') for exterior cladding elements and 610 mm (2') for interior elements, and that such work is included in the Contract Price.

1.2.2. Operational Limitations:

- 1.2.2.1. The existing building will remain in full use and occupancy throughout the Work, except for such parts of the building that have been vacated for the Work.
- 1.2.2.2. The Contractor's use of the Place of the Work is limited to permit regular use of the Owner's existing facilities to continue with the least amount of interference and disruptions possible.
- 1.2.2.3. In consultation with, and to acceptance of, the Consultant in the presence of the Owner, designate an entrance and a circulation route that workers shall use and that shall not be used by the Owner's staff, building occupants, or the public.

1.2.3. Dust tight enclosure and partition doors and entrance doors to the Place of the Work shall remain closed.

1.2.4. Areas of the existing building adjacent to the Place of the Work or areas affected by the Work, including circulation and access routes, shall be maintained in a clean state Equivalent to the level of cleanliness maintained in the existing building, and as follows:

- 1.2.4.1. Clean and vacuum the Place of the Work and areas surrounding the Place of the Work daily or more frequently as required.
- 1.2.4.2. Wet mop floor areas in vicinity of access doors to the Place of the Work daily, or more frequently as required.
- 1.2.4.3. Vacuum carpeted areas daily or more frequently as required.
- 1.2.4.4. Wet clean carpets in accordance with manufacturer's recommendations once work in such areas is complete.
- 1.2.4.5. Final cleaning shall be in accordance with Section 01 77 00 – Closeout Procedures.

1.2.5. Waste Protection and Removal:

- 1.2.5.1. Waste management and disposal shall be in accordance with Section 01 74 00 – Cleaning and Waste Management as supplemented herein.
- 1.2.5.2. Transport waste in containers with tightly fitting lids or cover waste with a wet sheet.
- 1.2.5.3. Remove waste as it is created. Debris shall be contained and covered if it cannot be removed immediately.

- 1.2.5.4. Do not transport waste through occupied areas of existing building.
- 1.2.5.5. Remove waste at the end of each Working Day through construction access routes.
- 1.2.5.6. Document condition of the existing building in areas immediately adjacent to the Place of the Work by means of construction photographs in accordance with Section 01 32 00 – Construction and Progress Documentation.

1.3. Security

- 1.3.1. The Contractor shall be solely responsible for securing the Place of the Work and the Work, and for securing areas used for the storage of Products or construction machinery and equipment. The Owner shall have no responsibility in this regard.
 - 1.3.1.1. Provide and maintain security lighting.
 - 1.3.1.2. Provide and maintain temporary locks. Premises to be locked after working hours.
- 1.3.2. Provide security for the Place of the Work by methods compatible with the security system for the existing building.
 - 1.3.2.1. The Contractor shall coordinate the Work with the Consultant in the presence of the Owner in order to ensure no disruption to the existing building's security system.
 - 1.3.2.2. Where existing building's security system is breached due to the Contractor's negligence, be responsible for any damage or theft of property, regardless if area where damage or theft occurred is under the Contractor's control or not.
- 1.3.3. At commencement of the work of finishing trades, employ a security guard to attend the Place of the Work after working hours until date of Substantial Performance of the Work.

1.4. Sanitary Facilities

- 1.4.1. The Owner shall designate existing washrooms for use of workers. Regularly maintain and clean these washroom facilities, in compliance with applicable regulations, codes and by-laws, for the duration of the Work. At Substantial Performance of the Work, turn over to the Owner, clean washroom facilities, in same condition facilities were prior to commencement of the Work. Arrange and pay for repairs, making good and replacement if necessary, as directed by Consultant. Provision of such access to existing washrooms does not relieve the Contractor of the responsibility to Provide and maintain, in compliance with applicable regulations, codes and by-laws, sufficient sanitary temporary water closets and washbasins for use of workers as required by applicable regulations, codes and by-laws. Additional sanitary temporary water closets and washbasins for use of workers, as required, shall be provided at no additional cost to the Owner.

END OF SECTION

Part 1 - General

1.1. General Requirements

1.1.1. Read and conform to:

- 1.1.1.1. CCDC 2 Stipulated Price Contract - 2020, as amended by Supplementary Conditions.
- 1.1.1.2. Division 01 requirements and documents referred to therein.

1.2. Contractor's Quality Assurance Program

- 1.2.1. Submit to the Owner and the Consultant for their information, a quality assurance program (the "Quality Assurance Program").
 - 1.2.2. The Quality Assurance Program shall meet the requirements of Canadian Standards Association CSA Z299.3 or such other requirements as set out in the Contract Documents.
 - 1.2.3. The Quality Assurance Program shall be designed so that quality requirements are obtained by progressive implementation of the controls and inspection functions stated in the Quality Assurance Program.
 - 1.2.4. The Contractor shall make any modifications to the Quality Assurance Program as reasonably requested by the Owner and/or the Consultant.
 - 1.2.5. The Quality Assurance Program shall include, but shall not be limited to, the following:
 - 1.2.5.1. A system by which changes to the Contract Documents and correspondence with Subcontractor and other correspondence is handled in a controlled manner.
 - 1.2.5.2. A system for purchased or manufactured materials to be identified, inspected to the specified standard, and covered by a material test report.
 - 1.2.5.3. A system by which measuring and testing equipment is properly stored, handled, and calibrated to a known standard.
 - 1.2.5.4. A system by which incoming materials are: inspected to the specified standard; accepted; allocated safe storage; and properly recorded.
 - 1.2.5.5. A system by which process inspection requirements shall be clearly stated for operations and carried out by qualified personnel.
 - 1.2.5.6. A system by which final inspections will be carried out and accepted by authorized personnel prior to release for shipping or major assembly.
 - 1.2.5.7. A system by which non-conformance to requirements of the Contract Documents shall be recorded and solutions proposed by the Owner or the Consultant are also recorded.
 - 1.2.5.8. A system by which instructions for handling and storage of equipment shall be given.
 - 1.2.5.9. A system by which site-bodied-out items can be inspected and received in a manner which allows replacement or correction.
 - 1.2.5.10. A system by which a record of quality inspections, tests, and actions shall be kept.
 - 1.2.5.11. A system by which the Owner and the Consultant shall be afforded access to manufacturing areas and quality records and issued with copies of pertinent drawings and manufacturing schedules.
 - 1.2.6. The Contractor shall provide the Owner and the Consultant with regular Quality Assurance Reports for their information according to an agreed schedule.
- ### **1.3. Contractor's Field Quality Control**
- 1.3.1. The Contractor shall be responsible for field quality control of the Work including quality control of Subcontractors and material Suppliers.

- 1.3.2. Ensure that the only specified or approved Products and materials are used.
- 1.3.3. Provide and maintain an effective quality control program, in accordance with the Quality Assurance Program, and perform sufficient inspections and tests of all items of work, including those of Subcontractors, to ensure compliance with the Contract Documents.
- 1.3.4. Furnish appropriate facilities, instruments, and testing devices required for performance of the quality control function.
- 1.3.5. Required certificates of inspection testing or approval shall be secured by the Contractor and delivered to the Owner in such time as not to delay progress of the Work.
- 1.3.6. The Contractor shall develop a field quality control manual covering both factory and field installation. The form of the manual shall be reviewed and accepted by the Consultant. This manual will document quality control practices of the Contractor, Subcontractors, and major Suppliers. The manual shall include, but not be limited to, specific criteria related to:
 - 1.3.6.1. Concrete slab moisture and pH testing and surface preparation, including flatness and levelness.
 - 1.3.6.2. Surface preparation.
 - 1.3.6.3. Fastener and anchor installation.
 - 1.3.6.4. Air barrier continuity: identify continuity of air barrier systems, including joints and overlapping of dissimilar systems.
 - 1.3.6.5. Air barrier, adhesion testing.
 - 1.3.6.6. Sealant mixing, tack time, set time.
 - 1.3.6.7. Sealant staining of porous substrate testing.
 - 1.3.6.8. Sealant adhesion testing, including butterfly tests where applicable.
 - 1.3.6.9. Painting, verification and adhesion testing where required.
 - 1.3.6.10. Material compatibility testing.
 - 1.3.6.11. On line fabrication quality control practices.
 - 1.3.6.12. Shipping.
 - 1.3.6.13. Field installation.
 - 1.3.6.14. Field inspection and testing (by the Contractor).
 - 1.3.6.15. Field inspection and testing (independent).
 - 1.3.6.16. Inspection and testing shall be performed by company qualified to perform the inspections or tests specified or required.
- 1.3.7. The Contractor shall maintain a logbook (copies to be provided to the Consultant at completion of fabrication) documenting date, time, results, and significance of in-plant testing carried out, where applicable, linked to daily production. The form of this logbook shall be reviewed and accepted by the Consultant.
- 1.4. Independent Inspection and Testing Agencies**
 - 1.4.1. The Contractor shall retain and pay for inspection and testing that is for the Contractor's own quality control or is required by regulatory requirements.
 - 1.4.2. Section 01 21 00 – Cash Allowances specifies a cash allowance for independent inspection and testing services to be retained and paid for by the Contractor. Cash allowance excludes any inspection and testing that is for the Contractor's own quality control or is required by regulatory requirements.
 - 1.4.3. Employment of inspection and testing agencies by the Contractor or the Owner does not relieve the Contractor from responsibility to perform the Work in accordance with the Contract Documents.

- 1.4.4. Allow and arrange for inspection and testing agencies to have access to the Work, including access to off-site manufacturing and fabrication plants.
- 1.4.5. For inspection and testing required by the Contract Documents or by Authorities Having Jurisdiction, provide the Consultant and inspection and testing agencies with timely notification in advance of required inspection and testing.
- 1.4.6. Provide labour, Construction Equipment and temporary facilities to obtain and handle test samples on site.

1.5. Inspection and Testing Agency Reports

- 1.5.1. For inspection and testing required by the Contract Documents or by regulatory requirements, and performed by the Contractor retained inspection and testing agencies, submit to the Consultant and the Owner copies of reports. Submit within five (5) Working Days after completion of inspection and testing.
- 1.5.2. For inspection and testing performed by the Owner retained inspection and testing agencies, copies of inspection and testing agency reports will be provided to the Contractor.

1.6. Cooperation With Testing and Inspection Companies

- 1.6.1. Representatives of the testing laboratories shall have access to work at all times; provide facilities for such access in order that the laboratories may properly perform its function.
- 1.6.2. Cooperate with testing and inspection companies and give adequate notification of any changes in source of Supply, additional work shifts and any other proposed changes.
- 1.6.3. Prior to commencing significant segments of work, give the Consultant and independent testing and inspection agencies appropriate notification so as to afford them reasonable opportunity to review work previously completed. Failure to meet this requirement may be cause for the Consultant to classify the work as defective.
- 1.6.4. Ensure no Product is installed before it is tested when a test is specified, nor work executed where a test or inspection is required and the inspectors cannot attend.
- 1.6.5. Cooperate in permitting access for inspection to all places where work is being done or material is stored prior to shipping.
- 1.6.6. Allow free access to testing agencies and Supply necessary sampling materials for tests. Supply additional labour required to assist the testing and inspection companies in making tests.
- 1.6.7. Cost of above labour and material shall be borne by the Contractor.
- 1.6.8. Testing and inspection service does not relieve the Contractor and Subcontractor of their responsibility for normal shop inspection, quality control of production and for errors made by them.

1.7. Manufacturer's Field Review

- 1.7.1. Where manufacturer's field review is specified, manufacturer's representative shall review the relevant parts of the work at the Place of the Work, or wherever such affected work is in progress, to ensure that work is being executed in accordance with manufacturer's written recommendations and verify its product to be fit-for-purpose intended.
- 1.7.2. Manufacturer's field review is to ensure that the Products specified are being used in the Work and are being applied on surfaces prepared in accordance with their recommendations and the requirements of the Contract Documents.
- 1.7.3. Unless otherwise indicated in the Contract Documents, manufacturer's representative shall undertake a minimum of 1 field review, with additional reviews as deemed necessary by the manufacturer, to determine that the work of such sections is in accordance with the manufacturer's written recommendations.
- 1.7.4. Manufacturer's representative shall submit a type-written report on manufacturer's letterhead within 4 days after each field review. Report shall document manufacturer's representative's field observations and recommendations.

- 1.7.5. Manufacturer's field review reports shall be prepared and distributed following the procedures specified for preparation and Submittal of inspection and testing reports given above.

1.8. Tolerances

- 1.8.1. Unless more stringent tolerances are required by a Section of the Specifications or a referenced standard, meet following tolerances for installed work:
- 1.8.1.1. "plumb" means plumb within 6 mm in 3 m (1/4" in 10' - 0").
 - 1.8.1.2. "level" means level within 6 mm in 3 m (1/4" in 10' - 0").
 - 1.8.1.3. "square" means not in excess of 10 seconds, less or more than 90°.
 - 1.8.1.4. "straight" means within 8 mm in 3 m (5/16" in 10' - 0"), under a 3 m (10' - 0") straightedge.

1.9. Qualifications

- 1.9.1. For manufacturer's, fabricator's and installer's qualifications, conform to requirements specified under respective trade Section as applicable. Where applicable, manufacturer's field services shall be obtained as specified under respective trade Section.
- 1.9.2. Quality Control System Protocol:
- 1.9.2.1. Prior to commencement of Work, establish quality control system protocols, rules, related chain of commands and commitment to provide quality work as intended in the Contract Documents for Work.
 - 1.9.2.2. Retain services of quality control staff, shop and field supervisors complete with their skills, knowledge, duties and responsibilities. Upon request provide full resume of supervisors showing their qualifications.

1.10. Engineer's Qualifications

- 1.10.1. Employ a licensed engineer registered to practice in Province of Ontario carrying a minimum \$2,000,000.00 professional liability insurance to:
- 1.10.1.1. design components of work of this Project specific to their license to practice.
 - 1.10.1.2. be responsible for determining sizes or other specific requirements within their license to practice in accordance with applicable codes and regulations.
 - 1.10.1.3. be responsible for production and review of Shop Drawings.
 - 1.10.1.4. inspect work of this Section during fabrication and erection/installation.
 - 1.10.1.5. be responsible for sealing and signing each Shop Drawing and associated calculations performed.
 - 1.10.1.6. provide Site administration and inspection of this part of the Work.
- 1.10.2. Certification: Submit certification stating performance of engineered work will perform as required.
- 1.10.3. The Owner and/or the Consultant reserves the right to request proof of Professional Liability Insurance from Engineer engaged in the Project. Upon request, submit a valid Certificate of Insurance confirming coverage, including policy limits and expiry date, within 3 Working Days. Failure to provide satisfactory proof of insurance may result in the rejection of the Engineer's Work or services at the Owner's sole discretion.

1.11. Welder Qualifications

- 1.11.1. Have welding executed by firms certified in accordance with CSA W47.1 Division 1 or 2.1 and submit copies of certificates to the Consultant prior to start of work.
- 1.11.2. Ensure operators employed on the Work are qualified in accordance with CSA W47.1 for work as required by the Contract and submit copies of certificates to the Consultant prior to start of work.

- 1.11.3. Ensure Inspection/Testing Company and welding inspector and supervisors meet qualifications in accordance with CSA W178.1 and CSA W178.2 and are certified by the Canadian Welding Bureau in Category (a), Buildings.
- 1.11.4. Have welding undertaken by companies and welders fully approved to following codes and reference standards and carry proof with them while on site:
 - 1.11.4.1. CSA W47.1.
 - 1.11.4.2. Operators shall be qualified "Class O" in accordance with CSA W47.1.
 - 1.11.4.3. CSA W59.
- 1.12. Source Quality Control**
- 1.12.1. Refer to respective trade Sections for source quality control requirements.
- 1.13. Site Quality Control**
- 1.13.1. Refer to respective trade Sections for field quality control requirements.
- 1.14. Testing and Inspection of Mechanical and Electrical Systems**
- 1.14.1. Provide testing and inspection of Mechanical and Electrical Systems as defined in the Contract Documents under trade Sections of Divisions 21, 23, 26, and 27, as applicable.
- 1.15. Testing and Commissioning of Security System**
- 1.15.1. Provide testing and commissioning of the Security Systems as defined in the Contract Documents under trade Sections of Divisions 28, as applicable.

END OF SECTION

Part 1 - General

1.1. General Requirements

1.1.1. Read and conform to:

- 1.1.1.1. CCDC 2 Stipulated Price Contract - 2020, as amended by Supplementary Conditions.
- 1.1.1.2. Division 01 requirements and documents referred to therein.

1.2. Reference Standards

- 1.2.1. Conform to referenced portions of referenced standards, in whole or in part, in their most recently revised or amended form, as specifically requested in the Contract Documents. Incorporation of Reference Standards in the Contract Documents have the same force and effect as if printed in full.
- 1.2.2. "Reference Standards" means consensus standards, trade association standards, association standards, guides, manuals, Specifications, Drawings, and other publications expressly referenced in the Contract Documents.
- 1.2.3. Where an edition or version date is not specified, referenced standards shall be deemed to be the latest edition or revision issued by the publisher at the time of Bid closing. However, if a particular edition or revision date of a specified standard is referenced in an applicable code or other regulatory requirement, the regulatory referenced edition or version shall apply.
- 1.2.4. Reference standards establish minimum requirements. If the Contract Documents call for requirements that differ from a referenced standard, the more stringent requirements shall govern.
- 1.2.5. If compliance with two or more reference standards is specified and the standards establish different or conflicting requirements, comply with the most stringent requirement. Refer uncertainties to the Consultant for clarification.
- 1.2.6. Within the Specifications, reference may be made to the following standards writing, testing, or certification organizations by their acronyms or initialisms:
 - 1.2.6.1. AA - Aluminum Association.
 - 1.2.6.2. ACI - American Concrete Institute.
 - 1.2.6.3. AISC - American Institute of Steel Construction.
 - 1.2.6.4. ANSI - American National Standards Institute.
 - 1.2.6.5. ASME - American Society of Mechanical Engineers.
 - 1.2.6.6. ASTM - American Society for Testing and Materials.
 - 1.2.6.7. AWMAC - Architectural Woodwork Manufacturers Association of Canada.
 - 1.2.6.8. AWPA - American Wire Producers Association.
 - 1.2.6.9. CaGBC - Canadian Green Building Council.
 - 1.2.6.10. CGSB - Canadian General Standards Board.
 - 1.2.6.11. CISC - Canadian Institute of Steel Construction.
 - 1.2.6.12. CPCI - Canadian Prestressed Concrete Institute.
 - 1.2.6.13. CSA - Canadian Standards Association.
 - 1.2.6.14. CSSBI - Canadian Sheet Steel Building Institute.
 - 1.2.6.15. CWB - Canadian Welding Bureau.
 - 1.2.6.16. ICEA - Insulated Cable Engineers Association.
 - 1.2.6.17. IEEE - Institute of Electrical and Electronics Engineers.

- 1.2.6.18. IGMAC – Insulating Glass Manufacturers Association of Canada.
- 1.2.6.19. LEED - Leadership in Energy and Environmental Design.
- 1.2.6.20. MPP – Master Painters Institute.
- 1.2.6.21. MSS - Manufacturers Standardization Society of the Valve and Fittings Industry.
- 1.2.6.22. NAAMM - National Association of Architectural Metal Manufacturers.
- 1.2.6.23. NEMA - National Electrical Manufacturers Association.
- 1.2.6.24. NFPA - National Fire Protection Association.
- 1.2.6.25. NHLA - National Hardwood Lumber Association.
- 1.2.6.26. NLGA - National Lumber Grades Authority.
- 1.2.6.27. OPS – Ontario Provincial Standards.
- 1.2.6.28. PCI – Prestressed Concrete Institute.
- 1.2.6.29. SMACNA – Sheet Metal and Air Conditioning Contractors National Association.
- 1.2.6.30. SSPC - The Society for Protective Coatings.
- 1.2.6.31. TSSA – Technical Standards and Safety Authority.
- 1.2.6.32. TTMAC - Terrazzo, Tile and Marble Association of Canada.
- 1.2.6.33. UL – Underwriters' Laboratories.
- 1.2.6.34. ULC - Underwriters' Laboratories of Canada.

END OF SECTION

Part 1 - General

1.1. General Requirements

1.1.1. Read and conform to:

- 1.1.1.1. CCDC 2 Stipulated Price Contract - 2020, as amended by Supplementary Conditions.
- 1.1.1.2. Division 01 requirements and documents referred to therein.

1.2. Abbreviations

1.2.1. The following abbreviations and acronyms, in addition to those including in the International System of Units are used throughout the Contract Documents and have the following meanings:

- 1.2.1.1. 2PDT - Two Pole Double Throw.
- 1.2.1.2. 3PDT - Triple Pole Double Throw.
- 1.2.1.3. (M) – Measured.
- 1.2.1.4. A - Ampere (Amp).
- 1.2.1.5. AB – Air Barrier.
- 1.2.1.6. ABS - Acrylonitrile Butadiene Styrene.
- 1.2.1.7. AC - Alternating Current.
- 1.2.1.8. AFF - Above Finished Floor.
- 1.2.1.9. AI - Analog Input.
- 1.2.1.10. Amp – Ampere.
- 1.2.1.11. AODA – Accessibility for Ontarians with Disabilities Act, 2005, SO 2005, c11
- 1.2.1.12. ATS - Automatic Transfer Switch.
- 1.2.1.13. AWG - American Wire Gauge.
- 1.2.1.14. B/C – Bottom of Curb.
- 1.2.1.15. B/W – Bottom of Wall.
- 1.2.1.16. BIL - Basic Input Level.
- 1.2.1.17. BTU - British Thermal Unit.
- 1.2.1.18. BYND – Beyond.
- 1.2.1.19. c/c - Centre to Centre.
- 1.2.1.20. C/L – Centre Line.
- 1.2.1.21. C/W – Complete With.
- 1.2.1.22. CB – Catch Basin.
- 1.2.1.23. CCO - Contract Change Order.
- 1.2.1.24. CCS - Copper Clad Steel.
- 1.2.1.25. CD – Change Directive.
- 1.2.1.26. CBR - California Bearing Ratio.
- 1.2.1.27. CCTV - Closed Circuit Television.
- 1.2.1.28. CFM - Cubic Feet per Minute.
- 1.2.1.29. CH – Ceiling Height.

- 1.2.1.30. CIP – Cast-in-Place.
- 1.2.1.31. CL – Closet.
- 1.2.1.32. CLR – Clear.
- 1.2.1.33. CMOS - Complementary Metal Oxide Semiconductor.
- 1.2.1.34. CMU – Concrete Masonry Unit.
- 1.2.1.35. CONC – Concrete.
- 1.2.1.36. CP - Control Panel.
- 1.2.1.37. CPM - Critical Path Method.
- 1.2.1.38. CPP - Concrete Pressure Pipe.
- 1.2.1.39. CPT - Control Power Transformer.
- 1.2.1.40. CPVC - Chlorinated Polyvinyl Chloride.
- 1.2.1.41. CS - Carbon Steel.
- 1.2.1.42. CT - Current Transformer.
- 1.2.1.43. CWP - Cold Working Pressure.
- 1.2.1.44. c/w - Complete With.
- 1.2.1.45. D/L – Drip Line.
- 1.2.1.46. dB – Decibels.
- 1.2.1.47. DC - Direct Current.
- 1.2.1.48. DDC - Direct Digital Control.
- 1.2.1.49. DFT - Dry Film Thickness.
- 1.2.1.50. DI - Discrete Input.
- 1.2.1.51. DN – Down (on stairs).
- 1.2.1.52. DIP - Dual In-line Package.
- 1.2.1.53. DPDT - Double-Pole/Double-Throw.
- 1.2.1.54. DR - Dimension Ratio.
- 1.2.1.55. DW – Dishwasher.
- 1.2.1.56. DVD - Digital Versatile Disk.
- 1.2.1.57. ECA - Environmental Compliance Approval.
- 1.2.1.58. EGS - Emergency Gas Scrubber.
- 1.2.1.59. EMI - Electromagnetic Interference.
- 1.2.1.60. EMT - Electrical Metal Tubing.
- 1.2.1.61. EPDM - Ethylene Propylene Diene Monomer Rubber.
- 1.2.1.62. EQ – Equal.
- 1.2.1.63. ESC - Engine Start Contacts.
- 1.2.1.64. ESR - Elevated Storage Reservoir.
- 1.2.1.65. ET - Elevated Tank.
- 1.2.1.66. EX – Existing.

- 1.2.1.67. EXT – Exterior.
- 1.2.1.68. FAT - Factory Acceptance Test.
- 1.2.1.69. FD - Floor Drain.
- 1.2.1.70. FEC - Front End Communication Controller.
- 1.2.1.71. FF – Floor Flatness.
- 1.2.1.72. FH – Floor Hatch.
- 1.2.1.73. FLA - Full Load Amps.
- 1.2.1.74. FPM - Feet Per Minute.
- 1.2.1.75. FRP - Fibre Reinforced Plastic.
- 1.2.1.76. FRR – Fire Resistance Rating.
- 1.2.1.77. FS F-Series.
- 1.2.1.78. GFI- Ground Fault Interrupter.
- 1.2.1.79. GL – Glass.
- 1.2.1.80. GPM - Gallons per Minute.
- 1.2.1.81. GPS - Global Positioning System.
- 1.2.1.82. GS - Galvanized Steel.
- 1.2.1.83. GB/GWB – Gypsum Wall Board.
- 1.2.1.84. GWMP - Ground Water Management Plan.
- 1.2.1.85. HEPA - High-Efficiency Particulate Air.
- 1.2.1.86. HHM – Hydro Manhole.
- 1.2.1.87. HHPP - Hex Head Pipe Plug.
- 1.2.1.88. HM – Hollow Metal.
- 1.2.1.89. HMI - Human Machine Interface.
- 1.2.1.90. HP – Hydro Pole.
- 1.2.1.91. h.p. – Horsepower.
- 1.2.1.92. HVAC - Heating, Ventilation and Air Conditioning.
- 1.2.1.93. HWT – Hot Water Tank.
- 1.2.1.94. Hz – Hertz.
- 1.2.1.95. I/O - Input/Output point(s).
- 1.2.1.96. i/i – Inside to Inside.
- 1.2.1.97. ID, i.d. - Inside Diameter.
- 1.2.1.98. IGBT - Insulated Gate Bipolar Transistor.
- 1.2.1.99. IP - Iron Pipe.
- 1.2.1.100. IPS - Iron Pipe Size.
- 1.2.1.101. IPT - Iron Pipe Thread.
- 1.2.1.102. INS – Insulation.
- 1.2.1.103. INT – Interior.

- 1.2.1.104. IR - Voltage (refers to current x resistance).
- 1.2.1.105. JB - Junction Box.
- 1.2.1.106. JC - Junction Cabinets.
- 1.2.1.107. kPa – Kilopascal.
- 1.2.1.108. kVA - Kilovolt-Ampere.
- 1.2.1.109. kVDC - Kilovolt Direct Current.
- 1.2.1.110. kW – Kilowatt.
- 1.2.1.111. kWh - Kilowatt Hour.
- 1.2.1.112. L – Litre.
- 1.2.1.113. LAN - Local Area Network.
- 1.2.1.114. LCD - Liquid Crystal Display.
- 1.2.1.115. LED - Light Emitting Diode.
- 1.2.1.116. LEL - Lower Explosive Limit.
- 1.2.1.117. LP – Low Point.
- 1.2.1.118. L/s - Litre Per Second.
- 1.2.1.119. LS – Light Standard.
- 1.2.1.120. m – Metres.
- 1.2.1.121. mA – Milliampere.
- 1.2.1.122. MAX – Maximum.
- 1.2.1.123. MCC - Motor Control Centre.
- 1.2.1.124. MCL - Maximum Contaminant Level.
- 1.2.1.125. MGS - Magnetic Guidance System.
- 1.2.1.126. MH – Man Hole.
- 1.2.1.127. MHz – Megahertz.
- 1.2.1.128. MIG - Million Imperial Gallons.
- 1.2.1.129. MIGD - Million Imperial Gallons per Day.
- 1.2.1.130. MISA - Municipal/Industrial Strategy for Abatement.
- 1.2.1.131. mPa - Milli Pascal.
- 1.2.1.132. MPDD - Modified Proctor Dry Density.
- 1.2.1.133. mg/L - Milligrams Per Litre.
- 1.2.1.134. MIN – Minimum.
- 1.2.1.135. mm – Millimeters.
- 1.2.1.136. MSDS - Materials Safety Data Sheets.
- 1.2.1.137. MUTCD - Manual of Uniform Traffic Control Devices.
- 1.2.1.138. N – Newton.
- 1.2.1.139. NIC – Not in Contract.
- 1.2.1.140. Nm - Newton-Metre.

- 1.2.1.141. NTS – Not to Scale.
- 1.2.1.142. OBC – Ontario Building Code.
- 1.2.1.143. o.c. - On Centre.
- 1.2.1.144. o/o – Outside to Outside
- 1.2.1.145. OCIP - Owner Controlled Insurance Program.
- 1.2.1.146. OD, o.d. - Outside Diameter.
- 1.2.1.147. O&M - Operations and Maintenance.
- 1.2.1.148. OIT - Operator Interface Terminal.
- 1.2.1.149. OTM - Ontario Traffic Manual.
- 1.2.1.150. OVHD – Overhead.
- 1.2.1.151. Pa – Pascal.
- 1.2.1.152. PB – Push Button.
- 1.2.1.153. PCS - Process Control System.
- 1.2.1.154. PE - Plant Exerciser.
- 1.2.1.155. PF - Power Factor.
- 1.2.1.156. PH or ph - Number of phases of AC.
- 1.2.1.157. P&ID - Process and Instrumentation Diagram.
- 1.2.1.158. PID - Process Identifier.
- 1.2.1.159. PL – Property Line.
- 1.2.1.160. PLAM – Plastic Laminate.
- 1.2.1.161. PLC - Programmable Logic Controller.
- 1.2.1.162. ppm - Parts per million.
- 1.2.1.163. PSI – Pounds per square inch.
- 1.2.1.164. PT - Potential Transformer.
- 1.2.1.165. PTD – Painted.
- 1.2.1.166. PTFE - Polytetra fluoro-ethylene.
- 1.2.1.167. PTTW - Permit to take water.
- 1.2.1.168. PVC - Polyvinyl Chloride.
- 1.2.1.169. PVMS - Portable Variable Message Signs.
- 1.2.1.170. QA - Quality Assurance.
- 1.2.1.171. QC - Quality Control.
- 1.2.1.172. QPL - Qualification Program List.
- 1.2.1.173. R – Radius.
- 1.2.1.174. RC - Reverse Circulation.
- 1.2.1.175. RCP – Reflected Ceiling Plan.
- 1.2.1.176. RCPP - Reinforced Concrete Pressure Pipe.
- 1.2.1.177. RF - Radio Frequency.

- 1.2.1.178. RFI - Request for Interpretation.
- 1.2.1.179. RFQ - Request for Quotation.
- 1.2.1.180. RH – Relative Humidity.
- 1.2.1.181. RLC - Resistor/Inductance/Capacitor (filter).
- 1.2.1.182. RMS - Root Mean Square.
- 1.2.1.183. RO – Rough Opening.
- 1.2.1.184. ROW – Right of Way.
- 1.2.1.185. RPU - Remote Processing Unit.
- 1.2.1.186. RTD - Resistance Temperature Detector.
- 1.2.1.187. RTU - Remote Terminal Unit.
- 1.2.1.188. RWL – Rain Water Leader
- 1.2.1.189. SAT - Site Acceptance Test.
- 1.2.1.190. SCADA - Supervisory Control and Data Acquisition.
- 1.2.1.191. SCR - Silicon Controlled Rectifier.
- 1.2.1.192. SIM – Similar.
- 1.2.1.193. SOG – Slab on Grade.
- 1.2.1.194. SPA – Site Plan Approval.
- 1.2.1.195. SPDT - Single-Pole Double-Throw.
- 1.2.1.196. SPMDD - Standard Proctor Maximum Dry Density.
- 1.2.1.197. SS - Stainless Steel.
- 1.2.1.198. STL – Steel.
- 1.2.1.199. SWP - Steam Working Pressure.
- 1.2.1.200. T/O – Top of
- 1.2.1.201. T/W – Top of Wall.
- 1.2.1.202. TBC – To be Confirmed.
- 1.2.1.203. TBD – To be Determined.
- 1.2.1.204. TCP/IP - Transmission Control Protocol / Internet Protocol.
- 1.2.1.205. T/C – Thermocouple.
- 1.2.1.206. TC – Top of Curb.
- 1.2.1.207. TDDT - Time Delay During Transfer.
- 1.2.1.208. TDEC - Time Delay Engine Cool-off.
- 1.2.1.209. TDEN - Time Delay Emergency to Normal.
- 1.2.1.210. TDES - Time Delay Engine Start.
- 1.2.1.211. TDOE - Time Delay On Energizing.
- 1.2.1.212. TDOD - Time Delay On De-energizing.
- 1.2.1.213. TDH - Total Dynamic Head.
- 1.2.1.214. TDNE - Time Delay Normal to Emergency.

- 1.2.1.215. TEW - Thermoplastic Equipment Wire.
- 1.2.1.216. TEFC - Totally Enclosed Fan Cooled (motor).
- 1.2.1.217. THD - Total Harmonic Distortion.
- 1.2.1.218. THWN - Thermoplastic Heat and Water Resistant Nylon Coated.
- 1.2.1.219. TPP – Tree Protection Plan.
- 1.2.1.220. TPZ – Tree Protection Zone.
- 1.2.1.221. TYP – Typical.
- 1.2.1.222. UPS - Uninterruptible Power Supply.
- 1.2.1.223. UV – Ultraviolet.
- 1.2.1.224. V – Volt.
- 1.2.1.225. VA Volt-Ampere.
- 1.2.1.226. VAC - Alternating Voltage.
- 1.2.1.227. VAR - Reactive Volt-Amperes.
- 1.2.1.228. VB – Vapour Barrier.
- 1.2.1.229. VCP - Visual Comfort Probability.
- 1.2.1.230. VDC - Direct Voltage.
- 1.2.1.231. VERT – Vertical.
- 1.2.1.232. VFD - Variable Frequency Drive.
- 1.2.1.233. VIF – Verify in Field.
- 1.2.1.234. VOC - Volatile Organic Compounds.
- 1.2.1.235. W – Watt.
- 1.2.1.236. WAN - Wide Area Network.
- 1.2.1.237. WB – Water Bottle Filler.
- 1.2.1.238. W/C - Water to Cement.
- 1.2.1.239. WC – Water Closet.
- 1.2.1.240. WG - Water Gauge (pressure).
- 1.2.1.241. WOG - Water-Oil-Gas (valves, pressure).
- 1.2.1.242. WRB – Weather Resistive Barrier.
- 1.2.1.243. WV – Water Valve.
- 1.2.1.244. YDSS - York-Durham Sewage System.

END OF SECTION

Part 1 - General

1.1. General Requirements

1.1.1. Read and conform to:

- 1.1.1.1. CCDC 2 Stipulated Price Contract - 2020, as amended by Supplementary Conditions.
- 1.1.1.2. Division 01 requirements and documents referred to therein.

1.2. Temporary Water Supply

- 1.2.1. Connect to and use the Owner's existing water Supply for temporary use during construction.

1.3. Temporary Heating and Ventilation

1.3.1. Provide temporary ventilation for the Work as required to:

- 1.3.1.1. Prevent accumulations of fumes, exhaust, vapours, gases and other hazardous, noxious, or volatile substances in enclosed spaces, as required to maintain a safe work environment meeting applicable regulatory requirements.

1.4. Temporary Electrical Power and Lighting

- 1.4.1. Existing building heating, ventilation, power, and lighting may be relied upon and used during construction except during hours or days when the building is not operational.
- 1.4.2. Coordinate and make arrangements with the building operator and pay any costs required for provision of these services during hours or days when the building is not operational.

END OF SECTION

Part 1 - General

1.1. General Requirements

1.1.1. Read and conform to:

- 1.1.1.1. CCDC 2 Stipulated Price Contract - 2020, as amended by Supplementary Conditions.
- 1.1.1.2. Division 01 requirements and documents referred to therein.

1.1.2. Construction Facilities - General

- 1.1.2.1. Provide temporary construction facilities as necessary for performance of the Work and in compliance with applicable regulatory requirements.
- 1.1.2.2. Maintain temporary construction facilities in good condition for the duration of the Work.
- 1.1.2.3. Remove temporary construction facilities from Place of the Work when no longer required.
- 1.1.2.4. Construction facilities shall be limited to the boundaries of the Place of the Work unless otherwise authorized by the Owner.

1.2. Vehicular Access and Parking

- 1.2.1. Provide access roads as may be necessary to provide safe and adequate access for materials, Products and other supplies. Provide and maintain access sidewalks, roadways and similar facilities as may be required for access to the Work. Do not block public roads or impede traffic during work of this Project and if required to temporarily block traffic then provide flag person to direct traffic acceptable to Municipal authorities. Remove accumulations of ice and snow from areas providing access to Site. Ensure access is available for emergency vehicles. Comply with fire plan for vehicular traffic.
- 1.2.2. Provide roads, walks, ramps stairs and other such means of access as necessary. Maintain temporary entrances to building(s) including enclosed hoarding as required. Maintain access to existing service entrance(s) at all times, including ready access for fuel oil trucks and delivery vehicles. Bridge excavations with construction to safely support any load that could be imposed or provide personnel to assist in deliveries to building(s) as required.
- 1.2.3. Arrange parking for the Contractor's vehicles with the Owner. The Owner shall not be responsible for parking fines incurred by the Contractor, Subcontractors or their employees.
- 1.2.4. Do not be nuisance to public traffic any time. Manage construction traffic by using designated roads and by providing trained flag persons to direct public traffic as appropriate.
- 1.2.5. Existing Parking Facilities: Confine parking to institution's designated parking facilities. Arrange and pay for associated costs. Do not block any streets, walkways or allow their use for parking by any construction crew or visitors except with approved specific permission from appropriate authorities and in accordance with stipulated standing regulations and restrictions. Minimize traffic movement and temporary closing of access streets.

1.3. Sanitary Facilities

- 1.3.1. Regularly maintain and clean existing facilities for use by workers in compliance with Occupational Health and Safety Act, RSO 1990,c O.1 applicable codes and by-laws for the duration of the Work in accordance with Section 01 35 00 – Special Procedures.
- 1.3.2. Misuse of water closets and washing facilities or fouling of building by workers shall constitute grounds for instant dismissal from Site.

1.4. Fire Protection

- 1.4.1. Take necessary precautions to eliminate fire hazards and to prevent damage to the Work, building materials, equipment and other property both public and private having to do with the Work. Inspect the Work at least daily for this purpose.

- 1.4.2. Provide and maintain in working order, suitable labelled fire extinguishers and locate in prominent positions, to approval of Authorities Having Jurisdiction.
- 1.4.3. When welding, brazing and performing any operation with an open flame, keep a portable fire extinguisher within close access of operator.
- 1.4.4. Store and locate materials and equipment packed in cardboard cartons, wood crates and other combustible containers in orderly and accessible manner. Place suitable types of firefighting equipment in vicinity of materials or equipment packed in this type of crate or carton until permanent fire protection and equipment are available.
- 1.4.5. Store rags and waste containing oil, grease or other flammable materials in an approved fireproof cabinet or remove from the Place of the Work at end of each Working Day.
- 1.4.6. Only fire-resistant tarpaulins are permitted at the Place of the Work.
- 1.4.7. Provide temporary standpipes as the Work proceeds in accordance with applicable regulations.
- 1.4.8. Use only non-combustible materials for interior temporary construction.
- 1.4.9. No fires or burning of waste is permitted at the Place of the Work.
- 1.4.10. Supplement these requirements in accordance with Section 01 35 00.
- 1.4.11. Fire Watch
- 1.4.12. Definition: 'Hot Work' is defined as work using open flames or sources of heat that could ignite materials in the work area.
- 1.4.13. Obtain 'Hot Work Permit' from the Owner prior to Hot Work operation, which may cause the building's fire alarm system to be activated or create an unwarranted fire risk condition. The prevention of fires and false fire alarms caused by these perilous operations are the primary goals of this procedure. Gas hoses, backflow preventers, fire resistive tarpaulins, curtains and other cutting and welding equipment must be in good repair before the permit is issued.
- 1.4.14. During and after welding or similar heat producing activities (Hot Work), monitor areas of work for the presence heat using suitable heat sensing equipment and qualified trained fire watch personnel. Fire watch personnel shall be trained in the proper operation of first aid fire extinguishers. Comply with the Owner's fire watch requirements. If the Owner's fire watch requirements are unknown, determine the Owner's requirements a minimum of 48 hours prior to required Hot Work activity.
- 1.4.15. Provide fire watch during and for at least 30 minutes after work, and during coffee or lunch breaks. Provide fire watch suitable extinguishers, or charged small hose. Train fire watch in use of this equipment and in sounding fire alarm.
- 1.4.16. Necessary Precautions:
 - 1.4.16.1. Carry out the following precautions within 10 m (35 ft) of work:
 - 1.4.16.2. Floors swept clean of combustibles.
 - 1.4.16.3. Combustible floors wet down, covered with damp sand or fire-resistive sheets.
 - 1.4.16.4. Flammable liquids removed; other combustibles, if not removed protected with fire-resistive tarpaulins or metal shields.
 - 1.4.16.5. Explosive atmosphere in area eliminated.
 - 1.4.16.6. Wall and floor openings covered.
 - 1.4.16.7. Fire-resistive tarpaulins suspended beneath work.
 - 1.4.16.8. Work on Walls or Ceilings:
 - 1.4.16.8.1. Construction is non-combustible and without combustible covering or isolation.
 - 1.4.16.8.2. Combustibles moved away from other side of wall.

1.4.16.9. Work on Enclosed Equipment:

1.4.16.9.1. Enclosed equipment cleaned of all combustibles.

1.4.16.9.2. Containers purged of flammable liquids.

1.4.17. Fire watch personnel may not do other jobs which detract from their primary responsibility.

1.4.18. Upon completion Hot Work activity, fire watch personnel shall sign a log sheet. Submit copy of log sheet at completion of each Hot Work activity. Return the work permit to the person who issued it within 30 minutes of job completion.

1.5. Use of Existing Elevators

1.5.1. Designated elevators may be used by construction personnel and for transporting Products. Coordinate use with the Owner representative.

1.5.2. Provide protective coverings for finish surfaces of cars and entrances. Assume responsibility for and Make Good any damage to existing elevators caused by construction personnel.

END OF SECTION

Part 1 - General

1.1. General Requirements

1.1.1. Read and conform to:

- 1.1.1.1. CCDC 2 Stipulated Price Contract - 2020, as amended by Supplementary Conditions.
- 1.1.1.2. Division 01 requirements and documents referred to therein.

1.2. Temporary Barriers and Enclosures - General

- 1.2.1. Provide temporary barriers and enclosures necessary to protect the public and building occupants, and to secure Place of the Work during performance of the Work.
- 1.2.2. Comply with applicable regulatory requirements.
- 1.2.3. Maintain temporary barriers and enclosures in good condition for the duration of the Work.
- 1.2.4. Remove temporary barriers and enclosures from Place of the Work when no longer required.

1.3. Occupation of Public Property

- 1.3.1. Arrange for and provide hoarding and barricades around areas occupying public property, (within and outside the boundary of the Place of the Work), required to execute the Work. Comply with requirements of Authorities Having Jurisdiction.
- 1.3.2. Pay fees associated with occupation of public property.
- 1.3.3. Structural Design and Inspection: Employ a licensed engineer registered in the province of Ontario to:
 - 1.3.3.1. design hoarding and barricades located on public property.
 - 1.3.3.2. be responsible for production and review of Shop Drawings.
 - 1.3.3.3. sealing and signing each Shop Drawing and any associated calculations performed.
 - 1.3.3.4. provide Site inspection of this part of the Work.

1.4. Hoarding and Boardwalk

- 1.4.1. Provide hoarding and gates in accordance with the requirements of the Municipality, the Occupational Health and Safety Act, RSO 1990, c O.1 Regulations for Construction Projects and other Authorities Having Jurisdiction to:
 - 1.4.1.1. Protect public, the Owner's occupants, personnel and property from injury and damage.
 - 1.4.1.2. Exclude non-construction personnel and public from parts of the Place of the Work under construction.
- 1.4.2. Framing, sheathing decking as per details indicated on Drawings and materials listed herein are minimum requirements which may be superseded by Engineer's design.
- 1.4.3. Wood Hoarding and Boardwalk Framing: National Lumber Grades Authority No. 1 Grade SPF.
- 1.4.4. Plywood Hoarding Sheathing: Exterior COFI Select tight face.
- 1.4.5. Plywood Boardwalk Decking: Exterior COFI Sheathing.
- 1.4.6. Wire Mesh: 50 mm x 50 mm x 3.4 mm (2" x 2" x 1/8") galvanized.
- 1.4.7. Gates and Pass Doors: Selected by the Contractor.
- 1.4.8. Gate and pass door hardware shall be selected by the Contractor including fire exit hardware.
- 1.4.9. Temporary Roofing and Cladding (Minimum): Waterproof tarpaulins.
- 1.4.10. Limit extent of the Place of the Work shall be as indicated on Drawings.

- 1.4.11. Prohibit use of roads outside of the Place of the Work except for construction purposes and as required for access to the Place of the Work.
- 1.4.12. Maintain hoarding in a clean condition, free of unauthorized bills, signs and defacement.
- 1.4.13. Provide covered extensions of hoarding and boardwalks, beyond those indicated on Drawings, where risk of falling objects exists, to protect the Owner's personnel, tenants and patrons.
- 1.4.14. Post adequate warning signage, prominently displayed and within view of each other on hoarding, warning of the illegality and danger of unauthorized trespassing into the parts of the Place of the Work under construction.
- 1.4.15. Maintain Access to Exits and Exits, for emergency escape through or around hoarding to a safe area of refuge acceptable to Authorities Having Jurisdiction.
- 1.4.16. Relocate and reconstruct hoarding to accommodate phasing of the Work.
- 1.4.17. Remove and dispose of hoarding upon completion of the parts of the Work.

1.5. Barricades

- 1.5.1. Provide hoardings, guard rails, barriers, notices, warning boards and all kinds protection features for protection of workers as well as for protection of public and of public and private properties; and as required by law or by Authorities Having Jurisdiction.
- 1.5.2. Alter, remove and relocate or replace as required, hoardings, barriers and entrances therein as required by Authorities Having Jurisdiction and by Work.

1.6. Dust Tight Partitions

- 1.6.1. Provide dust tight polyethylene screens and steel stud and gypsum board partitions to localize interior building areas from dust and noise generating activities.
- 1.6.2. Erect, maintain, and relocate screens and partitions as required to facilitate construction operations and the Owner's operational requirements.

1.7. Fire Routes

- 1.7.1. Maintain fire access routes, including overhead clearances, for use by emergency response vehicles.

1.8. Protection Of Building Finishes

- 1.8.1. Provide necessary temporary barriers and enclosures to protect existing and completed or partially completed finished surfaces from damage during performance of the Work.

END OF SECTION

Part 1 - General

1.1. General Requirements

1.1.1. Read and conform to:

- 1.1.1.1. CCDC 2 Stipulated Price Contract - 2020, as amended by Supplementary Conditions.
- 1.1.1.2. Division 01 requirements and documents referred to therein.

1.2. Temporary Controls - General

- 1.2.1. Provide temporary controls as necessary for performance of the Work and in compliance with applicable regulatory requirements.
- 1.2.2. Maintain temporary controls in good condition for the duration of the Work.
- 1.2.3. Remove temporary controls and Construction Equipment used to provide temporary controls from Place of the Work when no longer required.

1.3. Dust and Particulate Control

- 1.3.1. Implement and maintain dust and particulate control measures in accordance with applicable regulatory requirements.
- 1.3.2. Execute Work by methods that minimize dust from construction operations and spreading of dust on Site or to adjacent properties.
- 1.3.3. Provide temporary enclosures to prevent extraneous materials resulting from sandblasting or similar operations from contaminating air beyond immediate work area.
- 1.3.4. Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.
- 1.3.5. Use appropriate covers on trucks hauling fine, dusty, or loose materials.

1.4. Pollution Control

- 1.4.1. Take measures to prevent contamination of soil, water, and atmosphere through uncontrolled discharge of noxious or toxic substances and other pollutants, potentially causing environmental damage.
- 1.4.2. Be prepared, by maintaining appropriate materials, equipment, and trained personnel on Site, to intercept, clean up, and dispose of spills or releases that may occur. Promptly report spills and releases that may occur to:
 - 1.4.2.1. Authority Having Jurisdiction,
 - 1.4.2.2. Person causing or having control of pollution source, if known, and
 - 1.4.2.3. Owner and Consultant.
 - 1.4.2.4. Contact Manufacturer of pollutant, if known and applicable, to obtain safety data sheets (SDS) and ascertain hazards involved and precautions and measures required in cleanup or mitigating actions.
 - 1.4.2.5. Take immediate action to contain and mitigate harmful effects of the spill or release.

1.5. Pest Control

- 1.5.1. Be responsible to provide control measures, restraining procedures and treatments to prevent infestation and spread of insects, rodents and other pests deemed to be present at Site and/or noticed during course of the Work. Carry out fumigation, pest control procedure and posting of warning signs, notices including contents of such notices in accordance with requirements of Pesticides Act, RSO 1990, cP.11 and any other Authorities Having Jurisdiction.

1.6. Temporary Fire Protection

- 1.6.1. Provide and maintain sufficient temporary standpipes and connections, fire hose, valves, temporary cabinets and extinguishers, to comply with requirements of the governing Municipal and Provincial authorities to satisfaction of the Consultant and local fire department and insurance authorities to protect the property of the Owner and the Contractor against fire hazards during construction.
- 1.6.2. Adjust and modify temporary fire protection facilities to accommodate progress of the Work.
- 1.6.3. Bulk storage of flammable liquids and other hazardous materials is not allowed on Site.
- 1.6.4. Handle flammable liquids in approved containers.
- 1.6.5. Bringing in, use and disposal of gasoline, benzene or other flammable materials must be handled with good and safe practice as required by Authorities Having Jurisdictions.
- 1.6.6. Maintain temporary fire protection systems in operation 24 hours a Day.
- 1.6.7. Provide and maintain temporary access routes to exits, clear and visibly identified, 24 hours a Day.
- 1.6.8. Take necessary precautions to eliminate fire hazards and to prevent damage to work, building materials, equipment and other property both public and private having to do with the Work. Inspect work of this Contract at least once a week for this purpose.
- 1.6.9. In areas of existing building being renovated and adjacent areas where affected by construction activities, make necessary adjustments and modifications to temporary fire protection as required during progress of the work, removing such temporary modifications when the permanent system is installed and operating. Maintain all existing fire exits at all times.
- 1.6.10. Provide fire protection to satisfaction of the Consultant, to Authorities Having Jurisdiction and to insurance authorities stipulated by the Owner. Maintain in operation 24 hours a Day.
- 1.6.11. Provide and maintain free access from street to fire hydrants and to outside connections for standpipes or other fire extinguishing equipment, permanent or temporary; and maintain free access to control valves and hoses on fire lines within building and to all portable fire extinguishers. Ensure devices are visibly identified 24 hours a Day.
- 1.6.12. Provide and maintain in working order, suitable Underwriters' labelled fire extinguishers and locate in prominent positions, to approval of Authorities Having Jurisdiction. Such extinguishers remain property of the Contractor. Remove from building at date of Substantial Performance of the Work.
- 1.6.13. Store and locate materials and equipment packed in cardboard cartons, wood crates and other combustible containers in orderly and accessible manner. Place approved types of fire-fighting equipment in vicinity of materials or equipment packed in this type of crate or carton until permanent fire protection and equipment are available.
- 1.6.14. Store rags and waste containing oil, grease or other flammable materials in an approved metal container and remove from Site at end of each Working Day.
- 1.6.15. Only fire resistant tarpaulins are permitted on Site.
- 1.6.16. Provide temporary standpipes as work proceeds in accordance with the regulations under the Occupational Health and Safety Act, RSO 1990, c O.1.
- 1.6.17. In eliminating fire risks, or effectively controlling Site activities to minimize fire risk, observe following precautions as a minimum:
 - 1.6.17.1. Prior to commencing work in any area, ensure workers are acquainted with the location of all fire-fighting apparatus and are familiar with its proper use and apparatus is in good working order.
 - 1.6.17.2. Stop all work immediately when any deficiencies in fire protection are encountered after work commences. Remedy all such deficiencies before resuming any other work.
 - 1.6.17.3. In areas where spraying with water will not cause damage, including areas at roof level, thoroughly wet area before commencing welding, oxyacetylene cutting, brazing, grinding or other hot work and keep area thoroughly wet until at least 1/2 hour following the last of previously stipulated hot work ceases. In areas where spraying with water would cause

damage, provide approved fire-retardant mats or blankets to cover all areas which might be reached by sparks, flame, hot slag, or other hot material from welding, cutting, brazing, grinding, or other hot work. In addition, provide blank flanges, plugs, caps, or other suitable means to seal openings and/or hot material and fill those items with water before commencing hot work. Stop all work immediately if water is lost or drained from any of those rubber-lined items. These requirements for rubber-lined items also apply to all other items with combustible linings.

- 1.6.17.4. When electric or gas welding, brazing, cutting and performing any operation with an open flame within 3000 mm (10') or above space that may be occupied by persons, keep a portable fire extinguisher within 3000 mm (10') or above of operator at all times.
- 1.6.17.5. Provide adequate fire watch at all times when welding, burning, cutting, brazing, or other hot work is in progress and until such times as the source of ignition or flame has been extinguished and for longer as required. Ensure each fire watcher has a suitable fire extinguisher on hand at all times.
- 1.6.17.6. Ensure fire watchers have no duties other than fire protection and that fire watch continues through coffee breaks, meal periods and after normal work hours as necessary to ensure fire watch for at least 1/2 hour after welding, burning, brazing, cutting and similar hot work ceases.
- 1.6.17.7. Comply with the rules and regulations of the Fire Protection and Prevention Act, 1997, c4, and the Accident Prevention Regulations of The Workplace Safety Insurance Board.
- 1.6.18. Notify the Fire Department and the Consultant immediately should a fire of any nature occur whether the fire has been extinguished or not. Notify the Fire Department and the Consultant of any fire alarm shutdowns; notify once fire alarm has been recertified and operational.
- 1.6.19. If the Contractor is the cause of a false alarm, it may be required to reimburse the Owner for any charges from the Municipal Department resulting from the false alarm.
- 1.6.20. Establish a log book maintained by the Contractor which records all activity affecting the Owner's fire alarm system. The log book shall record the date, time, trade, worker's name, nature and location of work performed, zone or zones affected, status of the system while work was performed, time and date of completion of the operation, and status of the system upon completion of the Work. At the end of each Working Day, the Contractor shall review the log and sign indicating system is fully operational, except as recorded by the log. Inform the Owner of system status and which zones may be affected daily prior to the commencement of any new operation that affects the fire alarm system.
- 1.6.21. Fire Watch:
 - 1.6.21.1. A fire watch is required for each of the following activities regardless of the number, duration or size of activity in operation on a single floor or in a single area:
 - 1.6.21.1.1. any open flame activity (e.g. soldering and welding).
 - 1.6.21.1.2. shutdown of fire detection system.
 - 1.6.21.1.3. shutdown of sprinkler system.
 - 1.6.21.1.4. any other situation the Consultant and/or the Owner may deem appropriate.

END OF SECTION

Part 1 - General

1.1. General Requirements

1.1.1. Read and conform to:

- 1.1.1.1. CCDC 2 Stipulated Price Contract - 2020, as amended by Supplementary Conditions.
- 1.1.1.2. Division 01 requirements and documents referred to therein.

1.2. Basic Product Requirements

- 1.2.1. Ensure materials, plant, equipment and fixtures are new, unused and specifically purchased for this Project. Ensure the same are not damaged or defective and of quality specified and compatible for purpose intended. If requested provide evidence as to type, source and quality. Remove and replace defective Products, at own expense, regardless of previous reviews and be responsible for delays and expenses caused thereby. Replace factory finished equipment, or parts thereof, whose paint finish is damaged and cannot be reasonably remedied by paint touch-up.
- 1.2.2. In general, the Owner retains right to select all choices available within specified Products including colours, finishes and other options unless specified otherwise.
- 1.2.3. Unless otherwise specified, maintain uniformity of manufacture for like items throughout.
- 1.2.4. Permanent manufacturer's markings, labels, trademarks, and nameplates on Products are not acceptable in prominent locations, except where required by regulatory requirements or for operating instructions, or when located in mechanical or electrical rooms.

1.3. Product Options

1.3.1. Subject to the provisions of Section 01 25 00 –Substitution Procedures:

- 1.3.1.1. Wherever a Product or manufacturer is specified by a single proprietary name, provide the named Product only.
- 1.3.1.2. Wherever more than one Product or manufacturer is specified by proprietary name for a single application, provide any one of the named Products.
- 1.3.2. Wherever a Product is specified by reference to a standard only, provide any Product that meets or exceeds the specified standard. If requested by the Consultant, submit information verifying that the proposed Product meets or exceeds the specified standard and will fit in the intended space.
- 1.3.3. Wherever a Product is specified by descriptive or performance requirements only, provide any Product that meets or exceeds the specified requirements. If requested by the Consultant, submit information verifying that the proposed Product meets or exceeds the specified requirements and will fit in the intended space.

1.4. Product Availability and Delivery Times

- 1.4.1. Promptly upon Contract award and periodically during construction, review and confirm Product availability and delivery times. Order Products in sufficient time to meet the construction progress schedule and the Contract Time.
- 1.4.2. If a specified Product is no longer available, promptly notify the Consultant. The Consultant shall take action as required.
- 1.4.3. If delivery delays are foreseeable, for any reason, promptly notify the Consultant.
- 1.4.4. If a delivery delay is beyond the Contractor's control, the Consultant shall provide direction.
- 1.4.5. If a delivery delay is caused by something that was or is within the Contractor's control, the Contractor shall propose actions to maintain the construction progress schedule for the Consultant's review and acceptance.

- 1.4.6. In the event of failure to notify the Consultant at commencement of the Work and should it subsequently appear that Work may be delayed for such reason, the Consultant reserves right to substitute more readily available Products of similar character, at no increase in the Contract Price.

1.5. Product Delivery, Storage, and Handling

- 1.5.1. Deliver, store, and handle Products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

1.5.2. Delivery and Handling:

- 1.5.2.1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
- 1.5.2.2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
- 1.5.2.3. Deliver Products to Project Site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
- 1.5.2.4. Inspect Products on delivery to ensure compliance with the Contract Documents and to ensure that Products are undamaged and properly protected.

1.5.3. Storage:

- 1.5.3.1. Store Products to allow for inspection and measurement of quantity or counting of units.
- 1.5.3.2. Store materials in a manner that will not endanger the Project structure.
- 1.5.3.3. Store Products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
- 1.5.3.4. Store cementitious Products and materials on elevated platforms.
- 1.5.3.5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
- 1.5.3.6. Comply with Product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
- 1.5.3.7. Protect stored Products from damage and liquids from freezing.
- 1.5.3.8. Provide a secure location and enclosure at the Project Site for storage of materials and equipment by the Owner's construction forces. Coordinate location with the Owner.

1.5.4. Mould Control During Product Storage and Handling:

- 1.5.4.1. Do not bring building Products onto Site containing toxic moulds.
- 1.5.4.2. Exercise continuous quality control and enforce mould control requirements upon Subcontractors and establish proper Product storage and delivery sequence to protect Products from weather and other exposures conducive to mould growth.
- 1.5.4.3. Take special care while handling and storing materials, without limitation, such as particleboard, plywood, cellulose materials, wallpaper, ceiling panels, gypsum boards and insulation with kraft paper back up.
- 1.5.4.4. Monitor humidity levels and provide adequate ventilation in storage areas. Be watchful of any moisture condition in storage areas. Do not use materials which have been damaged by exposure to moisture and/or showing signs of mould growth.
- 1.5.4.5. Take measures during Product storage and handling to provide mould free finished construction.
- 1.5.4.6. Product with visible or invisible signs of mould amplification whether installed or not, shall be considered defective and removed at the Contractor's expense. The Contractor shall be

responsible to retain a qualified and experienced bio-contamination investigator to conduct at its expense sampling and laboratory analysis and other required assessment steps to determine whether or not materials are impacted by mould amplification and follow up recommended contamination management method.

1.6. Mechanical & Electrical Location Drawings

- 1.6.1. Mechanical and electrical Drawings indicate approximate locations diagrammatically. Prior to installation, request and obtain final locations and arrangement Drawings for mechanical and electrical items. Allow the Consultant to adjust final locations within a 1500 mm (5') radius from diagrammatic position indicated, without change to the Contract Price.
- 1.6.2. Align and cluster devices and fitments neatly in accordance with specified mounting heights, properly aligned horizontally and vertically.

1.7. Fire Rating

- 1.7.1. Where material, component or assembly is required to be fire rated, fire rating shall be determined on basis of results of tests conducted in conformance with CAN/ULC-S101 by 1 of following testing authorities acceptable to Authorities Having Jurisdiction:
 - 1.7.1.1. Underwriters Laboratories of Canada (ULC).
 - 1.7.1.2. Underwriters Laboratories Inc. (UL).
 - 1.7.1.3. FM Global.
 - 1.7.1.4. National Research Council of Canada.
 - 1.7.1.5. National Board of Fire Underwriters.
 - 1.7.1.6. Warnock Hersey – Intertek.
- 1.7.2. Where reference is made to only 1 testing authority, an Equivalent fire rating as determined or listed by another of aforementioned testing authorities is acceptable if approved by Authorities Having Jurisdiction. Obtain and submit such approval of authorities, in writing, when requesting acceptance of a proposed Equivalent rating or test design.
- 1.7.3. Ensure engineering judgements are sealed by a licensed engineer.

1.8. VOC REQUIREMENTS

- 1.8.1. Ensure following requirements are strictly adhered to throughout the Work.
- 1.8.2. No adhesive or sealant shall contain formaldehyde or a formaldehyde precursor as an ingredient.
- 1.8.3. Applications inside weatherproofing system shall comply with following VOC content limits when calculated in accordance with SCAQMD Rule 1168:
 - 1.8.3.1. Wood Glues: 30 g/L.
 - 1.8.3.2. Metal-to-Metal Adhesives: 30 g/L.
 - 1.8.3.3. Adhesives for Porous Materials (Except Wood): 50 g/L.
 - 1.8.3.4. Subfloor Adhesives: 50 g/L.
 - 1.8.3.5. Plastic Foam Adhesives: 50 g/L.
 - 1.8.3.6. Carpet Adhesives: 50 g/L.
 - 1.8.3.7. Carpet Pad Adhesives: 50 g/L.
 - 1.8.3.8. VCT and Asphalt Tile Adhesives: 50 g/L.
 - 1.8.3.9. Cove Base Adhesives: 50 g/L.
 - 1.8.3.10. Gypsum Board and Panel Adhesives: 50 g/L.

- 1.8.3.11. Rubber Floor Adhesives: 60 g/L.
- 1.8.3.12. Ceramic Tile Adhesives: 65 g/L.
- 1.8.3.13. Multipurpose Construction Adhesives: 70 g/L.
- 1.8.3.14. Fiberglass Adhesives: 80 g/L.
- 1.8.3.15. Contact Adhesive: 80 g/L.
- 1.8.3.16. Structural Glazing Adhesives: 100 g/L.
- 1.8.3.17. Wood Flooring Adhesive: 100 g/L.
- 1.8.3.18. Structural Wood Member Adhesive: 140 g/L.
- 1.8.3.19. Special-Purpose Contact Adhesive: 250 g/L.
- 1.8.3.20. Top and Trim Adhesive: 250 g/L.
- 1.8.3.21. Adhesive Primer for Plastic: 550 g/L.
- 1.8.3.22. Aerosol Adhesive, General-Purpose Mist Spray: 65 percent by weight.
- 1.8.3.23. Aerosol Adhesive, General-Purpose Web Spray: 55 percent by weight.
- 1.8.3.24. Special-Purpose Aerosol Adhesive (All Types): 70 percent by weight.
- 1.8.3.25. Other Adhesives: 250 g/L.
- 1.8.3.26. Architectural Sealants: 250 g/L.
- 1.8.3.27. Other Sealants: 420 g/L.
- 1.8.3.28. Sealant Primers for Nonporous Substrates: 250 g/L.
- 1.8.3.29. Sealant Primers for Porous Substrates: 775 g/L.
- 1.8.3.30. Other Sealant Primers: 750 g/L.
- 1.8.4. VOC requirements stipulated in Specifications prepared by Sustainability Consultant supersede the requirements noted herein.

1.9. Manufacturers' Written Instructions

- 1.9.1. Unless specified otherwise, use each Product in accordance with manufacturer's published written instructions regarding handling, storage, preparation, methods of installation, protection and cleaning. Take into account Site conditions and provide ancillary Products or accessories.
- 1.9.2. Conform to manufacturer's recommended installation temperatures. If finishes are installed at temperatures different from operation or service temperatures, make provisions for expansion and contraction in service as acceptable to manufacturer. Repair resulting damage should expansion provisions prove inadequate.
- 1.9.3. Notify the Consultant, in writing, of conflicts between the Contract Documents and manufacturer's instructions, so the Consultant shall establish course of action to be taken. If requested, make a copy of those instructions available at Site.
- 1.9.4. Improper installation or erection of Products, due to failure to comply with these requirements, shall require removal and re-installation at no increase in the Contract Price.
- 1.9.5. Whenever specific reference to following manufacturer's directions or instructions is made in Specifications, upon request submit copies thereof for review before commencing such work.

1.10. Anchors and Fasteners

- 1.10.1. Supply appropriate anchors, fasteners, accessories and adhesives required for fabrication and erection of Work.

- 1.10.2. Unless specified otherwise use exposed metal fastenings and accessories of same texture, colour and finish as Product being fastened.
- 1.10.3. Use metal fastenings of same material as metal component being fastened, or of metal which will not generate electrolytic action and cause damage to fastening or metal component under moist conditions. In general use non-corrosive or hot dip galvanized steel anchors occurring on or in exterior wall, slab or other exterior locations, unless higher standard is indicated or specified.
- 1.10.4. Fastening devices or adhesives shall be of appropriate type, used in sufficient quantity and in such manner to provide positive, permanent fastening which will not shift, work loose or fail during occupancy of building due to vibration or other causes resulting from normal use of building. Install anchors at spacing to provide required load/stress carrying capacity. Do not use wood plugs.
- 1.10.5. Lay out fastenings neatly, evenly spaced and aligned. Keep exposed fastenings to minimum.
- 1.10.6. Supply adequate instructions and templates and, if necessary supervise installation, where fastenings or accessories for your Section are required to be built into work of other Sections.
- 1.10.7. Do not use fastenings which will cause spalling, cracking, or deformation or deterioration of material being fastened by or to.
- 1.10.8. Do not use powder actuated fastening devices, which are used in tension, without approval. Take stringent safety precautions when using powder actuated fastenings. Use only low velocity plunger-type devices.
- 1.10.9. Use adhesives specified, or if not specified, those recommended by manufacturer of materials involved, compatible with materials to be joined and effective in forming permanent joint of adequate strength.
- 1.10.10. Use screws, nails, staples and other similar, driven fasteners suitable to materials to be joined and to conditions under which they are installed and used. Ensure in finished work, fasteners are sized to take durable hold under stress to be encountered without damage to, or weakening of, elements secured together and fastenings will not corrode or cause staining of exposed surfaces.
- 1.10.11. Do brazing or soldering to form durable connections of strength adequate to resist stresses to be encountered without deformation of elements joined. Prepare base metals and use methods and materials to ensure clean joint, and to prevent staining, corrosion, discolouration, deformation or other damage to finished Work.
- 1.10.12. Do welding to CSA W59 for steel and to CSA W59.2-M for aluminum, unless specified otherwise. Have welding performed by companies certified operatives to CSA W47.1 or CSA W47.2.
- 1.10.13. Provide accessory items or materials required, such as brackets, cleats, connectors, sealants, lubricants, cleaners, protection and similar items, whether specified or not, so Work is complete and performs as required.

1.11. Manufactured Items

- 1.11.1. Where a conflict occurs between specified technical description and manufacturer's standard model numbers and/or manufacturer's printed description of given model number, technical description specified herein governs. Manufacturers shall make necessary modifications in their manufacturing methods to meet all aspects of these Specifications.

END OF SECTION

Part 1 - General

1.1. General Requirements

1.1.1. Read and conform to:

- 1.1.1.1. CCDC 2 Stipulated Price Contract - 2020, as amended by Supplementary Conditions.
- 1.1.1.2. Division 01 requirements and documents referred to therein.

1.2. Verification of Existing Conditions

- 1.2.1. Examine Site at no cost or risk to the Owner for all matters relating to Work, extent of Work, means of access and egress, all obstacles, rights and interests of other parties which may be interfered with during execution of Work, all conditions and limitations the Contractor shall take into consideration in performing Work, including obstructions, existing structures or facilities, local conditions, actual levels, character and nature of Project and any other consideration which may affect performance of Work.
- 1.2.2. Where available obtain existing Drawings pertaining existing building layout, architectural, structural, mechanical, electrical details and assess impact in performing work of this Contract.
- 1.2.3. Examine existing conditions at no additional cost to the Owner, surfaces and substrata upon which your work depends. Drawings are, in part, diagrammatic and are intended to convey scope of Work and indicate general and approximate location, arrangement and sizes of fixtures, equipment, ducts, piping, conduit and outlets and similar items. Obtain more accurate information about locations, arrangement and sizes from study and coordination of Drawings, including Shop Drawings and manufacturers' literature and become familiar with conditions and spaces affecting these matters before proceeding with Work.
- 1.2.4. Ensure each Subcontractor has full understanding of extent of its work. Report in writing defects in such work and notify Subcontractors responsible for unfavourable and unsatisfactory conditions. Do not commence Work until unsatisfactory conditions have been corrected. Verify corrected work prior to commencing work. Execution and application of your work is deemed accepted of work upon which your work depends.

1.3. Existing Activities, Facilities and Conditions

- 1.3.1. Existing Project location may be in operation throughout Work. Do not interrupt existing services, facilities and activities at complex, except for authorized and scheduled interruptions of services acceptable to Owner. Obtain written permission of the Owner at least 5 Working Days in advance of any shutdown required for tie-in of new construction systems. Written requests for shutdown permission shall clearly identify exact extent of systems affected, time and duration.
- 1.3.2. Make necessary enquiries to determine locations of existing services such as hydro, telephone, water, natural gas, sewer and like. Make arrangements and pay all costs to temporarily relocate, shore, underpin or in any way accommodate existing services which affect Work of this Contract.
- 1.3.3. Protect and maintain in operation all existing services and systems. When removing or altering existing services, make safe, secure and maintain seals as applicable for all lines affected.
- 1.3.4. Perform required shutdowns outside of normal working hours at no increase in cost if requested by the Owner.

END OF SECTION

Part 1 - General

1.1. General Requirements

1.1.1. Read and conform to:

- 1.1.1.1. CCDC 2 Stipulated Price Contract - 2020, as amended by Supplementary Conditions.
- 1.1.1.2. Division 01 requirements and documents referred to therein.

1.2. Summary

- 1.2.1. Except where otherwise specified in technical Specifications or otherwise indicated on Drawings, comply with requirements of this Section.

1.3. Manufacturer's Instructions

- 1.3.1. Install, erect, or apply Products in strict accordance with manufacturer's instructions.
- 1.3.2. Notify the Consultant, in writing, of conflicts between Contract Documents and manufacturer's instructions where, in the Contractor's opinion, conformance with Contract Documents instead of the manufacturer's instructions may be detrimental to the Work or may jeopardize the manufacturer's warranty.
- 1.3.3. Do not rely on labels or enclosures provided with Products. Obtain written instructions directly from manufacturers.
- 1.3.4. Provide manufacturer's representatives with access to the Work at all times. Render assistance and facilities for such access so that manufacturer's representatives may properly perform their responsibilities.

1.4. Concealment

- 1.4.1. Conceal pipes, ducts, and wiring in floors, walls and ceilings in finished areas:
 - 1.4.1.1. after review by the Consultant and Authorities Having Jurisdiction, and
 - 1.4.1.2. where locations differ from those shown on Drawings, after recording actual locations on As-Built Drawings.
- 1.4.2. Provide incidental furring or other enclosures as required.
- 1.4.3. Notify the Consultant in writing of interferences before installation.

1.5. Fastenings - General

- 1.5.1. Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials.
- 1.5.2. Prevent electrolytic action and corrosion between dissimilar metals and materials by using suitable non-metallic strips, washers, sleeves, or other permanent separators to avoid direct contact.
- 1.5.3. Use non-corrosive fasteners and anchors for securing exterior work and in spaces where high humidity levels are anticipated.
- 1.5.4. Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage.
- 1.5.5. Keep exposed fastenings to a minimum, space evenly and install neatly.
- 1.5.6. Do not use fastenings or fastening methods that may cause spalling or cracking of material to which anchorage is made.

1.6. Fastenings Equipment

- 1.6.1. Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- 1.6.2. Bolts shall not Project more than one diameter beyond nuts.

1.7. Fire Rated Assemblies

- 1.7.1. When penetrating fire rated walls, ceiling, or floor assemblies, completely seal voids with fire-stopping materials, smoke seals, or both, in full thickness of the construction element as required to maintain the integrity of the fire rated assembly.

1.8. Location of Fixtures, Outlets and Devices

- 1.8.1. Consider location of fixtures, outlets, and devices indicated on Drawings as approximate.
- 1.8.2. Locate fixtures, outlets, and devices to provide minimum interference, maximum usable space, and as required to meet safety, access, maintenance, acoustic, and regulatory, including barrier free, requirements.
- 1.8.3. Promptly notify the Consultant in writing of conflicting installation requirements for fixtures, outlets, and devices. If requested, indicate proposed locations and obtain approval for actual locations.

1.9. Protection of Completed Work and Work in Progress

- 1.9.1. Adequately protect parts of the Work completed and in progress from any kind of damage.
- 1.9.2. Promptly remove, replace, clean, or repair, as directed by the Consultant, work damaged as a result of inadequate protection.
- 1.9.3. Do not load or permit to be loaded any part of the Work with a weight or force that will endanger the safety or integrity of the Work.

1.10. Remedial Work

- 1.10.1. Notify the Consultant of, and perform remedial work required to, repair or replace defective or unacceptable work. Ensure that properly qualified workers perform remedial work. Coordinate adjacent affected work as required.

1.11. Existing Conditions

- 1.11.1. Make Good surfaces and finishes damaged or disturbed due to Work of this Contract to match existing. Ensure materials used to repair damage are compatible with existing work.
- 1.11.2. Restore Site to condition equal to or, if specified in the Contract Documents, to condition better than existing conditions.

1.12. Installation

- 1.12.1. Except where specified otherwise, use each Product in accordance with manufacturer's published or written instructions, Specifications or recommendations regarding handling, storage, preparation, Site conditions, ancillary Products or accessories, methods of installation, protection and cleaning. Submit copy of such instructions and indicate if and where there is discrepancy between them and requirements of Specifications and obtain direction.
- 1.12.2. Whenever specific reference to following manufacturer's directions or instructions is made in Specifications, submit copies as requested thereof for review before commencing such work.
- 1.12.3. Do Work in accordance with industry practice for type of work unless Contract Documents stipulate more precise requirements. Do not let unskilled, incompetent workers perform work.
- 1.12.4. Do Work in neat and careful manner to retain Work plumb, square and straight.
- 1.12.5. Ensure Work is properly related to form close joints and appropriately aligned junctions, edges and surfaces and is free of warp, twist, wind, wave or other irregularities.
- 1.12.6. When required by Specifications or by manufacturer's recommendations, have manufacturer, Supplier or accredited agent, inspect work which incorporates their Products.

- 1.12.7. Do not permit materials to come in contact with other materials whether in presence of moisture or otherwise if conditions will result in corrosion, stain, discolouration or deterioration of completed Work. Provide compatible, durable separators where such contact is unavoidable.
- 1.12.8. Install and arrange fixtures, equipment, ducts, piping and conduit to conserve as much headroom and space as possible and avoid interference and obstruction of access. Observe good installation practice for safety, access, maintenance and follow manufacturer's recommendations. Location of fixtures, access panels, outlets and mechanical and electrical components indicated are approximate. Make changes requested to comply with these requirements at no additional cost to the Owner.
- 1.12.9. If requested by the Consultant, and before their installation, relocate equipment, services, doors, openings, furring and other work at no additional cost to the Owner; provided such relocation involves only reasonable minor adjustments and reasonable advance notice is given in writing. Ensure identification of electrical and mechanical system installations and other automated systems or equipment shall be provided in accordance with Contract Documents.
- 1.12.10. Lay out mechanical and electrical work in advance of furring installation to allow for its proper concealment.
- 1.12.11. Test and inspect work before applying pipe covering and before Work is concealed.

END OF SECTION

Part 1 - General

1.1. General Requirements

1.1.1. Read and conform to:

- 1.1.1.1. CCDC 2 Stipulated Price Contract - 2020, as amended by Supplementary Conditions.
- 1.1.1.2. Division 01 requirements and documents referred to therein.

1.2. Regulatory Requirements

- 1.2.1. Comply with applicable regulatory requirements when disposing of waste materials.
- 1.2.2. Obtain permits from Authorities Having Jurisdiction and pay disposal fees where required for disposal of waste materials and recyclables.

1.3. General Cleaning Requirements

- 1.3.1. Provide adequate ventilation during use of volatile or noxious substances. Do not rely on building ventilation systems for this purpose.
- 1.3.2. Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- 1.3.3. Prevent cross-contamination during the cleaning process.
- 1.3.4. Notify the Consultant of the need for cleaning caused by the Owner or Other Contractors.

1.4. Progressive Cleaning and Waste Management

- 1.4.1. Maintain the Work in a tidy and safe condition, free from accumulation of waste materials and construction debris.
- 1.4.2. Provide appropriate, clearly marked, containers for collection of waste materials and recyclables.
- 1.4.3. Remove waste materials and recyclables from work areas, separate, and deposit in designated containers at end of each Working Day. Collect packaging materials for recycling or reuse.
- 1.4.4. Remove waste materials and recyclables from Place of the Work daily.
- 1.4.5. Clean interior building areas prior to start of finish work and maintain free of dust and other contaminants during finishing operations.
- 1.4.6. Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly finished surfaces nor contaminate building systems.

1.5. Final Cleaning

- 1.5.1. Before final cleaning, arrange a meeting at Place of the Work to determine the acceptable standard of cleaning. Ensure that the Owner, the Consultant, the Contractor are in attendance.
- 1.5.2. Remove from Place of the Work surplus Products, waste materials, recyclables, Temporary Work, and Construction Equipment not required to perform any remaining work.
- 1.5.3. Provide professional cleaning by a qualified, established cleaning company.
- 1.5.4. Lock or otherwise restrict access to each room or area after completing final cleaning in that area.
- 1.5.5. Re-clean as necessary areas that have been accessed by the Contractor's workers prior to the Owner occupancy.
- 1.5.6. Remove stains, spots, marks, and dirt from finished surfaces, electrical and mechanical fixtures, furniture fitments, walls and floors.

- 1.5.7. Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and all other finished surfaces, including mechanical and electrical fixtures. Replace broken, scratched or otherwise damaged glass.
- 1.5.8. Remove dust from lighting reflectors, lenses, lamps, bulbs, and other lighting surfaces.
- 1.5.9. Vacuum clean and dust exposed wall, floor, and ceiling surfaces, behind grilles, louvres and screens.
- 1.5.10. Clean mechanical, electrical, and other equipment. Replace filters for mechanical equipment if equipment is used during construction.
- 1.5.11. Clean interior window glass and frames.

1.6. Waste Management and Disposal

- 1.6.1. Dispose of waste materials and recyclables at appropriate municipal landfills and recycling facilities in accordance with applicable regulatory requirements.
- 1.6.2. Do not burn or bury waste materials at Place of the Work.
- 1.6.3. Do not dispose of volatile and other liquid waste such as mineral spirits, oil, paints and other coating materials, paint thinners, cleaners, and similar materials together with dry waste materials or on the ground, in waterways, or in storm or sanitary sewers. Collect such waste materials in appropriate covered containers, promptly remove from Place of the Work, and dispose of at recycling facilities or as otherwise permitted by applicable regulatory requirements.
- 1.6.4. Cover or wet down dry waste materials to prevent blowing dust and debris.

END OF SECTION

Part 1 - General

1.1. General Requirements

1.1.1. Read and conform to:

- 1.1.1.1. CCDC 2 Stipulated Price Contract - 2020, as amended by Supplementary Conditions.
- 1.1.1.2. Division 01 requirements and documents referred to therein.

1.2. Closeout Procedures

1.2.1. Final Site Review: The Consultant shall perform final review in accordance with provisions under final Certificate for Payment. Conform to Construction Act, RSO 1990, c C.30 for commencement, procedure and release of hold back fund. Lien Period commencement, procedure and release of hold back monies will be in accordance with Construction Act, RSO 1990, c C.30.

1.2.2. Substantial Performance of the Contract

1.2.2.1. The Work will not be deemed to be ready for use or being used for the purposes intended pursuant to section 2 of the Construction Act, RSO 1990, c C.30 until the following conditions have been met at a minimum:

- 1.2.2.1.1. each item of mechanical, electrical, instrumentation, piping and HVAC equipment installed under this Contract has been tested to demonstrate compliance with the performance requirements of this Contract;
- 1.2.2.1.2. each mechanical, electrical, instrumentation, piping and HVAC system installed or modified under this Contract has been tested in accordance with the specified requirements;
- 1.2.2.1.3. the Work has satisfactorily passed all required inspection and performance testing and can be used for the purposes intended;
- 1.2.2.1.4. all test results have been submitted to the Owner;
- 1.2.2.1.5. all operating manuals, maintenance manuals and "As-Built" Drawings have been completed and submitted to the satisfaction of the Owner;
- 1.2.2.1.6. all training required under the Contract has been completed and instructions have been provided to the Owner's staff to enable the Owner shall operate the facility;
- 1.2.2.1.7. all spare parts and materials have been supplied; and
- 1.2.2.1.8. all warranty certificates have been submitted.

1.2.2.2. No deviations from these requirements will be permitted

1.2.3. Substantial Performance Review: Comply with the requirements of GC 5.4 SUBSTANTIAL PERFORMANCE OF THE CONTRACT AND PAYMENT OF HOLDBACK of the General Conditions. Provide a written request to the Consultant for Substantial Performance review of Work. Such request shall include a reconciliation of compliance with money test given in Clause 2 (1) (b) of Construction Act, RSO 1990, c C.30 in addition to all documentation specified in Contract Documents.

1.2.4. Certification of Substantial Performance: Submit an application for Substantial Performance of the Contract in accordance with GC 5.4 Substantial Performance of The Contract and Payment of Holdback. If the Owner approves the application, the Owner shall prepare Certificate of Substantial Performance of the Contract (the "Certificate") in a form required by Construction Act and provide it to the Contractor for publication in a Construction Trade Newspaper. If the Contractor fails to follow this process and publishes a Certificate that was not prepared or approved by the Owner, and the Owner, in its sole discretion, deems the published Certificate inaccurate, the Contractor will be provided with the corrected Certificate and must re-publish it at its own expense. In such case, the 60-day lien period will commence on the date of republication.

- 1.2.5. When the Certificate is published, attach a normal progress Certificate showing statement of account to date and sub-titled "SUBSTANTIAL PERFORMANCE". Wherever practicable, accompany it with Final Change Order, sub-titled "FINAL". Consolidate all expenditures from cash allowances.
- 1.2.6. Defect and Deficiency:
- 1.2.6.1. A defect is an item of Work required by Contract which has been installed but requires repair and/or replacement at a specific time.
 - 1.2.6.2. A deficiency is an item of Work required by Contract which has not been installed or put into operating condition.
 - 1.2.6.3. A warranty item is an item of Work, installed under Contract which manufacturer or installer agrees to maintain in, or restore to perfect condition for a specific period of time, after the Owner's acceptance of Work as being substantially performed.
 - 1.2.6.4. When, in the Consultant's opinion, Work under Contract is substantially performed and prior to final review by the Owner, a preliminary review shall be made at which time defects and deficiencies are listed, taking care to distinguish between preliminary and final reviews.
- 1.2.7. Deficiency Review:
- 1.2.7.1. Provide a written request to the Consultant for deficiency review of Work. Ensure such request includes a statement by the Contractor that Work to be reviewed by the Consultant for deficiencies is, to best of his knowledge, in compliance with the Contract Documents, reviewed Shop Drawings, samples and previously instructed corrections by the Consultant have been corrected.
 - 1.2.7.2. Provide a schedule of planned deficiency reviews having regard to foregoing.
- 1.2.8. Deficiency Lists:
- 1.2.8.1. Neither the Owner's representatives, nor the Consultant shall be responsible for issue of extensive lists of deficiencies. The Contractor assumes prime responsibility for ensuring items shown on Drawings and described in Specifications are completely his. Any reviews to approve Certificates of Substantial Performance will be immediately canceled if it becomes obvious that extensive deficiencies are outstanding.
 - 1.2.8.2. Promptly correct deficiencies noted by the Consultant. Do not proceed with installation of subsequent parts of Work until deficiencies have been corrected. Make every effort to ensure both defects and deficiencies are Made Good prior to final review.
 - 1.2.8.3. During review, a decision will be made as to which elements must be completed at a later date due to uncontrollable circumstances such as weather, which defects must be rectified before building can be accepted and which defects are to be treated as warranty items.
 - 1.2.8.4. Make Good deficiencies before Contract is considered complete.
 - 1.2.8.5. The Contractor will provide the Consultant an electronic punch list prior to conducting their review. Ensure punch list includes a complete list of items identified in Contract that the Contractor and his Subcontractors feel still incomplete or deficient in any way. Effectively identify each room or area so the Consultant can reference that room or area in punch list during their review of Work. Deficiency list is made up of items identified in punch list plus any other items found by the Consultant deemed to be incomplete or deficient.
- 1.2.9. Notification of Correction of Deficiencies: Advise the Consultant in writing, upon completion of rectification of deficiencies noted by the Consultant. Failure to provide such notification may be cause to withhold final payment.
- 1.2.10. Documents:
- 1.2.10.1. Within 21 Days of commencement of Work, the Contractor shall make first submittal required by OAA/OGCA Document No. 100-2018.
 - 1.2.10.2. Submit documents in accordance with requirements of Contract Documents.

- 1.2.10.3. Submit required documents along with request for Certificate of Substantial Performance. The Consultant's review for Substantial Performance is not required until such submittal is received.
- 1.2.11. Final Review for Final Payment:
 - 1.2.11.1. Submit an application for Total Performance of the Contract in accordance with GC 5.6 FINAL PAYMENT of the General Conditions.
 - 1.2.11.2. Further to requirements of GC 5.6, final review of Work shall constitute review precedent to issuance of final certificate of payment.
 - 1.2.11.3. If there are any further deficiencies determined by this review, they shall be listed by the Consultant and provided to the Contractor. This list is recognized as final deficiency list for purposes of acceptance of Work under Contract.
 - 1.2.11.4. Such deficiencies shall be corrected by a date mutually agreed upon between the Consultant and the Contractor, unless a specific date is required by Contract and a re-review by the Consultant shall be called for by the Contractor following his own review to take place within 7 Days from date of request.
 - 1.2.11.5. The Contractor shall thereafter submit his invoice for final payment.

1.3. Warranty Period

- 1.3.1. Provide on-going review and attendance to the Place of the Work, call-back, maintenance and repair problems during the Warranty Periods.
- 1.3.2. At beginning of the last month of the Warranty Period as specified in Article A-13, the Owner, the Contractor and the Consultant, along with key Subcontractors as designated by the Owner and/or the Consultant, shall carry out a complete review of building and its systems to determine which deficiencies are to be rectified under the warranty. The Contractor shall be responsible for timely written notification of the Owner, and the Consultant prior to such end of Warranty Period inspection and any delay in such notification shall extend such Warranty Period until proper notification is received by the Owner and the Consultant.

1.4. Extended Warranties

- 1.4.1. Extended warranties shall be in accordance with the Contract Documents, as amended, and as follows:
 - 1.4.1.1. Where specifically identified in the Contract Documents, extended warranties shall be furnished by individual manufacturer for particular Product/system/assembly.
 - 1.4.1.2. Where specifically identified in the Contract Documents, extended warranties shall be furnished by individual manufacturer for particular Product/system/assembly otherwise, extended warranties shall be furnished by the Contractor for a particular Product/system/assembly/section of the Specifications.
 - 1.4.1.3. Extended warranties shall include for proper performance of the portion of the Work as defined by the scope of the applicable Specification section to the extent that the design and Contract Documents permit such performance.
 - 1.4.1.4. The Owner shall promptly give the warrantor Notice in Writing of observed defects and deficiencies which occur during the Warranty Period.
 - 1.4.1.5. Extended warranties shall commence at date of Substantial Performance of the Contract.
 - 1.4.1.6. Extended warranties specified shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on Product warranty do not relieve the Contractor of obligations under requirements of the Contract Documents.
 - 1.4.1.7. Submit extended warranty on warrantor's standard form specifically endorsed by the warrantor to the Owner and shall include the following information:

- 1.4.1.7.1. Name and address of Project.
- 1.4.1.7.2. Warranty commencement date (date of Substantial Performance of the Work).
- 1.4.1.7.3. Warranty period.
- 1.4.1.7.4. Specific warranty terms as required in applicable portion of Contract Documents.
- 1.4.1.7.5. Name and title of authorized signing officer and seal of warrantor.

END OF SECTION

Part 1 - General

1.1. General Requirements

1.1.1. Read and conform to:

- 1.1.1.1. CCDC 2 Stipulated Price Contract - 2020, as amended by Supplementary Conditions.
- 1.1.1.2. Division 01 requirements and documents referred to therein.

1.2. Closeout Submittals

1.2.1. Certificate of Substantial Performance:

- 1.2.1.1. Conform to Construction Act, RSO 1990, c C.30 and publish copy of Certificate of Substantial Performance of the Contract in a Construction Trade Newspaper.
- 1.2.1.2. Submit promptly copies of construction trade newspaper containing publication of copy of Certificate of Substantial Performance of the Contract.

1.2.2. Pre-Start Health and Safety Review Reports (PSR): Submit all exemption documents or PSR Reports prior to Substantial Performance of the Contract in accordance with Section 01 40 00.

1.2.3. As-Built Drawings:

- 1.2.3.1. Prior to applying for Certification of Substantial Performance of the Contract, the Consultant shall provide the Contractor an electronic set of requested Drawings for As-Built purposes.
- 1.2.3.2. Add "AS-BUILT" at each Drawing title block and on title page of Specifications.
- 1.2.3.3. The Contractor shall be responsible for:
 - 1.2.3.3.1. maintaining As-Built drawings during progress of work, in complete sets, at the Place of the Work.
 - 1.2.3.3.2. including additional changes over and above those included in any Addenda, Request for Interpretations, Supplemental Instructions, Change Directives and Change Orders.
 - 1.2.3.3.3. including accurate locations, depths, sizes and types of underground utilities and concealed services in the As-Built Drawings.
 - 1.2.3.3.4. having changes recorded in a manner consistent with original Drawings' software.
 - 1.2.3.3.5. ensuring outline clouds and notations are removed from Drawings.
 - 1.2.3.3.6. having one (1) set As-Built Drawing prints submitted to Consultant for review before final submission.
 - 1.2.3.3.7. incorporating any review comments made by the Consultant.
 - 1.2.3.3.8. resubmitting final reviewed set in following format:
 - 1.2.3.3.8.1. one (1) electronic set in CAD and PDF formats.
 - 1.2.3.3.8.2. One (1) set of white prints.
- 1.2.3.4. Refer to Divisions 21, 23, 26, 27 and 28 Mechanical and Electrical Drawings for supplementary requirements.

1.2.4. Operation and Maintenance Instructions and Data Book: Provide the Consultant with one electronic copy of operating and maintenance instructions and data books, ten (10) Days prior to advising the Consultant that Work is substantially performed which include:

- 1.2.4.1. Complete listing of Subcontractors' names, addresses and telephone numbers with notation as to which portions of the Contract have been provided by them.

- 1.2.4.2. Complete listing of materials, Products and equipment including serial numbers, manufacturer's names and sources of Supply.
 - 1.2.4.3. Description of each system, with description of each major component of systems.
 - 1.2.4.4. Operation and installation instructions for each assembly, component and system.
 - 1.2.4.5. Complete cleaning and maintenance instructions for each finish, assembly, component and system, including warnings of harmful practices.
 - 1.2.4.6. Lists of spare parts for each assembly, component and system complete with names, addresses and telephone numbers of Suppliers.
 - 1.2.4.7. Operating curves of mechanical and electrical equipment.
 - 1.2.4.8. A lubrication schedule of all equipment.
 - 1.2.4.9. Page-size Valve Tag Schedule and Flow Diagrams.
 - 1.2.4.10. Water treatment procedures and tests.
 - 1.2.4.11. Final balancing Reports for mechanical systems.
 - 1.2.4.12. Installation manual or installation instructions for each mechanical, electrical or architectural item, stamped and signed by Subcontractors submitting them.
 - 1.2.4.13. Record Drawings of mechanical, electrical and special installations.
 - 1.2.4.14. Final reviewed Shop Drawings.
 - 1.2.4.15. Copies of all warranties, properly executed.
 - 1.2.4.16. Provide reviewed Operation and Maintenance Instructions and Data Books consisting of 3-ring hard cover loose-leaf binders, indexed as to contents and identified on binding edges as "OPERATION AND MAINTENANCE INSTRUCTIONS AND DATA BOOK, FOR (PROJECT NAME)". Ensure binders contain name of the Contractor and date of Substantial Performance of the Contract. Provide same binder electronically in PDF format.
 - 1.2.4.17. Organize and label contents into applicable categories of work, parallel to Specification Sections and provide a Table of Contents.
 - 1.2.4.18. Use consistent terminology.
 - 1.2.4.19. Submit maintenance and operation instructions which are manufacturer's latest published editions at date of submission.
 - 1.2.4.20. Should any finish, Product or assembly be injured or damaged by faulty maintenance materials, practices not warned against in maintenance manual or by failure to provide proper maintenance manuals in time, rectify such damage or injury at no additional cost to the Owner.
- 1.2.5. Distribution System Diagrams: Prior to date of Substantial Performance of the Contract, submit framed single line diagrams of electrical distribution systems.

1.3. Spare Parts, Maintenance Materials, and Special Tools

- 1.3.1. Supply spare parts, maintenance materials, and special tools in quantities specified in technical Specifications sections.
- 1.3.2. Ensure spare parts and maintenance materials are new, not damaged nor defective, and of same quality, manufacturer, and batch or production run as installed Products.
- 1.3.3. Provide tags for special tools identifying their function and associated Product.
- 1.3.4. Deliver to and store items at location directed by the Owner at Place of the Work. Store in original packaging with manufacturer's labels intact and in a manner to prevent damage or deterioration.

- 1.3.5. Catalogue all items and submit to the Consultant an inventory listing organized by Specifications section. Include the Consultant reviewed inventory listing in operation and maintenance manual.

END OF SECTION

Part 1 - General

1.1. General Requirements

1.1.1. Read and conform to:

- 1.1.1.1. CCDC 2 Stipulated Price Contract - 2020, as amended by Supplementary Conditions.
- 1.1.1.2. Division 01 requirements and documents referred to therein.

1.2. Prerequisites to Demonstration and Training

- 1.2.1. Testing, adjusting, and balancing has been performed in accordance with Contract Documents.
- 1.2.2. Equipment and systems are fully operational.
- 1.2.3. Completed operation and maintenance manual is available for use in demonstration and training.
- 1.2.4. Conditions for demonstration and training comply with requirements specified in technical Specifications.

1.3. Submittals

- 1.3.1. Submit proposed dates, times, durations, and locations for demonstration and training of each item of equipment and each system for which demonstration and training is required. Allow sufficient time for training and demonstration for each item of equipment or system, or time as may be specified in technical Specifications.
- 1.3.2. The Consultant and the Owner shall review Submittals and advise the Contractor of any necessary revisions.
- 1.3.3. Submit report(s) within five (5) Working Days after completion of demonstration and training:
 - 1.3.3.1. identifying time and date of each demonstration and training session
 - 1.3.3.2. summarizing the demonstration and training performed, and
 - 1.3.3.3. including a list of attendees.

1.4. Demonstration and Training

- 1.4.1. Demonstrate operation of each system to the Owner and the Consultant.
- 1.4.2. Train the Owner's personnel in operation, adjustment and maintenance of equipment and systems, using operation and maintenance data provided as the basis for instructions. Arrange and coordinate instruction of the Owner's staff in care, maintenance and operation of building systems and finishes.
- 1.4.3. The Contractor, manufacturer's representatives and responsible personnel from Subcontractors whose work is being demonstrated shall be present at these demonstration and training sessions.
- 1.4.4. Training the Owner's representative on use of software required for operation and maintenance of building systems and provide a toll-free telephone number or website address for further assistance to the Owner.
- 1.4.5. Prepare and insert additional data in the operation and maintenance data manuals when the need for additional data becomes apparent during demonstration or instruction.
- 1.4.6. Demonstration and instruction report: Submit a written report of such demonstration, instruction, and Commissioning to the Consultant as part of the contract closeout Submittals described earlier in this section. Report shall include time and date of each demonstration, instruction, and Commissioning activity, complete with a list of persons present.
- 1.4.7. Correct deficiencies and defects identified during demonstration, instruction, or Commissioning.

END OF SECTION

Part 1 - General

1.1. General Requirements

1.1.1. Read and conform to:

- 1.1.1.1. CCDC 2 Stipulated Price Contract - 2020, as amended by Supplementary Conditions.
- 1.1.1.2. Division 01 requirements and documents referred to therein.

1.2. Commissioning Agency

- 1.2.1. The Contractor shall retain and pay for a Commissioning agency to provide Commissioning services for the Project.

1.3. The Contractor Responsibilities

- 1.3.1. Prepare each system ready for Commissioning. Verify systems installation is complete and in operation.
- 1.3.2. Coordinate Commissioning with and assist Commissioning agency.
- 1.3.3. Perform and document verification, performance testing, adjusting, and balancing operations.
- 1.3.4. Cooperate with Commissioning agency and provide access to equipment and systems.
- 1.3.5. Provide personnel and operate systems at designated times, and under conditions required for proper Commissioning.
- 1.3.6. Make instruments available to Commissioning agency to facilitate spot checks during Commissioning.
- 1.3.7. Participate in Commissioning meetings.
- 1.3.8. Complete Commissioning forms as requested by Commissioning agency.
- 1.3.9. Correct deficiencies identified in Commissioning process.
- 1.3.10. Incorporate Commissioning data into operation and maintenance manual.
- 1.3.11. Ensure that Commissioning agency participates in demonstration and training as specified in Section 01 79 00 – Demonstration and Training.
- 1.3.12. Provide instruments necessary for Commissioning.

1.4. Commissioning Agency Responsibilities

1.4.1. The Commissioning agency shall:

- 1.4.1.1. Prepare a Commissioning plan, including systems to be commissioned, forms, checklists and responsibilities of Commissioning team members.
- 1.4.1.2. Implement the Commissioning plan and lead the Commissioning team through start-up, verification, performance testing, training, and document preparation.
- 1.4.1.3. Convene, chair, prepare and distribute minutes of Commissioning meetings.
- 1.4.1.4. Supervise Commissioning activities and witness inspections and tests.
- 1.4.1.5. Make periodic Site visits for the purpose of selective checking of accuracy of Commissioning form submissions, witness testing, and review of mock-ups.
- 1.4.1.6. Review content of operations and maintenance manual.
- 1.4.1.7. Prepare and maintain the Issues Log.
- 1.4.1.8. Prepare and maintain completed construction checklist log.
- 1.4.1.9. Compile test data, inspection reports, and certificates; include them in the systems manual and Commissioning process report.

1.5. The Consultant Responsibilities

1.5.1. The Consultant shall:

- 1.5.1.1. Participate in Commissioning meetings.
- 1.5.1.2. Coordinate Commissioning agency's involvement in Shop Drawing review process.
- 1.5.1.3. Review verification and performance test results and direct the Contractor to correct defects or deficiencies in the Work.
- 1.5.1.4. Review final Commissioning report.

1.6. The Owner Responsibilities

1.6.1. The Owner shall:

- 1.6.1.1. Assign operations and maintenance personnel to participate in meetings, and witnessing of demonstration, and training.
- 1.6.1.2. Designate a person to acknowledge receipt of Reports.

END OF SECTION

PART 1 - GENERAL

1.1 WORK INCLUDED

- 1.1.1 Comply with Division 1, General Requirements and documents referred to therein.
- 1.1.2 Labour, Products, equipment and services necessary for demolishing, salvaging, relocating and removing wholly or in part the various items designated on the drawings or required to be removed or partially removed for the receipt of the Work of this Contract.
- 1.1.3 Refer to Architectural, Structural, Mechanical and Electrical Drawings for extent of selective demolition work.
- 1.1.4 Selective demolition includes, but is not necessarily limited to:
 - 1.1.4.1 Alteration and renovations to existing building.
 - 1.1.4.2 Cutting and removing of walls, floor finishes, etc., in the existing buildings as indicated on drawings.
 - 1.1.4.3 Patching, making good walls, floors and ceilings including painting, as required.
 - 1.1.4.4 Removal of rubbish, debris, demolished fixtures, fitments and items not scheduled to remain Owner's property, resulting from the demolition and preparatory work.
 - 1.1.4.5 Dust Control during the operations of the work of this section.
 - 1.1.4.6 Removal, temporary storage, and reinstallation of existing building finishes.

1.2 QUALITY ASSURANCE

- 1.2.1 Comply with pertinent codes, regulations and insurance carriers providing coverage for this Work.
- 1.2.2 Carry out selective demolition in strict accordance with requirements of authorities having jurisdiction
- 1.2.3 Execute the work in strict accordance with 'The Occupational Health and Safety Act and Regulations for Construction Projects' latest addition. Keep a copy of the Act at the place of the Work at all times.
- 1.2.4 Carry out demolition work in accordance with CSA S350-M1980 (R2003). Keep a copy of the standard at the place of the Work at all times.
- 1.2.5 Submit fire safety plan in accordance with requirements of Owner.
- 1.2.6 If suspected hazardous or contaminated materials are encountered, advise Consultant and await instructions for requirements regarding the removal and disposal of such contaminants which may be considered health hazards prior to demolition.

1.3 SUBMITTALS

- 1.3.1 Submit demolition and cutting schedule to Consultant for review. Schedule to show timing and phasing of the Work in the various areas of the existing building. Deviation from schedule will not be permitted without approval.
- 1.3.2 Submit shop drawings indicating location, composition, and construction of temporary protection, partitions, and all other temporary work.
- 1.3.2.1 Where applicable, indicate required fire resistance rating and ULC listed assembly.
- 1.3.3 Submit drawings for demolition of structural elements bearing stamp of a professional engineer registered in the Place of Work.

1.4 PROTECTION

- 1.4.1 Use all means necessary to protect existing objects designated to remain and in the event of damage, immediately make all repairs and replacements necessary to the approval of the Consultant and at no additional cost to Owner.
- 1.4.2 Provide protection required to enable existing building and equipment to remain in continuous and normal operations, and maintain construction schedule.
- 1.4.3 Erect barricades, covered ways, barriers, scaffolding, screens, notice and warning boards and maintain all lights, signals and protection of all kinds for the protection of workmen on the Work, for the protection of adjoining property and for the protection of public.

PART 2 - PRODUCTS

2.1 SALVAGE AND DISPOSAL OF MATERIALS

- 2.1.1 All materials resulting from the selective demolition except as otherwise specified or indicated on the Drawings or shall become the property of the Contractor. Remove all demolition material and debris from the site as quickly as possible and dispose of legally.

2.2 TEMPORARY PARTITIONS

- 2.2.1 Partitions shall be erected prior to demolition. Except where otherwise indicated or required, construct partitions of wood studs, exterior grade plywood, and insulation, and caulk all joints including perimeter joints. Partitions shall extend from floor-to-floor and roof.
- 2.2.2 Where temporary partitions require a fire resistance rating, provide partitions matching an approved ULC listed assembly with equivalent or better fire resistance rating.

PART 3 - EXECUTION

3.1 PREPARATION

- 3.1.1 Supply, install and maintain during demolition work, temporary barriers and protective covers required for safety, in compliance with requirements of authorities having jurisdiction, and to the approval of the Owner.
- 3.1.2 Provide barricades and guards as required to give full protection to the public, to building occupants, to workmen employed for demolition and to adjoining property.
- 3.1.3 Protect adjacent spaces and property against damages which might occur from falling debris or other causes; do not interfere with use of adjacent spaces or buildings; maintain free, safe passage to and from same. Maintain access to and from occupied areas of building during selective demolition work.
- 3.1.4 Take precautions to guard against movement of existing buildings and structures and displacement of building and structure elements to remain. If at any time the safety of such elements appear to be in danger, suspend operations and notify the Consultant promptly. Take measures to support such elements. Do not resume demolition until the Consultant issues instructions.
- 3.1.5 Do not place or store material in corridors, public areas, streets, lanes, passageways or similar locations.
- 3.1.6 Do not restrict traffic on public streets, lanes and sidewalks except as otherwise permitted by authorities having jurisdiction and as acceptable to the Owner.
- 3.1.7 Notify the Consultant at least two full working days prior to commencing of the Work.
- 3.1.8 The drawings do not purport to show all objects existing on the site.
- 3.1.9 Before commencing the Work, carefully check drawings and verify with the Consultant regarding all objects to be removed and all objects to be preserved.
- 3.1.10 Schedule all Work in a careful manner with all necessary consideration for the requirements of Owner, his employees and the public.
- 3.1.11 Before starting the operations, arrange with the appropriate trade concerned for the disconnection of all utility services, affecting the work.
- 3.1.12 Preserve in operating condition all active utilities to remain.

3.2 DEMOLITION

- 3.2.1 Refer to Drawings for extent of selective demolition work. Do all demolition work not specified to be done under other Sections.
- 3.2.2 At end of each work shift, leave work in a safe condition so that no part of the building or its finishes are in danger of toppling, collapsing, or falling.

- 3.2.3 In order to afford the least interference with the efficient operations of the existing building and to keep the risk of fire to a minimum at all times, ensure that demolished materials are continuously removed from the buildings and grounds as they accumulate, that no hazard condition is left during non-working hours, and that full measures are taken by sprinkling and other means to keep dust to a minimum, and to confine what dust there is within the working area.
- 3.2.4 Maintain proper and safe means of fire exit from all zones of the existing building to the approval of the authorities having jurisdiction.
- 3.2.5 Confine operation to those parts of the buildings which are to be altered or renovated. Do not damage existing construction beyond that necessary for performance of new work and repair such damage as required.
- 3.2.6 Carefully remove in re-usable condition, transport and store on site where directed by Owner's representative and protect against damage, all materials and equipment to be salvaged or relocated for reuse in the new work as directed by Owner's representative.
- 3.2.7 Take possession of all other materials arising from the demolition work and remove from the site.
- 3.2.8 Cut openings through existing walls, partitions and floors. Establish exact location of steel reinforcing in existing concrete slabs or walls before holes are made. Be responsible for damage to existing steel reinforcing and be liable for structural failure. Make good surfaces disturbed with materials to match existing.
- 3.2.9 The use of pneumatic or electrical jack hammers is not permitted.
- 3.2.10 Where items are to be removed from existing structure or surfaces that are to remain in place, remove those items complete with hangers, brackets and other readily removable supports and fastenings:
 - 3.2.10.1 Remove bolts, but not inserts embedded in concrete or masonry.
 - 3.2.10.2 Remove bolt and rivet fastenings from steel structure.
- 3.2.11 Demolish work into sections of practical size for removal without alteration or damage to the existing building remaining in place.
- 3.2.12 Upon completion of demolition, leave interior surfaces broom clean.
- 3.2.13 New openings required in existing walls and partitions shall be carefully cut and formed to blend into existing work.
- 3.2.14 Join and make good new work to existing in such a manner that the joint is structurally sound and inconspicuous.
- 3.2.15 Cuts, breaks and other temporary openings into existing surfaces, which are required for installation or application of new fixtures, fitments, materials or services shall be, at completion of work, patched and/or made good and finished to blend

with surrounding finishes. Openings to allow passage of ducts shall be closed tight to perimeters of duct at all locations where fire dampers are required.

- 3.2.16 In areas where work is required to be performed over acoustic ceilings composed of lay-in panels in a supporting grid, carefully remove panels to avoid damage and replace when work is completed. If existing lay-in panels in a room are damaged and cannot be matched with new panels, then replace all the panels in that room with new units to the Engineer's approval at no additional expense to Owner.
- 3.2.17 Where fireproofing membranes or coverings to existing structural steel members and open web steel joists are disturbed, restore the fire protection with materials and methods acceptable by the authorities having jurisdiction.
- 3.2.18 Materials and other equipment not required for re-use shall not be stored or sold from the site.
- 3.2.19 Burning of materials on site is prohibited.
- 3.2.20 Maintain the existing building in a weather and watertight condition at all times.
- 3.2.21 Maintain security of existing building.

3.3 MAKING GOOD

- 3.3.1 Make good materials and finishes which are damaged or disturbed during the process of additions and reconstruction under the Contract.
- 3.3.2 Where existing work is to be made good, match new work exactly with the old work in material, form, construction and finish unless otherwise noted or specified.
- 3.3.3 Protect work in the existing building, such as floors, finishes, trim, and other materials and assemblies, as completely as possible to hold the replacing of damaged work to a minimum.
- 3.3.4 Preparation for new finishes:
 - 3.3.4.1 Remove existing finishes, including painting.
 - 3.3.4.2 Fill cracks and depressions with suitable filler and finish smooth, as recommended by the manufacturer of the new finishes.
 - 3.3.4.3 Grind protrusions level with substrates and finish smooth.
 - 3.3.4.4 Remove all evidences of existing adhesive, grease, oil, soil and other encrustations of foreign material by washing, scraping and grinding if necessary.
 - 3.3.4.5 Clean and prepare substrates to receive new work.

3.4 CUTTING AND PATCHING

- 3.4.1 Perform cutting, fitting, and patching to complete the Work. Do not cut, drill or sleeve load bearing members without obtaining written approval for each condition.

- 3.4.2 Remove and replace defective and non conforming work.
- 3.4.3 Perform work to avoid damage to other work.
- 3.4.4 Prepare proper surfaces to receive patching and finishing.
- 3.4.5 Cut rigid materials using power saw or core drill. Pneumatic or impact tools not allowed.
- 3.4.6 Restore work with new products to match existing in accordance with Contract Documents.
- 3.4.7 Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- 3.4.8 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with fire rated material, full thickness of construction element.
- 3.4.9 Refinish surfaces to match adjacent finishes; for continuous surfaces refinish to nearest intersection; for an assembly, refinish entire unit.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- 1.1.1 Comply with Division 1, General Requirements and documents referred to therein.
- 1.1.2 Provide labour, materials, products, equipment and services necessary to complete the rough carpentry work specified herein.

1.2 REFERENCES

- 1.2.1 ASTM A153, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- 1.2.2 ASTM A325, Specification for Bolts Quenched/Tempered Steel Nominal Thread Diameter M16 - M36 For Structural Steel Joints.
- 1.2.3 ASTM A653, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- 1.2.4 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
- 1.2.5 ASTM F1667, Driven Fasteners: Nails, Spikes and Staples.
- 1.2.6 CAN/CSA O80 Series M, Wood Preservation.
- 1.2.7 CSA O121-M, Douglas Fir Plywood.
- 1.2.8 CAN/CSA O141, Softwood Lumber.
- 1.2.9 CAN/ULC-S102, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
- 1.2.10 NLGA, Standard Grading Rules for Canadian Lumber, National Lumber Grades Authority

1.3 QUALITY ASSURANCE

- 1.3.1 Lumber identification: Grade stamp of an agency certified by the Canadian Lumber Standards Accreditation Board.
- 1.3.2 Plywood identification: Grade mark in accordance with applicable CSA standards.
- 1.3.3 Lumber quality: Carefully select individual pieces so that knots and obvious defects will not interfere with placing bolts, proper nailing or making proper connections.
- 1.3.4 Moisture Content of wood at time of construction shall be 19% maximum.

- 1.3.5 Each piece of pressure treated lumber and fire retardant treated lumber shall be shop marked with the pressure treatment brand and ULC monogram respectively, in accordance with CAN/CSA O80-M.
- 1.3.6 Dimensions of lumber shall conform to dressed sizes specified in CAN/CSA-0141 unless actual dimensions are otherwise indicated or specified.
- 1.3.7 Dimensional references to lumber on Drawings and in Specifications are to nominal sizes unless actual dimensions are indicated. Such actual dimensions shall be dry size.
- 1.3.8 Lumber defects: Discard wood with defects which will render a piece unable to serve its intended function. Lumber will be rejected by Consultant for excessive warp, twist, bow, crook, mildew, fungus, or mould, as well as for improper cutting and fitting, whether or not it has been installed.

1.4 ENVIRONMENTAL REQUIREMENTS

- 1.4.1 When it is required that wood maintain dimensional stability and tolerances to ensure accurate installation of later work, store and install it only in dry areas, and where no further installation of moist materials is contemplated.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- 1.5.1 Store materials in a dry area. Cover materials with tarpaulins or polyethylene sheets to prevent moisture absorption and impairment of structural and aesthetic properties. Vent to allow air movement. Tie covering to keep in place.

PART 2 - PRODUCTS

2.1 MATERIALS

- 2.1.1 General:
 - 2.1.1.1 Materials used for Work of this Section are to include, but not be limited to the following criteria:
 - 2.1.1.1.1 Regionally sourced materials.
 - 2.1.1.1.2 FSC certified wood.
 - 2.1.1.1.3 Low VOC content limits in accordance with [Regulations \(SOR/2021-268\)](#)
 - 2.1.1.2 Adhesives - Urea-formaldehyde-free glues.
 - 2.1.1.3 All dimensional lumber and plywood to be FSC certified.
 - 2.1.1.4 All composite wood and/or agrifibre products (including core materials) and adhesives used to fabricate laminated assemblies used in building must not contain added urea-formaldehyde.
 - 2.1.1.5 Material to be sourced regionally from within 800 km of jobsite wherever possible.

- 2.1.2 Lumber: Softwood, G4 S, moisture content 19% or less at time of installation, in accordance with the following:
 - 2.1.2.1 Lumber shall be of same species and grade, equally seasoned and shall be processed and stamped at same mill.
 - 2.1.2.2 CSA O 141 and NLGA Standard Grading Rules for Canadian Lumber.
 - 2.1.2.3 Board quality: Construction or better.
 - 2.1.2.4 Dimension quality:
 - 2.1.2.4.1 Structural joists, planks, and framing: No. 1 Select Structural.
 - 2.1.2.4.2 Light framing: Construction.
- 2.1.3 Plywood: CSA O 121-M, G1 S, T & G, standard construction, laminated with waterproof adhesive, exterior grade, Thickness as indicated on drawings.
- 2.1.4 Fire retardant treatment of lumber and plywood (interior and protected locations): 'Dricon FRT' fire retardant treatment by Biewer Lumber or approved alternative, conforming to ASTM E84, to provide a flame spread rating of 25 or less.
- 2.1.5 Rough hardware: Conforming to ASTM F1667; Nails, bolts, screws, anchors, expansion shields, and other fastenings required to frame and fix rough carpentry as follows:
 - 2.1.5.1 Nails, spikes and staples: Spiral type.
 - 2.1.5.2 Bolts: ASTM A325; 12.7 mm diameter minimum with nuts and washers unless noted otherwise.
 - 2.1.5.3 Screws: Countersunk head, full thread type.
 - 2.1.5.4 Galvanize rough hardware used in fire treated wood and hardware exposed to the atmosphere.
- 2.1.6 Fasteners for use in pressure treated wood: Provide hot dipped galvanized fasteners complying to ASTM A153 and connectors in accordance with ASTM A653, Class G185 for non-structural members. Provide type 304 or 316 stainless steel fasteners and connectors for use in Structural, pressure treated wood.

PART 3 - EXECUTION

3.1 EXAMINATION

- 3.1.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 GENERAL

- 3.2.1 Lay out work carefully and to accommodate work of others. Cut and fit accurately: erect in position indicated by Drawings.
- 3.2.2 Install rough carpentry to allow for expansion and contraction of the materials.
- 3.2.3 Cut work into lengths as long as practicable and with square ends. Align, level, square, plumb, and secure work permanently in place. Brace work temporarily as required. Join work only over solid backing.
- 3.2.4 Bore holes true to line and to same size as bolts. Drive bolts into place for snug fit, and use plates or washers for bolthead and nut bearings. Turn up bolts and lag screws tightly when installed, and again just before concealed by other work or at completion of Work.
- 3.2.5 Provide anchors, bolts, and inserts required for attachment of the work of this Section, to those performing the work of other Sections and who are responsible for their installation.
- 3.2.6 Do not attach work by wood plugs or blocking in concrete or masonry. Use lead shields, expansion shields, or similar methods only as approved by Consultant.

3.3 MISCELLANEOUS WOODWORK

- 3.3.1 Fit and install wood furring, strapping, grounds and blocking. Adequately size, correctly place and conceal members for finishes, fitments and for Work under other Sections. Do not assume that Drawings show required work exactly or completely. Anchor wood members securely in place.
- 3.3.2 Install rough bucks, nailing strips and linings to rough openings as required for backing for frames and other Work.
- 3.3.3 Except where steel supports are specifically shown, provide wood blocking and supports in metal stud partitions for fastening of item such as casework and other wall mounted accessories. Have respective trades approve the location of such wood blocking.
- 3.3.4 Bolt wood blocking or nailing strips to steel framing.
- 3.3.5 Align and plumb faces of furring and blocking to tolerance of 1:600.
- 3.3.6 Use fire retardant lumber for blocking/framing in ceiling\ spaces, partitions and bulkheads.

3.4 FASTENERS

- 3.4.1 Frame, anchor, fasten, tie and brace members for required strength and rigidity.
- 3.4.2 Use hot dipped galvanized fasteners for exterior Work and Work below grade.

- 3.4.3 Countersink bolts and bolt heads as required for clearance of other Work.
- 3.4.4 Size fasteners to penetrate base member by half of fastener length minimum.
Minimize splitting of wood members by staggering nails in direction of grain.
- 3.4.5 For plywood use spiral, annular or resin coated nails and staples.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- 1.1.1 Comply with Division 1, General Requirements and documents referred to therein.
- 1.1.2 Provide labour, materials, products, equipment and services necessary to complete the finish carpentry work specified herein.

1.2 REFERENCES

- 1.2.1 ANSI A208.1, Particleboard.
- 1.2.2 ANSI A208.2, Medium Density Fibreboard for Interior Use.
- 1.2.3 ANSI/HPVA HP-1, Hardwood and Decorative Plywood.
- 1.2.4 ANSI/NEMA LD 3, High-Pressure Decorative Laminates.
- 1.2.5 ASTM F1667, Driven Fasteners: Nails, Spikes and Staples.
- 1.2.6 Architectural Woodwork Manufacturers Association of Canada (AWMAC).
- 1.2.7 Architectural Woodwork Standards (AWS) - Quality Standards for Architectural Woodwork.
- 1.2.8 CSA O115-M, Hardwood and Decorative Plywood.
- 1.2.9 CAN/CSA O141, Softwood Lumber.
- 1.2.10 CSA O151-M, Canadian Softwood Plywood.
- 1.2.11 National Hardwood Lumber Association (NHLA) Rules for the Measurement and Inspection of Hardwood and Cypress.
- 1.2.12 National Lumber Grades Authority (NLGA) Standard Grading Rules for Canadian Lumber.

1.3 SUBMITTALS

- 1.3.1 Shop drawings: Submit shop drawings of finish carpentry Work in accordance with Section 01 33 00 indicating materials, thicknesses, sizes, finishes, wood species, grades, profiles, connection attachments, shop jointing, field jointing, reinforcing, anchorage, fastener types and sizes, location of exposed fastenings, mechanical and electrical service routes, service outlets, cutout locations, and sizes. Include erection drawings, plans, elevations, sections, and details as applicable.
- 1.3.2 Samples: Submit samples of the following in accordance with the requirements of Section 01 33 00:

- 1.3.2.1 Two representative pieces of each type of wood to receive a stained or natural finish.
- 1.3.2.2 Two representative pieces of each type of wood finished as specified.
- 1.3.2.3 Two of each colour, pattern, gloss, and texture of plastic laminate, in manufacturer's standard tag size.
- 1.3.2.4 Two samples of laminated plastic joints, edging, cutouts and postformed profiles.
- 1.3.2.5 Two of each stone finish, in 100 x 75 x 20 mm samples.
- 1.3.2.6 One of each item of finish carpentry hardware.

1.4 QUALITY ASSURANCE

- 1.4.1 Execute Work of this Section by member of AWMAC, with 5 years experience in finish carpentry Work of comparable complexity and scope. Submit proof of experience upon Consultant's request.
- 1.4.2 Fabricate finish carpentry Work in accordance with AWS Quality Standards, Premium Quality materials and installation unless otherwise indicated. Perform Work in accordance with the definition of Good Workmanship as defined in the AWS Quality Standards.
- 1.4.3 Remove and replace finish carpentry Work which does not conform to the AWS Quality standards or as amended by these Specifications.
- 1.4.4 Field sample installation:
 - 1.4.4.1 Shop fabricate one field sample installation of an Interview Room millwork desk, complete with hardware and shop applied finishes, installed in location acceptable to Consultant.
 - 1.4.4.2 Arrange for Consultant's review and acceptance, allow 48 hours after acceptance before proceeding with Work.
 - 1.4.4.3 Obtain Consultant's acceptance. Accepted sample may become part of Work. Mark sample to Consultant's acceptance and match remainder of work to accepted sample. Remove unacceptable sample installation.
 - 1.4.4.4 Upon acceptance, sample installation shall serve as a minimum standard of quality for the balance of the work of this Section.

1.5 DELIVERY, STORAGE, AND HANDLING

- 1.5.1 Deliver, store, and handle finish carpentry in accordance with the AWS Quality Standards. Control the temperature and humidity in accordance with the AWS recommendations, before, during, and after finish carpentry delivery, and also during storage and installation.

- 1.5.2 Cover finished plastic laminated work with heavy kraft paper or put in cartons during shipment. Protect installed surfaces by approved means. Do not remove until immediately before final inspection.

1.6 EXTENDED WARRANTY

- 1.6.1 Submit an extended warranty for plastic laminate work of this Section in accordance with General Conditions, except that warranty period is extended to 2 years from date of Substantial Performance of the Work.
- 1.6.1.1 Warrant against defects in material and workmanship including but not limited to opening of joints, cracking, shrinkage, warpage, and delamination of plastic laminate.
- 1.6.1.2 Coverage: Complete replacement including affected adjacent Work.

PART 2 - PRODUCTS

2.1 MATERIALS

- 2.1.1 General:
- 2.1.1.1 Materials used for Work of this Section are to include, but not be limited to the following criteria:
- 2.1.1.1.1 Regionally sourced materials.
- 2.1.1.1.2 FSC certified wood.
- 2.1.1.1.3 All materials under Work of this Section, including but not limited to, adhesives and mastics, are to have low VOC content limits in accordance with Volatile Organic Compound (VOC) Concentration Limits for Certain Products Regulations (SOR/2021-268).
- 2.1.1.1.4 Adhesives - Urea-formaldehyde-free glues.
- 2.1.1.2 All dimensional lumber and plywood to be FSC certified.
- 2.1.1.3 All composite wood and/or agrifibre products (including core materials) and adhesives used to fabricate laminated assemblies used in building must not contain added urea-formaldehyde.
- 2.1.1.4 Material to be sourced regionally from within 800 km of jobsite wherever possible.
- 2.1.2 Concealed framing lumber and plywood:
- 2.1.2.1 Concealed framing lumber: Eastern Spruce, Balsam Fir, or Jack Pine, to CAN/CSA O141, NLGA, and AWS Custom Grade, S4S, average moisture content 7% +/- 2% at installation.
- 2.1.3 Softwood plywood: CSA O151-M; 19 mm unless indicated otherwise, (G 2S).

- 2.1.4 Hardwood lumber and wood veneer:
 - 2.1.4.1 Hardwood lumber (WD-1):
 - 2.1.4.1.1 Conforming to NHLA and AW S Premium Grade, S4S, average moisture content 7% +/- 2% at installation.
 - 2.1.4.2 Hardwood lumber: Quarter cut Japanese Ash, with 15% shine.
 - 2.1.4.3 Wood veneer (WDV-1):
 - 2.1.4.3.1 Conforming to CSA O115 in sizes and thickness shown on drawings.
 - 2.1.4.3.2 Veneers to have a high standard of finished appearance. Mineral streaks, discolouration, grain ruptures, loose texture, doze and shakes shall not be acceptable. Face veneers must not contain open joints, face depression, glue stain, patches, plastic repair or any other manufacturing irregularities or defects.
 - 2.1.4.4 Wood veneer: Quarter cut Japanese Ash, with 15% shine.
 - 2.1.4.5 Wood veneer to overlap solid wood edging to conceal edge (concealed lipping); typical for all millwork.
- 2.1.5 Plastic laminate (P/LAM): Provide plastic laminates conforming to ANSI/NEMA LD 3 as follows:
 - 2.1.5.1 Flatwork face sheet: 1.2 mm thick, heavy wear resistance.
 - 2.1.5.2 Vertical interior face sheets: 0.8 mm thick.
 - 2.1.5.3 Postformed face sheet: 0.8 mm thick.
 - 2.1.5.4 Backing sheet: thickness to match face sheet, high pressure laminate, manufactured by same manufacturer as face sheet.
 - 2.1.5.5 Plastic laminate types, colours and finishes (P/LAM#): Refer to the Interior Material Schedule for plastic laminate types required by this Section. Products listed in the Schedule shall be base bid. Alternative products will be considered provided they are approved by the Consultant.
 - 2.1.5.6 Provide samples for the Consultant's approval.
 - 2.1.5.7 Edge banding: Provide 3 mm thick pencil round PVC edge banding in colour as selected by the Consultant. Provide sample for the Consultant's approval.
- 2.1.6 Veneer core plywood:
 - 2.1.6.1 Hardwood plywood conforming to ANSI/HPVA HP-1.
 - 2.1.6.2 Plywood grade: APA plywood, Grade A-A where both sides of carpentry item is visible, Grade A-D where one side of carpentry item is visible, in sizes, thickness and shapes as indicated.
- 2.1.7 Medium Density Fibreboard (MDF) core or panel: ANSI A208.2; FSC certified, no-added formaldehyde, moisture resistant MDF panels engineered for interior high

moisture areas, 'Medex' by Sierra Pine Composite Solutions or approved alternative by Flakeboard Company Limited; meeting the following minimum criteria:

- 2.1.7.1 Density: 769 kg/m³.
- 2.1.7.2 Internal bond: 1.38 N/mm².
- 2.1.7.3 Modulus of rupture: 41.34 N/mm².
- 2.1.7.4 Modulus of elasticity: 4134 N/mm².
- 2.1.7.5 Moisture content: 4-6%.
- 2.1.8 Particle board core: ANSI A208.1, no-added formaldehyde, FSC certified particleboard containing recycled content, 'Purekor Platinum Particleboard' by Panel Source or approved alternative by Sierra Pine Composite Solutions; meeting the following minimum criteria:
 - 2.1.8.1 Density: 720 kg/m³.
 - 2.1.8.2 Internal bond: 0.76 N/mm².
 - 2.1.8.3 Modulus of rupture: 25.4 N/mm².
 - 2.1.8.4 Modulus of elasticity: 2861 N/mm².
- 2.1.9 Fire retardant coating: Provide clear fire retardant coating to wood panels as indicated. Two component, VOC free coating providing Class A Flame Spread rating to ASTM E84 and meet requirements of authorities having jurisdiction. 'Safecoat Clear Fire Retardant Coating' as manufactured by Quantum Group of Companies or approved alternative.
- 2.1.10 Draw bolts and splines: Type as recommended by fabricator.
- 2.1.11 Nails and staples: Conforming to ASTM F1667; Size and type to suit application, galvanized for exterior work, interior humid areas and for treated lumber; plain finish elsewhere.
- 2.1.12 Bolts, nuts, washers, blind fasteners, lags and screws: Size and type to suit application. Stapling is not acceptable.
- 2.1.13 Adhesive and bituminous mastic: Selected by the millwork fabricator with low VOC content.
- 2.1.14 Glass and glazing materials: In accordance with drawing A1.1

2.2 PLASTIC LAMINATE WORK

- 2.2.1 Perform plastic laminate Work in accordance with AWS Quality Standards and ANSI/NEMA LD 3.
- 2.2.2 Ensure adjacent parts of continuous laminate work match in colour and pattern.

- 2.2.3 Laminate plastic laminates to core materials in accordance with manufacturer's instructions.
- 2.2.4 Fabricate core surfaces and profiles with continuous support and bond over entire surface to receive plastic laminate.
- 2.2.5 Apply plastic laminate backing sheets to balance shrinkage stresses induced by plastic laminate face sheets.
- 2.2.6 Minimize joints in plastic laminate Work; do not install joints in plastic laminate Work in less than 2400 mm o.c. Locate joints minimum 610 mm from cut-outs. Offset core and plastic laminate facing joints.
- 2.2.7 Form shaped profiles and bends as indicated, using postformed grade laminate to laminate manufacturer's instructions.
- 2.2.8 Use straight self-edging laminate strip to match adjacent colour, finish, gloss, and pattern to cover exposed edge of core material. Chamfer exposed edges uniformly at approximately 20 degrees. Do not mitre laminate edges.
- 2.2.9 Apply laminated plastic liner sheet to interior of cabinetry and where indicated.

2.3 FABRICATION

- 2.3.1 Finished carpentry required by this Section is to include but not be limited to the following items:
 - 2.3.1.1 Door and miscellaneous frames.
 - 2.3.1.2 Wood base.
 - 2.3.1.3 Solid edge moldings.
- 2.3.2 Be responsible for methods of construction and for ensuring that materials are rigidly and securely attached and will not be loosened by the work of other sections.
- 2.3.3 Coordinate locations of concealed supports and blocking with other parts of Work. Provide cutouts for outlet boxes and other fixtures and ventilation slots as required for audio visual equipment.
- 2.3.4 Fabricate work in a manner which will permit expansion and contraction of the materials without visible open joints. Conceal joints and connections in wherever possible.
- 2.3.5 Set nails and countersink screws, apply wood filler to indentations, sand smooth and leave ready to receive finish.
- 2.3.6 Mitre exposed corners, no end grain shall be visible in completed installation.

- 2.3.7 Finished millwork shall be free from bruises, blemishes, mineral marks, knots, shakes and other defects and shall be selected for uniformity of colour, grain and texture.
- 2.3.8 Shop assemble finish carpentry to accommodate delivery and handling and to ensure passage through building openings.
- 2.3.9 Shop install cabinet hardware for doors, shelves and drawers. Recess shelf standards unless noted otherwise.
- 2.3.10 Wall and ceiling panels:
 - 2.3.10.1 Provide wall and ceiling panels as shown on Contract Drawings.
 - 2.3.10.2 Provide cutouts for electrical fixtures, diffusers, and sprinklers.
 - 2.3.10.3 Suspension system all components to be in accordance with manufacturer's recommendations.
- 2.3.11 Wood base: Fabricate wood base from solid hardwood to height and profile as shown on Contract Drawings.

2.4 SHOP FINISHING

- 2.4.1 Shop applied finishes:
 - 2.4.1.1 Shop finish (Type 1 - dressed lumber, polyurethane finish):
 - 2.4.1.1.1 Provide shop applied polyurethane finish conforming to MPI code INT 6.3K for premium grade finish.
 - 2.4.1.1.2 Provide paint system for dressed lumber including but not limited to items such as bases, door and miscellaneous frames and trims as indicated.
 - 2.4.1.2 Shop finish (Type 2 - wood panelling and casework, polyurethane finish):
 - 2.4.1.2.1 Provide shop applied polyurethane finish conforming to MPI code INT 6.4E for premium grade finish.
 - 2.4.1.2.2 Provide paint system for millwork panelling and casework items as indicated and required.
- 2.4.2 Finish application:
 - 2.4.2.1 Apply finish systems in accordance with the MPI Painting Specification Manual. Apply each Product to manufacturer's recommended dry film thickness.
 - 2.4.2.2 Finish systems listed are required minimum, apply additional coats if necessary to obtain substrate hiding acceptable to the Consultant.
 - 2.4.2.3 Tint prime and intermediate coats lighter than final top coats for identification of each succeeding coat and to facilitate inspections. Include only manufacturer's recommended reducing and tinting accessories. Do not add adulterants.
 - 2.4.2.4 Sand lightly between coats to achieve a tooth or anchor for subsequent coats.

- 2.4.2.5 Apply finish uniformly in thickness, colour, texture, and gloss, as determined by the Consultant under adequate illumination and viewed at a distance of 600. Apply finishes free of defects in materials and application which, in the opinion of the Consultant, affect appearance and performance. Defects include, but are not limited to:
 - 2.4.2.5.1 Improper cleaning and preparation of surfaces.
 - 2.4.2.5.2 Entrapped dust, dirt, rust.
 - 2.4.2.5.3 Alligatoring, blisters, peeling.
 - 2.4.2.5.4 Scratches, blemishes.
 - 2.4.2.5.5 Uneven coverage, misses, drips, runs, and poor cutting in.
- 2.4.2.6 Do not apply coatings on substrates which are not sufficiently dry. Unless indicated otherwise, allow each painting system coat to cure dry and hard before following coats are applied.
- 2.4.2.7 Repaint and refinish entire areas of damaged or incompletely covered surfaces; patching will not be permitted.

PART 3 - EXECUTION

3.1 EXAMINATION

- 3.1.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 INSTALLATION

- 3.2.1 Install Work in accordance with AWS Quality Standards and tolerances for Architectural Woodwork. Set and secure finish carpentry in place, rigid, plumb, square, and level.
- 3.2.2 Scribe and cut as required, fit to abutting walls, and surfaces, fit properly into recesses and to accommodate columns, fixtures, outlets, or other projecting, intersecting or penetrating objects leaving a 0.8 mm gap maximum.
- 3.2.3 Coordinate cutouts for plumbing fixtures, inserts, appliances, outlet boxes, and other fixtures, in finish carpentry. Round internal corners of cut-outs and seal exposed cores.
- 3.2.4 Form joints to conceal shrinkage.
- 3.2.5 Install draw bolts and splines in laminated plastic counter top joints at maximum spacing 450 mm o.c., and 75 mm from edge. Make joints flush, hairline butt joints.
- 3.2.6 Install finishing hardware accurately and securely in accordance with manufacturer's directions, adjust and clean.

- 3.2.7 Install prefinished millwork at locations shown on drawings. Position accurately, level, plum b straight.
- 3.2.8 Apply bituminous coating over wood framing members in contact with masonry or cementitious construction.
- 3.2.9 Wall and ceiling panels:
- 3.2.9.1 Wall panels: Install wall panels in locations indicated on drawings. Ensure that panels are securely installed in true vertical and horizontal manner.
- 3.2.10 Fire retardant coating: Apply fire retardant fire coating to panels in accordance with manufacturer's written instructions and to meet requirements of authorities having jurisdiction.
- 3.2.11 Door and miscellaneous frames:
- 3.2.11.1 Butt and cope internal joints of door frames to make snug, tight, joint. Cut right angle joints with mitred joint.
- 3.2.11.2 Fit backs of frames snugly to wall surfaces to eliminate cracks at junction of frame with walls.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- 1.1.1 Comply with Division 1, General Requirements and documents referred to therein.
- 1.1.2 Provide labour, materials, products, equipment and services necessary to complete the thermal insulation work specified herein.

1.2 REFERENCES

- 1.2.1 ASTM C 612, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
- 1.2.2 CGSB 71-GP-24M, Flexible Adhesive for Bonding Cellular Polystyrene Insulation.
- 1.2.3 CAN/ULC-S701, Thermal Insulation, Polystyrene, Boards and Pipe Covering.
- 1.2.4 CAN/ULC-S702, Mineral Fibre Thermal Insulation for Buildings.

1.3 SUBMITTALS

- 1.3.1 Product data: Submit manufacturer's Product data in accordance with Section 01 33 00 indicating characteristics, performance criteria, and limitations. Indicate installation requirements and techniques, storage, and handling criteria and installation procedure acceptable to manufacturer.
- 1.3.2 Certification: Submit installer's certification verifying compliance with specification requirements.

1.4 QUALITY ASSURANCE

- 1.4.1 Qualifications: Execute Work of this Section by company specializing in thermal insulation Work with minimum of three years, recent, documented experience, on Work of comparable complexity and scope.

PART 2 - PRODUCTS

2.1 MATERIALS

- 2.1.1 All materials under Work of this Section, including but not limited to, adhesives are to have low VOC content limits.
- 2.1.2 Semi-rigid mineral insulation: ASTM C612, Type IVB; mineral wool insulation. Thickness: As indicated on Drawings. 'RockBoard 60' by Roxul Inc. or approved similar by Owens Corning Canada LP.
- 2.1.2.1 Adhesive and fasteners: Type as recommended by insulation manufacturer to suit intended application.

- 2.1.3 Mineral wool filler,
- 2.1.3.1 Conforming to ASTM C 665, Paperless, semi-rigid, spun mineral fibre mats, of thickness as indicated on Contract Drawings, 'Roxul AFB' by Roxul Inc. or approved alternative.
- 2.1.4 Batt Insulation: CAN/ULC-S702, Type 1, friction fit. 'EcoTouch Pink Fiberglas Insulation' by Owens Corning Canada LP, 'ComfortBatt' by Roxul Inc., or approved alternative.
- 2.1.5 Foil faced insulation:
- 2.1.5.1 Stone wool insulation board: Conforming to ASTM C612 with density 56 kg/m³. Thickness: As indicated on Drawings; 'Rockboard PG Pin Perf' by Roxul or approved alternative by Owens Corning Canada LP or approved alternative manufacturer.
- 2.1.5.2 Facing: Board to be complete with perforated polypropylene facing in white colour.
- 2.1.6 Semi-rigid insulation (INS-9): Semi-rigid mineral wool conforming to CAN/ULC-S702, Type 1, minimum density 70 kg/m³, thickness as indicated. 'CavityRock MD' by Roxul Inc. or approved alternative. For use at cavity walls as indicated.
- 2.1.7 Acoustic Insulation: In accordance with Section 09 21 16.

PART 3 - EXECUTION

3.1 EXAMINATION

- 3.1.1 Verify condition of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.
- 3.1.2 Ensure substrate surfaces are dry, clean, suitable to receive adhesive and free from other deleterious substances.

3.2 INSTALLATION

- 3.2.1 Install thermal insulation in longest panel sizes possible in accordance with manufacturer's instructions.
- 3.2.2 Butt insulation with moderate contact and, cut and fit them tightly around other construction elements. Offset single layer vertical joints and both vertical and horizontal joints in multiple layer applications.
- 3.2.3 Make thermal insulation continuous, maintain thermal protection continuity and secure to prevent displacement. Ensure that insulation is tight to substrate without air gaps.
- 3.2.4 Cut and fit thermal insulation tightly around electrical boxes, plumbing and heating pipes and ducts, exterior doors and windows, and other protrusions.

- 3.2.5 Leave 75 mm separation between thermal insulation and heat emitting devices such as recessed light fixtures.
- 3.2.6 Cut and trim thermal insulation neatly to fit spaces; do not excessively compress insulation to fit. Install only thermal insulation boards which are free from chipped or broken edges.
- 3.2.7 Pack miscellaneous cavities with insulation to maintain continuity of thermal barrier.
- 3.2.8 Arrange for Consultant to review thermal insulation before it is enclosed.

3.3 SECUREMENT

- 3.3.1 Batt insulation: Install batt insulation in partitions, between studs, and as indicated on Contract Drawings and in accordance with the manufacturer's instructions. Fill stud cavities to full height of partitions and carefully cut and fit batt insulation around services and protrusions.
- 3.3.2 Semi-rigid cavity wall insulation:
 - 3.3.2.1 Provide insulation tight to the inner wythe starting at the base of the wall in parallel courses with tight butt joints. Stagger end joints in adjacent course.
 - 3.3.2.2 Provide finish work level, plumb and true.
 - 3.3.2.3 Provide securement for cavity wall insulation with wedge type retainers in accordance with manufacturer's written instructions, unless otherwise recommended by insulation manufacturer to suit intended condition.
- 3.3.3 Semi-rigid insulation: Install semi-rigid insulation neatly fitted between Z girts and C channels. Adhere insulation with temporary adhesive.
- 3.3.4 Rigid and semi-rigid insulation (Adhesive attachment):
 - 3.3.4.1 Apply adhesive to thermal insulation foam boards in accordance with manufacturer's recommendations.
 - 3.3.4.2 Omit adhesive bonding of foam board insulation over expansion and control joints.
- 3.3.5 Mechanical Fastening (insulating fastening system):
 - 3.3.5.1 Install insulation with insulation fastening system in accordance with manufacturer's written instructions.
 - 3.3.5.2 Apply compatible pressure sensitive tape over butt joints of insulation.
- 3.3.6 Mechanical Fastening (Stic-Klip):
 - 3.3.6.1 Install insulation by adhesive clip method in accordance with manufacturer's specifications.

- 3.3.6.2 Locate clips 100 mm from edges of panels where they abut other materials and at joints between panels otherwise, spaced throughout at 300 mm to 450 mm centres each way.
- 3.3.6.3 At clip locations clean supporting surfaces and apply 50 mm square film of adhesive; coat clips with adhesive and press firmly to wall, holding in place until adhesive exudes through clip base perforations; remove excess adhesive to permit curing; impale insulation panels on clips and secure.
- 3.3.6.4 Apply compatible pressure sensitive tape over butt joints of insulation.
- 3.3.6.5 Coordinate with applicable Sections as required for installation of high density insulation.
- 3.3.6.6 Install rigid insulation in accordance with manufacturer's written instructions.
- 3.3.6.7 Provide insulation with tight butt joints. Stagger end joints.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- 1.1.1 Comply with Division 1, General Requirements and documents referred to therein.
- 1.1.2 Provide labour, materials, products, equipment and services necessary to complete the firestopping and smoke seals work specified herein.

1.2 REFERENCES

- 1.2.1 ASTM E814, Test Method for Fire Tests of Through-Penetration Fire Stops.
- 1.2.2 CAN/CGSB 19.13, Sealing Compound, One Component, Elastomeric, Chemical Curing.
- 1.2.3 CAN/ULC S102, Surface Burning Characteristics of Building Materials and Assemblies.
- 1.2.4 CAN/ULC S115, Standard Method of Fire Tests of Firestop Systems.
- 1.2.5 CAN/ULC S702, Thermal Insulation, Mineral Fibre for Buildings.

1.3 DEFINITIONS

- 1.3.1 Fire Separation: A construction assembly, plane or device, either vertical or horizontal, which is required to prevent the passage of fire and smoke for a prescribed period of time. Proof of compliance to required time rating shall be by ULC, Warnock Hersey (or similar approved) certification or shall be as listed in the Ontario Building Code Supplementary Standard SB-2.
- 1.3.2 Smoke Separation: A construction assembly, plane or device, either vertical or horizontal, which is not required to prevent the passage of fire for a prescribed period of time but is required to prevent the passage of smoke. A "Smoke Separation" is also known as a "Fire Separation with No Rating" or a "Zero Hour Rated Separation".
- 1.3.3 Non-Rated Separation: A construction assembly, plane or device, either vertical or horizontal, which is not required to prevent the passage of fire for a prescribed period of time and is not required to prevent the passage of smoke.

1.4 SUBMITTALS

- 1.4.1 Product data: Submit copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
 - 1.4.1.1 Performance criteria, compliance with appropriate reference standard, characteristics, limitations.
 - 1.4.1.2 Product transportation, storage, handling and installation requirements.

- 1.4.1.3 Submit firestop and smoke seal manufacturer's Product data for materials and prefabricated devices, including manufacturer's printed installation instructions.
- 1.4.2 Shop drawings: Submit shop drawings in accordance with Section 01 33 00 indicating:
 - 1.4.2.1 Fire rated and smoke sealed systems for each typical application.
 - 1.4.2.2 Construction details, accurately reflecting actual job conditions.
 - 1.4.2.3 ULC or Intertek Testing assembly listing.
- 1.4.3 Certification:
 - 1.4.3.1 Submit certified documentation from manufacturer for each worker performing Work of this Section.
 - 1.4.3.2 Submit installer's and Product manufacturer's certification verifying compliance with the Contract Documents and conformance with ASTM E814 and CAN/ULC S115.

1.5 QUALITY ASSURANCE

- 1.5.1 Perform Work of this Section by manufacturer-approved, skilled, qualified, and experienced workers trained in installation of Work of this Section.

1.6 SITE CONDITIONS

- 1.6.1 Conform to manufacturer's requirements and maintain a minimum temperature of 5 degrees C for a minimum period of 24 h before application, during, and until application is fully cured.
- 1.6.2 Maintain sealant at a minimum 18 degrees C for best workability.

PART 2 - PRODUCTS

2.1 APPROVED EQUIVALENT

- 2.1.1 Acceptable manufacturers of rated systems include:
 - 2.1.1.1 AD Fire Protection Systems Inc.
 - 2.1.1.2 Hilti Canada Corporation.
 - 2.1.1.3 3M Canada.
 - 2.1.1.4 Tremco Incorporated.

2.2 MATERIALS

- 2.2.1 All materials under Work of this Section, including but not limited to, primers and sealants are to have low VOC content limits

- 2.2.2 Firestop sealant: single component, low modulus, silicone rubber, moisture curing, ULC labelled to CAN/CGSB 19.13-M and CAN/ULC S115.
- 2.2.3 Firestop insulation: to CAN/ULC-S702, Type 2; mineral fibre manufactured from rock or slag, suitable for manual application.
 - 2.2.3.1 Density: Minimum 64 kg/m³ when tested to ASTM C303.
 - 2.2.3.2 Combustibility: Noncombustible to CAN/ULC S114.
 - 2.2.3.3 Melt temperature: >1175 degrees C.
 - 2.2.3.4 Surface burning characteristics: to CAN/ULC S102, maximum flame spread of 0, smoke developed of 0.
 - 2.2.3.5 Moisture Absorption: 0.04 percent when tested to ASTM C1104.
 - 2.2.3.6 Smoulder Resistance: 0.01 percent when tested to CAN/ULC S129.
- 2.2.4 Damming, back-up, supports, and anchorage: In accordance with manufacturer's fire rated systems and to acceptance of authorities having jurisdiction.
- 2.2.5 Primer: As recommended by firestopping sealant manufacturer.

2.3 SYSTEMS

- 2.3.1 Firestopping and smoke seals: ULC or Intertek Testing Services listed Products and systems in accordance with CAN/ULC S115 suitable to actual application and installation conditions.
- 2.3.2 Do not use Products containing asbestos.
- 2.3.3 Firestopping components shall not contain volatile solvents or require special application to protect plastic pipe from firestopping compound.

PART 3 - EXECUTION

3.1 EXAMINATION

- 3.1.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.
- 3.1.2 Verify that substrates and surfaces to receive firestopping and smoke seals are clean, dry, and frost free.

3.2 FIRESTOP AND SMOKE SEAL LOCATIONS AND RATINGS

- 3.2.1 Install ULC firestop and smoke seal system rated to match fire resistance ratings and smoke seal ratings of assemblies into which they are installed.

- 3.2.2 Install firestop and smoke seal systems. Use systems with required fire and smoke ratings at following typical locations, including but not limited to:
 - 3.2.2.1 Gaps at intersections of fire-resistance rated masonry and gypsum board partitions.
 - 3.2.2.2 Control and sway joints in fire-resistance rated walls and partitions such as masonry and gypsum board.
 - 3.2.2.3 Gaps at top of fire-resistance rated partitions such as masonry and gypsum board partitions.
 - 3.2.2.4 Penetrations through fire-resistance rated walls and partitions including mechanical and electrical services and openings and sleeves for future use.
 - 3.2.2.5 Penetrations through fire-resistance rated floor slabs, ceilings, and roofs.
 - 3.2.2.6 Gaps at edge of floor slabs at exterior walls such as curtain wall and precast concrete panels.
 - 3.2.2.7 Perimeter of retaining angles on rigid ducts greater than 0.012 m², firestopping material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.
 - 3.2.2.8 At non-rated assemblies that require a smoke seal.
 - 3.2.2.9 Where required by Ontario Building Code.

3.3 PREPARATION

- 3.3.1 Prepare, modify, and adjust void sizes, proportions, and conditions to conform to fire rated and smoke sealed assembly requirements such as assembly opening size and dimensional restrictions.
- 3.3.2 Mask adjacent surfaces to avoid spillage and over-coating of adjacent surfaces. Remove stains from adjacent surfaces.

3.4 INSTALLATION

- 3.4.1 Install firestopping and smoke seal systems in accordance with manufacturer's instructions and fire rated assembly to establish continuity and integrity of fire separations.
- 3.4.2 Install firestop insulation in compacted thicknesses required by ULC design. Compress insulation approximately 50 percent.
- 3.4.3 Install primers as recommended by firestop and smoke seal Product manufacturers.
- 3.4.4 Install temporary forming, damming, back-up as required, remove after materials have achieved initial cure and will resist displacement.
- 3.4.5 Install firestop and smoke seal filler in horizontal joints providing 25% compression fit.

- 3.4.6 Use resilient, elastomeric firestopping and smoke seal systems in following locations:
 - 3.4.6.1 Openings and sleeves for future use.
 - 3.4.6.2 Penetration systems subject to vibration or thermal movement.
 - 3.4.6.3 Penetration systems in acoustical containment enclosures.
- 3.4.7 Trowel and tool exposed firestop and smoke seal Product surfaces to uniform, smooth finish.
- 3.4.8 Repair damaged firestopped and smoke sealed surfaces to acceptance of Consultant.
- 3.4.9 Identify each firestop and smoke seal penetration assembly with permanent label listing following:
 - 3.4.9.1 Assembly and rating in hours.
 - 3.4.9.2 Date of installation.
 - 3.4.9.3 Installing company's name and telephone number.
- 3.4.10 Do not cover materials until full cure has taken place.

3.5 CLEAN-UP

- 3.5.1 Remove excess materials and debris and clean adjacent surfaces immediately after application.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- 1.1.1 Comply with Division 1, General Requirements and documents referred to therein.
- 1.1.2 Provide labour, materials, products, equipment and services necessary to complete the sealant work specified herein, including security sealant at areas where accused and prisoners will be held.
- 1.1.3 Work of this Section does not include sealants in firestopping and smoke sealed assemblies.
- 1.1.4 Work of this Section does not include sealant work identified in individual specification sections.

1.2 REFERENCES

- 1.2.1 ASTM C834, Specification for Latex Sealants.
- 1.2.2 ASTM C920, Specification for Elastomeric Joint Sealants.
- 1.2.3 ASTM C1330, Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.

1.3 SUBMITTALS

- 1.3.1 Product data: Submit copies of Product data in accordance with Section 01 33 00 describing type, composition and recommendations or directions for surface preparation, material preparation and material installation.
- 1.3.2 Samples:
 - 1.3.2.1 Submit following samples in accordance with Section 01 33 00.
 - 1.3.2.1.1 Two samples of sealant/caulking, for colour selection.
 - 1.3.2.1.2 Two samples of back-up material and primer for physical characteristics.

1.4 QUALITY ASSURANCE

- 1.4.1 Qualifications: Work of this Section shall be executed by trained applicators approved by sealant manufacturer and having a minimum of 5 years proven experience.

1.5 SITE CONDITIONS

- 1.5.1 Do not install materials when ambient air temperature is less than 5°C, when recesses are wet or damp, or to manufacturer's recommendations.

1.6 DELIVERY, STORAGE AND HANDLING

- 1.6.1 Arrange delivery of materials in original, unopened packages with labels intact, including batch number, and ensure that on-site storage is kept to a minimum. Do not store materials on site where there exists any danger of damage from moisture, direct sunlight, freezing and other contaminants.

1.7 EXTENDED WARRANTY

- 1.7.1 Submit an extended warranty for Sealant Work in accordance with General Conditions, except that warranty period is extended to 2 years from date of Substantial Performance of the Work.
- 1.7.1.1 Warrant against leakage, cracking, crumbling, melting, shrinkage, running, loss of adhesion and staining adjacent surfaces.
- 1.7.1.2 Coverage: Complete replacement including affected adjacent Work.

PART 2 - PRODUCTS

2.1 MATERIALS

- 2.1.1 All materials under Work of this Section, including but not limited to, primers and sealants are to have low VOC content
- 2.1.2 Use materials as received from manufacturers, without additives or adulterations. Use one manufacturer's Product for each kind of Product specified.
- 2.1.3 Sealant Type A: ASTM C920, Type S, Grade NS, Class 25; One-part, non-sag type, silicone sealant, in standard colours selected.
- 2.1.3.1 'DC CWS' by Dow Corning Canada Inc.
- 2.1.3.2 'Sikasil 305CN' by Sika Canada Inc.
- 2.1.3.3 'Tremsil 400' by Tremco Incorporated
- 2.1.3.4 Or approved equivalent
- 2.1.4 Sealant Type B: ASTM C920, Type S, Grade NS; One-part mildew-resistant silicone, in standard colours selected.
- 2.1.4.1 '786 Mildew Resistant Silicone Sealant' by Dow Corning Canada Inc.
- 2.1.4.2 'Sikasil GP Mildew Resistant' by Sika Canada Inc.
- 2.1.4.3 'Tremsil 200 Silicone Sealant' by Tremco Incorporated.
- 2.1.4.4 Or approved equivalent
- 2.1.5 Sealant Type C: ASTM C834; Pure acrylic siliconized sealant; in standard white colour (paintable).

- 2.1.5.1 'Tremflex 834 Silconized Sealant' by Tremco Incorporated.
- 2.1.5.2 Or approved equivalent
- 2.1.6 Sealant Type D: Epoxy security sealant (for security areas accessible by accused/prisoners): Pick-proof gunned flexible epoxy joint filler: two component 100% solids, gun-grade epoxy joint filler with flexible, pick-proof properties for sloped areas.
 - 2.1.6.1 Acceptable materials, or approved equivalent,
 - 2.1.6.1.1 'Epolith-G' as manufactured by BASF Canada,
 - 2.1.6.1.2 'Euco #452-P Epoxy System, Epoxy Security Sealant' by The Euclid Chemical Company,
 - 2.1.6.1.3 'DynaPoxy EP-1200' by Pecora Corporation, or
 - 2.1.6.1.4 'Sikadur 31 Hi-Mod Gel' or 'Sikadur Injection Gel' by Sika Canada Inc.
 - 2.1.6.2 Or approved equivalent

2.2 ACCESSORIES

- 2.2.1 Primers: Type recommended by material manufacturers for various substrates, primers to prevent staining of adjacent surfaces encountered on project.
- 2.2.2 Joint backing: ASTM C1330; Round, solid section, closed cell, skinned surface, soft polyethylene foam gasket stock, compatible with primer and sealant materials, 30 to 50% oversized, Shore A hardness of 20, tensile strength 140 to 200 kPa. Bond breaker type surface.
- 2.2.3 Bond breaker: Type recommended by material manufacturers.
- 2.2.4 Void filler around the window frames to be one part expanding polyurethane foam.
- 2.2.5 Cleaning agents: As recommended by material manufacturer, non-staining, harmless to substrates and adjacent finished surfaces.

2.3 MIXING

- 2.3.1 Follow manufacturer's instructions on mixing, shelf and pot life.

PART 3 - EXECUTION

3.1 EXAMINATION

- 3.1.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 PREPARATION

- 3.2.1 Protect adjacent exposed surfaces to prevent smearing, staining or other damage, by masking or other means, prior to performing Work. Make good any damage caused by sealant application. Remove protection upon completion and clean adjacent, exposed surfaces of any compound deposited upon such surfaces.
- 3.2.2 Prepare joints to receive sealants to manufacturer's instructions. Ensure that joints are clean and dry and ferrous surfaces are free from rust and oil.
- 3.2.3 Clean recesses to receive sealant, to be free of dirt, dust, loose material, oil, grease, form release agents and other substances detrimental to sealant's performance.
 - 3.2.3.1 Remove lacquer or other protective coatings from metal surfaces, without damaging metal finish, using oil-free solvents. Remove rust, mill scale and coatings from ferrous metals by wire brush, grinding or sand blasting.
 - 3.2.3.2 Ensure recess is dry.
 - 3.2.3.3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings. Remove incompatible coatings as required.
- 3.2.4 Ensure that all materials in contact with sealant are compatible. Test substrate for adhesion.
- 3.2.5 Depth of recess: Maintain depth to ½ joint width up to a maximum of 13 mm and not less than 6 mm at centre of joint. For greater depth, use joint backing under. Where recess is less than specified depth, cut back surface of recess to specified recess depth.
- 3.2.6 Install polyethylene backing rod in joints 6 mm or more in width. Roll backing rod into joint. Do not stretch or bend backing rod. Install bond breaker to back of recess.
- 3.2.7 Prime sides of recess, in accordance with sealant manufacturer's instructions.
- 3.2.8 Condition products for use in accordance with manufacturer's recommendations.

3.3 INSTALLATION

- 3.3.1 Apply sealant immediately after adjoining Work is in condition to receive such Work. Apply sealant in continuous bead using gun with correctly sized nozzle. Use sufficient pressure to evenly fill joint.
- 3.3.2 Ensure sealant has full uniform contact with, and adhesion to, side surfaces of recess. Superficial painting with skin bead is not acceptable. Tool sealant to smooth surface, free from ridges, wrinkles, sags, air pockets, embedded impurities, dirt, stains or other defects.

- 3.3.2.1 At recesses in angular surfaces, finish sealant with flat profile, flush with face of material at each side.
- 3.3.2.2 At recesses in flush surfaces, finish compound with concave face, flush with face of material at each side.
- 3.3.3 Make sealant bead uniform in colour.
- 3.3.4 Cure sealants in accordance with sealant manufacturer's instructions. Do not cover up sealants until proper curing has taken place.
- 3.3.5 Immediately remove excess compound or droppings which would set up or become difficult to remove from adjacent finished surfaces, using recommended cleaners, as work progresses. Do not use scrapers, chemicals or other tools which could damage finished surfaces. Remove defective sealant.
- 3.3.6 Clean recesses and re-apply sealant.
- 3.3.7 Remove masking tape immediately after joints have been sealed and tooled.

3.4 CLEANING

- 3.4.1 Clean surfaces adjacent to joints, remove sealant smears or other soiling resulting from application of sealants. At metal surfaces, remove residue. Do not mar or damage finishes on materials adjacent to joints. Repair or replace marred or damaged materials.

3.5 SCHEDULE OF LOCATIONS

- 3.5.1 Following sealant location schedule is included for convenience and may not be complete. Examine Contract Drawings and other specification sections and determine entire extent of Work of this Section. Generally seal following locations:
 - 3.5.1.1 Concrete, masonry, wood and stone to metal.
 - 3.5.1.2 Wood to masonry, concrete and stone.
 - 3.5.1.3 Metal to metal.
 - 3.5.1.4 All dissimilar materials.
 - 3.5.1.5 Where 'sealant' or 'caulking' in indicated on drawings.
- 3.5.2 Sealant Type A:
 - 3.5.2.1 Interior and exterior control joints, except in floors.
 - 3.5.2.2 Door frames, louver frames, blank-off panels, interior and exterior side.
 - 3.5.2.3 Protrusions through interior and exterior walls and floors, interior and exterior side, except where fire rated seals are required.
 - 3.5.2.4 Seal thresholds.

3.5.3 Sealant Type B:

3.5.3.1 Control joints in tiled areas.

3.5.3.2 Between access panels and tile.

3.5.3.3 Between tiles and adjacent materials.

3.5.4 Sealant Type C:

3.5.4.1 Perimeter of millwork counters.

3.5.4.2 Perimeter of interior windows.

3.5.4.3 Perimeter of firehose cabinets.

3.5.4.4 Junction between drywall and masonry.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- 1.1.1 Comply with Division 1, General Requirements and documents referred to therein.
- 1.1.2 Provide labour, materials, products, equipment and services necessary to complete the metal doors and frames work specified herein.

1.2 REFERENCES

- 1.2.1 ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.
- 1.2.2 ASTM A568/A568M, Specification for General Requirements for Steel, Carbon and High-Strength Low-Alloy, Hot-Rolled Sheet and Cold-Rolled Sheet.
- 1.2.2.1 ASTM E90, Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
- 1.2.3 CAN/ULC S104-10 Standard Method for Fire Tests of Door Assemblies.
- 1.2.4 CAN/ULC S105-09 Standard Specification for Fire Door Frames Meeting the Performance Required by CAN/ULC-S104
- 1.2.5 CAN/CGSB-1.198, Cementitious Primer, (for Galvanized Surfaces).
- 1.2.6 CGSB 41-GP-19Ma, Rigid Vinyl Extrusions for Windows and Doors.
- 1.2.7 CAN/ULC-S702, Thermal Insulation, Mineral Fibre for Buildings.
- 1.2.8 CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.
- 1.2.9 CSA W59-M, Welded Steel Construction (Metal Arc Welding).
- 1.2.10 NFPA 80, Standard for Fire Doors and Other Opening Protectives.

1.3 DESIGN REQUIREMENTS

- 1.3.1 Design exterior frame assemblies to accommodate expansion and contraction when subjected to minimum and maximum surface temperature of -35 degrees C to 35 degrees C.

1.4 SUBMITTALS

- 1.4.1 Product data: Submit manufacturer's Product data in accordance with Section 01 33 00 indicating door and frame construction.
- 1.4.2 Shop drawings:

- 1.4.2.1 Submit shop drawings in accordance with Section 01 33 00 for each type of door and frame indicating:
 - 1.4.2.1.1 Thickness and type of steel.
 - 1.4.2.1.2 Thickness and type of core.
 - 1.4.2.1.3 Thickness and type of steel stiffeners and location of them within the door.
 - 1.4.2.1.4 Thickness and type of metal facing on edges of door and method of fastening.
 - 1.4.2.1.5 Location of mortises, reinforcement, anchorages, joining, welding, sleeving, exposed fasteners, openings and arrangement for hardware.
- 1.4.2.2 Include schedule identifying each unit with door marks and numbers relating to numbering on Contract Drawings and in door schedule. Indicate doors and frames to be fire rated.

1.5 QUALITY ASSURANCE

- 1.5.1 Perform Work in accordance with requirements by a member of the Canadian Steel Door and Frame Manufacturers Association.
- 1.5.2 Label and list fire rated doors and frames by an organization acceptable to authorities having jurisdiction and accredited by the Standards Council of Canada in conformance with CAN/ULC S104 and CAN/ULC S105 for ratings indicated, Labelling shall be in accordance with NFPA 80.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- 2.1.1 Baron Steel Doors and Frames.
- 2.1.2 Daybar Industries Limited
- 2.1.3 Fleming Doors Products.
- 2.1.3.1 Or approved equivalent,

2.2 MATERIALS

- 2.2.1 General:
 - 2.2.1.1 All materials under Work of this Section, including but not limited to, primers are to have low VOC content
 - 2.2.1.2 Wherever possible, metals used in work of this Section are to contain recycled content.
- 2.2.2 Steel: ASTM A568/A568M, Class 1; Commercial grade steel, hot dip galvanized to ASTM A653/A653M, ZF120 galvanized coating.
- 2.2.3 Minimum base steel thickness:

2.2.3.1	Frames	1.6 mm
2.2.3.2	Typical doors	1.6 mm
2.2.3.3	Acoustic doors	1.6 mm
2.2.3.4	Interior stiffeners	0.9 mm
2.2.3.5	Lock/strike reinforcements	1.6 mm
2.2.3.6	Hinge reinforcements	2.7 mm
2.2.3.7	All other reinforcement	1.6 mm
2.2.3.8	Top and bottom channels	1.2 mm
2.2.3.9	Glazing stops	0.9 mm
2.2.3.10	Guard boxes	0.9 mm
2.2.3.11	Jamb spreaders	0.9 mm
2.2.4	Top caps and thermal breaks: CGSB 41-GP-19Ma; Rigid PVC extrusions.	
2.2.5	Primer: CAN/CGSB 1.198.	
2.2.6	Core material:	
2.2.6.1	Interior doors: Mineral fibre insulation with a minimum face density of 24 kg/m ³ .	
2.2.6.2	Sound rated doors: Mineral fibre insulation with a minimum face density of 24 kg/m ³ .	
2.2.6.3	Fire rated doors: Mineral fibre insulation to CAN/ULC S702, Type 1A; 24 kg/m ³ .	
2.2.7	Screws: Stainless steel screws with countersunk flat head.	
2.2.8	Door silencers: Type 6-180, black neoprene.	
2.2.9	Frame anchors:	
2.2.9.1	Frames in masonry: 1.2 mm minimum, adjustable T-strap jamb anchors.	
2.2.9.2	Frames in steel stud partitions: 0.9 mm minimum steel anchors of suitable design securely welded inside each jamb.	
2.2.9.3	Frames in precast: Countersunk galvanized expansion bolts complete with galvanized anchor, base anchors, and spacers behind hollow metal frame.	
2.2.9.4	Labelled frames: In accordance with ULC requirements.	
2.2.10	Floor anchors: 1.6 mm minimum adjustable floor clip angles with 2 holes for anchorage to floor.	
2.2.11	Labels for fire doors and door frame: Brass plate, riveted to door and door frame.	

2.2.12 Grilles: Corrosion resistant steel with baked enamel finish. Model 61DG Series by Nailor Industries Inc or approved alternative by Hart and Cooley.

2.2.13 Glass and glazing: In accordance with Section 08 80 00.

2.3 FABRICATION

2.3.1 Fabricate doors and frames in accordance with reviewed shop drawings.

2.3.2 Welding: CSA W59 to produce a finished unit with no visible seams or joints, square, true and free of distortion.

2.3.3 Welding: Continuous unless specified otherwise. Execute welding by a firm fully acceptable to the Canadian Welding Bureau to requirements of CSA W47.1.

2.3.4 Form profiles accurately to details shown on Contract Drawings.

2.3.5 Ream and remove burrs from drilled and punched holes.

2.3.6 Grind welded corners and joints to a flat plane and fill with metallic filler and sand to a uniform smooth finish. Apply one coat of primer.

2.3.7 Provide weather strip for exterior doors in accordance with Section 08 70 00 and door manufacturer.

2.3.8 Frames, windows, and screens:

2.3.8.1 Fabricate frames of welded construction. Cut mitres and joints accurately and weld continuously on inside of frame profile. Exterior frames to be thermally broken.

2.3.8.2 Construct large frame sections with provision for on Site assembly to suit Site conditions.

2.3.8.3 Blank, reinforce, drill and tap frames for mortised, templated hardware. Protect mortised cut-outs with guard boxes.

2.3.8.4 Reinforce frames where required for surface mounted hardware.

2.3.8.5 Reinforce frames over 1200 mm wide with roll formed steel channels or hollow structural sections.

2.3.8.6 Furnish exterior door frames with a continuously welded integral steel weather drip at head of frame.

2.3.8.7 Prepare each door opening for single stud rubber door silencers, 3 for single door openings located in strike jamb, and 2 for double door openings located in head.

2.3.8.8 Install 2 channel or angle spreaders per frame, to ensure correct frame alignment. Install stiffener plates or spreaders between frame trim where required, to prevent bending of trim and to maintain alignment when setting in place.

- 2.3.8.9 Form channel glazing stops minimum 16 mm height, accurately cut, mitred, fitted and fastened to frame sections with stainless steel counter-sunk, flat head screws spaced at maximum 450 mm throughout and 50 mm from each end.
- 2.3.9 Anchorage:
 - 2.3.9.1 Anchor units to floor and wall construction. Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb, minimum number of anchors for each jamb:
 - 2.3.9.1.1 Frames up to 2285 mm: 3 anchors.
 - 2.3.9.1.2 Frames from 2285 mm to 2440 mm: 4 anchors.
 - 2.3.9.2 Where frames are to be set in masonry or concrete, supply adjustable anchors to trade installing frame.
 - 2.3.9.3 Fabricate frames for installation in steel stud partitions with steel anchors of suitable design, minimum number of anchors for each jamb:
 - 2.3.9.3.1 Frames up to 2285 mm height: 4 anchors.
 - 2.3.9.3.2 Frames 2285 mm to 2440 mm: 5 anchors.
- 2.3.10 General Door Requirements:
 - 2.3.10.1 Hollow steel construction, flush swing type, of sizes to conform to details, schedules and reviewed shop drawings with provisions for cut-outs for glass and grilles and reinforced to receive hardware fastenings.
 - 2.3.10.2 Blank, reinforce, drill and tap doors for mortised, templated hardware. Where required, reinforce doors for surface mounted hardware and door closers.
 - 2.3.10.3 Reinforce oversized doors with steel channels and plates
 - 2.3.10.4 Where openings are required, form integral cut-outs with framing, glass stop moldings and division bars.
 - 2.3.10.5 Install grilles to fit tight and secure into openings.
 - 2.3.10.6 Bevel both stiles of single doors 1 in 16.
 - 2.3.10.7 Reinforce doors with galvanized metal stiffeners at 150 mm o.c.
- 2.3.11 Interior Doors:
 - 2.3.11.1 Supply and install inverted, recessed, fully welded channels at top and bottom of doors.
 - 2.3.11.2 Fabricate doors with joints between front and back panels meeting on stile edges. Make joints continuously welded for entire height of door. After welding has been completed, grind joints smooth to match metal. Ensure that no filler is used in joints.
 - 2.3.11.3 Fill hollow space within door and vertical stiffeners from top to bottom with mineral fibre batt insulation.

2.3.12 Fire Rated Doors:

- 2.3.12.1 Supply and install inverted, recessed, spot welded channels at top and bottom of doors. Supply and install steel flush top caps on exterior doors.
- 2.3.12.2 Fabricate doors with joints between front and back panels meeting on stile edges. Make joints continuously welded for entire height of door. After welding has been completed, grind joints smooth to match metal. Ensure that no filler is used in joints.
- 2.3.12.3 Fabricate doors to achieve fire rating as indicated on drawings and in accordance with ULC. Provide ULC label plate on door at hinged edge midway between top hinge and head of door.
- 2.3.12.4 Fabricate door from temperature rise rated core laminated under pressure to each face.

2.3.13 Sound Rated Doors:

- 2.3.13.1 Coordinate with Section 08 70 00 as required for sizing and installation of door gaskets as required for acoustic doors. Accurately size frame and door to accept the required gasketing and to maintain the required clear width/height.
- 2.3.13.2 Supply and install inverted, recessed, spot welded channels at top and bottom of doors. Provide 1.6 mm continuous flush steel non-removable end caps, welded in place.
- 2.3.13.3 Mortise, reinforce, drill and tap doors to receive sound seals.
- 2.3.13.4 Fabricate doors with joints between front and back panels meeting on stile edges. Make joints mechanically interlocked, adhesive assisted with edge seams.
- 2.3.13.5 Fabricate doors to achieve STC rating as indicated on drawings and in accordance with ASTM E90.
- 2.3.13.6 Fill hollow space within door and vertical stiffeners from top to bottom with mineral fibre insulation.

PART 3 - EXECUTION

3.1 EXAMINATION

- 3.1.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 HOLLOW METAL DOOR, FRAME, AND SCREEN INSTALLATION

- 3.2.1 Install hollow metal doors, frames, and screens plumb, square, level, secure, and at correct elevation.
- 3.2.2 Install doors clear of floor finishes, and with the correct rebate opening for the door installation. Install door silencers.

- 3.2.3 Secure anchorages and connections to adjacent construction. Brace frames rigidly in position while building-in. Remove temporary steel shipping jamb spreaders. Install wood spreaders at third points of frame rebate height to maintain frame width. Supply and install vertical supports as indicated on drawings for openings over 1200 mm in width. Remove wood spreaders after frames have been built-in.
- 3.2.4 Allow for structural deflection and prevent structural loads from being transmitted to hollow metal frames.
- 3.2.5 Touch-up areas where galvanized coating has been removed or damaged with primer.
- 3.2.6 Fire doors: Install fire rated doors and frames in accordance with requirements of NFPA 80.
- 3.2.7 Sound doors:
 - 3.2.7.1 Install sound doors and gasketing in accordance with manufacturer's written instructions and to meet desired STC ratings.
 - 3.2.7.2 Adjust head and jamb gasketing to make proper contact against door around the entire perimeter.
 - 3.2.7.3 Proper contact is defined as follows: properly adjusted gasket shall be under slight compression when door is closed. Degree of compression must be even throughout full length of seal on all sides. Door must close fully without assistance.

3.3 ADJUSTING AND CLEANING

- 3.3.1 Adjust doors for smooth and balanced door movement.
- 3.3.2 Clean doors, frames and screens.

END OF SECTION

PART 1 - GENERAL

1.1 WORK INCLUDED

- 1.1.1 Comply with Division 1, General Requirements and documents referred to therein.
- 1.1.2 Provide labour, materials, products, equipment and services necessary to complete the wood door work specified herein.

1.2 REFERENCES

- 1.2.1 ANSI A208.1, Particleboard.
- 1.2.2 AWMAC, Architectural Woodwork Manufacturers' Association of Canada. Quality Standards for Architectural Woodwork.
- 1.2.3 CSA O 112 Series, Wood Adhesives.

1.3 DEFINITIONS

- 1.3.1 Exposed surfaces: Surfaces visible when doors are opened, backs of hinged doors and edges of hinged doors exposed when opened.
- 1.3.2 Pre-machined: Factory prepared cut-outs for hardware and glazing. Site trimming of work will not be permitted, except trimming of door height.

1.4 REQUIREMENTS OF REGULATORY AGENCIES

- 1.4.1 Fire rated doors and frames: Labelled and listed by a nationally recognized testing agency having factory inspection service in conformance with CAN/ULC S104-10 and CAN/ULC S105-09 for ratings indicated.
- 1.4.2 Install fire rated assemblies to NFPA 80 except where specified otherwise.

1.5 SUBMITTALS

- 1.5.1 Shop drawings: Submit shop drawings of wood doors in accordance with Section 01 33 00; indicate location, size, and hand of each door; elevation of each kind of door, construction details, location and extent of hardware blocking; indicate thicknesses, core construction, veneers, finish, quantities, fastenings and finishes and other pertinent data:
 - 1.5.1.1 Dimensions and locations of cutouts, mortises and holes for hardware.
 - 1.5.1.2 Grain pattern and veneer matching.
 - 1.5.1.3 Factory finish requirements.
 - 1.5.1.4 Fire ratings for fire doors.

- 1.5.1.5 Jointing, fastening and related items
- 1.5.2 Samples: Submit the following samples in accordance with Section 01 33 00:
 - 1.5.2.1 Door Sample: Submit two 300 mm x 300 mm corner samples showing construction, edge details, core and face veneers.
 - 1.5.2.2 Frame Sample: Submit two 300 mm long corner samples showing profiles, jointing method, face veneer, and glazing details.
 - 1.5.2.3 Factory Finish Control Samples: Submit duplicate 600 mm x 600 mm stain finished wood veneer samples on representative substrates. Resubmit samples until approval is granted. After approval is obtained, divide one approved sample into four equal sized pieces and distribute to:
 - 1.5.2.3.1 Owner: Two pieces.
 - 1.5.2.3.2 Site: One piece.
 - 1.5.2.3.3 This Section: One piece.

1.6 QUALITY ASSURANCE

- 1.6.1 Quality of work and materials: Unless otherwise specified, comply with the requirements for Premium Grade in accordance with the AWI/AWMAC/WI Architectural Woodwork Standards AWS-2009, and requirements of ANSI/WDMA Extra Heavy Duty performance level.
- 1.6.2 Finish Matching: Finish for solid wood members shall match wood veneer finish.
- 1.6.3 Source Limitations, Doors: Obtain doors through one source from a single manufacturer.
- 1.6.4 Source Limitations, Frames: Obtain frames through one source from a single manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

- 1.7.1 Deliver, store, and handle wood doors in accordance with the AWMAC Quality Standards amended as follows:
 - 1.7.1.1 Wrap wood doors individually in protective wrapping for shipment and Site storage.
 - 1.7.1.2 Handle wood doors carefully to prevent damage; replace damaged doors.
 - 1.7.1.3 Store doors flat on a dry, level surface. Ventilate and maintain recommended relative humidity before, during and after installation.

1.8 WARRANTY

- 1.8.1 Provide a life time warranty commencing on date of Substantial Performance against defects in the materials and workmanship for wood doors, including but not limited to warping, cupping, twisting, shrinkage, swelling, delamination and splitting.

- 1.8.2 Warranty shall include hanging, finishing and complete replacement cost of defective doors.

PART 2 - PRODUCTS

2.1 MATERIALS

- 2.1.1 Materials used for Work of this Section are to include, but not be limited to the following criteria:
- 2.1.1.1 Regionally sourced materials.
- 2.1.1.2 FSC certified wood.
- 2.1.1.3 All materials under Work of this Section, including but not limited to, adhesives are to have low VOC content
- 2.1.2 Adhesives: Urea-formaldehyde-free glues.
- 2.1.3 All composite wood and/or agrifibre products (including core materials) and adhesives used to fabricate laminated assemblies used in building must not contain added urea-formaldehyde.
- 2.1.4 Material to be sourced regionally from within 800 km of jobsite wherever possible.
- 2.1.5 Wood doors (solid core):
- 2.1.5.1 5 ply wood door: As manufactured by Baillargeon Doors or Lambton Doors, Or approved equivalent,
- 2.1.5.2 Core: To ANSI A208.1, minimum density 513 kg/m³ minimum, sanded faces, of thickness to fill void. Extruded particle board cores with voids are not permitted.
- 2.1.5.3 Mineral Core: Incombustible mineral as required by Underwriter's Laboratories of Canada, for the rating indicated.
- 2.1.5.4 Rails:
- 2.1.5.4.1 Top: 35 mm structural composite lumber.
- 2.1.5.4.2 Bottom: 35 mm structural composite lumber.
- 2.1.5.5 Stiles: 16 mm hardwood laminated to 19 mm structural composite lumber.
- 2.1.6 Hardware Blocking, Non-Rated Doors: 150 mm glued block or structural composite lumber in particleboard core doors as follows:
- 2.1.6.1 Provide top rail blocking in doors indicated to have closers.
- 2.1.6.2 Provide bottom rail blocking in doors indicated to have kick or mop plates, and mortised or surface bottom door sweeps.
- 2.1.6.3 Provide midrail blocking in doors indicated to have exit devices.

- 2.1.7 Hardware Blocking, Fire Protection Rated Doors: Fire resistant materials acceptable to authorities having jurisdiction, for positive attachments of closers, exit devices, hinges and locksets.
- 2.1.8 Door Edge: Minimum 6 mm hardwood, one piece full length, species to match wood veneer; edge detail: AWMAC Edge Type A.
- 2.1.9 Resilient Bumpers: Round, black rubber, 3 mm thick, adhesive mount.
- 2.1.10 Factory Finish: Conversion Varnish to AWI/AWMAC QSI.
- 2.1.11 Crossbanding: 1.6 mm thick minimum wood based composite or hardwood.
- 2.1.11.1 Door facing:
 - 2.1.11.1.1 1.5 mm thick stain grade Japanese Ash Veneer to match wood veneers under Section 06 20 00. Provide samples for the Consultant's approval.
 - 2.1.11.1.2 Veneers to have a high standard of finished appearance. Mineral streaks, discolouration, grain ruptures, loose texture, and shakes shall not be acceptable. Face veneers must not contain open joints, face depression, glue stain, patches, plastic repair or any other manufacturing irregularities or defects.
 - 2.1.11.2 Wood veneer and finish for doors shall be of the same manufacture and source as architectural wood panelling and wood ceilings to ensure uniformity of appearance is maintained; coordinate with Section 06 20 00.
- 2.1.12 Medium Density Fibreboard: Premium grade, minimum 768 kg/cu.m. (48 pcf.) density, fire retardant treated, acceptable to authority having jurisdiction.
- 2.1.13 Particleboard: CSA O188.1, extruded particle board, minimum density of 448 kg/cu.m. (28 pcf).
- 2.1.14 Adhesive: CSA O 112 Series, Type I; Waterproof; suitable for specific end use.
- 2.1.15 Grilles: Corrosion resistant steel with baked enamel finish. Model 61DG Series by Nailor Industries Inc or approved alternative by Hart and Cooley.
- 2.1.16 Door Frames:
 - 2.1.16.1 Metal door frames in accordance with Section 08 11 13.
 - 2.1.16.2 Wood door frames in accordance with Section 06 20 00.
- 2.1.17 Glass and glazing: In accordance with Section 08 80 00.
- 2.1.18 Glazing Frames For Fire Rated Doors: Wood veneer wrapped steel, of same species as facing or rolled steel with butt corners, countersink tamper resistant screws.
- 2.1.19 Glazing Frames for Unrated Doors: Wood, of same species as door facing; channel shape; butt corners; countersink tamper resistant screws.

2.2 FABRICATION - GENERAL

- 2.2.1 Use wood veneer of same species on doors and frames.
- 2.2.2 Fabricate fire rated assemblies to ULC requirements and bearing ULC, ULI or Warnock-Hersey International Ltd., label, as acceptable to authorities having jurisdiction for the required fire protection ratings.
- 2.2.3 Locate fire rating labels on the inside of the frame hinge jamb and door hinge edge midway between the top hinge and the head of the door.
- 2.2.4 Pre-machine work in factory.

2.3 FABRICATION - FRAMES

- 2.3.1 Fabricate work square and to the required lines. Use wood members in maximum lengths obtainable, free from bruises, blemishes, mineral marks, knots, shake and other defects.
- 2.3.2 Fabricate frames in medium density fibreboard core and finish in wood veneer to match doors.
- 2.3.3 Machine and hand sand surfaces exposed in the finished work to an even, smooth surface free from defects detrimental to appearance. Mitre all corners. Recess and conceal fasteners and anchor heads. Fill with matching wood plugs.
- 2.3.4 Glue and blind screw or nail and properly frame material with tight, hairline joints and hold rigidly in place. Locate prominent joints where directed. Glue and pin mortise and tenon joints. Intermediate joints between supports will not be permitted.
- 2.3.5 Provide 3 resilient bumpers on strike jamb for each single door and 2 resilient bumpers on frame heads for each leaf of double doors.

2.4 FABRICATION – DOORS

- 2.4.1 Fabricate doors to sizes indicated on drawings.
- 2.4.2 Fabricate doors square, true, and free from distortion waves, ridges or core ghost lines. Factory machine doors for finish hardware and flooring.
- 2.4.3 Fabricate doors using hot press construction technology. Bond stiles and rails to core using adhesive. Sand for uniform thickness. Laminate door facing and trim, to assembled core in hot press.
- 2.4.4 Cut and bevel stile edges as follows:
 - 2.4.4.1 Lock side: 3 mm in 50 mm.
 - 2.4.4.2 Hinge side: 1.5 mm in 50 mm.
- 2.4.5 Finish wood doors in factory and deliver to site ready for hanging.

2.5 FACTORY FINISH

- 2.5.1 Factory finish work scheduled to receive stained and clear finish to match approved control sample. Apply finish in accordance with manufacturer's approved methods using approved equipment to cut outs, and exposed surfaces. Unfinished work will be listed as deficiencies.
- 2.5.2 Spray finish work to AWI/AWMAC Conversion Varnish Premium Grade. Apply wash coat. Let dry and sand lightly. Apply first shade coat, let dry and sand. Apply second shade/toner coat, let dry and sand. Apply 1 coat of sealer, let dry and sand. Apply top coat with clear conversion varnish, 45 degree sheen.
- 2.5.3 Sand smooth work and clean surfaces free of dust before applying successive coat. Carefully sand with even strokes to provide perfect, scratch free surface.

PART 3 - EXECUTION

3.1 EXAMINATION

- 3.1.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 INSTALLATION

- 3.2.1 Install doors plumb, rigid, square, clear of floor finishes, and with correct rebate opening for door installation.
- 3.2.2 Conform to requirements of AWMAC Quality Standard, for wood door installation.
- 3.2.3 Install door grilles plumb and level, where indicated.
- 3.2.4 Install fire rated assemblies to NFPA 80 except where specified otherwise.

3.3 ADJUSTING AND CLEANING

- 3.3.1 Replace the following wood doors:
 - 3.3.1.1 Warped more than 3 mm, measured at any point on door, relative to perfectly flat surface.
 - 3.3.1.2 Core telegraphing visible at 1500 mm distance, under final Site lighting conditions.
- 3.3.2 Adjust doors for smooth and balanced door movement.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- 1.1.1 Comply with Division 1, General Requirements and documents referred to therein.
- 1.1.2 Provide labour, materials, products, equipment and services necessary to complete the interior glazed system work specified herein.

1.2 REFERENCES

- 1.2.1 AAMA 2603, Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
- 1.2.2 AAMA CW-10, Care and Handling of Architectural Aluminum from Shop to Site.
- 1.2.3 ANSI H 35.1 M, Alloy and Temper Designation Systems for Aluminum (Metric).
- 1.2.4 ASTM A167, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
- 1.2.5 ASTM B209M, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- 1.2.6 ASTM B221M, Specification for Aluminum-Alloy Extruded Bars, Rods, Wires, Profiles and Tubes.
- 1.2.7 ASTM F738M, Specification for Stainless Steel Metric Bolts, Screws, and Studs.
- 1.2.8 CAN/CGSB-19.13-M, Sealing Compound, One-Component, Elastomeric, Chemical Curing.
- 1.2.9 CSA W 59, Welded Steel Construction (Metal Arc Welding).

1.3 DESIGN REQUIREMENTS

- 1.3.1 Design the entire interior glazed system, including framing and supports as required.
- 1.3.2 Prevent deflection and permanent or progressive glazing displacement. Restrict horizontal and vertical mullion deflection to less than $L/175$, and 10 mm maximum regardless of span.
- 1.3.3 Design anchorage inserts for installation as part of other Sections of Work. Design anchorage assemblies with a minimum safety factor of 2.0.
- 1.3.4 Design members to withstand dead load and live loads calculated in accordance with OBC and applicable local regulations, to maximum allowable deflection of $1/360$ of span.

1.4 SUBMITTALS

- 1.4.1 Shop drawings: Submit shop drawings in accordance with Section 01 33 00 indicating:
 - 1.4.1.1 Plans, sections, details, type of extrusions, profiles, thicknesses, seals, finishes, panels, operating components, closures, fillers, and end caps, and sealants.
 - 1.4.1.2 Products and glazing types.
 - 1.4.1.3 Anchorage inserts, system installation tolerances.
 - 1.4.1.4 Section and hardware reinforcement, anchorage, assembly fixings.
 - 1.4.1.5 Detailing, locations, and allowances for movement, expansion, contraction.
- 1.4.2 Samples: Submit two samples of following in accordance with Section 01 33 00:
 - 1.4.2.1 250 mm long samples of each type of extrusion and finish.
- 1.4.3 Reports/Certificates:
 - 1.4.3.1 Submit documentation to substantiate ten years of experience in glazed partition manufacture and installation.
 - 1.4.3.2 Submit written manufacturer's certificate certifying compliance with the specifications.
- 1.4.4 Close-out submittals: Submit data for incorporated into the Operations and Maintenance Manual as part of Section 01 78 00.

1.5 QUALITY ASSURANCE

- 1.5.1 Retain a licensed Professional Engineer, registered in Province of Ontario, to perform following services for interior glazed system Work:
 - 1.5.1.1 Design of interior glazed system.
 - 1.5.1.2 Review, stamp, and sign shop drawings.
 - 1.5.1.3 Conduct on-Site inspections and prepare and submit inspection reports.

1.6 DELIVERY, STORAGE, AND HANDLING

- 1.6.1 Handle glazed partition work in accordance with AAMA CW-10.
- 1.6.2 Protect surfaces with strippable coating. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather. Do not remove before final cleaning of building.

1.7 EXTENDED WARRANTY

- 1.7.1 Submit an extended warranty for glazed partition work in accordance with General Conditions, except that warranty period is extended to 5 years.
- 1.7.1.1 Warrant against failure to meet the design criteria and requirements.
- 1.7.1.2 Coverage: Complete replacement including affected adjacent Work.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURER(S) AND SYSTEM(S)

- 2.1.1 Office front glass doors and glazing:
- 2.1.2 Elite System Solutions, 4.875" system, single glazing, by PC350 or approved alternative.
- 2.1.2.1 Sliding Doors: Inline Sliding Solutions complete with gaskets as manufactured by PC350 or approved alternative. Inline sliding doors are a center top hung inline self supporting solution and does not require the use of floor tracks. Multiple configurations are available to meet your space and footprint with a family of products that allow for customization.
- 2.1.2.2 Glass: Glazing with structural silicone vertical joints in accordance with Section 08 80 00.
- 2.1.2.3 Door pulls: stainless steel pull by PC350 or approved alternative
- 2.1.2.4 Materials and finishes:
- 2.1.2.4.1 Material and finish; Anodized Aluminium, to match adjacent office glass front finish.

2.2 MATERIALS

- 2.2.1 General:
- 2.2.1.1 All materials under Work of this Section, including but not limited to, sealants and coatings are to have low VOC content
- 2.2.1.2 Wherever possible, metals used in work of this Section are to contain recycled content.
- 2.2.2 Stainless steel sheet and channels: ASTM A167, Type 304. Size as shown.
- 2.2.3 Stainless steel shapes: ASTM A276, Type 304. Sizes and shapes as shown.
- 2.2.4 Aluminum extrusions and channels: ASTM B221 and ANSI H35.1 AA6063 alloy, T6 temper.
- 2.2.4.1 Profile and dimensions: Refer to Contract Drawings.

- 2.2.5 Aluminum sheet: ASTM B209 and ANSI H35.1 AA1100 aluminum alloy, H14 temper, minimum 1.29 mm for sheets less than 610 mm wide and minimum 2.05 mm for sheets of a greater dimension.
- 2.2.6 Reinforcements and anchors: ASTM A167, Type 316. Size as shown.
- 2.2.7 Glass and glazing materials: In accordance with Section 08 80 00.
- 2.2.8 Frame sealant: Type as recommended by the glazed partition work manufacturer.
- 2.2.9 Glazed partition work sealant: CAN/CGSB-19.13-M; Single-Component, silicone sealant; 'Spectrem 1' by Tremco Incorporated or '790 Silicone Building Sealant' by Dow Corning Canada Inc. Colour as selected by Consultant.
- 2.2.10 Joint backing: Closed cell foam polyethylene rod, outsized minimum 30-50% larger than joint width and compatible with joint sealant. Product as recommended by sealant manufacturer.
- 2.2.11 Anchors, clips, and angles: Stainless steel.
- 2.2.12 Closures and trim: 1 mm minimum stainless steel or aluminum sheet, finish to match glazed partition.
- 2.2.13 Screws, bolts and other fasteners: ASTM F738M; Stainless Steel Type 316.

2.3 FABRICATION

- 2.3.1 Fabricate sections true to detail, free from defects impairing appearance, strength and durability. Fabricate extrusions with sharp, well defined corners.
- 2.3.2 Fabricate, fit, and secure framing joints and corners accurately, with flush surfaces, and hairline joints.
- 2.3.3 Conceal anchors, reinforcement and attachments from view. Fabricate reinforcement in accordance with design requirements.
- 2.3.4 Do not expose manufacturer's identification labels on glazed partition assemblies.
- 2.3.5 Fabricate filler and closure pieces as necessary for a complete installation.
- 2.3.6 Fabricate glazed partition work closures and trim from stainless steel or aluminum sheet to match glazed partition.

PART 3 - EXECUTION

3.1 EXAMINATION

- 3.1.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 INSTALLATION

- 3.2.1 Install interior glazed system work in accordance with reviewed shop drawings, manufacturer's written instructions.
- 3.2.2 Install Work of this Section securely, in correct location, level, square, plumb, at proper elevations, free of warp or twist.
- 3.2.3 Install closures and trim pieces.
- 3.2.4 Refer to Contract Drawings for glazing type locations. Install glazing in accordance with Section 08 80 00.
- 3.2.5 Adjust operable parts for correct function.
- 3.2.6 Remove damaged or unacceptable Products and assemblies from Site and replace to Consultant's acceptance.
- 3.2.7 Install glass presence markers, in two cross stripes extending from diagonal corners. Maintain markers until final clean-up.

3.3 ERECTION TOLERANCES

- 3.3.1 Tolerances: Non-cumulative.
 - 3.3.1.1 Maximum variation from plumb: 1.5 mm/3 m non-cumulative or 12 mm/30 m, whichever is less.
 - 3.3.1.2 Maximum misalignment of two adjoining members abutting in plane: 0.8 mm.
 - 3.3.1.3 Vertical and horizontal positions: +/- 3 mm.
 - 3.3.1.4 Racking of face: 6 mm, nil in elevation.
 - 3.3.1.5 Operable components: Consistent with smooth operation and weatherproof performance.
 - 3.3.1.6 Maximum perimeter sealant joint between glazed partitions and adjacent construction: 12 mm.

3.4 JOINT BACKING AND GLAZED PARTITION WORK SEALANT

- 3.4.1 Prepare substrate surface and mask as recommended by sealant manufacturer.
- 3.4.2 Install joint backing and sealant at glazed partition work and perimeter joints for sound tight installation in accordance with sealant manufacturer's instructions. Tool sealant. Remove excess sealant.

3.5 CLEANING

- 3.5.1 Maintain glazed partition work, inside and outside, in clean condition throughout construction period.

- 3.5.2 Remove labels, protective material, and glass presence markers from prefinished surfaces.
- 3.5.3 Wash glazed partition work with solution of mild detergent in warm water, with particular attention to recesses and corners. Wipe surfaces clean and dry.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- 1.1.1 Comply with Division 1, General Requirements and documents referred to therein.
- 1.1.2 Provide labour, materials, products, equipment and services necessary to complete the finish hardware work specified herein.
- 1.1.3 Provide guidance to the Owner for the purpose of designing and selecting door hardware to ensure compatibility with security system and compliance with accessibility guidelines and Health & Safety requirements.

1.2 REFERENCES

- 1.2.1 BHMA, Builders Hardware Manufacturing Association.
- 1.2.2 Fire Prevention and Protection Act.

1.3 SUBMITTALS

- 1.3.1 Product data: Submit manufacturer's Product data in accordance with Section 01 33 00 indicating compliance with reference standards, transportation, storage, handling and installation requirements.
- 1.3.2 Shop drawings: Submit shop drawings and 3 complete hardware lists in accordance with Section 01 33 00 indicating:
 - 1.3.2.1 Door locations, sizes, hardware manufacturer's catalogue numbers, finish symbols and quantities required.
 - 1.3.2.2 Locations and mounting heights of each type of hardware.
- 1.3.3 Supply templates and required information to door and frame manufacturer to enable accurate sizes, locations of cut-outs and reinforcement for hardware.
- 1.3.4 Submit templates to required trade to arrange for provisions for accurate setting and fitting of hardware.
- 1.3.5 Samples: Submit 2 samples in accordance with Section 01 33 00 of each item that is different from hardware specified and include manufacturer's parts lists and installation instructions.
 - 1.3.5.1 Submit hardware component samples illustrating style, colour and finish. Tag samples identifying applicable Specification article number, brand name and number, finish, building location, date and catalogue number.
 - 1.3.5.2 Do not order hardware until samples have been accepted. Submit new samples to replace rejected samples. Supply hardware and finishes identical to each accepted sample.

- 1.3.6 Closeout submittals: Submit the following in accordance with Section 01 78 00 for each Product for incorporation into Operation and Maintenance Manual:
 - 1.3.6.1 Maintenance data.
 - 1.3.6.2 Operating instructions and safety precautions.
 - 1.3.6.3 Parts list with name and address of supplier.
 - 1.3.6.4 Lubrication schedule and type of lubricant recommended.
 - 1.3.6.5 Keys, tools and special devices.
 - 1.3.6.6 Inspection procedures related to preventive maintenance.

1.4 QUALITY ASSURANCE

- 1.4.1 General:
 - 1.4.1.1 Manufacturers: Companies specializing in manufacturing door hardware and registered with BHMA.
 - 1.4.1.2 Hardware supplier: Company specializing in supplying commercial door hardware and acceptable to manufacturer.
- 1.4.2 Certifications:
 - 1.4.2.1 Employ an Architectural Hardware Consultant to inspect completed installation and certify that hardware has been supplied and installed in accordance with manufacturer's printed instructions and as specified.
 - 1.4.2.2 Submit manufacturer's certificate that finish hardware and fire rated hardware meets specified requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- 1.5.1 Be responsible for packaging of hardware, on a set by set basis. As material is received from various manufacturers identify it to correspond to Hardware List symbols.
- 1.5.2 Label packages legibly, indicating manufacturer's number, types, sizes, opening number and Hardware List reference number. Wrap hardware and include in package, screws, bolts and fastening necessary for correct installation. If hardware package is not complete, pay additional charges incurred by installer.
- 1.5.3 Deliver hardware to Site packaged, labelled and cross-referenced to hardware list for each item and its scheduled installation location.
- 1.5.4 Accept Products of this Section on Site and ensure that each item is undamaged.
- 1.5.5 Catalogue and store hardware in secure area.

PART 2 - PRODUCTS

2.1 GENERAL

- 2.1.1 Aluminum door hardware: Supplied and installed by aluminium supplier.
- 2.1.2 Carefully check and verify Hardware Groups on Contract Drawings to ensure that hardware listed can be used as specified. Inform Consultant of concerns regarding quality, quantity, operation or function of hardware selected:
 - 2.1.2.1 Verify hand of doors, examine details on Contract Drawings and at Site to ensure hardware supplied can be correctly installed and is correct for Work as constructed.
 - 2.1.2.2 Select hardware in accordance with applicable codes and regulations and to approval of local Fire Marshal.
 - 2.1.2.3 Replace and pay for defective hardware including hardware which was incorrectly selected, and remedial and installation costs.
- 2.1.3 Ensure that hardware selected will function correctly, meets Contract requirements and Ontario Building Code and authorities having jurisdiction.
- 2.1.4 Ensure that each hardware item is of same type, design and by same manufacturer.
- 2.1.5 Manufacturer's names or trademarks are not permitted on exposed surfaces of hardware.
- 2.1.6 Include in packing slip a list of parts, name of supplier and door number in which lock is to be installed.
- 2.1.7 Hardware for fire rated and labelled door and frame assemblies: ULC listed or as accepted by authorities having jurisdiction.
- 2.1.8 Fire rated assemblies:
 - 2.1.8.1 Hardware: Selected and installed in accordance with applicable codes and regulations, NFPA-80 and to approval of Ontario Fire Marshal.
 - 2.1.8.2 Fire rated doors: ULC labelled hardware. Submit written certification of conformance to ULC requirements for each type of hardware prior to delivery.
 - 2.1.8.3 Locksets and latchsets on fire rated pairs of doors: 19 mm throw minimum.

2.2 ACCESSORIES

- 2.2.1 Items to be attached to masonry or concrete with expandable shields, lag screws, bolts or other fastening devices as required. Exposed screws: Stainless steel, Phillips or Robertson heads.

2.3 FINISHES

- 2.3.1 Metal finishes: Free from defects, clean, unstained and of a uniform colour for each type of finish required. Exposed surfaces and anchors: Specified finish symbol of item.

2.4 SITE SPECIFIC REQUIREMENTS

- 2.4.1 Door hardware:

- 2.4.1.1 Commercial Grade hardware should be used for all locks. In addition a complete door hardware schedule should be approved and provided prior to any purchase of door hardware in accordance to the electronic access control system. A minimum of 15 business days should be allotted for this to take place.

- 2.4.1.2 Door Hardware schedule, supplied for review as part of shop drawings, where specifications are not available, doors should be equipped with classroom function, (Sargent or Corbin locksets) compatible with future replacement of the cylinder with a Medeco M3 IC core cylinder.

- 2.4.1.3 Designated emergency exits should be egress only equipped with a Storeroom function Sargent panic 80 Series (manufactured by Assa Abloy).

- 2.4.1.4 Doors with Handicap Door Operators and Card Access must be equipped with interface control boards (CX12 or equivalent).

- 2.4.1.5 Doors and Frames shall be factory fabricated to accommodate the following requirements:

- 2.4.1.5.1 Cable raceways.

- 2.4.1.5.2 Transfer hinges.

- 2.4.1.5.3 Electromagnetic lock.

- 2.4.1.5.4 Electric strikes.

- 2.4.1.5.5 Concealed door monitoring contacts.

- 2.4.1.6 Different lockset functionalities are utilized throughout the facility which include the following:

- 2.4.1.6.1 Storeroom Function: All electronic access control doors, electrical / mechanical rooms, janitorial rooms, accessible washrooms, file rooms.

- 2.4.1.6.2 Classroom Function: Only on doorways pre-approved by the Owner.

- 2.4.1.6.3 Passage Function: Corridor doors without electronic access control, enclaves, electronic access control doors with maglocks, boardrooms/ meeting rooms, Offices.

- 2.4.2 Keys / Keyway:

- 2.4.2.1 The key design would be based on the client group needs, and site requirements.

- 2.4.2.2 All keys and locksmithing is coordinated with Corporate Security.

- 2.4.2.3 A customized key setup will be completed by Corporate Security, and designed after the Contractor has completed door hardware installation (if required).
- 2.4.2.4 All re-keying of facilities will be completed by Corporate Security once the electronic access control has been completed and commissioned.
- 2.4.2.5 All locks are to be on the Grand Master Key (GMK) which will only be provided to Corporate Security.
- 2.4.2.6 The keyways for facilities will be generated and created by the Corporate Security's Locksmith Vendor only.
- 2.4.2.7 A minimum of 15 business days is required for any and all re-keying.

PART 3 - EXECUTION

3.1 EXAMINATION

- 3.1.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 INSTALLATION

- 3.2.1 Install hardware in accordance with manufacturer's installation instructions and applicable codes and regulations.
- 3.2.2 Install hardware in accordance with hardware templates.
- 3.2.3 Adjust fixed and operable hardware for correct clearances and function.
- 3.2.4 Mount hardware measured from finished floor to centre of hardware, unless indicated otherwise:
 - 3.2.4.1 Top hinge: 250 mm from head of door to top.
 - 3.2.4.2 Bottom hinge: 265 mm from finished floor to bottom of hinge.
 - 3.2.4.3 Intermediate hinge: Equal distance between top and bottom hinge.
 - 3.2.4.4 Locksets, latchsets: 1000 mm.
 - 3.2.4.5 Panic device crossbar: 1000 mm.
 - 3.2.4.6 Push plates: 1100 mm to bottom of plates.
 - 3.2.4.7 Guard bars: 1100 mm.
 - 3.2.4.8 Door pulls: 1100 mm to bottom of pulls.
 - 3.2.4.9 Blank strike: 1450 mm.
 - 3.2.4.10 Blank fronts: 1450 mm.

3.3 FIELD QUALITY CONTROL

- 3.3.1 Have hardware inspected after installation by hardware supplier's representative, obtain certification in writing that hardware has been supplied and installed in accordance with Specifications and hardware manufacturer's instructions and is functioning correctly.

3.4 HARDWARE SCHEDULE

- 3.4.1 Hardware schedule: Refer to hardware groups on Contract Drawings.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- 1.1.1 Comply with Division 1, General Requirements and documents referred to therein.
- 1.1.2 Provide labour, materials, products, equipment and services necessary to complete the glass and glazing work specified herein.

1.2 REFERENCES

- 1.2.1 ASTM C920, Specification for Elastomeric Joint Sealants.
- 1.2.2 ASTM C1036, Standard Specification for Flat Glass.
- 1.2.3 ASTM C1048, Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
- 1.2.4 ASTM D2240, Test Method for Rubber Property - Durometer Hardness.
- 1.2.5 CAN/CGSB-12.1-M, Tempered or Laminated Safety Glass.
- 1.2.6 CAN/CGSB-12.3-M, Flat, Clear Float Glass.
- 1.2.7 CAN/CGSB-12.8, Insulating Glass Units.
- 1.2.8 CAN/CGSB-12.9-M, Glass, Spandrel.
- 1.2.9 CAN/CGSB-12.11-M, Wired Safety Glass.
- 1.2.10 CAN/CGSB-12.20-M, Structural Design of Glass for Buildings.
- 1.2.11 Glass Association of North America (GANA) Glazing Manual.
- 1.2.12 NFPA 80, Standard for Fire Doors and Other Opening Protectives.
- 1.2.13 CAN/ULC S104, Standard Method for Fire Tests of Door Assemblies.
- 1.2.14 CAN/ULC S106, Standard Method for Fire Tests of Window and Glass Block Assemblies.
- 1.2.15 ULC 332, Standard for Burglary Resisting Glazing Material.

1.3 DESIGN REQUIREMENTS

- 1.3.1 Glass Design:
 - 1.3.1.1 Design glass using a probability of breakage of 8 lites per 1000 at the first application of design load.

- 1.3.1.2 Design glass to CAN/CGSB-12.20-M. Perform stress analysis. Design units to accommodate live, dead, lateral, wind, seismic, handling, transportation, and erection loads.
- 1.3.1.3 Perform a thermal stress analysis on each glass unit with Low-E coating and provide heat strengthening and/or tempered units as necessary to prevent thermal breakage.
- 1.3.1.4 Perform a thermal stress analysis on each insulating thermal unit and provide heat strengthening and/or tempered units as necessary to prevent thermal breakage.
- 1.3.1.5 Where required, design glazing units so as not to allow thermal stress fracture due to heat build-up behind insulating units.
- 1.3.2 Limit glass deflection to flexural limit of glass with full recovery of glazing materials.
- 1.3.3 Utilize inner light of multiple light sealed units for continuity of air and vapour seal.

1.4 SUBMITTALS

- 1.4.1 Shop drawings: Submit shop drawings in accordance with Section 01 33 00 for fabrication and erection of glazing elements indicating materials, thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.
- 1.4.2 Samples:
 - 1.4.2.1 Submit following samples in accordance with Section 01 33 00.
 - 1.4.2.2 Submit one sample of each type of glass.
 - 1.4.2.3 Certificates:
 - 1.4.2.3.1 Submit manufacturer's certification that glass and glazing materials are compatible.
 - 1.4.2.3.2 Certification from glass balustrade system manufacturer that all glass used has been heat-soaked.
 - 1.4.2.4 Submit compatibility and adhesion test reports from sealant manufacturer indicating that glazing materials were tested for compatibility and adhesion with glazing sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed for adhesion.
 - 1.4.2.5 Compatibility test report from manufacturer of insulating glass edge sealant, indicating that glass edge sealants were tested for compatibility with other glazing materials including sealants, setting blocks, edge blocks and any other material that contacts or can affect the edge seal.
 - 1.4.2.6 IGMA Compliance Audit: Submit in accordance with Section 01 33 00, a written certification of successful completion of a Compliance Audit within the last six months.

1.5 QUALITY ASSURANCE

- 1.5.1 Insulating glass unit fabricators shall be a certified member of the Insulating Glass Manufacturer's Alliance (IGMA). IGMA members must participate in the certification program and shall have successfully passed a Compliance Audit within the last six months.
- 1.5.2 Installers qualifications: Perform Work of this Section by a company that has a minimum of five years proven experience in the installation of glazing units of a similar size and nature.
- 1.5.3 Fire Protective Rated Glass: Each lite shall bear permanent, nonremovable label of ULC certifying it for use in tested and rated fire protective assemblies.

1.6 SITE CONDITIONS

- 1.6.1 Glaze with compounds, sealants, or tapes only when glazing surfaces are at temperatures over 4°C, and when positive that no moisture is accumulating on them from rain, mist, or condensation.
- 1.6.2 When temperature of glazing surfaces is below 4°C, obtain from Consultant approval of glazing methods and protective measures which will be used during glazing operations.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- 2.1.1 Glass manufacturers:
 - 2.1.1.1 AGC Flat Glass North America Ltd.
 - 2.1.1.2 Cardinal Glass Industries.
 - 2.1.1.3 Guardian Industries Corporation.
 - 2.1.1.4 PPG Canada Inc
 - 2.1.1.5 Viracon Inc.
 - 2.1.1.6 Approved Equal

2.2 MATERIALS

- 2.2.1 All materials under Work of this Section, including but not limited to, primers, coatings, sealers, sealants, adhesives and cleaners are to have low VOC content
- 2.2.2 Tempered glass: (Type GL.1) CAN/CGSB-12.1-M, Type 2, Class B, Category II, clear, minimum 10 mm thick.
- 2.2.3 Tempered glass: (Type GL.2) CAN/CGSB-12.1-M, Type 2, Class B, Category II, clear, minimum 13 mm thick.

2.3 GLAZING SCHEDULE

- 2.3.1 Glass Type GL-1: Clear vision door insert glass.
- 2.3.2 Glass Type GL-2: Clear vision PC350 office glass.

2.4 FABRICATION

- 2.4.1 Verify glazing dimensions on Site.
- 2.4.2 Clearly label each glass lite with maker's name and glass type. Ensure labels are easily removable, non-residue depositing type. Do not remove labels until after Work is accepted by Consultant.
- 2.4.3 Work shall have smooth finished surfaces free from distortion and defects detrimental to appearance and performance.
- 2.4.4 Carefully make and fit details. Take special care with exposed finished Work to produce a neat and correct appearance to the Consultant's acceptance.
- 2.4.5 Grind and polish a 1.5 mm arris to both edges of exposed glazing at locations where glazing is not encapsulated in framing and where edges are exposed to occupants.
- 2.4.6 Fabricate argon filled thermal units with air space filled minimum 90% with argon gas.

PART 3 - EXECUTION

3.1 EXAMINATION

- 3.1.1 Verify that openings for glazing are correctly sized and within tolerance.
- 3.1.2 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.
- 3.1.3 Laminated glass edges shall be completely covered by tape to protect against sealants and water if required by Manufacturer.

3.2 PREPARATION

- 3.2.1 Clean contact surfaces with solvent and wipe dry.
- 3.2.2 Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- 3.2.3 Prime surfaces scheduled to receive sealant.

3.3 INSTALLATION

- 3.3.1 Provide glazing in accordance with IGMA recommendations. Provide continuous contact between glazing tapes and gasket to the glazing.
- 3.3.2 Install glazing to the following Sections:
 - 3.3.2.1 Section 06 20 00 - Finish Carpentry,
 - 3.3.2.2 Section 08 11 13 - Metal Doors and Frames,
 - 3.3.2.3 Section 08 14 16 - Wood Doors,
 - 3.3.2.4 Provide neat, straight sight lines. Trim excess glazing material flush with top of stops and fixed leg of frames.
- 3.3.3 Remove protective coatings, glazing stops, clean rebate and glass contact surfaces with solvent, wipe dry.
- 3.3.4 Apply primer/sealer to contact surfaces, prior to glazing.
- 3.3.5 Apply glazing tape as per manufacturer's instructions including recommended corner sealant.
- 3.3.6 Use setting blocks at 1/4 points and spacers to centre glass unit in frame.
- 3.3.7 Install glazing in accordance with reviewed shop drawings and manufacturer's written instructions. Install glazing with full contact and adhesion at perimeter. Maintain edge clearance recommended by glass manufacturer.
- 3.3.8 Apply a continuous heel bead of sealant around perimeter of inboard lite of the sealed unit and the metal framing.
- 3.3.9 Re-install glazing stops ensuring continuous contact and rattle-free installation. Do not distort glass. Trim tape protruding more than 2 mm above stop.
- 3.3.10 Install glazing gasket in accordance with manufacturer's recommendations.
- 3.3.11 Do not cut or abrade tempered, heat treated, or coated glass.
- 3.3.12 Install glass presence markers in two cross stripes extending from diagonal corners. Maintain markers until final clean-up.
- 3.3.13 Remove, dispose of, and replace broken, cut, abraded glass, and defective glass including but not limited to production dimples, 'tiger-stripping', chips, cracks, etc.
- 3.3.14 Interior glass: Glaze interior glass using glazing gasket glazing tape.
- 3.3.15 Glass Film:
 - 3.3.15.1 Install glass film with adhesive, applied in accordance with film manufacturer's instructions.

3.3.15.2 Place without air bubbles, creases or visible distortion.

3.3.15.3 Fit tight to glass perimeter with razor cut edge.

3.4 CLEANING

3.4.1 Immediately remove sealant and compound droppings from finished surfaces.

3.4.2 Remove labels, protective material, and glass presence markers from prefinished surfaces.

3.4.3 Clean glass surfaces with cleaning agents and methods in accordance with Manufacturer's written instructions.

3.4.4 Do not wash glass film for 30 days after installation.

3.4.5 Do not use bristle brushes on glass film.

END OF SECTION

AREA	CODE	DESCRIPTION	COLOUR / SIZES	SUPPLIER / MANUFACTURER
INTERVIEW ROOM	WD-1	SOLID WOOD	QUARTER CUT JAPANESE ASH (15% SHINE)	
INTERVIEW ROOM	WDV-1	VENEER WOOD	QUARTER CUT JAPANESE ASH (15% SHINE)	
INTERVIEW ROOM	C-2	MILLIKEN CARPET CONSEQUENCE 2.0 COLLECTION	DESIGN NAME: OUTCOME COLOUR NAME: OUT108-27 COATTAIL 50 x 50cm TILE FORMAT C/W COMFORT PLUS CUSHION INSTALLATION METHOD: MONOLITHIC	FRASER FLOORS
ADMIN AREA	C-5	MILLIKEN CARPET CONSEQUENCE 2.0 COLLECTION	DESIGN NAME: OUTCOME COLOUR NAME: OUT108-79 POSITION 50 x 50cm TILE FORMAT C/W COMFORT PLUS CUSHION INSTALLATION METHOD: MONOLITHIC	FRASER FLOORS
ENCLAVE	C-8	MILLIKEN CARPET ARCADIA COLLECTION	DESIGN NAME: GRASSLAND COLOUR NAME: GRS10-118 SYLVAN 39.4" x 39.4" TILE FORMAT C/W COMFORT PLUS CUSHION INSTALLATION METHOD: MONOLITHIC	FRASER FLOORS
COURT CORRIDOR FLOOR (MAIN FIELD)	CT-3	STONE PROJECT PORCELAIN	GREY FALDA NATURAL 30x60cm	STONE-TILE
COURT CORRIDOR FLOOR (ACCENT)	CT-4	STONE PROJECT PORCELAIN	BLACK CONTRAFALDA POLISHED 30x120cm	STONE-TILE
COURT CORRIDOR WALLS (MAIN FIELD)	CT-6	STONE PROJECT PORCELAIN	WHITE CONTRAFALDA NATURAL 30x60cm	STONE-TILE
BUSINESS CENTRE	RSF-2	IQ OPTIMA SOLID VINYL TILE	'BELUGA' 88624"x24"	JOHNSONITE

AREA	CODE	DESCRIPTION	COLOUR / SIZES	SUPPLIER / MANUFACTURER
ADMIN AREA	RBC-4	RESILIENT WALL BASE (COLOUR TO COORDINATE WITH C-5)	'GREY' 48 STYLE: TIGHTLOCK CARPET HEIGHT: 4.5" MATERIAL: RUBBER	JOHNSONITE
BUSINESS CENTRE	RBC-6	RESILIENT WALL BASE (COLOUR TO COORDINATE WITH RSF-2)	'GREY HAZE' 24 STYLE: TIGHTLOCK RESILIENT HEIGHT: 4.375" MATERIAL: RUBBER	JOHNSONITE
ENCLAVE	RBC-9	RESILIENT WALL BASE	'WHITE' 50 STYLE: TIGHTLOCK RESILIENT HEIGHT: 4.375" MATERIAL: RUBBER	JOHNSONITE
TYPICAL OFFICE	A/TL-3	ARMSTRONG ACOUSTIC PANEL & T-BAR SYSTEM	OPTIMA SQUARE REGULAR FINE TEXTURE TILE C/W 9/16" SUPRAFINE T-BAR 750 x 750mm FORMAT	ARMSTRONG CEILING / WALL SYSTEMS
	PT-1	PITTSBURGH PAINTS	'COMMERCIAL WHITE' PPG1025-1 GLOSS LEVEL: G1 (CEILINGS)	
	PT-2	SHERWIN WILLIAMS	'AESTHETIC WHITE' SW 7035 GLOSS LEVEL: G2 (WALLS)	
	PT-8	DULUX	'SNOWFIELD' 00NN 72/000 GLOSS LEVEL: G2 (WALLS)	
	PT-14	DULUX	'WHITER SHADE' 50YR 62/008 GLOSS LEVEL: G2 (WALLS)	
	PT-25	SHERWIN WILLIAMS	'PASSIVE' SW 7064 GLOSS LEVEL, G5 (DOORS & FRAMES)	

1.1.1 Subject to compliance with specified requirements, all latex paints shall be Dulux 'Diamond' series or approved equivalent

1.1.2 Refer to specifications for glass types (GL-x)

1.1.3 Refer to specifications for metal types (MET-x)

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- 1.1.1 Comply with Division 1, General Requirements and documents referred to therein.
- 1.1.2 Provide labour, materials, products, equipment and services necessary to complete the gypsum board work specified herein.

1.2 REFERENCES

- 1.2.1 ASTM A653/A653M, Specification for Steel Sheet, Zinc-coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.
- 1.2.2 ASTM C 475, Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
- 1.2.3 ASTM C645, Specification for Non-Load Bearing (Axial) Steel Studs, Runners (Tracks), and Rigid Furring Channels for Screw Application of Gypsum Board.
- 1.2.4 ASTM C665, Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- 1.2.5 ASTM C754, Specification for Steel Framing Members to Receive Screw- Attached Gypsum Board.
- 1.2.6 ASTM C834, Standard Specification for Latex Sealants.
- 1.2.7 ASTM C 840, Specification for Application and Finishing of Gypsum Board.
- 1.2.8 ASTM C1002, Specification for Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases.
- 1.2.9 ASTM C 1177, Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
- 1.2.10 ASTM C 1178, Specification for Glass Mat Water-Resistant Gypsum Backing Board.
- 1.2.11 ASTM C1278, Specification for Fiber-Reinforced Gypsum Panel.
- 1.2.12 ASTM C 1396, Specification for Gypsum Board.
- 1.2.13 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.
- 1.2.14 ASTM F1267, Standard Specification for Metal, Expanded, Steel.
- 1.2.15 CAN/CGSB-71.25-M, Adhesive, for Bonding Drywall to Wood Framing and Metal Studs.

1.3 DESIGN REQUIREMENTS

- 1.3.1 Design ceiling suspension system in accordance with manufacturer's printed directions and ASTM C754.
- 1.3.2 Design ceiling system for adequate support of electrical fixtures as required by the current bulletin of the Electrical Safety Authority.
- 1.3.3 Design hanger anchor and entire suspension system static loading not to exceed 25% of their ultimate capacity including lighting fixture dead loads.
- 1.3.4 Design suspension system to support weight of mechanical and electrical items such as air handling boots and lighting fixtures, and with adequate support to allow rotation/relocation of light fixtures.
- 1.3.5 Design subframing as necessary to accommodate, and to circumvent, conflicts and interferences where ducts or other equipment prevent the regular spacing of hangers.
- 1.3.6 Design of wall assemblies with a height greater than 3000 mm and those incorporating non-standard gypsum board assemblies including, but not limited to, assemblies incorporating abuse resistant gypsum board and cement board.

1.4 REGULATORY REQUIREMENTS

- 1.4.1 Provide fire separations and fire protection exactly as specified in test design specification that validates the specified rating. Verify that work specified in other Sections, as a part of the entire assembly, meets applicable validating test design specification.

1.5 SUBMITTALS

- 1.5.1 Product data:
 - 1.5.1.1 Submit copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
 - 1.5.1.1.1 Performance criteria, compliance with appropriate reference standard, characteristics, and limitations.
 - 1.5.1.1.2 Product transportation, storage, handling and installation requirements.
- 1.5.2 Shop Drawings: Submit Shop Drawings in accordance with Section 01 33 00 indicating wall assemblies, suspension systems, adjacent construction, elevations, sections and details, dimensions, thickness, finishes and relationship to adjacent construction.
- 1.5.3 Certifications: Submit written certification stating that suspended ceiling system is designed for adequate support of electrical fixtures as required by the current bulletin of the Electrical Safety Authority.

1.6 QUALITY ASSURANCE

- 1.6.1 Qualifications: Execute the Work of this Section by skilled, qualified, and experienced workers trained in the installation of the Work of this Section.
- 1.6.2 Retain a Professional Engineer, licensed in Province of Ontario, with experience in Work of comparable complexity and scope, to perform following services as part of Work of this Section:
 - 1.6.2.1 Design of wall systems with height greater than 3000 mm and at non-standard gypsum board assemblies including, but not limited to, assemblies incorporating abuse resistant gypsum board and cement board.
 - 1.6.2.2 Design of suspended gypsum board and wood panel assemblies.
 - 1.6.2.3 Review, stamp, and sign Shop Drawings and design calculations.
 - 1.6.2.4 Conduct shop and on-site inspections, prepare and submit written inspection reports verifying that this part of Work is in accordance with Contract Documents and reviewed Shop Drawings.

1.7 SITE CONDITIONS

- 1.7.1 Do not begin Work of this Section until:
 - 1.7.1.1 Mechanical and electrical Work above the ceiling is complete.

PART 2 - PRODUCTS

2.1 MATERIALS

- 2.1.1 General:
 - 2.1.1.1 All materials under Work of this Section, including but not limited to, sealants, adhesives, and primers are to have low VOC content
 - 2.1.1.2 Wherever possible, gypsum board, steel studs, ceilings and framing used in work of this Section are to contain recycled content.
- 2.1.2 Steel framing: ASTM C754; ASTM A653/A653-M, Z275; cold rolled, galvanized steel sheet.
 - 2.1.2.1 Bailey Metal Products Ltd.
 - 2.1.2.2 Corus Metal Profiles
 - 2.1.2.3 Approved Equal
- 2.1.3 Steel studs and track runners: ASTM C645; Galvanized steel studs and runners, 32 mm wide x depth as indicated on Contract Drawings. Formed from galvanized steel sheet, thicknesses as follows:
 - 2.1.3.1 Less than 3000 mm: Minimum 0.53 mm (25 ga.).

- 2.1.3.2 Greater than 3000 mm and non-standard assemblies: Minimum 0.91 mm (20 ga.).
- 2.1.4 Sheet steel blocking: Galvanized sheet steel: ASTM A653/A653M Grade A, Z275 Commercial Quality zinc coating. 1.2 mm thick (18 ga.) thick for use as sheet blocking.
- 2.1.5 Main carrying channels: ASTM C645; Formed from galvanized steel sheet, 38 x 19 mm cold rolled, channels.
- 2.1.6 Resilient channel: ASTM C645; 0.5 mm thick galvanized metal, 57 mm wide x 12 mm deep for walls and ceiling to reduce sound transmission.
- 2.1.7 Furring channels: ASTM C645; Formed from galvanized steel sheet, 22 mm winged flange type, cold rolled.
- 2.1.8 Furring channels (hat type): ASTM C645; 0.5 mm base steel thickness, galvanized. 70 mm wide x 22 mm deep hat shaped channel.
- 2.1.9 Heavy duty furring channels: ASTM C645; 0.9 mm steel thickness, galvanized hat shaped channel with a wider and deeper size as required by manufacturers.
- 2.1.10 Hanger wires: 4.1 mm minimum diameter galvanized pencil rod.
- 2.1.11 Tie wire: 1.6 mm thick minimum diameter, soft annealed, galvanized steel wire.
- 2.1.12 Mesh: ASTM F1267, Type 2, Class 1; 3 mm (0.12") thick galvanized, flattened, expanded steel diamond mesh, nominal diamond size 25 x 50 mm. 'Security Mesh ASM .75-9F' by Amico Security Products, 'Dramex Style 3/4" - #9(10)F' by Expanded Metal Corporation, or approved alternative.
- 2.1.13 Strap/Clips: Galvanized steel strap or clip as recommended by mesh manufacturer.
- 2.1.14 Corner bead, casing bead, and special shapes: Formed from 0.6 mm thick minimum, galvanized steel sheet, designed to be concealed by joint compound.
- 2.1.15 Special trims:
 - 2.1.15.1 Trim: Formed from extruded silver anodized aluminium, visible profile of 13 x 13 mm. 'Plano PS 130 ASN' by Profilitec SPA or other approved alternative.
- 2.1.16 Control joint strip: Roll formed from galvanized steel sheet, with a tape protected recess, 6 mm wide x 11 mm deep.
- 2.1.17 Screw fasteners: ASTM C1002 Type S; Corrosion resistant.
- 2.1.18 Concrete anchors: tie wire sleeve anchors, 'Redi-Drive Anchors' by ITW Red Head or approved alternative.
- 2.1.19 Acoustic/Fire insulation (INS-3): ASTM C 665, Paperless, semi-rigid, spun mineral fibre mats, of thickness as indicated on Contract Drawings, 'Sustainable Insulation, NoiseReducer' by Certaineed Gypsum Canada, 'EcoTouch Quiet Zone Pink

Fiberglas Acoustic Insulation' by Owens Corning Canada LP or 'Roxul AFB' by Roxul Inc., approved equivalent.

2.1.20 Acoustical sealant:

2.1.20.1 Non-rated assemblies: ASTM C834; Acrylic, mould resistant sealant, paintable. 'Smoke and Acoustic Sealant CP506' by Hilti or approved alternative.

2.1.20.2 Fire-rated assemblies: ASTM E84; Acrylic based firestop sealant, colour: red or white as selected by Consultant. 'Flexible Firestop Sealant CP606' by Hilti or approved alternative.

2.1.21 Vibration isolation ceiling hangers: unit shall consist of a steel spring in series with a neoprene isolating element. Model W30N manufactured by Mason Industries Inc., or approved alternative by PAC International. Provide hangers to ensure that working load does not exceed 2/3 of solid load. Design hangers to tolerate 30 deg. misalignment.

2.1.22 Gypsum board: ASTM C1396; gypsum board 12.7 mm thick of maximum practical lengths to minimize end joints, unless indicated otherwise. Furnish Board by Certainteed Gypsum Canada, CGC Corporation, or Georgia-Pacific Consumer Products., approved equivalent.

2.1.23 Fire rated gypsum board: ASTM C 1396; gypsum board 15.9 mm thick of maximum practical lengths to minimize end joints, unless indicated otherwise. Furnish Type X Board by Certainteed Gypsum Canada, CGC Corporation, or Georgia-Pacific Consumer Products, approved equivalent.

2.1.24 Cementitious Board: ASTM C1177, high strength portland cement building panel with self adhesive glass tape; provide board with heavier mesh reinforcement for suspended applications. 'Durock Cement Board Next Gen.' by CGC Corporation, or approved alternative by Certainteed Gypsum Canada, approved equivalent.

2.1.25 Joint reinforcing tape:

2.1.25.1 Standard gypsum board: ASTM C 475; 50 mm wide x 0.25 mm thick, perforated paper, with chamfered edges.

2.1.25.2 Moisture resistant and tile backer boards: ASTM C 475; fibreglass mat joint tape as recommended by board manufacturer to suit location.

2.1.25.3 Cement Board: Mesh reinforcing tape recommended by cement board manufacturer.

2.1.26 Bonding adhesive: CAN/CGSB-71.25-M; Type for purpose intended and as recommended and approved by manufacturer.

2.1.27 Joint and patching compound: ASTM C475; Asbestos-free, supplied by manufacturer of gypsum board used.

- 2.1.28 Fast setting patching compound: ASTM C475; Asbestos-free, Sheetrock or Durabond by CGC Corporation, 'Moisture and Mold Resistant Setting Compound with M2Tech' by Certainteed Gypsum Canada or approved alternative.
- 2.1.29 Access doors: Supplied by other Sections for installation as part of the Work of this Section.
- 2.1.30 Wood panels: Wood panels in accordance with Section 06 20 00 - Finish Carpentry. Coordinate with Work of noted Section as required for sizing and installation of wood panels.

PART 3 - EXECUTION

3.1 EXAMINATION

- 3.1.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 SUSPENSION FRAMING

- 3.2.1 Install ceiling systems in accordance with reviewed Shop Drawings and manufacturer's written instructions.
- 3.2.2 Install hanger wires plumb and securely anchored to the building structural framing, independent of walls, pipes, ducts, and metal deck; install additional framing and hangers to bridge interference items.
- 3.2.3 Install vibration isolation hangers at all locations where indicated in strict accordance with manufacturer's printed instructions.
- 3.2.4 Install hanger wires at 1200 mm maximum centres along carrying channels, not less than 25 mm, and not more than 150 mm from channel ends.
- 3.2.5 Install additional hangers at lighting fixture and ductwork locations. Do not attach hanger wires to mechanical or electrical equipment. Do not support mechanical and electrical fixtures and fitting on ceiling without the ceiling manufacturer's written acceptance.
- 3.2.6 Install main carrying channels transverse to structural framing members. Lap main carrying channels 200 mm minimum at splices and wire each end with two loops and prevent clustering or lining-up of splices.
- 3.2.7 Install furring channels at 400 mm o.c., not less than 25 mm, and not more than 150 mm from perimeter walls, at openings, at interruptions in ceiling continuity, and at change in plane. Install furring channels to a tolerance of 3 mm maximum in 3600 mm.

- 3.2.8 Install additional main carrying and furring channels to frame and to reinforce openings such as recessed lighting fixtures, access hatches, ceiling grilles, outlet boxes, ventilating outlets and similar items.

3.3 STEEL STUDS AND FURRING

- 3.3.1 Install steel studs and furring in accordance with reviewed Shop Drawings and manufacturer's written instructions.
- 3.3.2 Provide 18 ga. thick galvanized sheet blocking for locations as indicated on Contract Drawings.
- 3.3.3 Install steel stud partitions to underside of structure unless indicated otherwise.
- 3.3.4 Install track runners at floors, ceilings, and underside of structure; align track runners accurately and secure to structure at 600 mm centres maximum.
- 3.3.5 Install double top track runner assembly to prevent the transmission of structural loads to steel studs.
- 3.3.6 Install steel studs vertically at 400 mm o.c., unless otherwise indicated, and not more than 50 mm from abutting walls, at openings, and at each side of corners. Install studs securely to track runners.
- 3.3.7 Schedule and coordinate steel framing installation with mechanical and electrical services installation.
- 3.3.8 Install full height, double studs at door and service openings, fastened together and stiffened back to the structure to prevent vibration when doors close.
- 3.3.9 Provide double studs boxed together at all openings, sill, head and jambs and at door jambs, fastened together and stiffened back to the structure to prevent vibration. At each opening exceeding 900 mm in width, double studs shall be 20 ga. extending to structure above, and adequately anchored at each end. Provide steel studs above and below openings spaced at 400 mm o.c. maximum. All metal stud partitions above doors and screens over 1220 mm wide shall be secured to structure over and reinforced with sway bracing to stabilize walls to prevent lateral movement.
- 3.3.10 Erect three studs at corner and intermediate intersections of partitions. Space 50 mm apart and brace together with wired 19 mm channels.
- 3.3.11 Stiffen partitions over 2440 mm high or 3000 mm long, or both, with horizontal bracing extended for full length of partitions. Provide one line of bracing in partitions. Space lines to provide equal unbraced panels. Provide bracing for portions of partitions over door openings in partitions over 3000 mm high, and bracing both above and below openings in partitions located no greater than 150 mm from top and bottom of opening, and extending two stud spaces beyond each edge of opening for both doors and windows. Wire tie or weld bracing to studs.

- 3.3.12 Frame control joints using back to back double studs at abutting structural elements, at dissimilar backup interface, at dissimilar walls and ceilings, at structural expansion and control joints, at door and other openings, and at 9000 mm maximum spacing in continuous runs. Install control joint strips and secure in place.
- 3.3.13 Install additional support framing at openings and cutouts for built-in equipment, upper cabinet support, access panels and similar items.
- 3.3.14 Attach to framing adequate steel reinforcing members or an 18 ga. steel stud mounted horizontally and notched around furring members to support the load of, and to withstand the withdrawal and shear forces imposed by, items installed upon the work of this Section. Such items include, but are not restricted to, coat hooks, washroom accessories, handrail anchors, rub rails, grab bars, guards, wall-hung cabinets and fitments, shelving, curtain and drape tracks; Owner supplied equipment; and minor mechanical and electrical work. Heavy mechanical and electrical equipment shall be self-supporting in Divisions 21, 23 and 26.
- 3.3.15 Provide for support and incorporation of flush-mounted and recessed mechanical and electrical equipment and fixtures only after consultation and verification of methods with those performing the work of Divisions 21, 23 and 26.
- 3.3.16 Install cross bracing in accordance with the steel stud manufacturer's recommendations.

3.4 FIRE RATED ASSEMBLIES

- 3.4.1 Install Products in fire rated assemblies in strict accordance with applicable ULC tested and approved designs.
- 3.4.2 Stiffen fire rated walls over 3.66 m high, where linear length of wall is greater than 2.44 m between perpendicular wall supports, with diagonal bracing above the ceiling extending perpendicular to wall at a 45° angle to structure above. Locate diagonal bracing at maximum 2.44 m o.c.
- 3.4.3 Where double layers of gypsum board are shown, and required for fire rating, screw first layer to studs and furring and laminate the second layer to the first using joint filler as an adhesive. Stagger joints between first and second layers.

3.5 ACOUSTICAL INSULATION

- 3.5.1 Install acoustic insulation in partitions, between steel studs, and as indicated on Contract Drawings and in accordance with the manufacturer's instructions. Fill stud cavities to full height of partitions and carefully cut and fit acoustic insulation around services and protrusions.

3.6 ACOUSTICAL SEALANT

- 3.6.1 Install acoustical sealant to acoustically insulated partitions in accordance with the manufacturer's instructions and Contract Drawings.

- 3.6.2 Install acoustical sealant under floor runner track, at partition perimeter both sides and at openings, cut-outs, and penetrations, concealed from view in the final installation.
- 3.6.3 Install firestop fill material behind fire rated acoustical sealant and provide firestop identification tag.
- 3.6.4 Smooth acoustical sealant with trowel prior to skin forming.

3.7 GYPSUM BOARD

- 3.7.1 Comply with ASTM C 840. Install gypsum board in accordance with reviewed Shop Drawings and manufacturer's written instructions.
- 3.7.2 Install gypsum board vertically or horizontally, whichever results in fewer end joints. Locate end joints over supporting members.
- 3.7.3 Install gypsum board in lightly butted contact at edges and ends and with 1.6 mm maximum open space between boards; do not force gypsum board into place. Do not install imperfect, damaged or damp boards.
- 3.7.4 Install gypsum board butting paired tapered edge joints, and mill-cut or field-cut end joints; do not place tapered edges against cut edges or ends.
- 3.7.5 Install vertical joints minimum 300 mm from the jamb lines of openings and stagger vertical joints over different studs on opposite sides of partitions.
- 3.7.6 Do not locate joints within 200 mm of corners or openings, except where control joints occur at jamb lines or where openings occur adjacent to corners. Where necessary, place a single vertical joint over the centre of wide openings.
- 3.7.7 Install gypsum board over concrete and concrete masonry units with adhesive as recommended by gypsum board manufacturer where indicated on Drawings.
- 3.7.8 Cut, drill and patch gypsum board as may be necessary to accommodate the Work of other trades.
- 3.7.9 Fire Separations:
 - 3.7.9.1 Construct gypsum board assemblies, where located, in accordance with tested assemblies to obtain required or indicated fire rated assemblies. As a minimum fire separations shall consist of metal framing covered on both sides by fire-rated gypsum board.
 - 3.7.9.2 Install assemblies tightly to enclosing constructions to maintain integrity of the separations. Install casing beads at all perimeter edges.

3.8 CEMENT BOARD

- 3.8.1 Apply cementitious board to framing, with screw fasteners and taped joints in accordance with manufacturer's instructions.

- 3.8.2 Pre-cut board to required sizes and make necessary cutouts. Fit ends and edges closely but not forced together.
- 3.8.3 Fasten board to steel framing with rust proof self-drilling, self-threading case hardened screws at 200 mm o.c. for walls and 150 mm o.c. for suspended applications.
- 3.8.4 Apply mesh tape centred over all joints and corners but not overlapped.
- 3.8.5 Apply 3 mm minimum thick skim coat of latex fortified mortar uniformly over entire cementitious board surfaces. Leave surface smooth and flat to receive subsequent finish.

3.9 CORNER, CASING BEADS AND TRIM

- 3.9.1 Corner reinforcing bead: Install along all external angles, erect plumb, level and with a minimum of joints. Secure with screws at 225 mm o.c. apply filler over flanges flush with nose of the bead and extending at least 75 mm onto surface of board each side of corner. When filler dries, apply a thin coat of topping cement and blend onto adjoining surfaces.
- 3.9.2 Casing bead: Install where wallboard butts against a surface having no trim concealing the juncture and where shown on drawings. Erect casing beads plumb or level, with minimum joints, and secure with screws at 300 mm o.c. apply filler over flange flush with bead and extending at least 75 mm onto surface of board. When dry, apply a thin coat of topping cement and blend onto adjoining surfaces.
- 3.9.3 Recess channels and trim: Install recess channels and special metal trim where shown. Secure to substrate. Provide casing beads full height on wallboard edges at recess channels and metal trim.

3.10 JOINT TAPING AND FINISHING

- 3.10.1 Install reinforcing tape and a minimum of 3 coats of joint compound over gypsum board joints, metal trim and accessories, and screw fasteners in accordance with the gypsum board manufacturer's instructions.
- 3.10.2 Fill gaps between, and any imperfections in, gypsum boards with joint compound, allow to dry, and sand smooth ready for painting.
- 3.10.3 Install finished gypsum board Work smooth, seamless, plumb, true, flush, and with square, plumb, and neat corners.
- 3.10.4 Finish gypsum board in accordance with ASTM C840 to the following grades:
 - 3.10.4.1 Level 0: No taping, finishing, or accessories required. Use above suspended ceilings and within other concealed spaces, unless the assembly is fire rated, sound rated, sound or smoke controlled, or unless the space serves as an air plenum.
 - 3.10.4.2 Level 1: At joints and interior angles embed tape in joint compound. Leave surface free of excess joint compound. Tool marks and ridges are acceptable. Use above

suspended ceilings and within other concealed spaces if the gypsum board assembly is fire rated, sound rated, sound or smoke controlled, or the space serves as an air plenum.

- 3.10.4.3 Level 2: At joints and interior angles embed tape in joint compound with one separate coat of joint compound applied over joints, angles, fastener heads, and accessories. Use for water resistant gypsum board indicated for use as a substrate for ceramic tile.
- 3.10.4.4 Level 3: At joints and interior angles embed tape in joint compound with two separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. Apply joint compound smooth and free of tool marks and ridges. Use where heavy grade wall coverings are the final decoration.
- 3.10.4.5 Level 4: At joints and interior angles embed tape in joint compound with three separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. Apply joint compound smooth and free of tool marks and ridges. Use for all locations except those indicated for other finish levels.
- 3.10.4.6 Level 5: At joints and interior angles embed tape in joint compound with three separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. Apply a thin skim coat of joint compound, or a material manufactured especially for this purpose, to the entire surface. Leave surface smooth and free of tool marks and ridges. Use where semi-gloss or gloss finish coatings are the final decoration.

3.11 ACCESS DOORS

- 3.11.1 Install access doors, supplied as part of other parts of the Work, in accordance with manufacturer's written instructions.

3.12 SITE TOLERANCES

- 3.12.1 Install metal support systems to ensure that, within a tolerance of +3 mm and - 1.5 mm for plaster thickness, finish surfaces will be flat within 3 mm under a 3 m straightedge, and with no variation greater than 1.5 mm in any running 300 mm, and that surface planes shall be within 3 mm of dimensioned location.

3.13 REPAIR

- 3.13.1 Make good cut-outs for services and other work, fill in defective joints, holes and other depressions with joint compound.
- 3.13.2 Make good defective work, and ensure that surfaces are smooth, evenly textured and within specified tolerances to receive finish treatments.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- 1.1.1 Comply with Division 1, General Requirements and documents referred to therein.
- 1.1.2 Provide labour, materials, products, equipment and services necessary to complete the tile and stone work specified herein.

1.2 REFERENCES

- 1.2.1 ANSI A108/A118/A136.1, Installation of Ceramic Tile.
- 1.2.2 ANSI A137.1, Specifications for Ceramic Tile.
- 1.2.3 ASTM C144, Specification for Aggregate for Masonry Mortar.
- 1.2.4 ASTM C 615, Specification for Granite Dimension Stone.
- 1.2.5 CAN/CGSB 25.20, Surface Sealer for Floors.
- 1.2.6 CAN/CSA A3000, Cementitious Materials Compendium.
- 1.2.7 TTMAC Specification Guide 09 30 00 Tile Installation Manual.
- 1.2.8 TTMAC, Maintenance Guide.

1.3 SUBMITTALS

- 1.3.1 Product data:
 - 1.3.1.1 Submit copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
 - 1.3.1.1.1 Performance criteria, compliance with appropriate reference standard, characteristics, limitations and warranties.
 - 1.3.1.1.2 Product transportation, storage, handling and installation requirements.
- 1.3.2 Shop drawings: Submit shop drawings in accordance with Section 01 33 00 indicating:
 - 1.3.2.1 Tile layout, patterns, and colour arrangement.
 - 1.3.2.2 Perimeter conditions, junctions with dissimilar materials.
 - 1.3.2.3 Setting details.
- 1.3.3 Samples: Submit following sample panels in accordance with Section 01 33 00:
 - 1.3.3.1 Each colour, texture, size, and pattern of tile.

- 1.3.3.2 Adhere tile samples to 400 x 400 x 12 .5 mm thick cement board complete with selected grout colour in joints.
- 1.3.4 Certificates: Submit manufacturer's certificates stating that materials supplied are in accordance with this specification.
- 1.3.5 Closeout submittals: Submit recommended maintenance instructions and listing of recommended maintenance Products for incorporation into Operations and Maintenance Manuals in accordance with Section 01 78 00.

1.4 QUALITY ASSURANCE

- 1.4.1 Perform Work of this Section by a company that is a member in good standing of the Terrazzo Tile and Marble Association of Canada with proven, acceptable experience on installations of similar complexity and scope.
- 1.4.2 Field sample installation:
 - 1.4.2.1 Construct one 2 m² field sample installation of tile in location acceptable to Consultant.
 - 1.4.2.2 Arrange for Consultant's review and acceptance, allow 48 hours after acceptance before proceeding with Work.
 - 1.4.2.3 Obtain Consultant's acceptance. Accepted sample may become part of Work. Mark sample to Consultant's acceptance and match remainder of work to accepted sample. Remove unacceptable sample installation.
 - 1.4.2.4 Upon acceptance, sample installation shall serve as a minimum standard of quality for the balance of the work of this Section.

1.5 DELIVERY, STORAGE AND HANDLING

- 1.5.1 Deliver materials in adequate crates or containers with manufacturer's name and product description clearly marked.
- 1.5.2 Handle and store tiles in a manner to avoid chipping, breakage or the instruction of foreign matter. Take precautions to protect the mortar and grout admixtures from freezing or from excessive heat.

1.6 SITE CONDITIONS

- 1.6.1 Do not install Work of this Section outside of the following environmental ranges without the Consultant's and Product manufacturer's written acceptance:
 - 1.6.1.1 Ambient air and surface temperature: 15 degrees C to 45 degrees C.
 - 1.6.1.2 Precipitation: None.
- 1.6.2 Install temporary protection and facilities to maintain the Product manufacturer's, and specified, environmental requirements for 7 Days before, during, and 7 Days after installation.

1.7 MAINTENANCE

- 1.7.1 Submit extra tile amounting to 3% of gross area covered, allowing proportionately for each pattern and type specified and which are part of the same Production run as installed Products. Store maintenance Products as directed by the Consultant.

PART 2 - PRODUCTS

2.1 MATERIALS

- 2.1.1 General: All materials under Work of this Section, including but not limited to, sealants, adhesives, and sealers are to have low VOC content.
- 2.1.2 Tile (CT):
- 2.1.2.1 Ceramic tile: To ANSI A137.1.
- 2.1.2.2 Granite tile: To ASTM C 615.
- 2.1.2.3 Supply coves, caps, inside and outside corners and bullnose tile as required.
- 2.1.2.4 Where unfinished tile edge is exposed, supply cap to Consultant's selection.
- 2.1.2.5 Tiles to be of the same batch to ensure consistency in tile sizes.
- 2.1.2.6 Tile (CT-#): Refer to the Interior Material Schedule for tile and stone types required by this Section. Products listed in the Schedule shall be base bid. Alternative products will be considered provided they are approved by the Consultant.
- 2.1.3 Tile Base: Cove base tile to match floor tile.
- 2.1.4 Floor Divider Strip: Stainless steel edge, continuous at all exposed tile edges, depth as required to suit tile thickness. 'Trimtec TR' by Profilitec S.P.A. or approved alternative.
- 2.1.5 Floor expansion joint:
- 2.1.6 Wall edge protection/profile:
- 2.1.6.1 Wall protection (Type 1): Aluminum edge protection with silver anodized finish, continuous at all exposed tile edges, depth as required to suit tile thickness. 'Kerajolly TR-AS' by Profilitec S.P.A. or approved alternative.
- 2.1.6.2 Wall protection (Type 2): Aluminum edge profile with silver anodized finish, continuous at all exposed tile edges, depth as required to suit tile thickness. 'Filojolly RJF-AS' by Profilitec S.P.A. or approved alternative. Typical trim for all outer corners of tiled walls.
- ## **2.2 ACCESSORIES**
- 2.2.1 Cement: CAN/CSA A3000, Type GU.

- 2.2.2 Sand: ASTM C144.
- 2.2.3 Water: Potable and free of minerals and other contaminants which are detrimental to mortar and grout mixes.
- 2.2.4 Polymer additive: Keralastic by Mapei Inc., or approved alternative by Flextile Ltd., Laticrete International Inc.
- 2.2.5 Thin-set mortar: 2 component to ANSI A108/A118/A136.1:
- 2.2.5.1 'Kerabond with Keralastic Latex Additive' by Mapei Inc. or approved alternative by Flextile Ltd., or Laticrete International Inc., or Ardex Canada unless otherwise recommended by grout manufacturer to suit tile size or application.
- 2.2.5.2 White coloured mortar shall be provided at appropriate tile types including, but not limited to; glass tile, light coloured marble, green marble and light coloured granite.
- 2.2.6 Levelling device system: Fast levelling, screw system, 'Leveltec System' by Profilitec or approved alternative.
- 2.2.7 Primer: To meet specified requirements of adhesive manufacturer.
- 2.2.8 Cleaner: In accordance with TTMAC's requirements and as recommended by tile manufacturer.
- 2.2.9 Crack-isolation system: Flexible, thin, fabric-reinforced, peel and stick membrane meeting ANSI A118.12 cut into strips to suit joints. 'Mapeguard 2' by Mapei Inc., or approved alternative by Laticrete International Inc., or Flextile Ltd. Provide manufacturer approved primer.
- 2.2.10 Grout:
- 2.2.10.1 Floors and bases (below 3 mm joint width): 'Keracolor U' by Mapei Inc. or approved alternative by Flextile Ltd. or Laticrete International Inc. or Ardex Canada.
- 2.2.10.2 Floors and bases (3 mm to 10 mm joint width): 'UltraColor Plus' by Mapei Inc. or approved alternative by Flextile Ltd. or Laticrete International Inc. or Ardex Canada.
- 2.2.10.3 Walls (1.5 mm to 3 mm joint width): 'Keracolor U' by Mapei Inc. or approved alternative by Flextile Ltd. or Laticrete International Inc. or Ardex Canada.
- 2.2.10.4 Walls (over 3 mm joint width): 'Ultracolor Plus' by Mapei Inc. or approved alternative by Flextile Ltd. or Laticrete International Inc. or Ardex Canada.
- 2.2.10.5 Grout colour: To be selected by the Consultant from the manufacturer's full colour range.
- 2.2.11 Joint backing: Round, closed cell, foam rod, oversized by 30% to 50%, Shore A hardness of 20, tensile strength 140 to 200 kPa.

2.2.12 Sealer: CAN/CGSB-25.20, penetrating, type as recommended by tile manufacturer.

2.2.13 Tile sealant: In accordance with Section 07 92 00.

2.3 MIXES

2.3.1 Levelling bed mix:

2.3.1.1 1 part Portland cement.

2.3.1.2 4 parts sand.

2.3.1.3 1 part water (including polymer additive), adjusted for water content of sand.

2.3.1.4 1/10 part polymer additive.

PART 3 - EXECUTION

3.1 EXAMINATION

3.1.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 SURFACE PREPARATION

3.2.1 Clean and dry surfaces thoroughly. Remove oil, wax, grease, dust, dirt, paint, tar, primers, form release agents, curing compound, and other foreign material from substrate surfaces which may prevent or reduce adhesion.

3.2.2 Neutralize any trace of strong acids or alkali from the substrate.

3.3 CONTROL JOINTS

3.3.1 Provide control, expansion and isolation joints in accordance with TTMAC specification 301MJ and as indicated on drawings. Install in locations indicated on drawings and specified herein.

3.3.2 Continue control, construction, and cold joints in the structural substrate up through the tile finish, and align with mortar joints where possible. Review joint locations on Site with the Consultant.

3.3.3 Install joint widths to match grout joint widths, except where a minimum width is indicated.

3.3.4 Install control joints in the following typical locations:

3.3.4.1 Aligned over changes in type of substrate.

3.3.4.2 At the restraining perimeters such as walls and columns.

- 3.3.4.3 Interior areas (not subject to sunlight): 6 mm minimum width, at 7320 mm o.c. maximum.
- 3.3.4.4 Interior areas (subject to sunlight): 6 mm minimum width, at 3660 mm o.c. maximum.
- 3.3.4.5 As indicated on the Contract Drawings.
- 3.3.5 Seal control joints in accordance with Section 07 92 00.

3.4 LEVELLING BED

- 3.4.1 Install a levelling bed on uneven substrate surfaces, level and plumb substrates in accordance with the following tolerances:
 - 3.4.1.1 Vertical surfaces: 3 mm in 2.4 m maximum.
 - 3.4.1.2 Horizontal surfaces: 6 mm in 3 m from finished levels of the surface, or better.
- 3.4.2 Clean structural substrate control joints and blow-clean with compressed air. Grout fill control joints flush to slab with levelling bed.

3.5 CRACK ISOLATION

- 3.5.1 Apply crack-isolation system over shrinkage and non-structural hairline cracks and "spiderwebbing" cracks in structural concrete floor slabs or in concrete topping on structural concrete floor slabs.
- 3.5.2 Apply liberal coat of primer with brush or roller over cracks, slightly wider than width of membrane. Roll out enough membrane to cover crack; cut and imbed while liquid is wet. Roll membrane to ensure adhesion.

3.6 GENERAL INSTALLATION REQUIREMENTS

- 3.6.1 Install tiles and stone in accordance with manufacturer's instructions and TTMAC Specification Guide 09 30 00 Tile Installation Manual. Manufacturer's installation instructions govern over TTMAC Installation Manual.
- 3.6.2 Lay out Work to produce a symmetrical pattern with minimum amount of cutting. Ensure cut tile and stone at room perimeter and at joints is not less than ½ full size.
- 3.6.3 Install trim to be placed under tile and stone in locations indicated on Drawings.
- 3.6.4 Set tiles and stones in place and rap or beat with a beating block as necessary to ensure a proper bond and to level surface. Align tile for uniform joints and allow to set until firm. Clean excess mortar from surface of tile with a wet cloth or sponge while mortar is fresh.
- 3.6.5 Ensure following minimum mortar contact coverage to back of tiles. Contact must be evenly distributed to give full support of the tile and stone.

- 3.6.5.1 98% for large format (305 mm x 305 mm or greater) interior applications.
- 3.6.5.2 90% for non-large format interior applications.
- 3.6.6 Adjust joints between units uniform, plumb, straight, even, and true, with adjacent tile flush. Align grout joints in both directions unless indicated otherwise.
- 3.6.7 Align floor, base and wall grout joints.
- 3.6.8 Install tile and stone accessory fittings for a complete and fully coordinated tile assembly.
- 3.6.9 Install wall tile full height unless indicated otherwise.
- 3.6.10 Do not place tile and stone, trim, and accessories over control, expansion, or isolation joints. Stop materials in either side on joints and provide control, expansion and isolation joints as specified.
- 3.6.11 Cut and fit tile and stone neatly around piping, fittings, joints, projections and around recesses items e.g. washroom accessories. Where surface mounted equipment and accessories are installed on tile surfaces, extend tile over surfaces. Cut edges smooth, even, and free from chipping; chipped and broken edges are not acceptable.
- 3.6.12 Leveling device system:
 - 3.6.12.1 Install screw system in accordance with manufacturer's written instructions.
 - 3.6.12.2 Place tie-base under floor covering.
 - 3.6.12.3 Insert cap vertically until it touches tile without screwing.
 - 3.6.12.4 Level tiles with a rotation of a few degrees.
 - 3.6.12.5 Remove screw cap when glue is completely dry. Use a rubber mallet to remove the cap following the same direction of the joint.
 - 3.6.12.6 Press on remaining thread to release cap to allow thread to be removed without unscrewing.
- 3.6.13 Do not proceed with grouting until minimum 48 hours after tile and stone has set, to prevent displacement of tiles and stones.
- 3.6.14 Apply grout in accordance with grout manufacturer's directions to produce watertight, filled joints without voids, cracks and excess grout. Thoroughly compact and tool floor grout. Finish grout flush to edge thickness of tile and stone and remove excess grout with soft burlap or sponge moistened with clean water.
- 3.7 CLEANING**
 - 3.7.1 Clean off excess grout with soft burlap or sponge moistened with clean water.

- 3.7.2 Polish floor and wall tile and stone after grout has cured in accordance with TTMAC recommendations in the Maintenance Guide; do not use acid for cleaning.
- 3.7.3 Apply 2 coats of sealer to unglazed ceramic floor tile in accordance with sealer manufacturer's printed directions.
- 3.7.4 Re-point joints after cleaning as required to eliminate imperfections, then re- clean as necessary. Avoid scratching tile and stone surfaces.

3.8 JOINT BACKING AND SEALANT

- 3.8.1 Install joint backing under sealant as necessary.
- 3.8.2 Install sealant around piping and fittings extending through tiled and stone surfaces.
- 3.8.3 Seal tile and stone control joints.
- 3.8.4 Seal internal tile to tile and stone to stone junctions. Tool to a smooth, flush surface, free from air bubbles and contamination.

3.9 PROTECTION

- 3.9.1 Prevent traffic over tiled and stone areas, and protect tiled and stone assemblies from weather, freezing, and water immersion, for 72 hours minimum, after final installation.
- 3.9.2 Prevent direct impact, vibration and heavy hammering on adjacent and opposite walls for 24 hours minimum, after final installation.
- 3.9.3 Cover work temporarily with building paper properly lapped and taped at joints until work has been approved by Consultant.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- 1.1.1 Comply with Division 1, General Requirements and documents referred to therein.
- 1.1.2 Provide labour, materials, products, equipment and services necessary to complete the acoustical ceilings work specified herein.

1.2 REFERENCES

- 1.2.1 ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.
- 1.2.2 ASTM C635, Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
- 1.2.3 ASTM C636, Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
- 1.2.4 ASTM C645, Specification for Non-Load Bearing (Axial) Steel Studs, Runners (Tracks), and Rigid Furring Channels for Screw Application of Gypsum Board.
- 1.2.5 ASTM E1264, Classification for Acoustical Ceiling Products.

1.3 DESIGN REQUIREMENTS

- 1.3.1 Design ceiling suspension systems in accordance with ASTM C636 and manufacturer's printed directions.
- 1.3.2 Design tile ceiling system for adequate support of electrical fixtures as required by the current bulletin of the Electrical Safety Authority. Acoustic panel system is not designed to carry the weight of electrical equipment.
- 1.3.3 Design hanger anchor and entire suspension system static loading not to exceed 25% of their ultimate capacity including lighting fixture dead loads.
- 1.3.4 Design tile suspension system to support weight of mechanical and electrical items such as air handling boots and lighting fixtures, and with adequate support to allow rotation/relocation of light fixtures. Acoustic panel system is not designed to carry the weight of mechanical and electrical equipment.
- 1.3.5 Design subframing as necessary to accommodate, to avoid conflicts and interferences where ducts or equipment prevent regular spacing of hangers.

1.4 SUBMITTALS

- 1.4.1 Shop drawings: Submit shop drawings in accordance with Section 01 33 00 indicating:

- 1.4.1.1 Suspension system layout including hangers and supports for acoustic tile system.
- 1.4.1.2 Acoustic panel system including suspension system, hangers, supports and panel sizes and locations.
- 1.4.1.3 Conditions at abutting, intersecting, and penetrating construction.
- 1.4.1.4 Dimensioned locations of lighting fixtures, diffusers, sprinkler heads and other items that pierce the ceiling plane.
- 1.4.2 Samples: Submit following samples in accordance with Section 01 33 00:
 - 1.4.2.1 One full-size sample of each type of tile panels to be used.
 - 1.4.2.2 One of each type of suspension system members.
- 1.4.3 Certificates: Submit written certification stating that suspended ceiling system is designed for adequate support of electrical fixtures as required by the current bulletin of the Electrical Safety Authority.

1.5 QUALITY ASSURANCE

- 1.5.1 Field sample installation:
 - 1.5.1.1 Construct one 3 m² field sample installation for each type of ceiling system incorporating typical light fixture and other typical mechanical and electrical fixtures.
 - 1.5.1.2 Test the adequacy of the suspension system to support the fixtures without deflection of ceiling or failure of hanging wire anchorage. Supply copy of Test Results to Consultant.
 - 1.5.1.3 Change materials and installation methods if tests indicate proposed system is inadequate and re-test as necessary until system approved.
 - 1.5.1.4 Give early notice to Consultant and Mechanical and Electrical Trades and co-operate with them in selecting suitable location for sample ceiling and timing of installation and test.
 - 1.5.1.5 Do not commence general installation work until sample ceiling approved, then install ceiling to conform with approved samples.
 - 1.5.1.6 Obtain Consultant's acceptance. Accepted sample may become part of Work. Mark sample to Consultant's acceptance and match remainder of work to accepted sample. Remove unacceptable sample installation.
 - 1.5.1.7 Upon acceptance, sample installation shall serve as a minimum standard of quality for the balance of the work of this Section.

1.6 SITE CONDITIONS

- 1.6.1 Do not install the Work of this Section until:
 - 1.6.1.1 Mechanical and electrical Work above the ceiling is complete.

- 1.6.1.2 Relative humidity is below 80 %.
- 1.6.1.3 Ventilation is adequate to remove excess moisture.
- 1.6.1.4 Areas are closed and protected against weather, and maintained at no less than 10 degrees C.
- 1.6.2 Install temporary protection and facilities to maintain Product manufacturer's, and above specification, environmental requirements 24 h before, during, and after installation.

1.7 MAINTENANCE

- 1.7.1 Submit extra acoustic ceilings amounting to 2% of gross ceiling area, allowing proportionately for each pattern and type specified to nearest full carton. Submit Products which are part of same production run as installed Products. Store maintenance Products as directed by Consultant.

1.8 DELIVERY, STORAGE AND HANDLING

- 1.8.1 Transport, handle and store material in manner to prevent warp, twist, damage to panel edges and surfaces in accordance with Manufacturer's recommendations.
- 1.8.2 Any warped and/or damaged panels and trim shall be rejected and be replaced by new, straight, undamaged and acceptable material at no cost to Owner.
- 1.8.3 Bent, twisted or otherwise damaged Tee grid suspension components shall not be used under any circumstances. Replace such damaged items with new undamaged material at no additional cost to Owner.
- 1.8.4 Store material in warm, dry place away from water and the elements. Protect against undue loading stresses and shock.
- 1.8.5 All packaged material shall be delivered in original manufacturer's wrappers and containers with labels and seals intact. All cartons shall bear U.L. label.

PART 2 - PRODUCTS

2.1 MATERIALS

- 2.1.1 Wherever possible, acoustical ceiling tiles, steel suspension system and framing used in work of this Section are to contain recycled content.
- 2.1.2 Galvanized steel sheet: ASTM A653/A653-M, Z275; cold rolled, galvanized steel sheet.
- 2.1.3 Main carrying channels: ASTM C645; Channels formed from galvanized steel sheet, 38 x 19 mm cold rolled.

- 2.1.4 Subframing: ASTM C645; Channels formed from galvanized steel sheet, dimensions and spans as required.
- 2.1.5 Hangers: 2.6 mm minimum diameter, galvanized steel wire.
- 2.1.6 Tie wire: 1.6 mm minimum diameter, soft annealed galvanized steel wire.
- 2.1.7 Concrete anchors: tie wire sleeve anchors, 'Redi-Drive Anchors' by ITW Red Head or approved alternative.
- 2.1.8 Wall mouldings and accessories, including but not limited to, corner caps, edge mouldings, panel hold over clip, metal closures, and trim. Finish and colour: same as main tees.
- 2.1.9 Exposed main, cross tees, and relocatable cross tees: ASTM C635, 38 mm high steel, bulb tee design double steel web, rectangular single spans without exceeding a deflection of 1/360 of the span. Splices to be integral and reversible; cross tee interlocking into main tee. Colour and finish: Manufacturer's standard white.
 - 2.1.9.1 9/16" suspension system:
 - 2.1.9.1.1 'Suprafine' by Armstrong World Industries Canada Inc.
 - 2.1.9.1.2 Or approved alternatives by CGC Corporation or Certainteed Gypsum Canada, Inc.
 - 2.1.10 Acoustic tile (A/TL):
 - 2.1.10.1 Conforming to ASTM E1264.
 - 2.1.10.2 Acoustic tile (A/TL-#): Refer to the Interior Material Schedule for acoustic tile types required by this Section. Products listed in the Schedule shall be base bid. Alternatives by CGC Inc. or Certainteed Ceilings Canada will be considered provided that they are approved by the Consultant.
 - 2.1.10.3 Provide samples for the Consultant's approval.
 - 2.1.11 Wall mouldings (typical): To match acoustical ceiling suspension system.
 - 2.1.12 Perimeter trim:
 - 2.1.12.1 Commercial quality extruded aluminum alloy 6063 perimeter trim channel for use with exposed tee suspension system, aluminum T-bar connection clips, hanging clips and galvanized steel splice plates. Sizes as indicated.
 - 2.1.12.2 Factory finished in applied baked polyester paint finish, in manufacturer's standard white to match tee suspension system.
 - 2.1.12.3 'Axiom Classic Trim' by Armstrong World Industries or approved alternative.

PART 3 - EXECUTION

3.1 EXAMINATION

- 3.1.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 SUSPENSION SYSTEM

- 3.2.1 Coordinate locations and openings of mechanical and electrical services support, and penetration through the acoustical ceilings. Coordinate field conditions, clearances, measurements, and mechanical and electrical services testing and commissioning, above the acoustical ceilings.
- 3.2.2 Install hanger wires plumb and securely anchored to the building structural framing, independent of walls, pipes, ducts, and metal deck; install additional framing and hangers to bridge interference items.
- 3.2.3 Install acoustical ceiling systems in accordance with manufacturer's written instructions, reviewed shop drawings, and ASTM C636, listed in order of precedence.
- 3.2.4 Install hanger wires at 1200 mm maximum centres along carrying channels, not less than 25 mm, and not more than 150 mm from channel ends.
- 3.2.5 Install additional hangers at lighting fixture and air distribution ductwork locations. Do not attach hanger wires to mechanical or electrical equipment. Do not support mechanical and electrical fixtures and fitting on ceiling without the ceiling manufacturer's written acceptance.
- 3.2.6 Install acoustical ceiling suspension system to a tolerance of 1:1200 of span and 0.4 mm maximum between adjacent metal members. Tolerances are not cumulative. Refer to Electrical Contract Drawings for fixture layout.
- 3.2.7 Do not bend or twist hangers as a means of levelling. Form double loops tightly and lock to prevent vertical movement or rotation within the loop.
- 3.2.8 Install edge moulding at intersection of ceiling and vertical surfaces.
- 3.2.9 Centre acoustical ceiling suspension systems on room axis; install equal border pieces. Install hangers onto the ends of main tee runners at not more than 150 mm from ends of runners, adjacent and perpendicular to walls.
- 3.2.10 Support the suspension system independently of walls, columns, ducts, pipes and conduits.
- 3.2.11 Install main runners in maximum available lengths. Layout joints in suspension members to avoid the perimeters of recessed fixtures. Lock grid members to form

a rigid assembly. Install additional tee, suspension system framing around recessed fixtures, diffusers, grilles and other items for a complete assembly.

3.3 ACOUSTIC LAY-IN TILES

3.3.1 Install acoustic tile in grid system openings supported by bottom flanges of members. Provide special shapes and sizes to provide a complete installation by cutting tile to fit into openings. Fit tile moderately tight between upright legs of members.

3.3.2 Carefully cut and trim acoustic tiles to accommodate items piercing the finished ceiling plane.

3.3.3 Remove and replace acoustic tiles with broken edges, or damaged, marked, discoloured, soiled, or stained faces.

3.4 ADJUSTMENTS AND CLEANING

3.4.1 Clean soiled or discoloured surfaces of exposed work on completion of work.

3.4.2 Replace components which are visibly damaged, marred or uncleanable.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- 1.1.1 Comply with Division 1, General Requirements and documents referred to therein.
- 1.1.2 Provide labour, materials, products, equipment and services necessary to complete the resilient base work specified herein.

1.2 REFERENCES

- 1.2.1 ASTM F1861, Specification for Resilient Wall Base.

1.3 SUBMITTALS

- 1.3.1 Product data:
 - 1.3.1.1 Submit copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
 - 1.3.1.1.1 Performance criteria, compliance with appropriate reference standard, characteristics, limitations.
 - 1.3.1.1.2 Product transportation, storage, handling and installation requirements.
- 1.3.2 Samples: Submit two 250 mm long samples of resilient base in accordance with Section 01 33 00.
- 1.3.3 Closeout submittals: Submit maintenance and cleaning data for incorporation into Operations and Maintenance Manuals in accordance with Section 01 78 00.

1.4 SITE CONDITIONS

- 1.4.1 Maintain air temperature and structural base temperature at installation area above 20 degrees C for 48 hours before, during and 48 hours after installation.
- 1.4.2 Store materials for 2 days prior to installation in area of Work to achieve temperature stability.
- 1.4.3 Do not install base in conditions of high humidity or where exposed to cold drafts. In hot weather, protect from direct sunlight.
- 1.4.4 Provide adequate ventilation during installation.

1.5 MAINTENANCE

- 1.5.1 Submit extra 5% or to nearest full roll of each colour, pattern and type of base required for maintenance use. Identify each carton. Store where directed.

PART 2 - PRODUCTS

2.1 MATERIALS

- 2.1.1 All materials under Work of this Section, including but not limited to, primers, and adhesives are to have low VOC content.
- 2.1.2 Rubber base (RBC):
 - 2.1.2.1 Conforming to ASTM F1861, Type TP, Group 1.
 - 2.1.2.2 Rubber wall base with coved profile, in lengths as long as possible including premoulded end stops and inner and outer corners.
 - 2.1.2.3 Rubber base (RBC-#): Refer to the Interior Material Schedule for rubber base types required by this Section. Products listed in the Schedule shall be base bid. Alternative products will be considered provided they are approved by the Consultant.
- 2.1.3 Primers and adhesives: Low VOC, waterproof, recommended by base manufacturer for specific material on applicable substrate, above, at or below grade.

PART 3 - EXECUTION

3.1 EXAMINATION

- 3.1.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.
- 3.1.2 Defective Work resulting from application to unsatisfactory surfaces will be considered the responsibility of those performing the Work of this Section.

3.2 BASE APPLICATION

- 3.2.1 Install resilient base in accordance with manufacturer's written instructions.
- 3.2.2 Lay out base to keep number of joints at minimum.
- 3.2.3 Prior to installing base, fill cracks and irregularities with a filler recommended by base manufacturer.
- 3.2.4 Set base in adhesive using a 3 kg hand roller, against wall and floor surfaces.
- 3.2.5 Install straight and level to variation of 1:1000.
- 3.2.6 Scribe and fit to door frames and other obstructions.
- 3.2.7 Cope internal corners.

3.3 CLEANING

- 3.3.1 Forty-eight hours after installation, clean resilient base surfaces with a mild soap solution approved by finish manufacturer.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- 1.1.1 Comply with Division 1, General Requirements and documents referred to therein.
- 1.1.2 Provide labour, materials, products, equipment and services necessary to complete the resilient flooring work specified herein.

1.2 REFERENCES

- 1.2.1 ASTM F710, Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
- 1.2.2 ASTM F970, Standard Test Method for Static Load Limit.
- 1.2.3 ASTM F1516, Standard Practice for Sealing Seams of Resilient Floor Products by the Heat Weld Method.
- 1.2.4 ASTM F1869, Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- 1.2.5 ASTM F 2170, Standard Test Method for Determining Relative Humidity in Concrete Slabs Using in-situ Probes.

1.3 SUBMITTALS

- 1.3.1 Product data:
 - 1.3.1.1 Submit copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
 - 1.3.1.1.1 Performance criteria, compliance with appropriate reference standard, characteristics, limitations.
 - 1.3.1.1.2 Product transportation, storage, handling and installation requirements.
- 1.3.2 Shop drawings: Submit shop drawings indicating seam layout and welding procedures in accordance with Section 01 33 00.
- 1.3.3 Samples: Submit samples in accordance with Section 01 33 00:
 - 1.3.3.1 Submit two 250 x 200 mm samples of each type of sheet and tile material and colour.
- 1.3.4 Closeout submittals: Submit maintenance and cleaning data for incorporation into Operations and Maintenance Manuals in accordance with Section 01 78 00.

1.4 SITE CONDITIONS

- 1.4.1 Maintain air temperature and structural base temperature at installation area above 20 degrees C for 48 hours before, during and 48 hours after installation.

- 1.4.2 Store materials for 2 days prior to installation in area of Work to achieve temperature stability.
- 1.4.3 Do not install flooring in conditions of high humidity or where exposed to cold drafts. In hot weather, protect from direct sunlight.
- 1.4.4 Provide adequate ventilation during installation.

1.5 EXTENDED WARRANTY

- 1.5.1 Resilient flooring: Provide flooring manufacturer's warranty naming Owner as beneficiary, covering excessive wear for a period of 5 years from the date Work is certified as Substantially Performed.

1.6 MAINTENANCE

- 1.6.1 Resilient sheet flooring: Submit extra 5% or to nearest full roll of each colour, pattern and type of flooring material required for maintenance use. Identify each roll. Store where directed. Submit maintenance material in one piece and of same production run as installed materials.
- 1.6.2 Resilient tile flooring: Submit extra 5% or to nearest full carton of each colour, pattern and type of flooring material and base required for maintenance use. Identify each carton. Store where directed.

PART 2 - PRODUCTS

2.1 MATERIALS

- 2.1.1 All materials under Work of this Section, including but not limited to, primers, and adhesives are to have low VOC content.
- 2.1.2 Resilient tile and sheeting flooring (RSF):
 - 2.1.2.1 Resilient flooring (RSF-#): Refer to the Interior Material Schedule for resilient sheet and tile flooring types required by this Section. Products listed in the Schedule shall be base bid. Alternative products will be considered provided they are approved by the Consultant.
 - 2.1.2.2 Provide samples of each type of flooring material for the Consultant's approval.
- 2.1.3 Resilient base: In accordance with Section 09 65 00.
- 2.1.4 Welding rod: type recommended by flooring manufacturer to complement flooring.
- 2.1.5 Primers and adhesives: Low VOC, waterproof, recommended by flooring manufacturer for specific material on applicable substrate, above, at or below grade.
- 2.1.6 Reducing edge strips, thresholds: Nitrile rubber plasticized vinyl, 80-95 Shore A Durometer, adhesive as recommended by manufacturer.

- 2.1.7 Concrete skim coat compound: High-performance, rapid-setting cement based skim coating compound. 'Ultra SkimCoat' by Mapei or approved alternative for filling minor voids and leveling existing substrate.
- 2.1.8 Stain sealer and polish: Type recommended by flooring manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- 3.1.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.
- 3.1.2 Ensure concrete floors meet the following minimum requirements and requirements of the flooring manufacturer. If there is a conflict between these requirements and those of the flooring manufacturer, the more stringent shall apply.
 - 3.1.2.1 Internal Relative Humidity Test: Perform internal relative humidity testing in accordance with ASTM F2170. Results shall not exceed 80% RH.
 - 3.1.2.2 Moisture Test: Moisture emissions from concrete subfloors (cured for a minimum of 28 days) must not exceed 3 lbs per 1000sf per 24 hours (1.4 kg H₂O/24 hr/93 m²) for acrylic adhesive and 5lbs for polyurethane adhesive via the Calcium Chloride Test Method (ASTM F1869).
 - 3.1.2.3 The pH level of the subfloor surface shall not be higher than 9.9. If higher, subfloor must be neutralized.
- 3.1.3 Ensure that sub-floors have been provided as specified without holes, protrusions, cracks, depressions or other major defects.
- 3.1.4 Ensure that control joints have been filled and levelled.
- 3.1.5 Defective Work resulting from application to unsatisfactory surfaces will be considered the responsibility of those performing the Work of this Section.

3.2 SUBFLOOR TREATMENT

- 3.2.1 Flooring shall be installed over subfloors conforming to ASTM F710 for concrete.
- 3.2.2 Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes and other defects with sub-floor filler.
- 3.2.3 Apply sub-floor filler to low spots and cracks to achieve floor level to a tolerance of 1:1000, allow to cure.
- 3.2.4 Meet ASTM F710 Standard for Concrete or other monolithic floors.
- 3.2.5 Clean and remove all deleterious materials from surfaces to receive this Work in accordance with the adhesive manufacturer's recommendations.

3.2.6 Prime concrete to flooring manufacturer's printed instructions.

3.3 RESILIENT SHEET FLOORING APPLICATION

3.3.1 Install resilient sheet flooring in accordance with manufacturer's written instructions.

3.3.2 Apply adhesive uniformly using recommended trowel in accordance with flooring manufacturer's instructions. Do not spread more adhesive that can be covered by flooring before initial set takes place.

3.3.3 Run sheets in direction of traffic. Double cut sheet joints and continuously seal according to manufacturer's printed instructions. Remove adhesive seepage of seams or surface while adhesive is still wet.

3.3.4 Heat weld seams in accordance with ASTM F1516 and manufacturer's printed instructions.

3.3.5 As installation progresses and after installation, roll flooring with minimum 45 kg roller to ensure full adhesion.

3.3.6 Cut flooring neatly around fixed objects.

3.3.7 Terminate flooring at centreline of door in openings where adjacent floor finish or colour is dissimilar.

3.3.8 Install reducing edge strips at unprotected or exposed edges where flooring terminates or where there are two finishes of different thicknesses.

3.4 RESILIENT TILE FLOORING

3.4.1 Install resilient tile flooring in accordance with manufacturer's written instructions.

3.4.2 Apply adhesive uniformly using recommended trowel in accordance with flooring manufacturer's instructions. Do not spread more adhesive that can be covered by flooring before initial set takes place.

3.4.3 Lay flooring with joints straight and parallel to building lines to produce symmetrical tile pattern. Install equal size perimeter tile on each side.

3.4.4 Install flooring to square grid pattern with all joints aligned.

3.4.5 As installation progresses, and after installation, roll flooring in 2 directions with minimum 45 kg minimum roller to ensure full adhesion.

3.4.6 Remove adhesive seepage at seams or surface while adhesive is still wet, in accordance with manufacturer's recommendation.

3.4.7 Cut tile and fit neatly around fixed objects.

3.4.8 Install feature strips and floor markings where indicated. Fit joints tightly.

3.4.9 Terminate flooring at centre line of door in closed position in openings where adjacent floor finish or colour is dissimilar.

3.4.10 Install reducing edge strips at unprotected or exposed edges where flooring terminates and at edges where there are two finishes of different thicknesses.

3.5 RESILIENT BASE APPLICATION

3.5.1 Resilient base: In accordance with Section 09 65 00. Coordinate with noted Section as required for installation of resilient base with resilient flooring materials.

3.6 CLEANING AND SEALING

3.6.1 Forty-eight hours after installation, clean sheet flooring surfaces with a mild soap solution approved by finish manufacturer. Rinse clean and allow to dry.

3.6.2 Apply stain sealer and allow to dry. Apply number of coats of sealer as recommended by flooring manufacturer and polish thoroughly.

3.7 PROTECTION OF FINISHED WORK

3.7.1 Protect floors from time of final set of adhesive until accepted by Consultant.

3.7.2 Prohibit traffic on floor for 48 hours after installation.

3.7.3 Cover cleaned surfaces with fibre reinforced, clean, non-staining clean, kraft paper. Secure in position with gummed tape to prevent drifting. Remove covering when directed by Consultant.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- 1.1.1 Comply with Division 1, General Requirements and documents referred to therein.
- 1.1.2 Provide labour, materials, products, equipment and services necessary to complete the carpet work specified herein.

1.2 REFERENCES

- 1.2.1 Canadian Carpet Institute (CCI), Contract Carpet Manual, No. 001.

1.3 SUBMITTALS

- 1.3.1 Product data: Submit two copies of manufacturer's Product data for each product specified in accordance with Section 01 33 00 indicating:
 - 1.3.1.1 Performance criteria, characteristics, and limitations.
 - 1.3.1.2 Product transportation, storage, handling and installation requirements.
- 1.3.2 Shop drawings: Submit shop drawings in accordance with Section 01 33 00 indicating:
 - 1.3.2.1 Carpeted floor areas, carpet selection, pile direction, location and direction of seams, cross joints, and other details required by Consultant to clarify work.
- 1.3.3 Samples:
 - 1.3.3.1 Submit following samples in accordance with Section 01 33 00.
 - 1.3.3.1.1 Submit duplicate 300 mm square pieces of each type of carpet specified.
- 1.3.4 Certification:
 - 1.3.4.1 Submit certification that carpet has been tested and passed the Indoor Air Quality (IAQ) Carpet Testing Program requirements of the Canadian Carpet Institute.
 - 1.3.4.2 Four weeks after Notification of Award, Submit certification from carpet manufacturer that carpet has been ordered.
 - 1.3.4.3 Submit program parameters for recycling.
- 1.3.5 Closeout submittals: Submit maintenance and cleaning data for incorporation into Operations and Maintenance Manuals in accordance with Section 01 78 00.

1.4 SITE CONDITIONS

- 1.4.1 Do not install Work of this Section when the ambient air and surface temperature is below 18 degrees C or above 40 degrees C without Consultant's and Product manufacturer's written acceptance.
- 1.4.2 Supply and install temporary protection and facilities to maintain Product manufacturer's, and above specified environmental requirements for 24 hours before, during, and 24 hours after installation.

1.5 MAINTENANCE

- 1.5.1 Submit extra 3% each colour, pattern and type of flooring material required for maintenance use. Extra materials to be from same production run as installed materials and clearly labelled. Provide in one continuous full width roll. Store where directed.
- 1.5.2 Upon completion of the work of this Section, bundle and wrap all large remnant pieces of carpet remaining and store where directed by Consultant.

PART 2 - PRODUCTS

2.1 MATERIALS

- 2.1.1 General: All materials under Work of this Section, including but not limited to, adhesives are to have low VOC content limits.
- 2.1.2 Carpet tile (C):
 - 2.1.2.1 Carpet tile (C-#): Refer to the Interior Material Schedule for carpet tile types required by this Section. Products listed in the Schedule shall be base bid. Alternative products will be considered provided they are approved by the Consultant.
 - 2.1.2.2 Provide samples for the Consultant's approval.
 - 2.1.2.3 All carpeted areas must meet or exceed the requirements of the Carpet Rug Institute's (CRI) Green Label Indoor Air Quality Test Program.
- 2.1.3 Adhesive: Non-release type: recommended by carpet manufacturer for direct glue down installation, low odour, free of volatile hydrocarbons such as toluene and mineral spirits.
- 2.1.4 Reducing edge strips, thresholds: Nitrile rubber plasticized vinyl, 80-95 Shore A Durometer, adhesive as recommended by manufacturer.
- 2.1.5 Metal thresholds: In accordance with Section 09 30 00.
- 2.1.6 Carpet protection: Non-staining heavy duty kraft paper.
- 2.1.7 Bases:

- 2.1.7.1 Wood base: In accordance with Section 06 20 00.
- 2.1.7.2 Resilient base: In accordance with Section 09 65 00.
- 2.1.8 Concrete skim coat compound: High-performance, rapid-setting cement based skim coating compound. 'Ultra SkimCoat' by Mapei Inc. or approved alternative for filling minor voids and leveling existing substrate.

PART 3 - EXECUTION

3.1 EXAMINATION

- 3.1.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 PREPARATION

- 3.2.1 Verify substrate surfaces are solid, free from surface water, dust, oil, grease, scaling or laitance, projections and other foreign matter detrimental to performance.
- 3.2.2 Repair depressions and cracks with latex base compound or water putty crack filler. Sweep and vacuum surfaces before laying carpet.
- 3.2.3 Pre-condition carpeting following manufacturer's printed instructions.

3.3 CARPET TILE INSTALLATION

- 3.3.1 Install floor carpet in accordance with pattern layout and reviewed shop drawings, manufacturer's printed instructions.
- 3.3.2 Cut and install carpet to fit tightly and neatly around perimeter of carpeted areas, around permanent fixtures and around projections through the floor.
- 3.3.3 Adhesive method:
 - 3.3.3.1 Apply adhesive and install carpeting in accordance with manufacturer's written instructions by direct glue-down method.
 - 3.3.3.2 Spread full bed of adhesive evenly over substrate surfaces and install carpet tile over adhesive. Roll carpet with approved type roller to remove air pockets, ripples and other defects.
- 3.3.4 Butt all carpet tiles to tight contact to make all joints as inconspicuous as possible.
- 3.3.5 Finish installation to present smooth wearing surface free from mis-alignment, lifting, burring and other faults.
- 3.3.6 Use material from same dye lot. Ensure colour, pattern and texture match within any one visual area. Maintain constant pile direction.

3.3.7 Continue carpeting through passageways and extend carpet into recesses, such as closets, and under movable casework, equipment and other movable items.

3.3.8 Terminate carpeting at centre line of door, in closed position, in openings where adjacent floor finish or colour is dissimilar.

3.4 BASES

3.4.1 Wood base: Install wood base in accordance with Section 06 20 00.

3.4.2 Resilient base: Install resilient base in accordance with Section 09 65 00.

3.5 CLEANING AND PROTECTION

3.5.1 Vacuum carpets clean immediately after completion of installation. Protect traffic areas.

3.5.2 Prohibit traffic on carpet until adhesive is cured.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- 1.1.1 Comply with Division 1, General Requirements and documents referred to therein.
- 1.1.2 Provide labour, materials, products, equipment and services necessary to complete the acoustical panel work specified herein.

1.2 SUBMITTALS

- 1.2.1 Product data: submit duplicate copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
 - 1.2.1.1 Performance criteria, compliance with appropriate reference standard(s), characteristics, limitations, and trouble-shooting protocol.
 - 1.2.1.2 Product transportation, storage, handling and installation requirements.
- 1.2.2 Shop drawings: submit shop drawings in accordance with Section 01 33 00 indicating elevations, sections, details, materials, dimensions, and finishes.
- 1.2.3 Samples: submit following samples in accordance with Section 01 33 00:
 - 1.2.3.1 Two 300 x 300 mm samples of each acoustical panel unit required, showing full range of exposed texture to be expected in completed work and one 300 x 300 mm sample for each finish type.
- 1.2.4 Closeout submittals:
 - 1.2.4.1 Submit following for panels incorporation into Operations and Maintenance Manuals in accordance with Section 01 78 00:
 - 1.2.4.1.1 Performance criteria and maintenance data.

1.3 QUALITY ASSURANCE

- 1.3.1 Installers qualifications: Perform Work of this Section by a company that has a minimum of five years proven experience in the installation of acoustical panel units of a similar size and nature and that is approved by manufacturer. Submit to Consultant, applicator's current certificate of approval by the material manufacturer as proof of compliance.
- 1.3.2 Field sample installation:
 - 1.3.2.1 Construct one 2 m² sample installation of each type of acoustical panels in location acceptable to Consultant.
 - 1.3.2.2 Arrange for Consultant's review and acceptance, allow 48 hours after acceptance before proceeding with Work.

1.3.2.3 Obtain Consultant's acceptance. Accepted sample may become part of Work. Mark sample to Consultant's acceptance and match remainder of work to accepted sample. Remove unacceptable sample installation.

1.3.2.4 Upon acceptance, sample installation shall serve as a minimum standard of quality for the balance of the work of this Section.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Prevent soiling, physical damage or wetting.

1.4.2 Store cartons open at each end to stabilize moisture content and temperature.

1.5 SITE CONDITIONS

1.5.1 Do not install Work of this Section outside of following environmental ranges without Consultant's and Product manufacturer's written acceptance:

1.5.1.1 Ambient air and surface temperature: 13 degrees C to 21 degrees C.

1.5.1.2 Precipitation: None.

1.5.1.3 Relative Humidity: 65 to 75%

1.5.2 Supply and install temporary protection and facilities to maintain Product manufacturer's, and above specified environmental requirements for 24 hours before, during, and 24 hours after installation.

1.6 MAINTENANCE

1.6.1 Submit extra 3% of gross wall area covered, for each pattern and type specified. Submit Products from same production run as installed products. Store maintenance Products as directed by Consultant.

PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 All materials under Work of this Section, including but not limited to, adhesives and touch-up paints are to have low VOC content.

2.1.2 Provide material sourced regionally from within 800 km of jobsite wherever possible.

2.1.3 Acoustical wall panel indicated on the design drawings:

2.1.3.1 Panel to have square edges and fabric finish and be complete with clips, angles and fasteners as required for complete installation.

2.1.3.2 Core: Dimensionally stable, fibreglass acoustic core with a density of 96 kg/cu.m with chemically hardened edges.

2.1.3.3 Fabric felt finish: Refer to the construction notes on the design drawings.

- 2.1.3.4 Panel size: Indicated on the drawings.
- 2.1.3.5 Acceptable Product: 'Acoustech M-Series tackable acoustical panel' by Arcacoustics or approved alternative.
- 2.1.4 Acoustical ceiling panel (AP):
 - 2.1.4.1 Panel size: as shown on Contract Drawings.
 - 2.1.4.2 Acceptable Product: 'Fresco 1.1 Decorative Coated finish ceiling acoustical panel' by Arcacoustics or approved alternative..
- 2.1.5 Z-clip and track: Type and size as recommended by panel to suit intended condition.
- 2.1.6 Furring strips: Wood furring strips in sizes as recommended by panel manufacturer to suit the intended application.
- 2.1.7 Touch-Up Paint: in colour to match panels.
- 2.1.8 Fasteners: Concealed, ANSI B18.6.4, stainless steel Type 304, painted head in colour to match panels.

2.2 FABRICATION

- 2.2.1 Verify dimensions of existing Work before commencing fabrications and report discrepancies to Consultant.
- 2.2.2 Fabricate Work in accordance with Contract Drawings and reviewed shop drawings. Fabricate, fit and assemble Work in shop where possible. Where shop fabrication is not possible, make trial assembly in shop.
- 2.2.3 Fabricate Work free from defects impairing function, appearance, strength and durability.

PART 3 - EXECUTION

3.1 EXAMINATION

- 3.1.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 INSTALLATION

- 3.2.1 Install panels, support and anchoring system, fasteners, trim and related items to lines and elevations indicated and in strict accordance with reviewed shop/erection drawings and manufacturer's printed instructions. Carefully co- ordinate work with other Sections.
- 3.2.2 Damaged panels, waviness, warp or distortion of finished work will not be accepted.

3.2.3 Cover field cut edges by means of trim or other moldings.

3.3 CLEANING

3.3.1 Clean exposed surfaces of acoustical panel, trim, moldings and suspension members to comply with manufacturer's instructions for cleaning.

3.3.2 Touch up any minor finish damage.

3.3.3 Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.4 PROTECTION

3.4.1 Protect installed work from damage due to subsequent construction activity, including temperature and humidity limitations and dust control, so that the work will be without damage and deterioration at the time of acceptance by the Owner.

END OF SECTION

PART 1 - GENERAL

1.1 WORK INCLUDED

- 1.1.1 Comply with Division 1, General Requirements and documents referred to therein.
- 1.1.2 Provide labour, materials, products, equipment and services to complete the painting and finishing work specified herein.
- 1.1.3 Examine the Specifications, Schedules, and Drawings for the work of other Sections regarding the provisions for prime and finish coats. Paint or finish materials installed throughout the Work which are required to be painted or finished and which are left unfinished or unpainted by other Sections.
- 1.1.4 The only exception to the requirements of the preceding paragraph is where the Specifications, Schedules or Drawings state positively and explicitly that a surface is not to be finished.
- 1.1.5 For areas indicated as unfinished in the Specifications, Schedules and Drawings, painting is not required, except for doors and frames, railings, steel stairs, insulation on mechanical equipment, pipes and fittings, and other items requiring protection including electrical panels in non-service areas which do not have a factory enamel finish; colours as selected by the Consultant. Mechanical and electrical identification systems shall be by Mechanical and Electrical Divisions.

1.2 QUALITY ASSURANCE

- 1.2.1 Applicator experience: Having minimum of five years proven satisfactory experience. When requested, provide a list of the last three comparable projects including, name and location, consultant, start and completion dates, and value of the painting work.
- 1.2.2 Applicator qualification: Qualified journeypersons, painters, as defined by local jurisdiction shall be engaged in painting and decorating work. Apprentices may be employed provided they work under the direct supervision of a qualified journeyperson in accordance with trade regulations.
- 1.2.3 Materials, preparation and quality of work: In conformance with requirements of the latest edition of the Architectural Painting Specification Manual by the Master Painters Institute, referred to as the MPI Painting Manual in this Section, issued by the local MPI Accredited Quality Assurance Association having jurisdiction.
- 1.2.4 Manufacturers and products: Listed under the Approved Product List section of the MPI Painting Manual.
- 1.2.5 Maintenance seminars: Provide, to the Owner, training seminars and recommendations on Product maintenance procedures.

- 1.2.6 Pre-installation meeting: Two weeks prior to commencing work of this Section, arrange for manufacturer's technical representative to visit the site and review preparatory and installation procedures to be followed, conditions under which the work will be done, and inspect the surfaces to receive the work of this Section. Advise the Consultant of the date and time of the meeting.
- 1.2.7 Manufacturer's site inspection: Have the manufacturer's technical representative inspect the Work at suitable intervals during application and at conclusion of the work of this Section, to ensure the Work is correctly installed. When requested, submit manufacturer's inspection reports and verification that the work of this Section is correctly installed.
- 1.2.8 Provide notice in writing of any defects or problems prior to commencing painting work or after the prime coat shows defects in the substrate.
- 1.2.9 Ensure written confirmation is received from steel fabricators of the specific surface preparation procedures and primers used for steel work to ascertain appropriate and compatible finish materials.
- 1.3 SAMPLES AND MOCK-UPS**
- 1.3.1 Samples: Provide duplicate minimum 300 mm square samples of surfaces or acceptable facsimiles requested painted with specified paint or coating in colours, gloss, sheen and textures required to MPI Painting Manual standards for review. When approved, samples become acceptable standard of quality for appropriate on-site surface with one of each sample retained on-site.
- 1.3.2 Sample installations: When requested by the Consultant, prepare and paint designated surface, area, room or item in each colour scheme to requirements specified, with specified paint or coating showing selected colours, gloss, sheen, textures and quality of work to MPI Painting Manual standards for review and approval. When approved, surface, area, room and items become acceptable standard of finish quality and workmanship for similar on-site work.
- 1.4 SUBMITTALS**
- 1.4.1 List of painting materials: submit duplicate copy of list of painting materials for review prior to ordering materials. If requested, provide an invoice list of all paint materials ordered for project work to Consultant indicating manufacturer, types and quantities for verification and compliance with specification and design requirements.
- 1.4.2 Material Safety Data Sheets (MSDS): Submit duplicate copies prior to commencement of work for review and for posting at job site as required.
- 1.4.3 Project Data Manual: At project completion provide an itemized list complete with manufacturers' application instructions, paint type and colour coding for all colours used for Owner's later use in maintenance.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- 1.5.1 Deliver all painting materials in sealed, original labeled containers bearing manufacturer's name, brand name, type of paint or coating and colour designation, standard compliance, materials content as well as mixing and/or reducing and application requirements.
- 1.5.2 Store all paint materials in original labeled containers in a lockable, dry, heated and well ventilated single designated area meeting the minimum requirements of both paint manufacturer and authorities having jurisdiction and at a minimum ambient temperature of 7 degree C. Only material used on this project shall be stored on site.
- 1.5.3 Where toxic, volatile, explosive, flammable materials are being used, provide adequate fireproof storage lockers and take all necessary precautions and post adequate warnings such as no smoking signs as required.
- 1.5.4 Take necessary precautionary and safety measures to prevent fire hazards and spontaneous combustion and to protect the environment from hazard spills. Store materials that constitute a fire hazard in suitable closed and rated containers and removed from the site on a daily basis.
- 1.5.5 Comply with requirements of authorities having jurisdiction, in regard to the use, handling, storage and disposal of hazardous materials.

1.6 SCHEDULING

- 1.6.1 Schedule painting operations to prevent disruption of and by other Sections.
- 1.6.2 Schedule painting operations in occupied facilities to prevent disruption of occupants in and about the building. Perform painting in accordance with Owner's operating requirements. Schedule work such that painted surfaces will have dried before occupants are affected. Obtain written authorization from Consultant for changes in work schedule.

1.7 PROJECT CONDITIONS

- 1.7.1 Unless specifically pre-approved by the Consultant and the product manufacturer, do not perform work when the ambient air and substrate temperatures are below 10 degrees C for both interior and exterior work.
- 1.7.2 Do not perform interior work unless adequate continuous ventilation and sufficient heating facilities are in place to maintain ambient air and substrate temperatures above minimum requirements for 24 hours before, during and 48 hours after work is complete, unless required otherwise by manufacturer's instructions. Provide supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.
- 1.7.3 Do not perform work when the relative humidity is above 85% or when the substrate temperature is less than 3 degree C above the measured dew point.

- 1.7.4 Do not perform work when the maximum moisture content of the substrate exceeds:
- 1.7.4.1 12 % for plaster and gypsum board.
- 1.7.5 Conduct all moisture tests using a properly calibrated electronic Moisture Meter.
- 1.7.6 Test plaster surfaces for alkalinity as required.
- 1.7.7 Apply work only to dry, clean, properly cured and adequately prepared surfaces in areas where dust is no longer generated by construction activities such that airborne particles will not affect the quality of finished surfaces.
- 1.7.8 Do not perform work unless a minimum lighting level of 323 Lux is provided on surfaces to be painted or decorated.

1.8 ENVIRONMENTAL PERFORMANCE REQUIREMENTS

- 1.8.1 Provide paint products meeting MPI "Green Performance Standard GPS-1".

1.9 EXTRA STOCK

- 1.9.1 At project completion provide extra stock as indicated of each type and colour of paint from same production run used in full unopened cans, properly labelled and identified, including mixing formula, for Owner's later use in maintenance. Store where directed. Provide:
 - 1.9.1.1 1 L of extra materials when less than 50 L are used for Project;
 - 1.9.1.2 3.78 L of extra stock when 50 to 200 L are used;
 - 1.9.1.3 7.57 L of extra stock when over 200 L are used.

1.10 WASTE MANAGEMENT AND DISPOSAL

- 1.10.1 Paint, stain and wood preservative finishes and related materials such as thinners, solvents are regarded as hazardous products and are subject to regulations for disposal. Obtain information on these controls from applicable authorities having jurisdiction.
- 1.10.2 Separate and recycle waste materials. Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility. Materials that cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.
- 1.10.3 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.
- 1.10.4 Strictly adhere to the following procedures to reduce the amount of contaminants entering waterways, sanitary and storm drain systems or into the ground:

- 1.10.4.1 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.
- 1.10.4.2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
- 1.10.4.3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
- 1.10.4.4 Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.
- 1.10.4.5 Empty paint cans are to be dry prior to disposal or recycling.
- 1.10.4.6 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.
- 1.10.5 Set aside and protect surplus and uncontaminated finish materials not required by the Owner and deliver or arrange collection for verifiable re use or re manufacturing.

PART 2 - PRODUCTS

2.1 MATERIALS

- 2.1.1 Only materials listed in the latest edition of the MPI Approved Product List (APL) are acceptable for use on this project. Provide material from a single manufacturer for each system used.
- 2.1.2 Other materials not listed in the APL shall be the highest quality product of an MPI listed manufacturer and shall be compatible with paint materials being used as required.
- 2.1.3 All materials under Work of this Section shall have VOC content.
- 2.1.4 All materials used shall be lead and mercury free.
- 2.1.5 Use only materials having a minimum MPI Environmentally Friendly E2 rating or better.
- 2.1.6 Provide materials having good flowing and brushing properties and capable to dry or cure free of blemishes, sags, air entrapment.
- 2.1.7 Where required, paints and coatings shall meet flame spread and smoke developed ratings to code requirements and authorities having jurisdiction.

2.2 EQUIPMENT

- 2.2.1 Painting and Decorating Equipment: to best trade standards for type of product and application.

- 2.2.2 Spray Painting Equipment: of ample capacity, suited to the type and consistency of paint or coating being applied and kept clean and in good working order at all times.

2.3 MIXING AND TINTING

- 2.3.1 Unless otherwise specified or pre-approved, provide materials ready-mixed and pre-tinted. Re-mix materials in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.
- 2.3.2 Mix paste, powder or catalyzed materials in strict accordance with manufacturer's written instructions.
- 2.3.3 Do not exceed amount of thinner beyond manufacturer's recommendations. Do not use kerosene or organic solvents to thin water-based materials.
- 2.3.4 If required, thin paint for spraying according in strict accordance with paint manufacturer's instructions. If directions are not on container, obtain instructions in writing from manufacturer and provide copy of instructions to Consultant.

2.4 FINISH AND COLOURS

- 2.4.1 The Consultant will select colours from a manufacturer's full range of colours. Refer to Interior Material Schedule and Drawings / Room Finish Schedule.

2.5 GLOSS AND SHEEN RATINGS

- 2.5.1 Paint gloss shall be defined as the sheen rating of applied paint, in accordance with the following MPI values:

Gloss Level	Description	Units@ 60 degrees	Units@ 85 degrees
G1	Matte or Flat finish	Max. 5	Max. 10
G2	Velvet finish	Max. 10	10 to 35
G3	Eggshell finish	10 to 25	10 to 35
G4	Satin finish	20 to 35	Min. 35
G5	Semi-Gloss finish	35 to 70	
G6	Gloss finish	70 to 85	
G7	High-Gloss finish	More than 85	

PART 3 - EXECUTION

3.1 CONDITION OF SURFACES

- 3.1.1 Prior to commencement of work thoroughly examine and test as required conditions and surfaces scheduled to be painted. Do not commence work until adverse conditions and defects have been corrected and surfaces and conditions are acceptable to the Consultant.

3.2 SURFACE PREPARATION

- 3.2.1 Prepare all surfaces in accordance with MPI requirements.
- 3.2.2 Sand, clean, dry, etch, neutralize and test surfaces under adequate illumination, ventilation and temperature requirements.
- 3.2.3 Remove and securely store miscellaneous hardware, surface fittings and fastenings such as electrical plates, mechanical louvers, door and window hardware, hinges, knobs, locks, trim, frame stops, removable rating/hazard/instruction labels, washroom accessories, light fixture trim, from wall and ceiling surfaces, doors and frames, prior to commencement of work. Carefully clean and replace items upon completion of work in each area. Do not use solvent or reactive cleaning agents on items that will mar or remove finishes. Remove doors to finish bottom and top edges and re-hang doors when work is complete.
- 3.2.4 Protect all adjacent interior surfaces and areas, including rating/hazard/instruction labels on doors, frames, equipment, piping, from painting operations and damage using drop cloths, shields, masking, templates, or other suitable protective means and make good damages caused by failure to provide such protection.
- 3.2.5 Make good substrate defects and sand ready for finishing particularly after the first coat is applied. Start of finishing on defective surfaces indicates acceptance of substrate and any costs of making good defects shall be borne by this Section including re painting of entire defective surface.
- 3.2.6 Confirm preparation and primer used with fabricator of steel items.

3.3 APPLICATION

- 3.3.1 Do not perform work unless substrates are acceptable and until heating, ventilation, lighting and completion of work of other Sections are acceptable for applications of products.
- 3.3.2 Apply materials in accordance with MPI Painting Manual Premium Grade finish and manufacturers' requirements.
- 3.3.3 Work specified is intended to cover surfaces satisfactorily when applied at proper consistency and in accordance with manufacturer's recommendations.

- 3.3.4 Tint each coat of finish progressively lighter to enable confirmation of number of coats.
- 3.3.5 Unless otherwise approved by Consultant, apply a minimum of four coats of paint where deep or bright colours are used, to achieve satisfactory results.
- 3.3.6 Sand between each coat to provide an anchor for next coat and to remove defects visible from a distance up to 1000 mm.
- 3.3.7 Do not apply finishes on surfaces that are not sufficiently dry. Unless manufacturer's directions state otherwise, each coat shall be sufficiently dry and hard before a following coat is applied.
- 3.3.8 Prime coat of stain or varnish finishes may be reduced in accordance with manufacturer's directions.
- 3.3.9 Paint finish shall continue through behind all wall-mounted items.

3.4 INTERIOR FINISHING SYSTEMS

- 3.4.1 Finish interior surfaces in accordance with MPI Painting Manual requirements:
- 3.4.2 Plaster and Gypsum Board:
 - 3.4.2.1 INT 9.2B: High performance architectural latex finish; gloss level as indicated, for dry areas.
 - 3.4.2.2 INT 9.2F: Waterborne epoxy (tile-like) finish; gloss level as indicated; for wet areas.
- 3.4.3 Touch up scratches and marks on factory finished equipment with products compatible with factory finish.
- 3.4.4 Do not paint over nameplates.
- 3.4.5 Paint the inside of all ductwork where visible behind louvers, grilles and diffusers for a minimum of 450 mm or beyond sight line, whichever is greater, with primer and one coat of flat black paint.
- 3.4.6 Paint disconnect switches for fire alarm system and exit light systems in red enamel.
- 3.4.7 Paint or band all fire protection piping and sprinkler lines in accordance with mechanical specification requirements. Keep sprinkler heads free of paint.
- 3.4.8 Paint or band all natural gas piping in accordance with mechanical specification requirements.

3.5 FIELD QUALITY CONTROL AND STANDARD OF ACCEPTANCE

- 3.5.1 Painted exterior and interior surfaces will be considered to lack uniformity and soundness if any of the following defects are apparent to the Consultant:

- 3.5.1.1 Brush and roller marks, streaks, laps, runs, sags, drips, heavy stippling, hiding or shadowing by inefficient application methods, skipped or missed areas, and foreign materials in paint coatings.
- 3.5.1.2 Evidence of poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, corners and re-entrant angles.
- 3.5.1.3 Damage due to touching before paint is sufficiently dry or any other contributory cause.
- 3.5.1.4 Damage due to application on moist surfaces or caused by inadequate protection from the weather.
- 3.5.1.5 Damage and/or contamination of paint due to blown contaminants (dust, spray paint, etc.).
- 3.5.2 Painted surfaces will be considered unacceptable if any of the following are evident under natural lighting source for exterior surfaces and final lighting source (including daylight) for interior surfaces:
 - 3.5.2.1 Visible defects are evident on vertical and horizontal surfaces when viewed at normal viewing angles from a distance of not less than 1000 mm.
 - 3.5.2.2 Visible defects are evident on ceiling, soffit and other overhead surfaces when viewed at normal viewing angles.
 - 3.5.2.3 When the final coat on any surface exhibits a lack of uniformity of colour, sheen, texture, and hiding across full surface area.
- 3.5.3 Make good painted surfaces rejected by the Consultant or Owner to approval of Consultant and at the no extra cost to the Owner. Touch up small affected areas. Repaint large affected areas or areas without sufficient material dry film thickness. Remove runs, sags of damaged paint by scraper or by sanding prior to application of paint.
- 3.5.4 Dry film thickness tests:
 - 3.5.4.1 Test for film thickness over entire surface to be painted, minimum one test per each 2 m² in field areas and one test per each 600 mm along inside corners including at ceiling to wall juncture.
 - 3.5.4.2 If any test registers below specified thickness, re-apply paint to entire surface to nearest inside and outside corners.
 - 3.5.4.3 If test registers more than 50% above specified thickness, consult with paint manufacturer, determine if problem exists, offer solutions to Consultant, and repair as directed.
 - 3.5.4.4 Re-test employing same criteria after repair

3.6 PROTECTION

- 3.6.1 Protect exterior surfaces and areas, including landscaping, walks, drives, adjacent building surfaces, equipment and any labels and signage from painting operations and damage by drop cloths, shields, masking, templates, or other suitable protective means and make good any damage caused by failure to provide such protection.
- 3.6.2 Protect interior surfaces and areas, equipment and any labels and signage from painting operations and damage by drop cloths, shields, masking, templates, or other suitable protective means and make good any damage caused by failure to provide such protection.
- 3.6.3 Erect barriers or screens and post signs to warn of or limit or direct traffic away or around work area as required.

3.7 CLEAN-UP

- 3.7.1 Remove paint where spilled, splashed, splattered or sprayed as work progresses using means and materials that are not detrimental to affected surfaces.
- 3.7.2 Keep work area free from an unnecessary accumulation of tools, equipment, surplus materials and debris.
- 3.7.3 Remove combustible rubbish materials and empty paint cans each day and safely dispose of same in accordance with requirements of authorities having jurisdiction.
- 3.7.4 Clean equipment and dispose of wash water / solvents as well as all 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.

3.8 EXISTING SURFACES

- 3.8.1 Finish or refinish existing surfaces of items or rooms where noted, including new work which has been incorporated into the existing work and existing work which has been damaged, altered or otherwise disturbed during renovation operations.
- 3.8.2 Refinish surfaces or rooms adjacent to rooms where alterations or renovations have been carried out and which have been damaged or otherwise disturbed by the alterations or renovations. Where such damages occur, refinish completely.
- 3.8.3 Remove from existing surfaces rust, scale, oil grease, mildew, chemicals and other foreign matters.
- 3.8.4 If coatings on existing surfaces have failed so as to affect the proper performance or appearance of materials to be applied, or if such coatings can be easily removed, remove them and prepare the substrates properly. Dull hard or glossy surfaces by sanding, sandblasting or by other abrasive methods prior to finishing.

- 3.8.5 Refinish surfaces entirely between changes of planes which have been incorporated into the existing work and existing work which has been damaged, altered or otherwise disturbed during renovation operations.

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL

- 1.1.1 The General Mechanical Requirements apply to all Sections of this Division and of Divisions 21, 22, 23 and 25.
- 1.1.2 The Specifications are arranged generally in accordance with the MasterFormat 2004 Edition. Sections of this Division are not intended to delegate functions or to delegate work to any specific trade.

1.2 DEFINITIONS

- 1.2.1 “Provide” means to supply and install the products and services specified.
- 1.2.2 “The Work” means the total construction required by the Contract Documents, and includes all labour, products, and services.
- 1.2.3 “Products” means all material, machinery, equipment, and fixtures forming part of the completed work as required by the Contract Documents.

1.3 INTENT

- 1.3.1 Provide all work, including items, articles, materials, operations, and methods listed, mentioned, and scheduled in the Contract Documents. Include all labour, equipment, tools, scaffolds, and other incidentals necessary and required for the complete installation.
- 1.3.2 Consider the Specifications as an integral part of the Drawings, which accompany them. Do not use the Drawings or the Specifications alone. Consider any item or subject omitted from one, but mentioned or reasonably implied in the other, as properly and sufficiently specified and provided under the work of this Division.
- 1.3.3 This installation shall be made in strict accordance with the Drawings, Specifications, and all applicable codes, regulations, standards, bylaws, including the Ontario Building Code, requirements of local authorities having jurisdiction, Owner's Insurers', and NFPA regulations. Codes, standards, and regulations referenced by these Specifications shall be the latest edition as applicable at the time of building permit application unless noted otherwise or specifically defined under the OBC.
- 1.3.4 All equipment and devices used shall be UL/cUL listed and/or CSA certified where applicable.
- 1.3.5 Each Sub-Contractor is considered an expert in their field.

1.4 EXAMINATION OF SITE AND CONTRACT DOCUMENTS

- 1.4.1 Before tendering, visit the site of the proposed Work and obtain all information as to existing conditions and limitations.
- 1.4.2 Examine the Specifications and all Drawings including the Specifications and Drawings of all other Divisions before commencing any portion of the Work to this Division.
- 1.4.3 No allowance will be made for any consideration that may have been overlooked.
- 1.4.4 Unless exceptions are specifically noted at the time of Tender, the submission of a Tender confirms that the Contract Documents and site conditions are accepted without qualification.

1.5 SCOPE

- 1.5.1 Major aspects of the Work shall include, but not necessarily be limited to, the following items. Refer to Contract Drawings for the full scope of the Work included in the Contract.
 - 1.5.1.1 HVAC system, consisting of variable air volume terminals, associated ductwork, grilles, diffusers and controls.
 - 1.5.1.2 DDC building automation system.
 - 1.5.1.3 Testing, adjusting and balancing.
 - 1.5.1.4 Commissioning of mechanical systems and equipment.

1.6 PERMITS, FEES AND INSPECTIONS

- 1.6.1 Apply for, obtain, and pay for all permits, licenses, inspections, examinations, and fees required.
- 1.6.2 Arrange for inspection of all work by the Authorities having jurisdiction over the Work. On completion of the Work, present to the Owner the final unconditional certificate of approval of the Inspection Authorities.
- 1.6.3 Comply with requirements of the edition as applicable at the time of building permit application, of the relevant CSA standards, the requirements of the Authorities, Federal, Provincial and Municipal codes, the applicable standards of the Underwriters' Association and all other Authorities having jurisdiction. These codes and regulations constitute an integral part of these Specifications. In case of conflict, the Codes take precedence over the Contract Documents.
- 1.6.4 In no instance reduce the standard established by the Drawings and Specifications by applying any of the codes referred to herein.

- 1.6.5 Before starting any work, submit the required number of copies of Drawings and Specifications to the Authorities for their approval and comments. Comply with any changes requested as part of the Contract, but notify the Owner immediately in writing of such changes for proper processing of these requirements. Prepare and furnish any additional drawings, details or information as may be required.

1.7 CONTRACT DRAWINGS

- 1.7.1 The Drawings for the Mechanical Work are diagrammatic performance drawings, intended to convey the scope of Work, and indicate general arrangement and approximate location of apparatus, fixtures, and pipe runs. The Drawings do not intend to show architectural and structural details.
- 1.7.2 Do not scale drawings, but obtain information involving accurate dimensions to structure from dimensions shown on architectural and structural drawings, or by site measurements. Consult general construction drawings as well as detail drawings to become familiar with all conditions affecting the Work and verify spaces in which the Work will be installed.
- 1.7.3 Make, at no additional cost to the Owner, any changes or additions to materials and/or equipment necessary to accommodate structural conditions (runs around beams, columns, etc.).
- 1.7.4 Alter at no additional cost to the Owner, the location of materials and/or equipment as directed, provided that the changes are made before installation and do not necessitate additional material.
- 1.7.5 Install all ceiling mounted components (diffusers, grilles, sprinklers) in accordance with reflected ceiling drawings reviewed by the Consultant.
- 1.7.6 Leave space clear and install all work to accommodate future materials and/or equipment as indicated and to accommodate equipment and/or material supplied by another Division of Work or Contract. Verify spaces in which work is to be installed. Install all pipe runs, etc., to maintain headroom and clearances and to conserve space in shafts and ceiling spaces.
- 1.7.7 Confirm on the site the exact location of outlets and fixtures. Confirm location of outlets for equipment supplied under other Divisions of Work or Contracts.

1.8 CONSTRUCTION DRAWINGS

- 1.8.1 Prepare dimensioned co-ordination drawings in conjunction with all trades concerned, showing sleeves, access door locations, and openings through structure and all insert sizes and locations. Show all electrical systems, mechanical systems, conduit, and ductwork.
- 1.8.2 Submit drawings approved by all trades, to the Consultant and include one complete set in each operating and maintenance instruction manual.

1.9 SHOP DRAWINGS

- 1.9.1 Submit Shop Drawings electronically in PDF format. Refer to Section 01 33 00 Submittal Procedures.
- 1.9.2 The Consultant will only consider Shop Drawings bearing the stamp of approval of the Contractor and all Sub-Contractors involved when applicable. Check for all pertinent information such as physical dimensions, make, performance, electrical characteristics, and indicate the intended use and location before stamping these drawings approved.
- 1.9.3 Assume responsibility for accuracy of equipment dimensions related to available space and accessibility for maintenance and service, and compliance with Codes and Inspection Authorities.
- 1.9.4 Submit Shop Drawings showing the following:
- 1.9.4.1 Project name.
 - 1.9.4.2 Project tag number.
 - 1.9.4.3 Manufacturer's name and model number.
 - 1.9.4.4 Supplier's name.
 - 1.9.4.5 Approval agencies.
 - 1.9.4.6 Shipping and working weight.
 - 1.9.4.7 Performance characteristics.
 - 1.9.4.8 Dimensions including required clearances.
 - 1.9.4.9 Electrical characteristics.
 - 1.9.4.10 Materials used in manufacture and type of finish.
 - 1.9.4.11 Time required to fabricate and to deliver.
 - 1.9.4.12 All variations from Tender Documents.
 - 1.9.4.13 Construction and field connection details.
 - 1.9.4.14 Motor locations.
- 1.9.5 Shop Drawings for packaged equipment shall be submitted as complete packages, including all equipment components and details (wiring diagrams, control diagrams, etc.).
- 1.9.6 The Consultant's review shall not relieve the Contractor from responsibility for deviations from the Consultant's Drawings and Specifications, unless he has in writing, called the Consultant's attention to such deviations at the time of submission of drawings. The Consultant's review shall be construed to apply to and only to general arrangement and shall not relieve the Contractor from the entire responsibility for correctness of details and dimensions. Any fabrication, erection, setting out or other work done in advance of the receipt of stamped drawings shall be done entirely at the Contractor's risk.
- 1.9.7 Shop Drawings will be marked by the Consultant for action by the Contractor as follows:
- | | |
|---------------------------------|---|
| Consultant's
<u>Markings</u> | Action by
<u>Contractor</u> |
| No comment | Proceed with work |
| Make correction noted | Proceed in accordance with mark-up.
Resubmit revised drawings for record |
| Revise and Resubmit | Submit revised drawings for review |

	Rejected	before proceeding Product not suitable. Do not proceed. Review specifications and drawings, and resubmit shop drawing that complies with contract.
1.10	SCHEDULING	
1.10.1	Comply with the General Contractor's construction schedule.	
1.10.2	Provide in the tender price any costs for premium time outside of normal working hours to complete the work on schedule.	
1.11	RECORD DRAWINGS	
1.11.1	Submit AutoCAD drawing files. As the job progresses, mark the prints to accurately indicate installed work. Have the white prints available for inspection at the site at all times, and present for scrutiny at job meeting. Transfer all information onto the AutoCAD drawing files. Drawing files shall retain all original layering standards. Submit one (1) set of AutoCAD drawing files of final "As-Built" drawings to the Consultant for review. Note that the consultant's AutoCAD drawing files are copyrighted and may not be used for any other purpose other than that described above.	
1.11.2	The drawing files shall be provided solely to assist the contractor in the preparation of "As-Built" drawings. The Consultant assumes no liability for any errors, omissions, incomplete information, incorporation of latest changes, or other instructions.	
1.11.3	While the Consultant takes precautions to ensure that no computer virus is transmitted, scanning for viruses upon receipt is recommended.	
1.11.4	Prepare Record Drawings showing the following:	
1.11.4.1	Inverts of all services entering and leaving the building and at property lines.	
1.11.4.2	Dimensions of underground services in relation to building lines at key points of every run.	
1.11.4.3	Elevations of underground services in relation to Ground floor level of the building.	
1.11.4.4	Dimensioned location of all services embedded in the structure.	
1.11.4.5	Dimensioned location of all services left for future Work.	
1.11.4.6	All Addendum changes.	
1.11.4.7	All changes to the work due to Change Orders.	
1.11.4.8	All changes to the Work during construction.	
1.11.4.9	Location and designation of all electrically supervised valves and smoke dampers.	

- 1.11.4.10 Location and designation of all items requiring access or service in a hidden location.
- 1.11.4.11 All changes to Specifications, details and equipment schedules.
- 1.11.4.12 All duct traverse points and associated airflow rates as reported in final Air Balancing reports.
- 1.11.5 Identify each “As-Built” drawing as follows, “As-Built Drawing: This drawing has been revised to show all systems as installed. Remove references to Mechanical Design Consultant.
- 1.11.6 Prior to Testing, Adjusting and Balancing, provide print copies of all current record drawings to the Balancing Contractor and the Commissioning Agent.
- 1.12 **PRODUCTS**
 - 1.12.1 Provide only new Products. Where manufacturer is not specified provide Products of high commercial standard and quality consistent with the standards of these Specifications.
 - 1.12.2 All Products must bear the approval of the CSA or have special approval of the inspection authority having jurisdiction for their respective functions and environments.
 - 1.12.3 Provide products of same manufacture for similar applications unless noted otherwise.
 - 1.12.4 Refer to equipment performance schedules in the respective specification section and on the Drawings.
- 1.13 **ALTERNATES AND SUBSTITUTIONS DURING PROGRESS OF WORK**
 - 1.13.1 Substitute Products will only be considered when tendered Products become unobtainable.
 - 1.13.2 Provide detailed Specifications and Shop Drawings with complete performance characteristics of the proposed alternate with the submission to the Consultant.
 - 1.13.3 Assume responsibility and pay for any additional installation costs incurred by all Divisions resulting from the substitution.
- 1.14 **VALUATION OF CHANGES**
 - 1.14.1 For each change submit a complete itemized breakdown of labour and material.
 - 1.14.2 Follow Division 1 associated section for Overhead and profit mark-up description.
- 1.15 **APPLICATION FOR PAYMENT**
 - 1.15.1 Conform to the Consultant’s method of submission of application for payment, which will be issued after the award of Contract.

1.16 SUPERINTENDENCE

- 1.16.1 The supervisory staff assigned to the project shall be fully competent to implement efficiently all requirements for scheduling, coordination, field engineering reviews, inspections and submittals defined in the Specifications.

1.17 INSTALLATION REQUIREMENTS

- 1.17.1 The Consultant's Drawings and instructions govern the general location of all items.
- 1.17.2 Install all equipment and apparatus to allow free access for maintenance, adjustment and replacement.
- 1.17.3 Install all Products and services in accordance with the manufacturer's requirements and/or recommendations.
- 1.17.4 Do not use explosive activated tools.
- 1.17.5 Install all services capped for future to allow easy access for future tie-in.
- 1.17.6 All equipment installed in parking structure floor slabs, ramps and driving areas shall meet all requirements of CAN/CSA-S413-07 with regard to corrosion protection:
- 1.17.6.1 The use of dissimilar materials shall be avoided, or if unavoidable, electric contact shall be prevented.
- 1.17.6.2 Embedded materials used for floor drains, pipes and other hardware shall be:
- 1.17.6.2.1 Non metallic, or;
- 1.17.6.3 A low copper aluminum alloy or an equally corrosion resistant metal, coated on surfaces in contact with concrete to prevent galvanic corrosion with steel reinforcing, or;
- 1.17.6.4 Protected against the corrosive effects of de-icing chemicals by an effective and durable coating.
- 1.17.7 Install equipment neatly to the satisfaction of the Consultant. Unless noted otherwise, install all products and services to follow building planes. Installation shall permit free use of space and maximum headroom
- 1.17.8 Cap off and seal all open ends of installed ductwork, piping and conduits to prevent entrance of foreign matter.
- 1.17.9 Do not install piping in a location or manner, which might result in freezing.

1.18 TEMPORARY SERVICES

- 1.18.1 Refer to Section 01 51 00 regarding temporary services, Contractor's shop, storage and other facilities.

1.19 COOPERATION

- 1.19.1 Confer with all trades installing equipment that may affect the work of this Division, and arrange equipment in proper relation with equipment installed under all Divisions of the Contract.
- 1.19.2 Furnish all items to be built in, in time, complete with all pertinent information, commensurate with the progress of the work.
- 1.19.3 Store materials neatly and out of the way and clean up daily all refuse caused by the work.
- 1.19.4 Coordinate work with all Divisions. Relocate equipment and/or material installed, but not coordinated with the work of other Divisions, as directed by the Consultant, at no extra cost. Inform other Divisions of the locations of openings, chases, sleeves, supports, services, connections, etc. to be incorporated into the work.
- 1.20 **PROTECTION**
 - 1.20.1 Protect building and structure from damage due to carrying out this work.
 - 1.20.2 Protect all mechanical work from damage. Keep all equipment dry and clean at all times.
 - 1.20.3 Cover all openings in equipment and materials.
 - 1.20.4 Be responsible for and make good any damage caused directly or indirectly to any walls, floors, ceilings, woodwork, brickwork, finishes, etc.
- 1.21 **FIELD REVIEW**
 - 1.21.1 The Consultants will make periodic visits to the site during construction to ascertain reasonable conformity to plans and specifications. The Consultant is not responsible for quality control. Contractor shall maintain his own quality control and will be responsible for the execution of his work in conformity with the Contract Documents and with the requirements of Authorities.
 - 1.21.2 The Owner and Consultant shall have access to the site at all times for periodic inspections. Maintain a complete set of contract documents on site for field reference by the Consultant.
 - 1.21.3 Provide all gauges, instruments, and other equipment necessary for field review by the Consultant.
 - 1.21.4 Application for final review will be considered when the Work has been completed and written declarations submitted that all commissioning, adjustment, set up and documentation is complete. Final review shall be done when:
 - 1.21.4.1 All reported deficiencies have been corrected.
 - 1.21.4.2 All systems have been balanced, tested, commissioned and are operational.
 - 1.21.4.3 The Owner has been instructed in the operation and maintenance of all equipment.

- 1.21.4.4 All reports have been submitted and reviewed.
- 1.21.4.5 All instruction manuals have been submitted and reviewed.
- 1.21.4.6 All tags and nameplates are in place and all data submitted and reviewed.
- 1.21.4.7 Cleaning up is finished in all respects.
- 1.21.4.8 All spare parts and replacement parts specified have been provided.
- 1.21.4.9 All record drawings have been submitted and reviewed.
- 1.22 **SERVICES TO EQUIPMENT SUPPLIED BY OTHERS**
 - 1.22.1 Provide all necessary connections required for equipment supplied by the Owner and other Divisions. Examine all Drawings and Specifications and identify all requirements.
 - 1.22.2 Provide valves, unions, caps, and vibration isolation for all services.
 - 1.22.3 The Contractor shall be responsible to verify, adjust and coordinate the type, size and location of mechanical services required for all equipment supplied by the Owner and other Divisions.
- 1.23 **PROVISION FOR FUTURE EQUIPMENT AND CONSTRUCTION**
 - 1.23.1 Spaces designated for future equipment or building expansion shall be left clear.
 - 1.23.2 Provide services for future extensions complete with Products necessary for present termination and to permit future extension.
 - 1.23.3 Identify each service by a permanent marker at its termination point.
- 1.24 **CUTTING AND PATCHING**
 - 1.24.1 Inform all other Divisions in time, concerning required openings. Where this requirement is not met, bear the cost of all cutting and patching, including layout, x-rays, ferros scanning at premium time. Obtain the permission of the Consultant before doing any cutting.
 - 1.24.2 Obtain the Consultant's approval before doing any cutting and patching. Any structural modifications must not affect structural, fire barrier or vapor barrier integrity.
- 1.25 **PAINTING**
 - 1.25.1 Provide all exposed ferrous metal work and Products, except ductwork and piping, with at least one (1) factory prime coat or paint one prime coat on site. Clean up or wire brush all equipment before painting. Unless otherwise noted finish painting will be done under Division 09 – Finishes of these Specifications.
 - 1.25.2 If not factory coated or galvanized, clean, wire brush and paint all ferrous supports and hangers concealed in ceiling spaces of kitchens or other similar high humidity areas.

1.25.3 Repaint or refinish all damaged factory applied finishes.

1.25.4 Provide oil-base red oxide primer applied as per manufacturer's recommendations.

1.26 **ABBREVIATIONS**

1.26.1 Abbreviations with respect to government agencies, testing agencies, technical societies, and approval agencies are as listed below:

AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
ARI	Air Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
CGA	Canadian Gas Association
CSA	Canadian Standards Association
FM	Factory Mutual
IAO	Insurers' Advisory Organization (CGI Information systems and Management Consultants Inc.)
MICA	Midwest Insulation Contractors Association
NBC	National Building Code
NBFU	National Board of Fire Underwriters (currently American Insurance Association)
NECB	National Energy Code of Canada for Buildings
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
OBC	Ontario Building Code
BC	National or State (US) Building Codes
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
TEMA	Tubular Exchanger Manufacturers Association
ULC/cUL	Underwriters' Laboratories of Canada

1.27 **MANUFACTURER'S CERTIFICATION**

1.27.1 Submit letters from the manufacturers of all equipment certifying that their technical representatives have inspected and tested their equipment, have approved the methods of installation and operation. Where existing systems are extended, provide letters covering both new and existing equipment and connections.

- 1.27.2 These letters shall state the names of persons present at the inspection and testing, methods used and a list of functions performed with location and room numbers where applicable.
- 1.27.3 Refer to the respective equipment sections for requirements for letters.
- 1.28 **OPERATION AND MAINTENANCE MANUALS**
- 1.28.1 Assemble three (3) manuals, each containing data sheets, brochures, operating, maintenance, recommended spare parts, and lubricating instructions and a complete set of reviewed shop drawings and bind in hard cover. Identify cover "Operation and Maintenance Manual for York Region Administrative Centre Annex". Manuals shall be separated with dividers in logical sections and volumes.
- 1.28.2 Present one (1) copy for review by Consultant. Make all corrections requested by the Consultant and forward the corrected review copy plus a duplicate to the Owner with a copy of transmittal to Consultant for his records. Include the following information in each manual:
- 1.28.2.1 Instrumentation and Control
- 1.28.2.1.1 Complete instrument list for all gauges, thermometers, gauge glasses and other instruments.
- 1.28.2.1.2 Sequence and description of operation for each control system.
- 1.28.2.1.3 Control diagram for each system complete with equipment summary giving system designation and catalogue number for each component.
- 1.28.2.1.4 Catalogue leaflet of each component used.
- 1.28.2.1.5 Applications programming information and programmer's manual.
- 1.28.2.1.6 Description of operating procedures, including required actions at each operator position, operation of computer peripherals, input and output formats and procedures, and emergency alarm and failure recovery procedures. Descriptions of system start-up, back-up equipment operation, and execution of all system functions and operating modes shall be provided.
- 1.28.2.1.7 Provide description of data communication, including data types and formats, data link components and interfaces, and operator test.
- 1.28.2.1.8 Instructions and schedules for inspections, cleaning, lubricating and calibration.
- 1.28.2.2 Other Equipment
- 1.28.2.2.1 Description of start-up and activating procedures, and commissioning procedures, as well as follow-up instructions to the Owner's operating staff to slowly break-in unit.

- 1.28.2.2.2 Maintenance instructions for all other equipment containing moving parts or requiring lubrication or chemical charging.
- 1.28.2.2.3 Include instruction list of parts indicating catalogue number and manufacturer, complete with drawings indicating the location of each part in the complete assembly; performance curves.
- 1.28.2.3 A copy of the following:
 - 1.28.2.3.1 All reviewed sprinkler layouts and hydraulic calculations.
 - 1.28.2.3.2 Certificates from all equipment manufacturers, duct-cleaning agents, pipe-cleaning agents, chemical treatment agents and local authorities having jurisdiction.
 - 1.28.2.3.3 All pipe and duct pressure test reports.
 - 1.28.2.3.4 Warranties and letters of guarantee from contractors and equipment manufacturers.
 - 1.28.2.3.5 Copies of permits, licenses and certificates.
 - 1.28.2.3.6 Start-up and activation and commissioning procedures and check sheets.
- 1.29 **WARRANTY**
 - 1.29.1 Refer to General Conditions of the Contract and Specimen Warranty Form.
 - 1.29.2 Furnish all extended warranty for equipment as required in the Specifications.

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL

1.1.1 Section 20 00 06 – General Requirements shall apply to and govern this section.

1.2 SHOP DRAWINGS

1.2.1 Provide Shop Drawings for:

1.2.1.1 Access doors and panels.

1.3 MATERIALS AND EQUIPMENT

1.3.1 Use only new materials and equipment of Manufacturer as specified or shown on the Drawings. Ensure that equipment and materials for similar applications are of the same Manufacturer.

1.3.2 If the Contractor wishes to substitute materials of Manufacturers other than those named, he shall state in his Tender the name and a complete description of the materials to be substituted, along with the amount of change in the Contract price.

1.3.3 Ensure that materials not specified to a specific Manufacturer are of high commercial standard and quality.

PART 2 - PRODUCTS

1.4 ACCESS DOORS AND PANELS

1.4.1 In plaster, gypsum board, tiled or masonry walls for exposed flush installation, provide 203mm by 203mm (8" x 8") prime coated 16 ga. access door with 18 ga. mounting frame, continuous concealed hinge, and screwdriver operated stainless steel cam latch, similar to Acudor UF-5000.

1.4.2 In plaster or tiled walls for recessed installation, provide 305mm by 305mm (12" x 12") 16 ga. access door recessed by 25mm (1"). Door to be complete with 14 ga. mounting frame, concealed pivoting rod type hinge, and flush-to-surface screwdriver operated stainless steel cam latch, similar to Acudor AT-5020.

1.4.3 In gypsum board surfaces or in acoustic tiles for recessed installation in public areas, provide 305mm by 305mm (12" x 12") bauco-plus architectural access door with concealed hardware and gypsum board inlay. Standard features include cam latch flush with surface, aluminum frame and glass fibre-reinforced nylon hardware, fully hinged removable door panel and integrated safety catches, perimeter gasket installed onsite.

1.4.3.1 In areas not accessible by public, provide 305mm by 305mm (12" x 12") 16 ga. access door recessed by 25mm (1"). Door to be complete with 14 ga. mounting frame with drywall taping bead on all sides, concealed pivoting rod type hinge, and flush-to-surface screwdriver operated stainless steel cam latch, similar to Acudor DW-5015.

- 1.4.4 In fire rated walls, provide 305mm by 305mm (12" x 12") 16 ga. rated access door, ULC listed "B" label for 1-1/2 or 2 hours. Door to be complete with 16 ga. mounting frame, concealed hinge, spring closer, and knurled knob operated universal self-latching bolt, similar to Acudor FB-5060.

PART 2 - EXECUTION

2.1 INSERTS, SLEEVES, ESCUTCHEONS AND CURBS

- 2.1.1 Use only factory made, threaded, or toggle type inserts as required for supports and anchors, properly sized for the load to be carried. Place inserts only in portions of the main structure and not in any finishing material.
- 2.1.2 Use factory made expansion shields where inserts cannot be placed, but only where permission is given by the Consultant.
- 2.1.3 Do not use powder-activated tools except with written permission from the Consultant.
- 2.1.4 Supply and locate inserts, holes, anchor bolts, and sleeves in time when walls, floors and roof are erected.
- 2.1.5 Pass insulation unbroken where pipe or duct is insulated, except through fire rated walls and floors. Size sleeves to provide 13mm (½") clearance all around.
- 2.1.6 Use the following sleeving for ducts:
- 2.1.6.1 Unless otherwise noted, use minimum 1.3mm (18 gauge) galvanized steel sleeves.
- 2.1.6.2 For rectangular duct openings through walls and floors provide a removable wood box-out of the required size.
- 2.1.6.3 Through firewalls, build fire dampers into wall.
- 2.1.6.4 Through floors where ducts are not furred in or enclosed in a duct-shaft, ensure the 100mm (4") high by 100mm (4") wide watertight concrete curbs are provided, with 19mm (¾") chamfered edges all around. Extend sleeves where used, flush to top of curb. Read Division 03 – Concrete for further information.
- 2.1.6.5 Through floors where ducts are enclosed in a duct shaft or furred in, provide the watertight concrete curbs at the extreme top and bottom ends of the shaft only.
- 2.1.6.6 Through roofs, provide curbs and sleeves as shown on the detail drawings and to suit flashing requirements.
- 2.1.7 After ducts are installed, pack the opening and seal both sides as follows:
- 2.1.7.1 Use fiberglass insulation for packing, except through curbed concrete floors use "Fire barrier" as distributed by Double A/D Distributors Ltd. (UL No. 4 U 18.7 Approved).

- 2.1.7.2 Seal the packing in openings through floors with permanently resilient (Silicone base or equal) compound, non-flammable and waterproof. Press duct supports firmly into caulking before bolting down to curb.
- 2.1.7.3 Through all vertical walls seal the fibreglass packing using a permanently resilient (silicone base or equal) sealing compound.
- 2.1.7.4 All fire stop materials and methods must be approved in accordance with CAN/ULC-S115-11, and be ULC listed.
- 2.1.7.5 Seal is not required for other packings.
- 2.1.8 Brace duct sleeves and box-outs to retain their position and shape during the pouring of concrete and other work.
- 2.1.9 Provide bracing for each duct at every passing through structure to prevent sagging.
- 2.1.10 Cover exposed duct sleeves and openings in exposed areas only. Use 1.3mm (18 gauge) galvanized steel escutcheons in form of a duct collar. Over curbs extend the collar 25mm (1") down the side of the curb, similar to counter flashing. Fix collar in position with cadmium plated screws.
- 2.2 **ACCESS DOORS AND PANELS**
- 2.2.1 Install all concealed mechanical equipment requiring adjustment or maintenance in locations easily accessible through access panels or doors. Install systems and components to result in a minimum number of access panels. Indicate access panels on "As Built" drawings.
- 2.2.2 Provide the respective Division of Work with panels, doors or the frames therefore; complete with all pertinent information for installation. Arrange with and deliver to the Division in whose work they occur to install them. Ensure that access doors are installed in a manner to match the building material grids where applicable.
- 2.2.3 Prepare detailed and coordinated drawings showing location and type of all access doors. Submit these drawings to Consultant to review.
- 2.2.4 Size all access doors to provide adequate access and commensurate with the type of structure and architectural finish, minimum size 150mm (6") by 150mm (6). Should it be necessary for persons to enter, provide a minimum 600mm (24") by 450mm (18") size doors.
- 2.2.5 Ensure proper fire rating of access doors in fire separations, fire-rated walls and ceilings.
- 2.2.6 Lay-in type tiles, properly marked, may serve as access panels.
- 2.3 **DRIP PANS**

- 2.3.1 Construct drip pans of min. 1.0mm (20 gauge) galvanized steel sheet with sealed connections. Provide drain lines from drip pans to nearest hub drain, funnel floor drain, janitor's sink or appropriate approved location.
- 2.3.2 Provide drip pans at the following locations:
 - 2.3.2.1 Beneath all pipes passing through electrical, UPS, elevator machine, diesel generator, telephone rooms, and IT closets over horizontal runs of bus ducts, and in locations as indicated on Drawings.
- 2.4 **WORKMANSHIP**
 - 2.4.1 Install ducts and pipes parallel and perpendicular to the building planes and concealed in chases, behind furring or above ceiling, except in unfinished areas. Install all exposed systems neatly and group together, to present a neat appearance.
 - 2.4.2 Install all equipment and apparatus requiring maintenance, adjustment, or replacement with sufficient clearance for servicing.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

- 1.1.1 Drawings and general provisions of the contract documents including; general/supplementary conditions and specifications
- 1.1.2 Owner's Project Requirements and Basis of Design
- 1.1.3 Section 01 91 00 - General Cx Requirements
- 1.1.4 Section 01 91 31 - Commissioning Plan.
- 1.1.5 Requirements by Other Trades

1.2 SUMMARY

- 1.2.1 Allow for work and equipment necessary to assist Commissioning Agent in completion of the commissioning process.
- 1.2.2 Commissioning process shall be identified in six (6) distinct phases
 - 1.2.2.1 Static Verification Checks (Spec, Location, Orientation, Tagging, Installation), *Contractor, ENG, Cx Agent*
 - 1.2.2.2 Startup (Energize, OEM Checks and Startup Procedures, Warranty Review), *OEM/Supplier, CM, Contractor, Eng, O&M, Cx Agent*
 - 1.2.2.3 Dynamic Pre-Functional Checks (Stop/Start, Open/Close, Control Min/Max), *Contractor, Cx Agent*
 - 1.2.2.4 Functional Performance Tests (Sequence of Op Testing & Systems Integration Tests), *Cx Agent, Contractor, Eng, O&M*
 - 1.2.2.5 Validation and Turnover (Deficiencies Signoff, Performance Validation, O&M Training and Cx Documentation Complete), *CM, Contractor, O&M, Cx Agent*
 - 1.2.2.6 Near End Warranty Review (Review MTV Data, O&M Discovery, Baseline Cx Review), *Cx Agent, O&M, OEM/Supplier, Eng*

1.3 DESCRIPTION

- 1.3.1 Commissioning is a quality-oriented systematic process of ensuring that all building systems perform interactively according to the design intent and the owner's operational needs. The commissioning process shall encompass and coordinate the traditionally separate functions of system documentation, equipment start-up, control system calibration, testing and balancing, performance testing and training.

1.4 COMMISSIONING MANUAL

- 1.4.1 The Commissioning Manager will prepare the Project Mechanical Commissioning Manual consisting of equipment check sheets. Contractor is responsible for providing manufacturer start up reports and commissioning check sheets for all pieces of equipment.

1.4.2 All commissioning check sheets must be completed and signed off by the Contractor. Refer to the end of this section for a sample check sheet.

1.4.3 The commissioning check sheets are designed to act as a tool for the Contractor to ensure each installation is complete before start-up, to reduce the number of deficiencies associated with system start-ups.

1.4.4 The Contractor is responsible for verifying that all installed equipment is as per the mechanical shop drawings. The Contractor is to initial and date the check sheets when the equipment technical checks are complete and also when equipment installations are complete (static checks). The Commissioning Agents will check-off that the technical data is correct, and will fill in the site specific data for all static and operation checks. When all deficiencies are complete and the piece of equipment is operating as designed, the Contractor and Commissioning Agents will sign off the form.

1.4.5

Technical Data	Specified Data	Commissioning Agent
	Shop Drawing	Commissioning Agent
	Installed	Contractor
	Verified	Commissioning Agent
	Date/Checked by	Contractor to sign when all shop drawing and installed information is completed.
Pre-functional Check sheets	Contractor Installation and Operation Review for Each Piece of Equipment	Check-sheets will be developed by the CxA Authority. Contractors shall fill up the forms and sign-off
Static Checks	Date / Checked by	Contractor to sign/complete when the installation of the equipment or system is complete and ready for the CxA Agent to verify.
	Installation Checks	Completed by Commissioning Agent
Operation Checks	Date / Checked by:	Completed by Commissioning Agent
	Performance Checks	Completed by Commissioning Agent as field testing of the equipment progresses
Signatures		Contractor and Commissioning Agent sign when the check sheet is completed

1.5 TESTING INSTRUMENTS AND EQUIPMENT

- 1.5.1 Provide testing instruments and equipment, and ancillary equipment such as two-way radios and ladders required to perform starting of mechanical equipment and systems.
- 1.5.2 Instruments used in equipment start-up must be calibrated and accurate. Provide calibration certificates if requested by the Commissioning Agents.

PART 2 - EXECUTION

2.1 CHECK SHEETS, FIELD REPORTS AND DATA

- 2.1.1 Contractors shall provide the required documentation for commissioning and shall include, but not be limited to Section 01 91 00 item 1.8 and Section 01 91 31 Table 5-1 and 5-2
- 2.1.2 Record all data gathered on site on start-up report forms, pre-functional check sheets and commissioning check sheets.
- 2.1.3 Make copies of all starting and testing data before equipment and system start-up personnel leave site. Maintain one copy of all data taken during starting on site.
- 2.1.4 Maintain one copy of all final starting, testing and adjusting reports on site up to Substantial Completion of the Work for reference purposes.
- 2.1.5 Make copies of all red-line record drawings available for Commissioning Agents to review.

2.2 COMMISSIONING REPORT

- 2.2.1 The Commissioning Manager will issue commissioning reports following all commissioning activities on site. The Contractor is responsible for completion of deficiencies as listed in the Commissioning Reports and shall return signed-off copies of issued commissioning reports noting action taken on items.
- 2.2.2 All commissioning deficiencies will be tracked to resolve and final sign-off by the Commissioning Manager.

2.3 PROVIDE THE FOLLOWING:

- 2.3.1 Refer to Section 01 91 31 Cx Plan Tables 5-1 & 5-2
- 2.3.2 Refer to section 01 91 00 item 1.8 Commissioning Documentation

2.4 COOPERATE WITH THE COMMISSIONING AGENCY AS FOLLOWS:

- 2.4.1.1 Inform Commissioning Agent in advance of all systems energizations / activations (electrical, mechanical and pipe trades), manufacturer start-ups, pressure tests, flushing & degreasing of systems, and of scheduled balancing dates.
- 2.4.1.2 Allow Commissioning Agent free access to the site during all project phases.
- 2.4.1.3 Make available ladders, basic scaffolds and access to all equipment and systems.

2.4.1.4 Provide prior to job start, one complete set of contract drawings and specifications including all addenda.

2.4.1.5 Provide one (1) copy of each approved notice of change and clarification.

2.4.1.6 Coordinate site visits during warranty period.

2.5 **COORDINATION**

2.5.1 The Commissioning Manager will prepare a Draft Commissioning Schedule prior to the start-up of building systems. The Contractor shall provide tentative dates for when each system will be ready for commissioning activities to commence.

2.5.2 At approximately 40% Construction Phase, commissioning meetings will be scheduled by the Commissioning Manager on site for coordination of commissioning activities.

2.5.3 Prior to commencement of each particular testing procedure, coordinate all sub-trades, manufacturers, suppliers and other specialties to ensure all phases of work are properly completed. Establish necessary manpower requirements.

2.5.4 A point by point checklist, sequence verification and NAE commissioning/functional testing after each unit is in place shall be performed by BAS contractor.

2.5.5 Advise the Commissioning Manager in advance that starting, testing and adjusting procedures are ready to commence. Consult with the Commissioning Manager to determine which procedures he may elect to witness. Provide advance notice prior to commencement of each procedure or series of procedures to allow the Commissioning Manager to arrange for witnessing of tests as required.

2.5.6 Starting and Testing Phases

2.5.6.1 Starting and testing program generally consists of following six distinct phases according to section 1.2.

2.5.6.1.1 Provide all necessary documentations as identified in section 3.1 and Cx plan.

2.5.6.1.2 The necessary documentations will be finalized in Cx plan at commissioning kick-off meeting in construction phase.

2.5.7 After each distinct phase of work has been completed, correct deficiencies and advise Commissioning Manager before commencing the next phase.

2.6 **TRAINING**

2.6.1 Training is to occur by an OEM factory trained technician directly involved and familiar with the site. Training materials, agenda and O+M manuals are to be provided at least 5 business days prior to training. Two training sessions are to occur prior to substantial and two session three months after project closeout. Time to be used at owner's discretion.

2.6.2 Provide four (4) on-site training sessions including classroom and terminal hands on, half day each, for personnel designated by the owner/owners service provider prior to and at

substantial completion or when system starts affecting conditions in tenant spaces that owner/owners service provider must respond to.

- 2.6.3 Provide one (1) additional training session at each of 6 and 9 months, following substantial completion. Each session shall be a half day in length and must be coordinated with the building owner/owners service provider.
- 2.6.4 Train the designated staff of owner's representative and owner to enable them to do the following:
 - 2.6.4.1 Day-to-day Operators: range of 4 to 8 persons (2 sessions)
 - 2.6.4.2 Proficiently operate the system
 - 2.6.4.3 Understand control system architecture and configuration
 - 2.6.4.4 Understand DDC system components
 - 2.6.4.5 Understand system operation, including DDC system control and optimizing routines (algorithms)
 - 2.6.4.6 Operate the workstation and peripherals
 - 2.6.4.7 Log on and off the system
 - 2.6.4.8 Access graphics, point reports, and logs
 - 2.6.4.9 Adjust and change system set points, time schedules, and holiday schedules
 - 2.6.4.10 Recognize malfunctions of the system by observation of the printed copy and graphical visual signals
 - 2.6.4.11 Understand system drawings and Operation and Maintenance manual
 - 2.6.4.12 Understand the job layout and location of control components
 - 2.6.4.13 Access data from DDC controllers and ASCs
 - 2.6.4.14 Operate portable operator's terminals
 - 2.6.4.15 Make and change graphics on the workstation
 - 2.6.4.16 Create, delete, and modify alarms, including annunciation and routing of these
 - 2.6.4.17 Create, delete, and modify point trend logs and graph or print these both on an ad-hoc basis and at user-definable time intervals
 - 2.6.4.18 Create, delete, and modify reports
 - 2.6.4.19 Add, remove, and modify system's physical points
 - 2.6.4.20 Create, modify, and delete programming
 - 2.6.4.21 Add panels when required

- 2.6.4.22 Add operator interface stations
- 2.6.4.23 Create, delete, and modify system displays, both graphical and others
- 2.6.4.24 Perform DDC system field checkout procedures
- 2.6.4.25 Perform DDC controller unit operation and maintenance procedures
- 2.6.4.26 Perform workstation and peripheral operation and maintenance procedures
- 2.6.4.27 Perform DDC system diagnostic procedures
- 2.6.4.28 Configure hardware including PC boards, switches, communication, and I/O points
- 2.6.4.29 Maintain, calibrate, troubleshoot, diagnose, and repair hardware
- 2.6.4.30 Adjust, calibrate, and replace system components
- 2.6.4.31 Maintain software and prepare backups
- 2.6.4.32 Interface with job-specific, third-party operator software
- 2.6.4.33 Add new users and understand password security procedures
- 2.6.4.34 Participants may attend one or more of these, depending on level of knowledge required.
- 2.6.4.35 The instructor(s) shall provide one copy of training material per student.
- 2.6.4.36 The instructor(s) shall be factory-trained instructors experienced in presenting this material.
- 2.6.4.37 Training shall include classroom and onsite training, using the installed system working controllers without affecting the space conditions.

PART 3 - REFERENCES

- 3.1 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
- 3.2 AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS, INC. (ASHRAE)
- 3.3 AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)
- 3.4 AMERICAN SOCIETY OF PLUMBING ENGINEERS (ASPE)
- 3.5 CANADIAN STANDARDS ASSOCIATION (CSA)
- 3.6 CANADIAN ELECTRICAL CODE (CEC OR CSA C22)
- 3.7 NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
- 3.8 SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION (SMACNA)
- 3.9 NATIONAL TESTING, ADJUSTING AND BALANCING BUREAU (TABB)

PART 4 - QUALITY ASSURANCE

- 4.1 USE FACTORY / OEM TRAINED REPRESENTATIVES OR THEIR APPOINTED DESIGNATES AND SUBMIT MANUFACTURER'S STARTUP AND CHECK SHEETS FOR STARTING AND WARRANTY INITIALIZATION OF ALL SYSTEMS AND EQUIPMENT.
- 4.2 TESTING AND CERTIFICATION OF EACH BACKFLOW PREVENTION DEVICE SHALL BE BY AN "APPROVED CROSS CONNECTION INSTALLATION SPECIALIST". ONE COPY OF THE CERTIFICATE TO BE SUBMITTED TO RESPECTIVE MUNICIPAL AUTHORITY, AND ONE COPY IS TO BE INSERTED IN EACH O & M MANUAL.
- 4.3 PRIOR TO CHARGING, ENERGIZING, FILLING, STARTING, TESTING, BALANCING, ADJUSTING, AND CLEANING PROCESSES, VERIFY WITH CONSULTANT AND THE CXA ANY TESTS REQUIRED TO BE WITNESSED. PROVIDE SUFFICIENT NOTICE TO CONSULTANT PRIOR TO COMMENCEMENT OF PROCEDURES.
- 4.4 CONSULTANT SHALL BE ALLOWED TO WITNESS ANY TESTING, CHARGING, ENERGIZING, FILLING, STARTING, BALANCING, ADJUSTING, AND CLEANING PROCESSES.
- 4.5 ASSUME ALL COSTS ASSOCIATED WITH THE PHASES OF STARTING AND TESTING, INCLUDING THE SUPPLY OF TESTING, DEMONSTRATION OR CLEANING SUPPLIES AND EQUIPMENT.
- 4.6 PRIOR TO STARTING EQUIPMENT OR SYSTEMS, SECURE AND REVIEW MANUFACTURER'S INSTALLATION, OPERATION, AND STARTING INSTRUCTIONS. READ IN CONJUNCTION WITH PROCEDURES DEFINED HEREIN.
- 4.7 USE MANUFACTURER'S OR SUPPLIER'S STARTING PERSONNEL WHERE REQUIRED TO ENSURE INTEGRITY OF MANUFACTURER'S WARRANTY.
- 4.8 COMPARE INSTALLATIONS TO PUBLISHED MANUFACTURER'S DATA AND RECORD DISCREPANCIES. ITEMS POTENTIALLY DETRIMENTAL TO EQUIPMENT PERFORMANCE SHALL BE CORRECTED PRIOR TO EQUIPMENT STARTING.
- 4.9 SOME PROCESSES INVOLVED IN STARTING PROCEDURES DEFINED IN THIS SECTION MAY BE DUPLICATIONS OF AUTHORITIES VERIFICATION. TO FACILITATE EXPEDIENT COMPLETION OF PROJECT, ARRANGE FOR AUTHORITIES TO ASSIST OR WITNESS THESE PROCEDURES.
- 4.10 ALL STARTING, TESTING, AND PROCEDURES SHALL BE IN ACCORDANCE WITH APPLICABLE PORTIONS OF ASME, ASHRAE, AABC, CSA, NFPA, SMACNA, ASTM, ASPE AND AS REQUIRED AND OUTLINED IN THESE

SPECIFICATIONS. IN PARTICULAR NOTE THE TESTING REQUIREMENTS OF THE OEM, AND OF THE LOCAL AUTHORITIES HAVING JURISDICTION.

- 4.11 PERSONNEL INVOLVED IN STARTING, TESTING, BALANCING AND ADJUSTING PROCEDURES SHALL BE EXPERIENCED IN THE DESIGN AND OPERATION OF MECHANICAL EQUIPMENT AND SYSTEMS BEING CHECKED AND SHALL BE ABLE TO INTERPRET RESULTS OF THE READINGS AND TESTS.
- 4.12 FAILURE TO FOLLOW INSTRUCTIONS PERTAINING TO CORRECT STARTING PROCEDURES MAY RESULT IN RE- EVALUATION OF EQUIPMENT BY AN INDEPENDENT TESTING AGENCY SELECTED BY OWNER AT CONTRACTOR'S EXPENSE. SHOULD RESULTS REVEAL EQUIPMENT HAS NOT BEEN PROPERLY STARTED, EQUIPMENT MAY BE REJECTED, REMOVED FROM SITE, AND REPLACED. REPLACEMENT EQUIPMENT SHALL ALSO BE SUBJECT TO FULL STARTING PROCEDURES, USING SAME PROCEDURES SPECIFIED ON THE ORIGINALLY INSTALLED EQUIPMENT.
- 4.13 ASSUME ALL LIABILITIES ASSOCIATED WITH STARTING, TESTING AND BALANCING PROCEDURES.

PART 5 - SAMPLE FORMS

- 5.1 THE SAMPLE CX PLAN CONTAINS A SAMPLE MECHANICAL START-UP CHECKSHEETS. PRE-FUNCTIONAL CHECK SHEETS WILL BE PROVIDED AT THE BEGINNING OF THE CONSTRUCTION PHASE.

END OF THIS SECTION

PART 1 - GENERAL

1.1 GENERAL

Section 20 00 06 - General Requirements, shall apply to and govern this section.

1.1.1 SCOPE OF WORK

- 3.1.1 Division 26 - Electrical will do all line side power wiring for equipment provided by Division 23 – HVAC and Division 25 – Integrated Automation.
- 3.1.2 Field control wiring of local safeties and interlocks for packaged equipment shall be provided under the respective Sections unless otherwise specified.
- 3.1.3 Conduit and wiring materials and methods shall be in strict accordance with the requirements of Division 26 - Electrical.
- 3.1.4 Check all wiring diagrams and control diagrams submitted in shop drawing form. Before submitting these shop drawings to the Consultant, submit these drawings to Division 26 - Electrical Contractor for approval. Have these drawings stamped by Division 26 - Electrical Contractor as verification of their approval before forwarding to the Consultant. Co-operate in the commissioning of all electrically driven equipment with Division 26 - Electrical.

PART 2 - PRODUCTS

2. GENERAL

- 3.2.1 Conduit and wiring materials and methods shall be in strict accordance with the requirements of Division 26 - Electrical.

PART 3 - EXECUTION

1. GENERAL

- 3.1.1 Refer to Division 26 - Electrical.

END OF SECTION

PART 1 - General

1.1 **GENERAL**

1.1.1 Section shall apply to and govern this section.

1.2 **SHOP DRAWINGS**

1.2.1 Submit shop drawings for all fire protection valves.

PART 2 - Products

2.1 **GENERAL**

2.1.1 All valves to be used on the fire protection system shall be approved by Underwriters Laboratories of Canada or Associated Factory Mutual Fire Assurance companies and shall bear identifying mark or label such as F.M., U.L.C., and I.A.O.

2.2 **VALVES**

2.2.1 Gate Valves

2.2.1.1 Up to DN50 (50mm) – shall be bronze O.S. & Y, rising spindle, double disc, 1,379kPa (200 psi).

Threaded ends - Jenkins Fig. 820J.

2.2.1.2 DN65 (64mm) and up – shall be iron body to ASTM A126-95 Class B, bronze mounted, O.S.&Y. solid wedge, rising spindle, double disc, flanged ends, 1,379kPa (200 psi) water, oil and gas.

2.2.1.3 Grooved end gate valves, DN65 (64mm) and up, shall be ductile iron body to ASTM A536, Grade 65-45-12, bronze mounted, O.S.&Y. resilient wedge, brass rising stem, cast iron, EPDM coated disc, grooved ends, 1725kPa (250 psi) CWP. Victaulic FireLock Series 771.

2.2.2 Butterfly Valves

2.2.2.1 DN65 (64mm) and up – shall be ductile iron body to ASTM A536, Grade 65-45-12, ductile iron disc with EPDM coating, weatherproof actuator with pre-wired supervisory switches, grooved ends, 2,065kPa (300 psi) CWP. Victaulic FireLock Series 705W.

2.2.3 Ball Valves

2.2.3.1 Up to DN50 (50mm) – shall be bronze body, standard port, chrome-plated brass ball, stainless steel stem, TFE seats, grooved or threaded ends with brass gear box. Victaulic FireLock Series 728.

2.2.4 Check Valves

2.2.4.1 DN65 (64mm) and up – shall be iron body to ASTM A126-95 Class B, bronze mounted, swing check with renewable bronze disc and seat ring.

Flanged ends - Jenkins Fig. 477J
 - Mueller 101M-AP

Valves on Siamese connection to have rubber faced disc.

Flanged ends - Jenkins Fig. 477J RD

- 2.2.4.2 Grooved end check valves, DN65 (64mm) and up, shall be ductile iron body to ASTM A-536, Grade 65-45-12, non-slam aluminum bronze or elastomer coated ductile iron disc, stainless steel spring and shaft, PPS coated or welded-in nickel seat, grooved ends. Victaulic FireLock Series 717 or 717R.

PART 3 - Execution

3.1 **GENERAL**

- 3.1.1 Valves shall be same size as line in which installed.
- 3.1.2 Valves shall be located in such a manner that the top works, operators, and bonnets may be easily removed.
- 3.1.3 Stems of valves shall be positioned for maximum ease of use, but in no event in a manner causing a hazard, or with stem down unless specifically shown as such.
- 3.1.4 Provide valves where shown on Drawings, or on schematic diagrams, or in details, or as specified.

3.2 **VALVES**

- 3.2.1 Provide valves on all mains and sub-mains to completely control, shut off and drain the system.
- 3.2.2 Provide all necessary drips and drains to completely empty the system.
- 3.2.3 Provide all necessary test and flushing connections. Provide sight flow connections where flow cannot be seen from shut-off valve location. Install chain operators and chains on valves 1.8m (6 ft.) or higher above floor. Keep chains out of working areas or ceilings.
- 3.2.4 Install a shut-off valve on each riser.
- 3.2.5 Shut-off valves upstream of fire pumps shall be supervised O.S.&Y. gate valves.

END OF SECTION

PART 1 - GENERAL

1.1 **GENERAL**

1.1.1 All equipment and accessories shall be I.A.O., UL, ULC, or FM labelled and/or approved.

1.1.2 All systems shall be designed to NFPA-13 standards and the Owner's Insurance Underwriters approval.

1.2 **SCOPE OF WORK**

1.2.1 Provide all labour, materials, tools, equipment, training, commissioning and certification required to complete the work as shown on the drawings and specified herein, including:

1.2.1.1 Dry-pipe systems.

1.2.1.2 Wet sprinkler systems.

1.2.1.3 Window sprinkler systems.

1.2.2 Contract starts at flanged connection 300mm (12") above floor

1.2.3 Apply and pay for all permits.

1.2.4 Provide all electrical supervision devices for each shutoff valve in system. Refer to Section 21 05 23 – Fire Protection Valves.

1.2.5 Provide all required additional electrical work and Division 26 – Electrical. Complete electrical work in accordance with Division 26 – Electrical.

1.2.6 Provide all additional working plans or load calculations as may be required by the bodies having jurisdiction. Include all costs pertaining to the review of these plans and calculations. All working plans and calculations shall be submitted to the Owner's insurer and local Fire Department for approval as required prior to construction commencement.

1.2.7 All pipe sizes, head location, head quantity, and layout of new systems shown on Drawings are to assist tender coordination only. It is the responsibility of the Contractor to ensure adequate head coverage, head quantities, pipe sizing, zoning, and valving for the system as per NFPA 13 hazard occupancies, Owner's Insurers' standards, and authorities having jurisdiction. Install additional heads, valves, and resize piping as required at no additional cost to the Owner. Size reduction of sprinkler main shall not be accepted unless approved by the Consultant. Re-routing of sprinkler main shall be approved in advance by the Consultant.

1.2.8 Identify all changes to the fire alarm system resulting from sprinkler shop drawings. All cost related to changes initiated by the Sprinkler Designer shall be the responsibility of Division 21 – Fire Suppression.

- 1.2.9 Obtain flow and pressure available from city main and obtain approval from IAO before commencing work. Verify flow and pressure data shown on contract documents with local authorities. Undertake flow test were required, at no additional cost to the Owner. Conduct test in accordance with IAO Standards.

1.3 **QUALITY ASSURANCE**

- 1.3.1 The system installation shall be carried out by a sprinkler company who is a member in good standing of the Canadian Automatic Sprinkler Association.

- 1.3.2 To assure uniformity and compatibility of piping components in grooved piping systems, all grooved products utilized shall be from the same manufacturer. Grooving tools shall be supplied by the same manufacturer as the grooved components.

1.4 **LAYOUT DRAWINGS**

- 1.4.1 Sprinkler layout as shown on the Drawings is diagrammatic. Refer to latest Architectural Drawings for final layout of wall, partitions, and occupancy areas.

- 1.4.2 Sprinkler contractor must check and verify all dimensions and conditions on the job, and ensure that the Work can be performed as indicated. Report all discrepancies to the Consultant before proceeding with the Work.

- 1.4.3 Prepare complete sprinkler layout drawings, arranging piping runs and sprinkler heads in proper relation to other equipment such as light fixtures, ducts, etc., to ensure clear ceiling heights indicated on Drawings. Coordinate location of sprinkler heads in suspended ceilings with the location of lighting, grilles, diffusers, and similar items. Maintain maximum headroom in areas with no ceilings.

- 1.4.4 Layout drawings shall also include all hydraulic calculations.

- 1.4.5 Obtain approval of the sprinkler layout drawings by an Insurers' Advisory Organization, and the Consultant before any work is started.

- 1.4.6 Sprinkler layout drawings shall take into consideration, architectural, structural, mechanical and electrical layouts of the building and sprinkler mains and branches must be arranged to not interfere with any of the aforementioned.

- 1.4.7 Submit drawings, support details, and weights to structural engineer for review.

- 1.4.8 Sprinkler heads are to be installed symmetrically in ceiling tiles.

- 1.4.9 Layout drawings are to be sealed by a Registered Professional Engineer, registered in the Province of Ontario.

- 1.4.10 Submit drawings to the Consultant for review only after they have been approved by the local authorities and the Owner's Insurer.

1.5 **SUBMITTALS**

- 1.5.1 Submit shop drawings for the following:

- 1.5.1.1 Sprinkler system layout, including hydraulic calculations
- 1.5.1.2 Sprinkler heads
- 1.5.1.3 Insulator switches
- 1.5.1.4 Alarm valves - wet and dry
- 1.5.1.5 Excess pressure pump
- 1.5.1.6 Pressure reducing stations
- 1.5.1.7 Air compressor
- 1.5.1.8 Flow switches
- 1.5.1.9 Low pressure switches
- 1.5.2 Layout drawings shall be approved by local Fire Department and Owner's Insurer prior submission to Consultant. All costs related to obtaining agency approval shall be borne by this Contractor.
- 1.5.3 Submit samples of all sprinkler heads to be used to the Consultant.
- 1.5.4 Forward to the Owner on completion of the contract the final unconditional acceptance certificates of the authorities.
- 1.5.5 Grooved joint couplings and fittings shall be shown on drawings and product submittals, and be specifically identified with the applicable style or series number.
- 1.5.6 Sprinklers shall be referred to on drawings, submittals and other documentation, by the sprinkler identification or model number as specifically published in the appropriate agency listing or approval. Trade names or other abbreviated designations shall not be allowed.
- 1.6 **DESIGN REQUIREMENTS**
 - 1.6.1 Size piping on basis of hydraulic design.
 - 1.6.2 Do all necessary hydraulic design, piping calculations, and submit to governing authorities for approval.
- 1.7 **HYDRAULIC CALCULATIONS**
 - 1.7.1 Office Areas, Court Rooms.
 - 1.7.1.1 System shall be hydraulically designed.
 - 1.7.1.2 Hazard classification – Light Hazard.
 - 1.7.1.3 Rate of water application (density) 0.068 L/s/m² (0.1 gpm/ft²) over 139 m² (1,500 ft²).

- 1.7.1.4 Pipe sizes shall be based on 16.3 m² (175 ft²) per head.
- 1.7.1.5 The reflected ceiling layout as prepared by the Consultant shall not be altered or revised by this requirement. The number and location of heads shown shall remain as shown as a minimum.
- 1.7.1.6 System shall be hydraulically designed.
- 1.7.1.7 Hazard Classification – Ordinary Hazard Group 1.
- 1.7.1.8 Rate of water application (density) 0.102 L/s/m² (0.15 gpm/ft²) over 139 m² (1,500 ft²).

PART 2 - PRODUCTS

2.1 **ELECTRIC SUPERVISION**

- 2.1.1 The sprinkler system shall be electrically supervised to indicate a trouble signal on the building fire alarm system annunciator for each of the following:
 - 2.1.1.1 Movement of control valve handle.
 - 2.1.1.2 Loss of excess water pressure required to prevent false alarms in a wet pipe system.
 - 2.1.1.3 Loss of air pressure in a dry pipe system.
 - 2.1.1.4 Loss of air pressure in a pressure tank.
 - 2.1.1.5 Loss of electrical power or phase reversal in any automatically starting electrical fire pump.
 - 2.1.1.6 Fire pump running.
 - 2.1.1.7 Sprinkler zone flow alarm.

2.2 **PRESSURE REDUCING VALVES**

- 2.2.1 Provide ULC (FM) listed pressure reducing stations equal to Tyco PRV-1 where shown on Drawings. Stations shall be complete with isolating valves, strainer, pressure gauges, cast iron body and bronze trim.
- 2.2.2 Select valves for inlet and outlet pressures as shown on Drawings.

2.3 **AIR COMPRESSOR**

- 2.3.1 Supply and install an Appl air compressor for the dry-pipe system.
- 2.3.2 Connect compressor to dry-pipe system complete with all valves, check valves and relief.
- 2.3.3 Compressor to be ULC listed, sized to allow charging of dry-pipe system within time limit required by NFPA and Authorities.

2.4 TEST AND DRAIN FITTINGS

- 2.4.1 For each system, provide Tyco Model F350 Sectional Test and Drain or Victaulic Style 720 TestMaster II combined test and drain fitting with orifice sized according to the installed sprinkler heads.
- 2.4.2 Pipe discharge to outside or the nearest floor drain. Outside drains shall be complete with 65mm (2-1/2") connections with cap and chain. Wall plate shall match the siamese connection.

2.5 SPRINKLER HEADS

- 2.5.1 Provide Tyco Model TY-FRB pendant automatic semi-recessed sprinklers complete with mounting plates all chrome plated in suspended ceilings.
- 2.5.2 Provide Tyco Model RFII concealed clean line sprinkler heads in all drywall ceilings. Plate cover colour to be selected by Consultant.
- 2.5.3 Provide Tyco Model TY-FRB rough brass upright or pendant sprinkler heads in areas without suspended ceilings.
- 2.5.4 Sidewall sprinkler heads shall be Tyco Model TY-FRB, all chrome plated.
- 2.5.5 Window sprinkler heads shall be Tyco Model WS, vertical pendent arrangement, polyester coated, white color.
- 2.5.6 Temperature ratings of sprinkler heads shall be suitable for the particular location, i.e. in general 75°C (167°F) heads shall be used, with higher temperature heads adjacent to unit heaters, etc.
- 2.5.7 Sprinklers shall be glass bulb type. Body shall be die-cast brass with hex-shaped wrench boss cast into the body to facilitate installation and reduce the risk of damage during installation.
- 2.5.8 Provide sprinkler guards for sprinkler heads in storage areas, mechanical rooms, and receiving area. Sprinklers guards shall be listed, supplied, and approved for use with the sprinkler by the sprinkler manufacturer.
- 2.5.9 The sprinkler bulb protector must remain in place until the sprinkler is completely installed and before the system is placed in service. Remove bulb protectors carefully by hand after installation. Do not use any tools to remove bulb protectors.

2.6 PIPE AND FITTINGS

- 2.6.1 Unburied piping shall be standard Schedule 40 black steel pipe, stretch reduced continuous weld up to and including 100mm (4") dia. and for 125mm dia. (5") and over, electric resistance weld. Where approved by the Authorities, lightwall piping may be used for piping of 50mm (2") dia. and over.
- 2.6.2 Fittings shall be standard screwed iron fittings.
- 2.6.3 Fittings shall be standard welding fittings if approved by authorities having jurisdiction.

- 2.6.4 Mechanical couplings such as Victaulic or Tyco/Grinnell may be used. Couplings shall be ULC listed and FM approved.
- 2.6.4.1 Mechanical couplings shall consist of two ASTM A536 ductile iron housings, pressure-responsive synthetic rubber gasket (grade to suit the intended service) and plated steel bolts and nuts.
- 2.6.4.2 Rigid Type Couplings: Housings shall be cast with offsetting, angle-pattern bolt pads to provide system rigidity and support and hanging in accordance with NFPA 13. Tongue and recess rigid type couplings shall only be permitted if the contractor uses a torque wrench for installation. Required torque shall be in accordance with the manufacturer's recommendations. Contractor shall remove and replace any improperly installed joints.
- 2.6.4.3 32mm – 100mm (1-1/4" thru 4"): "Installation Ready" rigid type coupling designed for direct "stab" installation onto grooved end pipe without prior disassembly of the coupling equal to Victaulic FireLock® EZ Style 009.
- 2.6.4.4 125mm (5") and larger: standard rigid joint, Victaulic FireLock® Style 005 or Style 07 Zero-Flex®.
- 2.6.4.5 Flexible type couplings: use in seismic areas where required by NFPA 13. Victaulic Style 75 or 77.
- 2.6.4.6 Grooved end fittings: ASTM A536 ductile iron, short radius, full flow (FireLock®), or standard ASTM A536 ductile iron, forged steel or ASTM A53 fabricated carbon steel fittings, factory grooved, designed to accept Victaulic couplings.
- 2.6.4.7 Grooved joint flange adapters: ASTM A536 ductile iron casting, flat faced, for incorporating flanged components with ANSI Class 125, 150 and 300 bolt-hole patterns to a grooved system. Victaulic Style 741, 743 or 744.
- 2.7 **PIPING "LOW PRESSURE" ALARM SENSOR**
- 2.7.1 ULC listed, 115 Volt or 24 Volt (to suit fire alarm system) adjustable piping mounted pressure sensor with contacts arranged to actuate a fire alarm system trouble signal if piping pressure drops to a pressure below the switch setting.
- 2.8 **WATER FLOW ALARM SWITCHES**
- 2.8.1 Potter Model VSR-F, ULC listed and FM approved, pipe mounting water flow alarm switch 50mm (2") to 200mm (8"), complete with:
- 2.8.1.1 A vane type sensor operating two single-pole, double-throw, snap action switches when sustained water flow exceeds 0.63 L/s (10 USgpm).
- 2.8.1.2 An integral, field adjustable retard device with automatic reset to delay switch operation to reduce the possibility of false alarms caused by a single or series of transient water flow surges.
- 2.8.1.3 A tamper-proof cover.

2.8.1.4 A U-bolt and piping saddle.

2.8.2 Where grooved end mechanical coupling joint piping is used, Victaulic Model WFD ULC listed and FM approved water flow alarm switch is also acceptable.

2.9 **SPRINKLER ZONE ALARM, TEST AND DRAIN ASSEMBLIES**

2.9.1 Tyco ULC listed and FM approved Model F350 Series factory assembled sprinkler zone alarm, pressure gauge, test and drain assemblies, each consisting of a water flow alarm, test and drain valves, a water flow sight glass, and interconnecting black steel piping and accessories, 50mm (2"), 65mm (2-1/2"), and 80mm (3") sizes.

2.9.2 Victaulic Style 747M zone control riser module assembly is also acceptable.

2.9.3 Install sprinkler zone alarm assembly in NFE Model #CV-200 lockable cabinet. Cabinet shall be constructed of 1.19mm (18-gauge) baked white enamel corrosion protected steel tub with 2mm (14-gauge) grey baked enamel steel door and frame with hollow channel reinforcement. Front section to have 51mm (2") adjustment to wall surface and complete with 13mm (1/2") turn back frame. Full metal door shall be fitted with full-length semi-concealed piano hinges, and flush stainless steel door latch.

2.9.4 Pipe module to drain.

2.10 **PRESSURE GAUGES**

2.10.1 Pressure gauges shall be ULC listed.

2.10.2 Provide pressure gauges of the Bourdon type, minimum one percent accuracy through the entire range, complete with bronze Bourdon tube, brass socket, brass rotary movement, bronze bushings, tube and movement independently mounted from case, stainless steel case and ring, inherent shock protection. Furnish gauges having 114mm (4-1/2") dial, black graduations, black case, silver brazed joints, and adjustable black pointer.

2.10.3 Select gauges to suit fluid working pressure and, if possible, test pressure. If test pressure falls outside safe instrument range, attach a note to this effect on the installation instructions. Ensure that the normal working pressure occurs approximately at mid scale.

2.10.4 Install each gauge complete with 6mm (1/8") or 8mm (1/4") bar stock valve, rated 150°C (300°F) and 6,895 kPa (1,000 psi). Provide pressure snubber on all pump services. Install pressure gauges as noted.

2.10.5 Submit a schedule in shop drawing form showing service, location, range, make, and catalogue number for gauges.

PART 3 - EXECUTION

3.1 **PIPE AND FITTINGS**

- 3.1.1 Provide unions, couplings, or flanges at all connections to equipment or fixtures requiring servicing or replacement.
- 3.1.2 Provide Underwriter approved hangers, and support all piping from building structure. Under no circumstances shall piping be hung from ductwork or steel roof-deck. Provide secondary steel supports where piping under ducts cannot be supported directly from structure. Where pipes are hung from joists, they shall be hung from top cord.
- 3.1.3 Sprinkler mains and branch headers shall be routed to avoid electrical, battery, UPS, elevator machine, diesel generator, switch gear and telephone rooms, unless prior approval is obtained from Consultant.
- 3.1.4 Grooved joint piping systems shall be installed in accordance with the manufacturer's guidelines and recommendations. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be supplied by coupling manufacturer. Grooved end shall be clean and free from indentations, projections and roll marks in the area from pipe end to groove. A factory trained field representative shall provide on-site training to contractor's field personnel in the installation of grooved piping products. Factory trained representative shall periodically review the product installation. Contractor shall remove and replace any improperly installed products.
- 3.2 **EXCESS PRESSURE PUMPS**
- 3.2.1 Support pumps rigidly by steel mounting plate attached to the flange above the alarm valve.
- 3.3 **EXTRA STOCK OF SPRINKLER HEADS**
- 3.3.1 Provide one (1) wall mounted steel cabinet with sprinkler wrench and six (6) heads of each type used in the installation. Cabinet shall have baked on enamel finish.
- 3.4 **ELECTRICAL WORK**
- 3.4.1 All wiring from the alarm valve, monitor switches and flow switches shall be done by Division 26 - Electrical.
- 3.4.2 All power wiring shall be by Division 26 - Electrical.
- 3.4.3 Provide all other field wiring required.
- 3.5 **TESTING, ADJUSTING, FLUSHING, BOILING OUT AND CLEANING**
- 3.5.1 After system is complete, flush and test entire system in accordance with NFPA-13.
- 3.5.2 Test all sprinkler lines hydrostatically at 2 times the working pressure or as required by the authorities but at not less than 1,380 kPa (200 psi), for a period of not less than four (4) hours without any drop in pressure. Do testing before piping is buried or furred in and before pressure sensitive devices are installed in the pipework. Correct all defects disclosed by tests. Retest until all results are acceptable.

- 3.5.3 If any leaks are discovered by the above tests, remove and replace the faulty portions of the systems and repeat the test. Repeat this procedure until the system is accepted by the consultant's representative on the site. Do not caulk threaded joints.
- 3.5.4 Check horizontal pipe with an accurate level for any alterations in pitch. Inspect laterals and cross arms, eliminate pockets.
- 3.5.5 Flush the system at full flow rate for ten (10) minutes, or until all foreign materials have been removed and the work is clear. Provide a standard certificate that flushing has been properly carried out and submit to Consultant.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Use of mechanical systems during construction.
- .2 Related Requirements
 - .1 Section 20 00 06.

1.2 USE OF SYSTEMS

- .1 Use of new HVAC systems for supplying temporary ventilation and heat is [permitted only under following conditions:
 - .1 There is no possibility of damage.
 - .2 Supply ventilation systems are protected by filters, inspected daily, changed every week or more frequently as required.
 - .3 Return systems have approved filters over openings, inlets, outlets.
 - .4 Warranties and guarantees are not relaxed.
 - .5 Regular preventive and other manufacturers recommended maintenance routines are performed by Contractor at own expense and under supervision of General Contractor.
 - .6 Refurbish system in work area before static completion; clean internally and externally,
- .2 Filters specified in this Section are over and above those specified in other Sections of this project.
- .3 Exhaust systems are not included in approvals for temporary heating ventilation.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 20 00 06

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section [01 33 00- Submittal Procedures] .
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for all HVAC equipment.
- .3 Shop Drawings:
 - .1 Indicate on drawings:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.
 - .3 Motor sizes and voltage.
 - .4 Equipment capacities.
 - .2 Shop drawings and product data accompanied by:
 - .1 Detailed drawings of bases, supports, and anchor bolts.
 - .2 Acoustical sound power data, where applicable.
 - .3 Points of operation on performance curves.
 - .4 Manufacturer to certify current model production.
 - .5 Certification of compliance to applicable codes.
 - .3 In addition to transmittal letter, use mechanical engineer's equipment tags.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with requirements of this Section.
- .2 Operation and Maintenance Data: submit operation and maintenance data for all mechanical HVAC equipment.
 - .1 Operation and maintenance manual approved by, and final copies deposited with, project engineer before final inspection.
 - .2 Operation data to include:
 - .1 Control schematics for systems including environmental controls.
 - .2 Description of systems and their controls.
 - .3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
 - .4 Operation instruction for systems and component.
 - .5 Description of actions to be taken in event of equipment failure.
 - .6 Valves schedule and flow diagram.
 - .7 Colour coding chart.

- .8 Valve Tag Chart
- .3 Maintenance data to include:
 - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
 - .2 Data to include schedules of tasks, frequency, tools required and task time.
- .4 Performance data to include:
 - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
 - .2 Equipment performance verification test results.
 - .3 Special performance data as specified.
 - .4 Testing, adjusting and balancing reports as specified in the relevant section.
- .5 Approvals:
 - .1 Submit 2 copies of draft Operation and Maintenance Manual to Engineer.
 - .2 Make changes as required and re-submit as directed by Engineer .
- .6 Additional data:
 - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
- .7 Site records:
 - .1 Engineer will provide 1 set of mechanical drawings in Aurocad. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring .
 - .2 Transfer information to Autocad drawings to show work as actually installed.
 - .3 Make available for reference purposes and inspection.
- .8 As-built drawings:
 - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of Autocad as-built drawings.
 - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" Signature of Contractor, Date.
 - .3 Submit to Engineer for approval and make corrections as directed.
 - .4 Perform testing, adjusting and balancing for HVAC using as-built drawings.
 - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
- .9 Submit copies of as-built drawings for inclusion in final TAB report.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance 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 in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 N/A

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable.
 - .1 Visually inspect substrate.
 - .2 Inform General Contractor and Engineer of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 PAINTING REPAIRS AND RESTORATION

- .1 Do painting as required.
- .2 Prime and touch up marred finished paintwork to match original.
- .3 Restore to new condition, finishes which have been damaged.

3.3 SYSTEM CLEANING

- .1 Vacuum interior of ductwork in the work area.

3.4 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit.
 - .2 Provide manufacturer's start up report for all boilers and air handling units.

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with General Contractor's instructions. Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

3.6 PROTECTION

- .1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 23 05 00.

1.2 REFERENCE STANDARDS

- .1 American Society of Mechanical Engineers (ASME)
 - .1 ASME B31.1-07, Power Piping.
- .2 ASTM International (ASTM)
 - .1 ASTM A125-1996(2007), Standard Specification for Steel Springs, Helical, Heat-Treated.
 - .2 ASTM A307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .3 ASTM A563-07a , Standard Specification for Carbon and Alloy Steel Nuts.
- .3 Factory Mutual (FM)
- .4 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
 - .1 MSS SP58-2002, Pipe Hangers and Supports - Materials, Design and Manufacture.
 - .2 MSS SP69-2003, Pipe Hangers and Supports - Selection and Application.
 - .3 MSS SP89-2003, Pipe Hangers and Supports - Fabrication and Installation Practices.
- .5 National Research Council Canada (NRC)
 - .1 National Plumbing Code of Canada 2015 (NPC).
- .6 Underwriter's Laboratories of Canada (ULC)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 23 05 00.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit shop drawings for:
 - .1 Bases, hangers and supports.
 - .2 Connections to equipment and structure.
 - .3 Structural assemblies.

- .4 Certificates:
 - .1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

- .5 Manufacturers' Instructions:
 - .1 Provide manufacturer's installation instructions.

1.4 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for incorporation into maintenance manual.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse or recycling in accordance with General Contractor's instructions.

Part 2 Products

2.1 SYSTEM DESCRIPTION

- .1 Design Requirements:
 - .1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.
 - .2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP58.
 - .3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.
 - .4 Design hangers and supports to support systems under conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.
 - .5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP58.
- .2 Performance Requirements:
 - .1 Design supports, platforms, catwalks, hangers to withstand seismic events if specified.

2.2 GENERAL

- .1 Fabricate hangers, supports and sway braces in accordance with MSS SP58. ANSI B31.1 and
- .2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

2.3 PIPE HANGERS

- .1 Finishes:
 - .1 Pipe hangers and supports: galvanized after manufacture.
 - .2 Use electro-plating galvanizing process or hot dipped galvanizing process.
 - .3 Ensure steel hangers in contact with copper piping are epoxy coated or copper plated.
- .2 Upper attachment structural: suspension from lower flange of I-Beam:
 - .1 Cold piping NPS 2 maximum: malleable iron C-clamp with hardened steel cup point setscrew, locknut [carbon steel retaining clip] .
 - .1 Rod: 13 mm FM approved.
 - .2 Cold piping NPS 2 1/2 or greater, hot piping: malleable iron beam clamp, eye rod, jaws and extension with carbon steel retaining clip, tie rod, nuts and washers, UL listed MSS-SP69; FM approved to MSS-SP58.
- .3 Upper attachment structural: suspension from upper flange of I-Beam:
 - .1 Cold piping NPS 2 maximum: ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, FM approved to MSS SP69; UL listed.
 - .2 Cold piping NPS 2 1/2 or greater, hot piping: malleable iron top-of-beam jaw-clamp with hooked rod, spring washer, plain washer and nut; FM approved; UL listed.
- .4 Upper attachment to concrete:
 - .1 Ceiling: carbon steel welded eye rod, clevis plate, clevis pin and cotters with weldless forged steel eye nut. Ensure eye is 6 mm minimum greater than rod diameter.
 - .2 Concrete inserts: wedge shaped body with knockout protector plate UL listed; FM approved to MSS SP69.
- .5 Shop and field-fabricated assemblies:
 - .1 Trapeze hanger assemblies:
 - .2 Steel brackets:
 - .3 Sway braces for seismic restraint systems: if specified.
- .6 Hanger rods: threaded rod material to MSS SP58:
 - .1 Ensure that hanger rods are subject to tensile loading only.
 - .2 Provide linkages where lateral or axial movement of pipework is anticipated.
 - .3 Do not use 22 mm or 28 mm rod.
- .7 Pipe attachments: material to MSS SP58:
 - .1 Attachments for steel piping: carbon steel [black] [galvanized] .
 - .2 Attachments for copper piping: copper plated black steel.
 - .3 Use insulation shields for hot pipework.
 - .4 Oversize pipe hangers and supports.

- .8 Adjustable clevis: material to MSS SP69 UL listed; FM approved, clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.
 - .1 Ensure "U" has hole in bottom for rivetting to insulation shields.
- .9 Yoke style pipe roll: carbon steel yoke, rod and nuts with cast iron roll, to MSS SP69.
- .10 U-bolts: carbon steel to MSS SP69 with 2 nuts at each end to ASTM A563.
 - .1 Finishes for steel pipework: galvanized or black.
 - .2 Finishes for copper, glass, brass or aluminum pipework: black; epoxy coated or galvanized, with formed portion plastic coated.
- .11 Pipe rollers: cast iron roll and roll stand with carbon steel rod to MSS SP69.

2.4 RISER CLAMPS

- .1 Steel or cast iron pipe: galvanized or black carbon steel to MSS SP58, type 42, UL listed; FM approved.
- .2 Copper pipe: carbon steel copper plated to MSS SP58, type 42.
- .3 Bolts: to ASTM A307.
- .4 Nuts: to ASTM A563.

2.5 INSULATION PROTECTION SHIELDS

- .1 Insulated cold piping:
 - .1 64 kg/m³ density insulation plus insulation protection shield to: MSS SP69, galvanized sheet carbon steel. Length designed for maximum 3 m span.
- .2 Insulated hot piping:
 - .1 Curved plate 300 mm long, with edges turned up, welded-in centre plate for pipe sizes NPS 12 and over, carbon steel to comply with MSS SP69.

2.6 CONSTANT SUPPORT SPRING HANGERS

- .1 Springs: alloy steel to ASTM A125, shot peened, magnetic particle inspected, with +/-5% spring rate tolerance, tested for free height, spring rate, loaded height and provided with Certified Mill Test Report (CMTR).
- .2 Load adjustability: [10] % minimum adjustability each side of calibrated load. Adjustment without special tools. Adjustments not to affect travel capabilities.
- .3 Provide upper and lower factory set travel stops.
- .4 Provide load adjustment scale for field adjustments.
- .5 Total travel to be actual travel + 20%. Difference between total travel and actual travel 25 mm minimum.
- .6 Individually calibrated scales on each side of support calibrated prior to shipment, complete with calibration record.

2.7 VARIABLE SUPPORT SPRING HANGERS

- .1 Vertical movement: 13 mm minimum, 50 mm maximum, use single spring pre-compressed variable spring hangers.
- .2 Vertical movement greater than 50 mm: use double spring pre-compressed variable spring hanger with 2 springs in series in single casing.
- .3 Variable spring hanger complete with factory calibrated travel stops. Provide certificate of calibration for each hanger.
- .4 Steel alloy springs: to ASTM A125, shot peened, magnetic particle inspected, with +/-5 % spring rate tolerance, tested for free height, spring rate, loaded height and provided with CMTR.

2.8 EQUIPMENT SUPPORTS

- .1 Fabricate equipment supports not provided by equipment manufacturer or other trades from structural grade steel meeting requirements of structural engineer. Submit calculations with shop drawings.

2.9 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

- .1 Provide templates to ensure accurate location of anchor bolts.

2.10 PLATFORMS AND CATWALKS

- .1 To relevant section.

2.11 HOUSE-KEEPING PADS

- .1 Provide 100 mm high concrete housekeeping pads for base-mounted equipment; size pads 50 mm larger than equipment; chamfer pad edges.
- .2 Concrete: to section for Cast-in-Place Concrete.

2.12 OTHER EQUIPMENT SUPPORTS

- .1 Fabricate equipment supports from structural grade steel meeting requirements of Section 05 12 23- Structural Steel for Buildings.
- .2 Submit structural calculations with shop drawings.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION

- .1 Install in accordance with Manufacturer's instructions and recommendations.

- .2 Vibration Control Devices:
 - .1 Install on piping systems at pumps, boilers, chillers, cooling towers, and as indicated.
- .3 Clamps on riser piping:
 - .1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.
 - .2 Bolt-tightening torques to industry standards.
 - .3 Steel pipes: install below coupling or shear lugs welded to pipe.
 - .4 Cast iron pipes: install below joint.
- .4 Clevis plates:
 - .1 Attach to concrete with minimum of 4 concrete inserts, one at each corner.
- .5 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.
- .6 Use approved constant support type hangers where:
 - .1 Vertical movement of pipework is 13 mm or more,
 - .2 Transfer of load to adjacent hangers or connected equipment is not permitted.
- .7 Use variable support spring hangers where:
 - .1 Transfer of load to adjacent piping or to connected equipment is not critical.
 - .2 Variation in supporting effect does not exceed 25 % of total load.

3.3 HANGER SPACING

- .1 Plumbing piping: to Provincial Plumbing Code and authority having jurisdiction.
- .2 Fire protection: to applicable fire code.
- .3 Gas and fuel oil piping: up to NPS 1/2: every 1.8 m.
- .4 Copper piping: up to NPS 1/2: every 1.5 m.
- .5 Flexible joint roll groove pipe: in accordance with table below for steel, but not less than one hanger at joints. Table listings for straight runs without concentrated loads and where full linear movement is not required.
- .6 Within 300 mm of each elbow.

Maximum Pipe Size : NPS	Maximum Spacing Steel	Maximum Spacing Copper
up to 1-1/4	2.4 m	1.8 m
1-1/2	3.0 m	2.4 m
2	3.0 m	2.4 m
2-1/2	3.7 m	3.0 m
3	3.7 m	3.0 m
3-1/2	3.7 m	3.3 m
4	3.7 m	3.6 m
5	4.3 m	
6	4.3 m	
8	4.3 m	
10	4.9 m	
12	4.9 m	

- .7 Pipework greater than NPS 12: to MSS SP69.

3.4 HANGER INSTALLATION

- .1 Install hanger so that rod is vertical under operating conditions.
- .2 Adjust hangers to equalize load.
- .3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

3.5 HORIZONTAL MOVEMENT

- .1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4 degrees from vertical.
- .2 Where horizontal pipe movement is less than 13 mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

3.6 FINAL ADJUSTMENT

- .1 Adjust hangers and supports:
 - .1 Ensure that rod is vertical under operating conditions.
 - .2 Equalize loads.
- .2 Adjustable clevis:
 - .1 Tighten hanger load nut securely to ensure proper hanger performance.
 - .2 Tighten upper nut after adjustment.
- .3 C-clamps:
 - .1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.
- .4 Beam clamps:
 - .1 Hammer jaw firmly against underside of beam.

3.7 CLEANING

- .1 Clean in accordance with Section [01 74 00- Cleaning and Waster Management] .
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for recycling or reuse in accordance with General Contractor's instructions.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 TAB is used throughout this Section to describe the process, methods and requirements of testing, adjusting and balancing for HVAC.
- .2 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do other work as specified in this section.

1.2 QUALIFICATIONS OF TAB PERSONNEL

- .1 Submit names of personnel to perform TAB to Engineer within 30 days of award of contract.
- .2 Provide documentation confirming qualifications, successful experience.
- .3 TAB: performed in accordance with the requirements of standard under which TAB Firm's qualifications are approved:
 - .1 Associated Air Balance Council, (AABC) National Standards for Total System Balance, MN-1-2002.
 - .2 National Environmental Balancing Bureau (NEBB) TABES, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems-1998.
 - .3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC Systems - Testing, Adjusting and Balancing-2002.
- .4 Recommendations and suggested practices contained in the TAB Standard: mandatory.
- .5 Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.
- .6 Use TAB Standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.
- .7 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.
- .8 TAB Standard quality assurance provisions such as performance guarantees form part of this contract.
 - .1 For systems or system components not covered in TAB Standard, use TAB procedures developed by TAB Specialist.
 - .2 Where new procedures, and requirements, are applicable to Contract requirements have been published or adopted by body responsible for TAB Standard used (AABC, NEBB, or TABB), requirements and recommendations contained in these procedures and requirements are mandatory.

1.3 PURPOSE OF TAB

- .1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads

- .2 Adjust and regulate equipment and systems to meet specified performance requirements and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.

- .3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.

1.4 EXCEPTIONS

- .1 TAB of systems and equipment regulated by codes, standards to satisfaction of authority having jurisdiction.

1.5 CO-ORDINATION

- .1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule to ensure completion before acceptance of project.
- .2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

1.6 PRE-TAB REVIEW

- .1 Review Contract Documents before project construction is started, and confirm in writing to Engineer adequacy of provisions for TAB and other aspects of design and installation pertinent to success of TAB.
- .2 Review specified standards and report to Engineer in writing proposed procedures which vary from standard.
- .3 During construction, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.

1.7 START-UP

- .1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.
- .2 Follow special start-up procedures specified elsewhere in Division 23.

1.8 OPERATION OF SYSTEMS DURING TAB

- .1 Operate systems for length of time required for TAB and as required for verification of TAB reports.

1.9 START OF TAB

- .1 Notify Engineer and General Contractor days prior to start of TAB.
- .2 Start TAB when building is essentially completed, including:
- .3 Installation of ceilings, doors, windows, other construction affecting TAB.
- .4 Application of weatherstripping, sealing, and caulking.
- .5 Pressure, leakage, other tests specified elsewhere Division 23.
- .6 Provisions for TAB installed and operational.
- .7 Start-up, verification for proper, normal and safe operation of mechanical and associated electrical and control systems affecting TAB including but not limited to:

- .1 Proper thermal overload protection in place for electrical equipment.
- .2 Air systems:
 - .1 Filters in place, clean.
 - .2 Duct systems clean.
 - .3 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances.
 - .4 Correct fan rotation.
 - .5 Fire, smoke, volume control dampers installed and open.
 - .6 Coil fins combed, clean.
 - .7 Access doors, installed, closed.
 - .8 Outlets installed, volume control dampers open.

1.10 APPLICATION TOLERANCES

- .1 Do TAB to following tolerances of design values:
 - .1 HVAC systems: plus 5%, minus 5%.

1.11 ACCURACY TOLERANCES

- .1 Measured values accurate to within plus or minus 2 % of actual values.

1.12 INSTRUMENTS

- .1 As part of TAB report, provide list of instruments used together with serial numbers.
- .2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.
- .3 Calibrate within 3 months of TAB.

1.13 PRELIMINARY TAB REPORT

- .1 Submit for checking and approval of Engineer, prior to submission of formal TAB report, sample of rough TAB sheets. Include:
 - .1 Details of instruments used.
 - .2 Details of TAB procedures employed.
 - .3 Calculations procedures.
 - .4 Summaries.

1.14 TAB REPORT

- .1 Format in accordance with SMACNA and NEBB standard .
- .2 TAB report to show results in SI units and to include:
 - .1 Project record drawings.
 - .2 System schematics.
- .3 Submit Acrobat PDF copy of TAB Report to Engineer for review.

1.15 VERIFICATION

- .1 Reported results subject to verification by Engineer.
- .2 Provide personnel and instrumentation to verify up to 30% of reported results.
- .3 Number and location of verified results as directed by Engineer.

- .4 Pay costs to repeat TAB as required to satisfaction of Engineer.

1.16 SETTINGS

- .1 After TAB is completed to satisfaction of Engineer, reinstall drive guards, close access doors, lock devices in set positions, ensure sensors are at required settings.
- .2 Permanently mark settings to allow restoration at any time during life of facility. Do not eradicate or cover markings.

1.17 COMPLETION OF TAB

- .1 TAB considered complete when final TAB Report received and approved by Engineer.

1.18 AIR SYSTEMS

- .1 Standard: TAB to most stringent of this section TAB standards of SMACNA, AABC, ASHRAE.
- .2 Do TAB of following systems, equipment, components, and controls:
 - .1 All air systems.
- .3 Qualifications: personnel performing TAB qualified to standards of AABC; current member in good standing of AABC.
- .4 Quality assurance: perform TAB under direction of supervisor qualified by AABC.
- .5 Measurements: to include as appropriate for systems, equipment, components, controls: air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, dewpoint), duct cross-sectional area, RPM, electrical power, voltage, noise, vibration.
- .6 Locations of equipment measurements: to include as appropriate:
 - .1 Inlet and outlet of dampers, filter, coil, humidifier, fan, other equipment causing changes in conditions.
 - .2 At controllers, controlled device.
- .7 Locations of systems measurements to include as appropriate: main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

1.19 OTHER TAB REQUIREMENTS

- .1 General requirements applicable to work specified this paragraph:
 - .1 Qualifications of TAB personnel: as for air systems specified this section.
 - .2 Quality assurance: as for air systems specified this section.
- .2 Building pressure conditions:
 - .1 Adjust HVAC systems, equipment, controls to ensure specified pressure conditions where specified.
 - .2 TAB procedures:

Part 2 Products

2.1 HVAC Components

- .1 Belts, sheaves and pulleys.

Part 3 Execution

3.1 HVAC Components

- .1 Replace belts, sheaves and pulleys as required to meet air flow requirements for belt driven fan systems.
- .2 Assist HVAC contractor in changing motor speeds if required for multi-speed motors.
- .3 Provide air balancing for new ERV and existing second floor furnace.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 23 05 00.

1.2 REFERENCE STANDARDS

- .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - .1 ANSI/ASHRAE/IESNA 90.1-04, SI; Energy Standard for Buildings Except Low-Rise Residential Buildings.
- .2 ASTM International (ASTM)
 - .1 ASTM B209M-07, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
 - .2 ASTM C335-05ae1, Standard Test Method for Steady State Heat Transfer Properties of Pipe Insulation.
 - .3 ASTM C411-05, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
 - .4 ASTM C449/C449M-00, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
 - .5 ASTM C547-07e1, Standard Specification for Mineral Fiber Pipe Insulation.
 - .6 ASTM C553-02e1, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
 - .7 ASTM C612-04e1, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
 - .8 ASTM C795-03, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
 - .9 ASTM C921-03a, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
- .3 Canadian General Standards Board (CGSB)
 - .1 CGSB 51-GP-52Ma-89, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
- .4 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (2005).
- .5 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-03, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.3 DEFINITIONS

- .1 For purposes of this section:

- .1 "CONCEALED" - insulated mechanical services and equipment in suspended ceilings and non-accessible chases and furred-in spaces.
- .2 "EXPOSED" - means "not concealed" as previously defined.
- .3 Insulation systems - insulation material, fasteners, jackets, and other accessories.
- .2 TIAC Codes:
 - .1 CRD: Code Round Ductwork,
 - .2 CRF: Code Rectangular Finish.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 23 05 00.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for duct insulation, and include product characteristics, performance criteria, physical size, finish and limitations.
 - .1 Description of equipment giving manufacturer's name, type, model, year and capacity.
 - .2 Details of operation, servicing and maintenance.
 - .3 Recommended spare parts list.
- .3 Samples:
 - .1 Submit for approval: complete assembly of each type of insulation system, insulation, coating, and adhesive proposed if requested.
 - .2 Mount sample on 12 mm plywood board.
 - .3 Affix typewritten label beneath sample indicating service.
- .4 Manufacturers' Instructions:
 - .1 Provide manufacturer's written duct insulation jointing recommendations and special handling criteria, installation sequence, cleaning procedures.

1.5 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: specialist in performing work of this section, and have at least 3 years successful experience in this size and type of project

1.6 DELIVERY, STORAGE AND HANDLING

- 1.7 Deliver, store and handle in accordance with manufacturer's written instructions.
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address and ULC markings.
 - .2 Packaging Waste Management: remove for reuse or recycling in accordance with General Contractor's instructions.

Part 2 Products

2.1 FIRE AND SMOKE RATING

- .1 To CAN/ULC-S102:
 - .1 Maximum flame spread rating: 25.
 - .2 Maximum smoke developed rating: 50.

2.2 INSULATION

- .1 Mineral fibre: as specified includes glass fibre, rock wool, slag wool.
- .2 Thermal conductivity ("k" factor) not to exceed specified values at 24 degrees C mean temperature when tested in accordance with ASTM C335.
- .3 TIAC Code C-1: Rigid mineral fibre board to ASTM C612, with factory applied vapour retarder jacket to CGSB 51-GP-52Ma.
- .4 TIAC Code C-2: Mineral fibre blanket to ASTM C553 faced with factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this section).
 - .1 Mineral fibre: to ASTM C553.
 - .2 Jacket: to CGSB 51-GP-52Ma.
 - .3 Maximum "k" factor: to ASTM C553.

2.3 JACKETS

- .1 Canvas:
 - .1 220 gm/m²cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
- .2 Lagging adhesive: compatible with insulation.
 - .1 Maximum VOC limit as per Authorities Having Jurisdiction.
- .3 Aluminum:
 - .1 To ASTM B209 with moisture barrier.
 - .2 Thickness: 0.50 mm sheet.
 - .3 Finish: Smooth.
 - .4 Jacket banding and mechanical seals: 12 mm wide, 0.5 mm thick stainless steel.
- .4 PVC:
 - .1 PVC Jacket provided by manufacturer.

2.4 ACCESSORIES

- .1 Vapour retarder lap adhesive:
 - .1 Water based, fire retardant type, compatible with insulation.
 - .1 Maximum VOC limit as permitted by AHJ.
- .2 Indoor Vapour Retarder Finish:
 - .1 Vinyl emulsion type acrylic, compatible with insulation.
- .3 Insulating Cement: hydraulic setting on mineral wool, to ASTM C449.

- .4 ULC Listed Canvas Jacket:
 - .1 220 gm/m²cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
- .5 Contact adhesive: quick-setting
 - .1 Maximum VOC limit as permitted by AHJ.
- .6 Canvas adhesive: washable.
 - .1 Maximum VOC limit as permitted by AHJ.
- .7 Tie wire: 1.5 mm stainless steel.
- .8 Banding: 12 or 19 mm wide, 0.5 mm thick stainless steel.
- .9 Facing: 25 mm galvanized steel hexagonal wire mesh stitched on one face of insulation with expanded metal lath on both faces of insulation.
- .10 Fasteners: 4 mm diameter pins with 35 mm square diameter clips, length to suit thickness of insulation.

Part 3 Execution

3.1 APPLICATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 PRE-INSTALLATION REQUIREMENTS

- .1 Pressure test ductwork systems complete, witness and certify.
- .2 Ensure surfaces are clean, dry, free from foreign material.

3.3 INSTALLATION

- .1 Install in accordance with TIAC National Standards.
- .2 Apply materials in accordance with manufacturers instructions and as indicated.
- .3 Use 2 layers with staggered joints when required nominal thickness exceeds 75 mm.
- .4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
 - .1 Ensure hangers, and supports are outside vapour retarder jacket.
- .5 Hangers and supports in accordance with [Section 23 05 29- Hangers and Supports for HVAC Piping and Equipment] .
 - .1 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.
- .6 Fasteners: install at 300 mm on centre in horizontal and vertical directions, minimum [2] rows each side.

3.4 DUCTWORK INSULATION SCHEDULE

- .1 Insulation types and thicknesses: conform to following table:

TIAC Code	Code	Vapour Retarder	Thickness (mm)
Rectangular cold and	C-1	Yes	25

dual temperature supply air ducts			
Round cold and dual temperature supply air ducts	C-2	Yes	25
Rectangular warm air ducts	C-1	No	25
Round warm air ducts	C-1	No	25
Supply, return and exhaust ducts exposed in space being served	None		
Outside air ducts to mixing plenum	C-1	Yes	25
Mixing plenums	C-1	Yes	25
Exhaust duct between dampers and louvers	C-1	Yes	25
Rectangular ducts outside	C-1	See drawings	50
Round ducts outside	C-1	See drawings	50
Acoustically lined ducts	none	See drawings	

.2 Exposed round ducts 600 mm and larger, smaller sizes where subject to abuse:

.1 Use TIAC code C-1 insulation, scored to suit diameter of duct.

.1 Finishes: conform to following table:

TIAC Code		
Rectangular	Round	
Indoor, concealed	None	none
Indoor, exposed within mechanical room	CRF/1	CRD/2
Indoor, exposed elsewhere	CRF/2	CRD/3
Outdoor, exposed to precipitation	CRF/3	CRD/4
Outdoor, elsewhere	CRF/4	CRD/5

3.5 CLEANING

.1 Clean in accordance with Section [01 74 00- Cleaning and Waste Management] .

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Waste Management: separate waste materials for reuse or recycling in accordance with General Contractor's instructions.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
- .2 ASTM International (ASTM)
 - .1 ASTM A480/A480M-12, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
 - .2 ASTM A635/A635M-09b, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Alloy, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability, General Requirements for.
 - .3 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- .3 National Fire Protection Association (NFPA)
 - .1 NFPA 90A-12, Standard for the Installation of Air-Conditioning and Ventilating Systems.
 - .2 NFPA 90B-12, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.
 - .3 NFPA 96-11, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.
- .4 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
 - .1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2005.
 - .2 SMACNA HVAC Air Duct Leakage Test Manual, 2012.
 - .3 IAQ Guideline for Occupied Buildings Under Construction 2007.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 23 05 00.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for metal ducts and include product characteristics, performance criteria, physical size, finish and limitations if requested.
- .3 Shop Drawings:
 - .1 Submit shop drawings if requested for specialized fittings.
- .4 Test and Evaluation Reports:
 - .1 Certification of Ratings:
 - .1 Catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with General Contractor's 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 in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect metal ducts from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse or recycling as directed by General Contractor.

Part 2 Products

2.1 SEAL CLASSIFICATION

- .1 Classification as follows:

Maximum Pressure Pa	SMACNA Seal Class
500	C
250	C
125	C

- .2 Seal classification:
 - .1 Class A: longitudinal seams, transverse joints, duct wall penetrations and connections made airtight with sealant and tape.
 - .2 Class B: longitudinal seams, transverse joints and connections made airtight with tape and sealant.
 - .3 Class C: transverse joints and connections made air tight with gaskets, tape and sealant. Longitudinal seams unsealed.
 - .4 Unsealed seams and joints.

2.2 SEALANT

- .1 Sustainability Characteristics:
 - .1 Adhesives and sealants: as required.
 - .2 Adhesives and sealants: VOC limits as per Authorities Having Jurisdiction.
- .2 Sealant: oil resistant, water borne, polymer type flame resistant duct sealant. Temperature range of minus 30 degrees C to plus 93 degrees C.

2.3 TAPE

- .1 Tape: polyvinyl treated, open weave fiberglass tape, 50 mm wide.

2.4 DUCT LEAKAGE

- .1 In accordance with SMACNA HVAC Air Duct Leakage Test Manual.

2.5 FITTINGS

- .1 Fabrication: to SMACNA.
- .2 Radiused elbows:
 - .1 Rectangular: standard radius 2 times width of duct.
 - .2 Round: smooth radius 2 times diameter.
- .3 Mitred elbows, rectangular:
 - .1 To 400 mm: with double thickness turning vanes.
 - .2 Over 400 mm: with double thickness turning vanes.
- .4 Branches:
 - .1 Rectangular main and branch: with 45 degrees entry on branch.
 - .2 Round main and branch: enter main duct at 45 degrees with conical connection.
 - .3 Provide volume control damper in branch duct near connection to main duct.
 - .4 Main duct branches: with splitter damper.
- .5 Transitions:
 - .1 Diverging: 20 degrees maximum included angle.
 - .2 Converging: 30 degrees maximum included angle.
- .6 Offsets:
 - .1 As indicated.
- .7 Obstruction deflectors: maintain full cross-sectional area.
 - .1 Maximum included angles: as for transitions.

2.6 FIRE STOPPING

- .1 Retaining angles around duct, on both sides of fire separation in accordance with AHJ.
- .2 Fire stopping material and installation must not distort duct.

2.7 GALVANIZED STEEL

- .1 Lock forming quality: to ASTM A653/A653M, Z90 zinc coating.
- .2 Thickness, fabrication and reinforcement: to ASHRAE and SMACNA.
- .3 Joints: to ASHRAE and SMACNA.

2.8 ALUMINUM

- .1 To ASHRAE and SMACNA. Aluminum type: as required.
- .2 Thickness, fabrication and reinforcement: to SMACNA and ASHRAE.
- .3 Joints: to SMACNA and ASHRAE.

2.9 HANGERS AND SUPPORTS

- .1 Hangers and Supports: in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.
 - .1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct.
 - .1 Maximum size duct supported by strap hanger: 500.
 - .2 Hanger configuration: to ASHRAE and SMACNA.

- .3 Hangers: galvanized or black steel angle with steel rods to ASHRAE and following table:

Duct Size (mm)	Angle Size (mm)	Rod Size (mm)
up to 750	25 x 25 x 3	6
751 to 1050	40 x 40 x 3	6
1051 to 1500	40 x 40 x 3	10
1501 to 2100	50 x 50 x 3	10
2101 to 2400	50 x 50 x 5	10
2401 and over	50 x 50 x 6	10

- .4 Upper hanger attachments:
- .1 For concrete: manufactured concrete inserts.
 - .2 For steel joist: manufactured joist clamp.
 - .3 For steel beams: manufactured beam clamps:

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions are acceptable for metal duct installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect site conditions.
 - .2 Inform Engineer and General Contractor of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 GENERAL

- .1 Do work in accordance with ASHRAE, NFPA 96 AND SMACNA standards as applicable.
- .2 Do not break continuity of insulation vapour barrier with hangers or rods.
 - .1 Ensure diffusers fully seated. Insulate strap hangers 100 mm beyond insulated duct.
- .3 Support risers in accordance with ASHRAE and SMACNA standards.
- .4 Install breakaway joints in ductwork on sides of fire separation.
- .5 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.
- .6 Manufacture duct in lengths and diameter to accommodate installation of acoustic duct lining where specified.

3.3 HANGERS

- .1 Strap hangers: install in accordance with SMACNA.
- .2 Angle hangers: complete with locking nuts and washers.

- .3 Hanger spacing: as follows:

Duct Size	Spacing
(mm)	(mm)
to 1500	3000
1501 and over	2500

3.4 SEALING AND TAPING

- .1 Apply sealant in accordance with manufacturer's recommendations and SMACNA.
.2 Bed tape in sealant and recoat with minimum of 1 coat of sealant to manufacturers recommendations.

3.5 LEAKAGE TESTS

- .1 Refer to Section 23 05 94 - Pressure Testing of Ducted Air Systems.
.2 In accordance with SMACNA HVAC Duct Leakage Test Manual.
.3 Do leakage tests in sections.
.4 Make trial leakage tests as instructed to demonstrate workmanship.
.5 Do not install additional ductwork until trial test has been passed.
.6 Test section minimum of 30 m long with not less than three branch takeoffs and two 90 degrees elbows or as designated on site.
.7 Complete test before performance insulation or concealment Work.

3.6 CLEANING

- .1 Leave Work area clean at end of each day.
.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
.3 Waste Management: separate waste materials for reuse or recycling as directed by General Contractor.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 General Requirements

1.2 REFERENCE STANDARDS

- .1 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
 - .1 SMACNA - HVAC Duct Construction Standards - Metal and Flexible, [2005] .

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with relevant Section.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for air duct accessories and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Indicate:
 - .1 Flexible connections.
 - .2 Duct access doors.
 - .3 Turning vanes.
 - .4 Instrument test ports.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance 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 air duct accessories from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 GENERAL

- .1 Manufacture in accordance with SMACNA - HVAC Duct Construction Standards.

2.2 FLEXIBLE CONNECTIONS

- .1 Frame: galvanized sheet metal frame.
- .2 Material:
 - .1 Fire resistant, self extinguishing, neoprene coated glass fabric, temperature rated at minus 40 degrees C to plus 90 degrees C, density of 1.3 kg/m².

2.3 ACCESS DOORS IN DUCTS

- .1 Non-Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame.
- .2 Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame and 25 mm thick rigid glass fibre insulation.
- .3 Gaskets: neoprene or foam rubber.
- .4 Hardware:
 - .1 Up to 300 x 300 mm: two sash locks complete with safety chain .
 - .2 301 to 450 mm: four sash locks complete with safety chain .
 - .3 451 to 1000 mm: piano hinge and minimum two sash locks.
 - .4 Doors over 1000 mm: piano hinge and two handles operable from both sides.
 - .5 Hold open devices.

2.4 TURNING VANES

- .1 Factory or shop fabricated double thickness with trailing edge, to recommendations of SMACNA and as indicated.

2.5 INSTRUMENT TEST

- .1 1.6 mm thick steel zinc plated after manufacture.
- .2 Cam lock handles with neoprene expansion plug and handle chain.
- .3 28 mm minimum inside diameter. Length to suit insulation thickness.
- .4 Neoprene mounting gasket.

2.6 SPIN-IN COLLARS

- .1 Conical galvanized sheet metal spin-in collars with lockable butterfly damper.
- .2 Sheet metal thickness to co-responding round duct standards.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for air duct accessories installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate.
 - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.2 INSTALLATION

- .1 Flexible Connections:
 - .1 Install in following locations:
 - .1 Inlets and outlets to supply air units and fans.
 - .2 Inlets and outlets of exhaust and return air fans.
 - .3 As indicated.
 - .2 Length of connection: [100] mm.
 - .3 Minimum distance between metal parts when system in operation: [75] mm.
 - .4 Install in accordance with recommendations of SMACNA.
 - .5 When fan is running:
 - .1 Ducting on sides of flexible connection to be in alignment.
 - .2 Ensure slack material in flexible connection.
- .2 Access Doors:
 - .1 For all concealed valves and balancing dampers above drywall ceilings.
 - .2 As provided by manufacturer of air handling units.
 - .3 Fire and smoke dampers.
 - .4 Control dampers.
 - .5 Devices requiring maintenance.
 - .6 Required by code.
 - .7 Reheat coils.
 - .8 Elsewhere as indicated.
- .3 Instrument Test Ports:
 - .1 General:
 - .1 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.
 - .2 Locate to permit easy manipulation of instruments.
 - .3 Install insulation port extensions as required.
 - .4 Locations:
 - .1 For traverse readings:

- .1 Ducted inlets to roof and wall exhausters.
 - .2 Inlets and outlets of other fan systems.
 - .3 Main and sub-main ducts.
 - .4 And as indicated.
 - .2 For temperature readings:
 - .1 At outside air intakes.
 - .2 In mixed air applications in locations as approved by consultant
 - .3 At inlet and outlet of coils.
 - .4 Downstream of junctions of two converging air streams of different temperatures.
 - .5 And as indicated.
- .4 Turning Vanes:
 - .1 Install in accordance with recommendations of SMACNA and as indicated.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section [01 74 00- Cleaning and Waste Management] .
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section [01 74 00- Cleaning and Waste Management] .

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 General Requirements

1.2 REFERENCE STANDARDS

- .1 Sheet Metal and Air Conditioning National Association (SMACNA)
 - .1 SMACNA HVAC Duct Construction Standards, Metal and Flexible-[2013] .

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section on Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for dampers and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section on Closeout Submittals] .
- .2 Operation and Maintenance Data: submit operation and maintenance data for dampers for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with 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 dampers from [nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 GENERAL

- .1 Manufacture to SMACNA standards.

2.2 SINGLE BLADE DAMPERS

- .1 Fabricate from same material as duct, but one sheet metal thickness heavier. V-groove stiffened.

- .2 Size and configuration to recommendations of SMACNA.
- .3 Locking quadrant with shaft extension to accommodate insulation thickness.
- .4 Inside and outside nylon or bronze end bearings.
- .5 Channel frame of same material as adjacent duct, complete with angle stop.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for damper installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate.
 - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed Consultant.

3.2 INSTALLATION

- .1 Install where indicated.
- .2 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.
- .3 Locate balancing dampers in each branch duct, for supply, return and exhaust systems.
- .4 Runouts to registers and diffusers: install single blade damper located as close as possible to main ducts.
- .5 Dampers: vibration free.
- .6 Ensure damper operators are observable and accessible.
- .7 Corrections and adjustments as directed by Consultant.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with General Contractor's instructions.
 - .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 General Contractor's instructions.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 General Requirements.

1.2 REFERENCE STANDARDS

- .1 ASTM International (ASTM)
 - .1 ASTM A653/A653M-[11] , Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section [01 33 00- Submittal Procedures] .
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for dampers and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Construction IAQ Management Plan:
 - .1 During construction meet or exceed the requirements of SMACNA IAQ Guideline for Occupied Buildings Under Construction.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with relevant section.
- .2 Operation and Maintenance Data: submit operation and maintenance data for dampers for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with 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 in dry location indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect dampers from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MULTI-LEAF DAMPERS

- .1 Opposed or parallel blade type as indicated.

- .2 Extruded aluminum or Structurally formed steel, interlocking blades, complete with extruded vinyl seals, spring stainless steel side seals, structurally formed and welded galvanized steel or extruded aluminum] frame.
- .3 Pressure fit self-lubricated bronze bearings.
- .4 Linkage: plated steel tie rods, brass pivots and plated steel brackets, complete with plated steel control rod.
- .5 Operator: provided by BAS contractor
- .6 Performance:
 - .1 Leakage: in closed position less than 2% of rated air flow.
- .7 Insulated aluminum dampers:
 - .1 Frames: insulated with extruded polystyrene foam with RSI 0.88.
 - .2 Blades: constructed from aluminum extrusions with internal hollows insulated with polyurethane or polystyrene foam, RSI 0.88.

2.2 DISC TYPE DAMPERS

- .1 Frame: insulated brake formed, welded, 1.6 mm thick, galvanized steel to ASTM A653/A653M.
- .2 Disc: insulated spin formed, 1.6 mm thick, galvanized steel to ASTM A653/A653M.
- .3 Gasket: extruded neoprene, field replaceable, with 10 year warranty.
- .4 Bearings: roller self lubricated and sealed.
- .5 Operator: compatible with damper, linear stroke operator, [spring loaded] actuator, zinc-aluminum foundry alloy casting cam follower.
- .6 Performance:
 - .1 Leakage: in closed position less than 2% of rated air flow.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for damper installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate.
 - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.2 INSTALLATION

- .1 Install where indicated.

- .2 Install in accordance with recommendations of SMACNA and manufacturer's instructions.
- .3 Seal multiple damper modules with silicon sealant.
- .4 Install access door adjacent to each damper.
- .5 Ensure dampers are observable and accessible.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with General Contractor's instructions.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 ASTM International (ASTM)
 - .1 ASTM C423-09a, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
 - .2 ASTM C916-85(2007), Standard Specification for Adhesives for Duct Thermal Insulation.
 - .3 ASTM C1071-12, Standard specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).
 - .4 ASTM C1338-08, Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
 - .5 ASTM G21-09, Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- .2 National Fire Protection Association (NFPA)
 - .1 NFPA 90A-12, Standard for the Installation of Air Conditioning and Ventilating Systems.
 - .2 NFPA 90B-12, Standard for the Installation of Warm Air Heating and Air Conditioning Systems.
- .3 North American Insulation Manufacturers Association (NAIMA)
 - .1 NAIMA AH116-2002, Fibrous Glass Duct Construction Standards.
- .4 Sheet Metal and Air Conditioning Contractor's National Association (SMACNA)
 - .1 SMACNA, HVAC Duct Construction Standards, Metal and Flexible-2005.
 - .2 SMACNA IAQ Guideline for Occupied Buildings Under Construction-2007.
- .5 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 23 05 00.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for duct liners and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 23 05 00.
- .2 Operation and Maintenance Data: submit operation and maintenance data for duct liners for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance 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 and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect duct liners from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse or recycling as directed by General Contractor.

Part 2 Products

2.1 DUCT LINER

- .1 General:
 - .1 Mineral Fibre duct liner: air surface coated [mat facing] .
 - .2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50 when tested in accordance with [CAN/ULC-S102] [NFPA 90B] [NFPA 90A] .
 - .3 Recycled Content: [EcoLogo certified] [with minimum [by weight] [35] recycled content] .
 - .4 Fungi resistance: to [ASTM G21] [ASTM C1338] .
- .2 Rigid:
 - .1 [Use on flat surfaces and where indicated.
 - .2 25 mm thick, to [ASTM C1071, fibrous glass rigid board duct liner.
 - .3 Density: 48 kg/m³ minimum.
 - .4 Maximum velocity on faced air side: 20.3 m/s.
 - .5 Minimum NRC of 0.70 at 25 mm thickness based on Type A mounting to ASTM C423.
- .3 Flexible:
 - .1 Use on round or oval surfaces as indicated.
 - .2 25 mm thick, to ASTM C1071 Type 1, fibrous glass blanket duct liner.
 - .3 Density: 24 kg/m³ minimum.
 - .4 Thermal resistance to be minimum [1.11 (m².degrees C)/W for 38 mm thickness] [1.41 (m².degrees C)/W to 50 mm thickness] [0.74 (m².degrees C)/W for 25 mm thickness] [0.37 (m².degrees C)/W for 12 mm thickness] when tested in accordance with [ASTM C177] , at 24 degrees C mean temperature.
 - .5 Maximum velocity on coated air side: [[25.4] [30.5] m/s] .
 - .6 Minimum NRC of [0.65 at 25 mm] thickness based on Type A mounting to ASTM C423.

2.2 ADHESIVE

- .1 Adhesive: to NFPA 90A, NFPA 90B and ASTM C916.
- .2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50. Temperature range minus 29 degrees C to plus 93 degrees C.
- .3 Water-based [fire retardant] type.

2.3 FASTENERS

- .1 Weld pins 2.0 mm diameter, length to suit thickness of insulation. Metal retaining clips, 32 mm square.

2.4 JOINT TAPE

- .1 Poly-Vinyl treated open weave fiberglass membrane 50 mm wide.

2.5 SEALER

- .1 Meet requirements of NFPA 90B and NFPA 90A.
- .2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50. Temperature range minus 68 degrees C to plus 93 degrees C.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for duct liner installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect site conditions before installation.
 - .2 Inform Engineer and General Contractor of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 GENERAL

- .1 Do work in accordance with SMACNA HVAC Duct Construction Standard and as indicated.
- .2 Line inside of ducts where indicated.
- .3 Duct dimensions, as indicated, are clear inside duct lining.

3.3 DUCT LINER

- .1 Install in accordance with manufacturer's recommendations, and as follows:
 - .1 Fasten to interior sheet metal surface with [100] [90] % coverage of adhesive [to ASTM C916] .
 - .1 Exposed leading edges and transverse joints to be factory coated or coated with adhesive during fabrication.

- .2 In addition to adhesive, [install weld pins not less than 2 rows per surface and not more than 425 mm on centres] [impact driven mechanical fasteners] to compress duct liner sufficiently to hold it firmly in place.

- .1 [Spacing of mechanical fasteners in accordance with [NAIMA AH116] [SMAC HVAC Duct Construction Standard]] .

- .2 In systems, where air velocities exceeds [20.3] m/s, install galvanized sheet metal nosing to leading edges of duct liner.

3.4 JOINTS

- .1 Seal butt joints, exposed edges, weld pin and clip penetrations and damaged areas of liner with joint tape and sealer. Install joint tape in accordance with manufacturer's written recommendations, and as follows:
 - .1 Bed tape in sealer.
 - .2 Apply [2] coats of sealer over tape.
- .2 Replace damaged areas of liner at discretion of Engineer.
- .3 Protect leading and trailing] edges of duct sections with sheet metal nosing having 15 mm overlap and fastened to duct.

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with General Contractor's instructions.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section [01 74 00- Cleaning and Waste Management] .
- .3 Waste Management: separate waste materials for recycling or reuse in accordance with General Contractor's instructions.

END OF SECTION

PART 1 – GENERAL

1.1 GENERAL

1.1.1 Section 20 00 06 - General Requirements, shall apply to and govern this Section.

1.2 SCOPE OF WORK

1.2.1 Provide all labour, materials, tools equipment, training commissioning and certification required to complete the work as shown on the Drawings and specified in this Section, including:

1.2.1.1 All supply, return, and exhaust air grilles and diffusers, including all specified ancillaries.

1.3 SUBMITTALS

1.3.1 Provide shop drawings for all registers, grilles, and diffusers.

1.3.2 Shop drawings to indicate dimensions, construction details, finishes and materials, accessories, performance data including throw, pressure drop and sound performance at the specified air flow rates.

1.3.3 Review requirements of outlets as to size, finish, and type of mounting with the Consultant prior to submitting shop drawings and schedules of outlets.

PART 2 - PRODUCTS

2.1 GENERAL

2.1.1 Provide baffles to direct air away from walls, columns or other obstructions within the radius of diffuser operation.

2.1.2 Provide plaster frame for diffusers located in plaster and gypsum board surfaces.

2.1.3 Provide anti-smudge frames or plaques on diffusers located in rough textured surfaces such as acoustical plaster.

2.2 REGISTERS, GRILLES AND DIFFUSERS

2.2.1 Type 'SD1' - Square Plaque Diffuser: EH Price Model SPD

1. The square plaque diffuser shall be supplied to deliver a 360 degree radial, horizontal air flow pattern. The back cone shall be a one-piece die-formed design with smooth, aerodynamically designed surfaces and no corner joints. This contoured design shall protect the ceiling and help to prevent smudging and streaking.

2. Furnish and install price model spd - steel square plaque ceiling diffusers of sizes and mounting types designated by the plans and air distribution schedule.

2.3 CONSTRUCTION

- 2.3.1 Diffusers shall be steel construction, and shall consist of a seamless, one-piece, precision formed backpan that incorporates a round inlet collar of sufficient length for connecting rigid or flexible duct.
- 2.3.2 An inner plaque assembly shall be incorporated and shall drop no more than 6.35mm(¼ inch) below the ceiling plane to assure proper air distribution performance.
- 2.3.3. The inner plaque assembly shall be completely removable from the room side to allow for full access to any dampers or other ductwork components located near the diffuser neck.
- 2.3.4 The diffuser shall integrate with all duct sizes shown on the plans without affecting the face size and appearance of the unit.
- 2.3.5. The face panel shall have smooth edges and rounded corners to blend with the back cone.
- 2.3.6. The diffuser ceiling module size shall match the existing ceiling. Field measure.

2.4 PAINT SPECIFICATION

- 2.4.1 Paint finish shall be baked-on powder coat finish.
- 2.4.2 The paint film thickness shall be a minimum of 2 mils.
- 2.4.3 The finish shall have a hardness of 2h as tested in accordance with ASTM D3363.
- 2.4.4 The finish shall pass an ASTM B117 corrosive environment salt spray test for 1000 hours with no measurable creep, rusting or blistering as per ASTM D1654, D610 and D714.
- 2.4.5 The finish shall pass an ASTM D870 water immersion test of a minimum of 500 hours with no measurable with no rusting or blistering as per ASTM D610 and G714.
- 2.4.6. The finish shall have an impact resistance of 100 inch-pounds in accordance with ASTM D2794.
- 2.4.7 All components shall have a custom finish in a color to match a customer supplied sample.

2.5 MOUNTING FRAME:

- 1. The diffuser mounting frame shall be suitable for lay-in or surface mount applications with the following frame style (select one):
 - A. Surface mount
 - B. 23.8mm (15/16 inch) wide flat t-bar
 - C. 14.3mm (9/16 inch) wide t-bar with drop frame
 - D. 14.3mm (9/16 inch) wide tegular t-bar
 - E. Concealed spline

- F. Snap-in t-bar
- G. Clip-on recessed spline
- E. Options (select all that apply):
 - 1. Beaded extended neck:
The diffuser shall be supplied with a beaded neck extended to a depth of 65mm (2-1/2 inches).
 - 2. Damper: Provide a steel radial opposed-blade damper (VCR7) at the diffuser where installation of a volume damper in the branch duct is not feasible.

PART 3 - EXECUTION

3.1 AIR OUTLETS (DIFFUSERS, GRILLES AND REGISTERS)

- 3.1.1 Paint the inside of all duct openings with black flat paint before installing diffusers or registers to it.
- 3.1.2 Provide sponge rubber gasket around all register frames to ensure an airtight seal against finished wall or ceiling.
- 3.1.3 Registers and diffusers will be installed in such a manner as to facilitate repeated removals without damaging ceiling or wall construction and finish.
- 3.1.4 Positions indicated are approximate only. Check location of outlets with the Consultant and make necessary adjustments in position to conform to architectural features, sprinklers, symmetry and lighting arrangement.
- 3.1.5 Provide diffusers, grilles, and registers as shown on schedule.
- 3.1.6 Cover open ends or registers of exhaust/return ducts with 25mm (1") thick filter media secured with tape. Filter media to remain until all dust producing operations are completed.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- .1 This Section specifies requirements that are common to Electrical Divisions work Sections and it is a supplement to each Section and is to be read accordingly. Where requirements of this Section contradict requirements of Divisions 00 or 01, conditions of Division 00 or 01 to take precedence.

1.2 DEFINITIONS

- .1 Wherever the words "indicated", "designated", "shown", "noted", "listed", or similar words or phrases are used in the Specification they shall be understood, unless the context otherwise provides, to mean that material or item referred to is "indicated", "designated", "shown", "listed", or "noted" on the Drawings.
- .2 Wherever the words "reviewed", "approved", "satisfactory", "as directed", "submit", "permitted", "inspected" or similar words or phrases are used in the Specification they shall be understood, unless the context otherwise provides, to mean that material or item referred to shall be "reviewed" "approved by", "satisfactory to", "as directed by", "submitted to", "permitted by", or "inspected by" the Architect and/or Engineer.
- .3 Term "provide" where used shall be understood to include labour, materials and services necessary to supply and install the item or work referred.
- .4 "Electrical Divisions" – refers to Divisions 26, 27, 28 and other Divisions as specifically noted, and which work as defined in Specifications and/or on drawings is responsibility of Electrical Contractor, unless otherwise noted.
- .5 "Mechanical Divisions" – refers to Divisions 20, 21, 22, 23, 25 and other Divisions as specifically noted, and which work as defined in Specifications and/or on drawings is responsibility of Mechanical Contractor, unless otherwise noted.

1.3 .WORK INCLUDED

- .1 This Contractor shall furnish all labour, material, tools, equipment, etc. required to complete all work shown on the drawings and herein specified. The work shall be in accordance with rules and regulations of all authorities having legal jurisdiction over the work. This Contractor shall provide any small items of work not specifically called for but required to complete the intended installation. Complete systems shall be left ready for continuous and efficient satisfactory operation.

1.4 SUBMITTALS

- .1 Shop drawings:
 - .1 Submit PDF of manufacturer's shop drawings for review by the Engineer. These shop drawings shall consist of distribution equipment, lighting fixtures, emergency battery units and other special equipment.

1.5 STANDARD OF MATERIALS AND EQUIPMENT

- .1 Material required for performance of work shall be new and of uniform pattern throughout work. Identical units or equipment shall be of same manufacture.
- .2 All material and equipment shall be of the type subject to Factory Mutual, Underwriters' Laboratories of Canada or Canadian Standards Association inspection and approval and shall bear ULC or CSA labels.

1.6 TESTING

- .1 Perform test on each system to the satisfaction of the Architect and submit test results for approval prior to the final acceptance of the work.
- .2 Panels shall be balanced within 5%.
- .3 Grounding shall be as required by Electrical Code.
- .4 Test all system grounding conductors for phase to ground loads, ammeter shall read less than one ampere.

1.7 AS-BUILT DRAWINGS

- .1 This Contractor shall keep a separate set of white prints on the site and note all changes and deviations from the original design. PDF and CAD drawings showing all as-built conditions shall be forwarded to the Engineer at the completion of this Contract and before applying for final payment. This Contractor shall prepare, at his own expense in AUTOCAD and PDF of all drawings showing all as built conditions. Submit this with the above noted as-built drawings.

1.8 DOCUMENTS

- .1 The drawings for the work accompanying these Specifications are made as accurately as possible, but absolute accuracy of dimensions cannot be guaranteed. They are intended to supplement and simplify the General Contract Drawings. No claim for extra payment on account of the difference of actual and estimated dimensions shall be allowed.
- .2 In the case of discrepancy of figure dimensions or any other conflict on the drawings or the Specifications, the maximum condition shall govern, and the tender shall be based on whichever indicates the greater cost.
- .3 The matter of discrepancy of figure dimensions or any other conflict on the drawings or the Specifications shall be immediately submitted to the Engineers for their decision. Without the decision, the discrepancy shall not be adjusted by the Contractor save at his own risk, and in the settlement of any complications arising from such adjusting, the sub-contractor shall bear all extra expense involved.
- .4 Circuiting shown on drawings is not intended to show actual circuit numbers, this circuiting is intended to show lighting or receptacle grouping only.
- .5 Where site conditions indicate conflict between the installation of electrical equipment and/or mechanical equipment or structural members, prepare complete interference drawings for discussion with the respective consultants.
- .6 This contractor shall prepare, at his own expense, any large scale working drawings which may be required by the examining authorities.

1.9 METRIC AND IMPERIAL MEASUREMENTS

- .1 Generally, both metric and imperial units of measurement are given in Sections of Specification governed by this section. Measurement conversions may be generally "soft" and rounded off. Exact measurements to be confirmed based on application. Where measurements are related to installation and onsite applications, confirm issued document measurements with applicable local code requirements, and/or as applicable, make accurate measurements onsite. Where significant discrepancies are found, immediately notify Consultant for direction.

1.10 EXAMINATION OF BID DOCUMENTS AND SITE

- .1 This Contractor shall visit the site of the project and familiarize himself with all conditions pertaining to his work prior to submitting his tender.
- .2 Any deviation and/or conflicts on site with the distribution diagram(s) shown on drawings, shall be reported to the Engineer before submitting Tender.

1.11 DELIVERY, STORAGE AND HANDLING

- .1 This Contractor shall place an order for all material and equipment immediately after signing of the Contract. He shall submit a list of delivery dates for each type of equipment within 30 days of the awarding of the Contract. The list shall include manufacturers' names.

1.12 LAWS AND REGULATIONS

- .1 Work provided under this Division shall conform to the standards and codes, current by-laws and regulations of authorities having jurisdiction. In case of conflict, the codes, by-laws and regulations take precedence over the Contract Documents. Do not reduce the standard established by the drawings and specifications by applying codes, by-laws and regulations.

1.13 PERMITS, CERTIFICATES, APPROVALS AND FEES

- .1 This Contractor shall be responsible for and shall obtain all permits, inspections, etc. as required by all authorities having jurisdiction over this work and shall pay for same. These costs shall be included in the Tender Price.
- .2 All permits shall be delivered to the Owner's Representative as soon as they become available.

1.14 COORDINATION OF WORK

- .1 This Contractor shall be responsible to co-ordinate the installation of equipment, conduit work, lighting fixtures, etc. with other trades and the Owner's representative prior to the actual installation.
- .2 This Contractor shall inform the General Contractor of sleeves or openings required in new work during tendering so that costs are included and shall inform the General Contractor in sufficient time to prevent unnecessary cutting.
- .3 This Contractor shall not install rigid conduit and floor boxes in existing structural floor slabs or framing or cut existing structural floor slabs and framing for this purpose in such a manner that the structural integrity of the floor is weakened. Co-ordinate such work with the Architect and/or Structural Engineer.
- .4 All equipment and material unless specifically noted otherwise, shall be new and without blemish or defect. All material and equipment shall be of the type subject to Factory Mutual, Underwriters' Laboratories of Canada or Canadian Standards Association inspection and approval and shall bear ULC or CSA labels.
- .5 Demonstrate the function and operation of each system to the maintenance staff or the Owner's representative.
- .6 For Hangers, Bonding, Inserts, Supports, Conduit Anchors (Unless Noted Otherwise)
 - .1 Provide hangers for conduits and lights.
 - .2 Dissimilar metals shall not come in direct contact with each other.
 - .3 Space hangers to prevent sagging and to prevent conduit joints from carrying the weight of the conduit and contents.
 - .4 Support vertical conduits at each floor and/or at each length of conduit.
 - .5 Hangers shall only be suspended from structural bearings such as beams, or joists. Where such bearings do not exist use bridging steel.
 - .6 Where applicable under Rule 10-406 (4) in the Ontario Electrical Safety Code, install a #6 copper bond wire, with approved clamps, from the metal gas pipe after the gas meter, to the nearest cold water pipe, or directly to the main service ground.
 - .7 Use proper inserts for all hangers and supports. Powder activated tools shall not be used.
 - .8 Provide supports for all equipment installed by this Division.

- .9 Rigidly anchor all conduits to structural bearings where required to control the direction of expansion and to prevent undue stress on branch connections and structure or crushing of insulation in sleeves. Pay particular attention to all building expansion joists.

1.15 PLANNING AND LAYOUT OF WORK

- .1 Control products, products requiring maintenance, junction boxes, and similar products, particularly such products located above suspended ceilings must be located for easy access for servicing and/or removal. Products which do not meet this location requirement are to be relocated to an accessible location at no additional cost.
- .2 This trade shall be responsible for his work until the completion and final acceptance, for replacing any item that may be defective, damaged, lost or stolen without additional cost to the Owner or delay to the completion of the project.
- .3 This Contractor shall schedule and perform his work to meet the completion schedule as set out by the Owner's Representative. Any overtime shall be included in his Tender.
- .4 The Electrical Contractor shall ensure that all light, power, heat, telephone and other electrical systems and services remain operational during the course of the extension or renovation of the existing building and, if necessary, this Contractor shall be responsible for providing such temporary services by cutting off, altering, adapting, relocating and connecting existing services and disconnecting and removing such temporary or existing services upon providing new permanent services as detailed on all drawings. The site shall be examined to determine the extent of the temporary services and all co-ordination shall be made with the Owner's Representative and the Branch Manager. All costs shall be included in the Tender Price.
- .5 Existing equipment, wiring etc. not being re-used under new schemes, shall be removed whether shown on drawings or not. All unused outlet boxes (where it is not practical to remove same) shall be blanked with coverplates. All costs shall be included in the Tender.

1.16 EXISTING SERVICES - (EXISTING BUILDING - EXTENSION/RENOVATION)

- .1 The Electrical Contractor shall ensure that all light, power, heat, telephone and other electrical systems and services remain operational during the course of the extension or renovation of the existing building and, if necessary, this Contractor shall be responsible for providing such temporary services by cutting off, altering, adapting, relocating and connecting existing services and disconnecting and removing such temporary or existing services upon providing new permanent services as detailed on all drawings. The site shall be examined to determine the extent of the temporary services and all co-ordination shall be made with the Owner's Representative and the Branch Manager. All costs shall be included in the Tender Price.
- .2 Route new services to avoid interference with existing construction.
- .3 Cut back and terminate existing services to present a neat appearance.
- .4 Existing equipment, wiring etc. not being re-used under new schemes, shall be removed whether shown on drawings or not. Remove and dispose of existing abandoned conduit, wiring, cables, devices, equipment, fixtures, hangers and supports. All wiring and cable to be removed to source panel. All unused outlet boxes (where it is not practical to remove same) shall be blanked with cover plates. All costs shall be included in the Tender.
- .5 Hand over to the Owner existing equipment to be removed such as panels, transformers, splitters, etc., when requested by the Owner.
- .6 Refer also to Demolition Section in the Contract Documents.
- .7 Conceal all conduit and boxes except in unfinished areas such as service rooms or as noted on the drawings where conduits shall be surface mounted. Walls shall be chased where necessary.
- .8 Replace all existing wiring devices that are shown on drawings as existing (E) to remain, with new wiring devices to match new.

- .9 It shall be the responsibility of any contractor, who while working on this project may disturb the wiring or produce heat, smoke, or dust that may activate the fire alarm system, to arrange to have the fire detectors in the area isolated before commencing such work. Failure to comply may result in false alarms. Subsequent charges and fines by the local municipality for attending to a false alarm shall be borne by this contractor

1.17 ACCESSIBILITY

- .1 All work shall be installed so as to be readily accessible for operation, maintenance and repairs. Provide access panel where necessary.

1.18 CUTTING AND PATCHING

- .1 Advise other Trades of the location of openings required for the installation of this Division's work. Provide and set sleeves, inserts, anchors, etc., when requested in advance of concrete pouring or similar work. Pay for and employ the Trades whose work is involved for cutting and patching of completed work. Lay out such work for review. Do not cut reinforcing steel without written instructions.
- .2 Unless noted otherwise, perform and pay for cutting and patching in existing or new construction required for installation of work under the Electrical Division. Sleeve as specified elsewhere in this Specification. Do not cut reinforcing steel without written instructions

1.19 FIRE STOPPING

- .1 General
 - .1 Provide fire stopping (fire barrier) for all penetrations through fire rated floors and walls that accommodate cables, conduits and cable trays.
 - .2 Fire stopping shall contain an intumescent material that shall be applied to surround the cable, conduit or cable tray. The material shall expand when exposed to heat providing seal preventing fire from proceeding through the floor or wall.
- .2 Products (Unless specified in specification)
 - .1 Use putty type material to seal around single cables and holes less than 12mm (1/2").
 - .2 Use "pillow and "block" material for cable trays and large openings.
- .3 Execution
 - .1 Refer to Architectural drawings to determine location of wall and floor fire ratings.
 - .2 Refer to manufactures recommendations for the proper type and installation procedures.

1.20 X-RAY AND SCANNING

- .1 Before core drilling any concrete floors or walls, x-ray and/or scan the area in question. Include for premium time to perform this work.

1.21 SEISMIC RESTRAINTS

- .1 General
 - .1 Seismic restraints shall be provided for all items and equipment forming part of division 16 work and in accordance with "guidelines for seismic restraints", NFPA, Ontario Building Code and Local Governing Authorities.
 - .2 The contractor shall retain an Ontario Registered Professional Engineer to approve seismic restraint measures who shall provide letters of assurance to the engineer for the electrical systems upon installation completion.
- .2 Restraints

- .1 Where drilling of the structure is required, the drilling shall be subject to the approval of the structural engineer.
- .2 Provide a system to secure all recessed light fixtures independently from the suspended ceiling system. Fixtures shall be supported directly and laterally from the building structure above, using #12 AWG wire minimum.
- .3 Provide a system to secure all conduit, cable tray and distribution cable systems to the building structure.
- .4 Contractor is responsible for all seismic restraint requirements as required by the current edition of the Ontario Building Code and/or Local Governing Authorities.

1.22 RESPONSIBILITY

- .1 This trade shall be responsible for his work until the completion and final acceptance, for replacing any item that may be defective, damaged, lost or stolen without additional cost to the Owner or delay to the completion of the project.

1.23 CHANGES OR REVISION TO WORK

- .1 No additional money over the Contract Price shall be paid unless an approved change order is issued by the Architect. Claims for extras shall be submitted with a complete breakdown of material, labour, hourly rates, etc.
- .2 Material costs shall be the net cost and not trade or list price.
- .3 No extra cost or credit shall be incurred for any change in location of equipment, providing distance does not exceed 3 m (10') and information is given before installation of said equipment.

1.24 WARRANTY

- .1 This Contractor shall warrant all work and apparatus installed under this Contract, against all defects or workmanship and material for a period of one year after acceptance of same by the Owner.
- .2 Provide extended warranties where called for. Submit (1) copy of warranty certificates with Data Book.

1.25 TRIAL USAGE

- .1 Allow for use of electrical systems to be thoroughly tested before final completion and acceptance of the work. Supply labour and equipment for such tests.

1.26 SUPERINTENDENCE

- .1 Maintain at the job site for the full duration of the project, qualified personnel with proven experience in erecting, supervising, testing and adjusting projects of comparable nature and complexity.

1.27 HOISTING APPARATUS

- .1 Unless noted otherwise, provide all apparatus necessary for the hoisting and placing of materials or equipment forming part of this Division.
- .2 Ensure that all equipment and materials can be hoisted and set in place. Include for the cost of dismantling and reassembling equipment where required.

1.28 CONTINUITY OF EXISTING SERVICES

- .1 Include in tender price for overtime work that may be required to tie-in services and wiring at night or weekends.

1.29 REFERENCE STANDARDS

- .1 Within the text of the specifications, reference may be made to the following standards:
 - .1 ACI American Concrete Institute
 - .2 AISC American Institute of Steel Construction
 - .3 ANSI American National Standards Institute
 - .4 ASTM American Society of Testing and Materials
 - .5 CEC Canadian Electrical Code (published by CSA)
 - .6 CEMA Canadian Electrical Manufacturer's Association
 - .7 CGSB Canadian General Standards Board
 - .8 CISC Canadian Institute of Steel Construction
 - .9 CLA Canadian Lumberman's Association
 - .10 CPCA Canadian Painting Contractors' Association
 - .11 CSA Canadian Standards Association
 - .12 FM Factory Mutual Engineering Corporation
 - .13 IEEE Institute of Electrical and Electronic Engineers
 - .14 IPCEA Insulated Power Cable Engineers Association
 - .15 OBC Ontario Building Code
 - .16 OHESC Ontario Hydro Electrical Safety Code
 - .17 ESA Electrical Safety Authority
 - .18 NEMA National Electrical Manufacturers' Association
 - .19 ULC Underwriters' Laboratories of Canada
 - .20 TSSA Technical Standards and Safety Authority
- .2 to these standards, in whole or in part as specifically requested in the specifications.
- .3 If there is question as to whether any product or system is in conformance with applicable standards, the Consultant reserves the right to have such products or systems tested to prove or disprove conformance.
- .4 The cost for such testing will be borne by the Owner in the event of conformance with Contract Documents or by the Contractor in the event of non-conformance.
- .5 Conform to latest date of issue of referenced standards in effect on date of submission of bids, except where a specific date or issue is specifically noted.

PART 2 - PRODUCTS

2.1 EQUIPMENT IDENTIFICATION

- .1 Provide lamacoid identification nameplates. These shall be WHITE with BLACK engraved letters and shall be installed with screws on all equipment, disconnect switches, panels, etc. indicating the load served. Each lighting panel shall have a typewritten directory showing lights or equipment connected to each circuit. Directories shall be mounted on the inside of the panel door with a transparent plastic cover.

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 CO-ORDINATION OF PROTECTIVE DEVICES

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

3.3 CLEANING

- .1 This Contractor shall be responsible to periodically remove all debris and to keep this area clean at all times.

END OF SECTION

Part 1 General

1.1 DEFINITIONS

- .1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.

1.2 REFERENCE STANDARDS

- .1 CSA Group
 - .1 Ontario Electrical Safety Code (28th Edition) - 2021
 - .2 CSA C22.1:21, Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.
 - .3 CSA C235:19, Preferred Voltage Levels for AC Systems, up to 50,000 V.
 - .4 CAN/CSA-C22.3 No.1:20, Overhead Systems.
- .2 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
 - .1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for all electrical equipment in PDF format including product characteristics, performance criteria, physical size, finish, limitations, etc.
- .3 Submit for review single line electrical diagrams under and locate as indicated.
 - .1 Electrical distribution system in main electrical room.
 - .2 Electrical power generation and distribution systems in power plant rooms.
- .4 Submit for review fire alarm riser diagram, plan and zoning of building at fire alarm control panel and annunciator.
- .5 Shop drawings in PDF format:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario, Canada.
 - .2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.
 - .3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
 - .4 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.

- .5 Submit full size drawings and product data to inspection authority having jurisdiction.
- .6 If changes are required, notify Consultant of these changes before they are made.
- .6 Certificates:
 - .1 Provide CSA certified equipment and material.
 - .2 Where CSA certified equipment and material is not available, submit such material and equipment to inspection authorities having jurisdiction for special approval before delivery to site.
 - .3 Submit test results of installed electrical systems and instrumentation.
 - .4 Permits and fees: in accordance with General Conditions of contract.
 - .5 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.
 - .6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Owners Representative and Consultant.
- .7 Manufacturer's Field Reports: submit to Consultant and Representative manufacturer's written report, within 5 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for all electrical equipment installed.
 - .1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
 - .2 Operating instructions to include following:
 - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
 - .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
 - .3 Safety precautions.
 - .4 Procedures to be followed in event of equipment failure.
 - .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.
 - .3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.
 - .4 Post instructions where directed.
 - .5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.
 - .6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance 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 in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect all equipment and materials.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 DESIGN REQUIREMENTS

- .1 Operating voltages: to CSA-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.
 - .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.
- .3 Language operating requirements: provide identification nameplates for control items in English.

2.2 MATERIALS AND EQUIPMENT

- .1 Provide material and equipment in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from inspection authority having jurisdiction before delivery to site and submit such approval as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .3 Factory assemble control panels and component assemblies.

2.3 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

- .1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.
- .2 Control wiring and conduit: in accordance with Section 26 29 03 - Control Devices except for conduit, wiring and connections below 50 V which are related to control systems specified in mechanical sections and as shown on mechanical drawings.

2.4 WARNING SIGNS

- .1 Warning Signs: in accordance with requirements of Owners Representative having jurisdiction.

- .2 Decal signs, minimum size 175 x 250 mm.

2.5 WIRING TERMINATIONS

- .1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.6 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with nameplates and labels as follows:
- .1 Nameplates: lamicoid 3 mm thick plastic engraving sheet melamine , matt white finish with white face and black core, lettering accurately aligned and engraved into core mechanically attached with self tapping screws
- .2 Sizes as follows:

NAMEPLATE SIZES			
Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

- .2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.
- .3 Wording on nameplates and labels to be approved by Consultant prior to manufacture.
- .4 Allow for minimum of twenty-five (25) letters per nameplate and/or label.
- .5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .6 Identify equipment with Size 3 labels engraved "ASSET INVENTORY NO. "
- .7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .8 Terminal cabinets and pull boxes: indicate system and voltage.
- .9 Transformers: indicate capacity, primary and secondary voltages.

2.7 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, 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 coding: to CSA C22.1
- .4 Use colour coded wires in communication cables, matched throughout system.

2.8 CONDUIT AND CABLE IDENTIFICATION

- .1 Colour code conduits, boxes and metallic sheathed cables.
- .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15m intervals.

- .3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

Type	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green
up to 5 kV	Yellow	Blue
up to 15 kV	Yellow	Red
Telephone	Green	
Other Communication Systems	Green	Blue
Fire Alarm	Red	
Emergency Voice	Red	Blue
Other Security Systems	Red	Yellow

2.9 RECEPTACLE AND COMMUNICATIONS IDENTIFICATION

- .1 Identify each receptacle with permanent indelible identifying markings, coloured plastic tapes with panel and circuit number.
- .2 Identify each communication outlet with permanent indelible identifying markings, coloured plastic tapes with LAN room and port number.
- .3 Maintain phase sequence and colour coding throughout.
- .4 Colour coding: to CSA C22.1.

2.10 FINISHES

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
 - .1 Paint outdoor electrical equipment Paint outdoor electrical equipment "equipment green" finish to local utility standard/OESA.
 - .2 Paint indoor switchgear and distribution enclosures light gray to local utility/OESA standard

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable.
 - .1 Visually inspect substrate in presence of Owners Representative and/or Consultant.
 - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant or Owners Representative.

3.2 INSTALLATION

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise

- .2 Do overhead and underground systems in accordance with CAN/CSA-C22.3 No.1 except where specified otherwise

3.3 NAMEPLATES AND LABELS

- .1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed

3.4 CONDUIT AND CABLE INSTALLATION

- .1 Install conduit and sleeves prior to pouring of concrete.
 - .1 Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit, and protruding 100 mm.
- .2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- .3 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

3.5 LOCATION OF OUTLETS

- .1 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.
- .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.
 - .1 Locate disconnect devices in mechanical and elevator machine rooms on latch side of floor.

3.6 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 equipment at following heights unless indicated otherwise.
 - .1 Local switches: not less than 900 mm and not more than 1100 mm.
 - .2 Wall receptacles:
 - .1 General: 300 mm.
 - .2 Above top of continuous baseboard heater: 200 mm.
 - .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 Fire alarm stations: 1200mm.
 - .5 Fire alarm bells: 2100 mm.

3.7 CO-ORDINATION OF PROTECTIVE DEVICES

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

3.8 FIELD QUALITY CONTROL

- .1 Load Balance:
 - .1 Measure phase current to panelboards 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 Provide upon completion of work, load balance report as directed in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS, phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.
- .2 Conduct following tests in accordance with Section 01 45 00 - Quality Control.
 - .1 Power 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 operation of systems where applicable.
 - .5 Systems: fire alarm and communications.
 - .6 Insulation resistance testing:
 - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
 - .3 Check resistance to ground before energizing.
- .3 Carry out tests in presence of Owner Representative and /or Consultant.
- .4 Provide instruments, meters, equipment and personnel including necessary after-hours labour as required to conduct tests during and at conclusion of project.
- .5 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.9 SYSTEM STARTUP

- .1 Instruct operating personnel in operation, care and maintenance of systems, system equipment and components.
- .2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.
- .3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

3.10 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 – Cleaning and Waste Management
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning and Waste Management.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 00 - Cleaning and Waste Management
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This Section includes requirements for selective demolition and removal of electrical communications and safety and security components including removal of conduit, junction boxes, and panels to source (home run removal) and incidentals required to complete work described in this Section and ready for new construction. Ensure that no redundant cabling remains in place.

1.2 RELATED REQUIREMENTS

- .1 [Section 02 41 19- Selective Demolition]

1.3 DEFINITIONS

- .1 Demolish: Detach items from existing construction and legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.
- .2 Remove: Planned deconstruction and disassembly of electrical items from existing construction including removal of conduit, junction boxes, cabling and wiring from electrical component to panel taking care not to damage adjacent assemblies designated to remain; legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.
- .3 Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.
- .4 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- .5 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed and salvaged, or removed and reinstalled.
- .6 Hazardous Substances: Dangerous substances, dangerous goods, hazardous commodities and hazardous products may include asbestos, mercury and lead, PCB's, poisons, corrosive agents, flammable substances, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly as defined by Federal Hazardous Products Act (RSC 1985) including latest amendments.

1.4 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA S350 M1980 [(R2003)], Code of Practice for Safety in Demolition of Structures

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Action Submittals: Provide in accordance with Section Section 01 33 00 - Submittal Procedures before starting work of this Section:
 - .1 Landfill Records: Indicate receipt and acceptance of selective demolition waste and hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.6 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate work of this Section to avoid interference with work by other Sections.
- .2 Scheduling: Account for Owner's continued occupancy requirements during selective demolition with associated general sections and schedule staged occupancy and worksite activities as a defined in associated general sections.

1.7 QUALITY ASSURANCE

- .1 Regulatory Requirements: Perform work of this Section in accordance with:
 - .1 Government of Canada, Labour Program: Workplace Safety
Provincial/Territorial Occupational Health and Safety Standards and Programs

1.8 SITE CONDITIONS

- .1 Existing Conditions: Condition of materials identified as being salvaged or demolished are based on their observed condition at time of site examination before tendering.
- .2 Discovery of Hazardous Substances: It is not expected that Hazardous Substances will be encountered in Work; immediately notify Consultant if materials suspected of containing hazardous substances are encountered and perform following activities:
 - .1 Refer to associated general sections for directives associated with specific material types.
 - .2 Hazardous substances will be as defined in Hazardous Products Act.
 - .3 Stop work in area of suspected hazardous substances.
 - .4 Take preventative measures to limit users' and workers' exposure, provide barriers and other safety devices and do not disturb.
 - .5 Hazardous substances will be removed by Departmental Representative or DCC Representative under a separate contract or as a change to Work.
 - .6 Proceed only after written instructions have been received from Consultant.

1.9 SALVAGE AND DEBRIS MATERIALS

- .1 Demolished items become Contractor's property and will be removed from Project site; except for items indicated as being reused, salvaged, or otherwise indicated to remain Owner's property].
- .2 Carefully remove materials and items designated for salvage and store in a manner to prevent damage or devaluation of materials in accordance with associated general sections.
 - .1 Leave main electrical distribution panel in place; panel can be used for temporary construction power for this and subsequent contracts in accordance with Section [01 51 00 - Temporary Utilities]; coordinate temporary power connections with Departmental Representative, DCC Representative or Owner.
 - .2 Leave main telephone terminal backboard in place; panel can be used for temporary construction telephone system for this and subsequent contracts in accordance with Section [01 51 00 - Temporary Utilities]; coordinate temporary telephone connections with Departmental Representative, DCC Representative, or Owner.

Part 2 Products

2.1 MATERIALS

- .1 General Patching and Repair Materials: Refer to Section[02 41 19- Selective Demolition] for listing of patching and repair materials incidental to removal or demolition of components associated with work of this Section.
- .2 Electrical Repair Materials: Use only new materials, CSA or ULC labelled as appropriate and matching components remaining after work associated with components identified for removal or demolition are completed
- .3 Fire stopping Repair Materials: Use fire stopping materials compatible with existing fire stopping systems where removal or demolition work affects rated assemblies, restore to match existing fire rated performance.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Existing Conditions: Visit site, thoroughly examine and become familiar with conditions that may affect the work of this Section before tendering the Bid; Consultant will not consider claims for extras for work or materials necessary for proper execution and completion of the contract that could have been determined by a site visit.

3.2 PREPARATION

- .1 Protection of Existing Systems to Remain: Protect systems and components indicated to remain in place during selective demolition operations and as follows:
 - .1 Prevent movement and install bracing to prevent settlement or damage of adjacent services and parts of existing buildings scheduled to remain.
 - .2 Notify Consultant and cease operations where safety of buildings being demolished, adjacent structures or services appears to be endangered and await additional instructions before resuming demolition work specified in this Section.
 - .3 Prevent debris from blocking drainage inlets.
 - .4 Protect mechanical systems that will remain in operation.
- .2 Protection of Building Occupants: Sequence demolition work so that interference with the use of the building by the Departmental Representative, DCC Representative or Owner and users is minimized and as follows:
 - .1 Prevent debris from endangering safe access to and egress from occupied buildings.
 - .2 Notify Consultant and cease operations where safety of occupants appears to be endangered and await additional instructions before resuming demolition work specified in this Section.

3.3 EXECUTION

- .1 Demolition and Removal: Coordinate requirements of this Section with information contained in [Section 02 41 19- Selective Demolition] and as follows:
 - .1 Disconnect electrical circuits and panel feeders; maintain electrical service and main distribution panel as is, ready for subsequent Work.

- .2 Remove existing luminaires, electrical devices and equipment including associated conduits, boxes, wiring, and similar items unless specifically noted otherwise.
- .3 Disconnect and remove existing fire alarm system including associated conduits, boxes, wiring, and similar items unless specifically noted otherwise.
- .4 Disconnect and remove communication systems including associated conduits, boxes, cabling, and similar items unless specifically noted otherwise.
- .5 Disconnect and remove telephone outlets, associated conduit, cabling and sub terminal backboards and related accessories; maintain telephone service and main terminal backboard as is.
- .6 Perform demolition work in a neat and workmanlike manner:
 - .1 Remove tools or equipment after completion of work, and leave site clean and ready for subsequent renovation work.
 - .2 Repair and restore damages caused as a result of work of this Section to match existing materials and finishes.
- .7 Disconnect panel feeders back to main distribution panel and re label respective circuit breaker as "SPARE".
- .8 Place weatherproof blank cover plates on exterior outlet boxes remaining after demolition and removal activities.
- .9 Remove existing conduits, boxes, cabling and wiring associated with removed luminaires, electrical devices and equipment.
- .10 Grind off conduits and make flush with surface of concrete where conduits are cast into concrete; seal open ends of conduit with silicone sealant and leave in place.
- .11 Seal open ends of conduit with silicone sealant and leave in place where they are inaccessible or cannot be removed without damaging adjacent construction.

3.4 CLOSEOUT ACTIVITIES

- .1 Demolition Waste Disposal: Arrange for legal disposal and remove demolished materials to accredited provincial landfill site or alternative disposal site (recycle centre) except where explicitly noted otherwise for materials being salvaged for re use in new construction in accordance with associated general sections.
- .2 Hazardous Substances Disposal: Arrange for disposal of hazardous substances in accordance with requirements of General Sections.

END OF SECTION

Part 1 General

- .1 CSA Group (CSA)
 - .1 CAN/CSA-C22.2 No.65-R2018, Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE).
 - .2 CAN/CSA-C22.2 No.18.1-13(R2018), Metallic Outlet Boxes. (Tri-national standard, with UL 514A and ANCE NMX- J-023/1).
 - .3 CSA C22.2 No.18.2-06(R2021), Nonmetallic Outlet Boxes.
 - .4 CSA C22.2 No.18.3-12(R2017), Conduit, Tubing, and Cable Fittings (Tri-national Standard, with ANCE NMX-J-017 and UL 514B).
 - .5 CSA C22.2 No.18.4-15(R2019), Hardware for the Support of Conduit, Tubing, and Cable (Bi-National Standard, with UL 2239).
 - .6 CSA C22.2 No. 18.5-13, Positioning devices (Bi-national standard, with UL 1565).
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
 - .1 EEMAC 1Y-2-1961, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).
- .3 National Electrical Manufacturers Association (NEMA)

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for wire and box connectors and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for wire and box connectors for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect wire and box connectors from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

- .1 Pressure type wire connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.
- .2 Fixture type splicing connectors to: CAN/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 conductors copper stranded.
 - .2 Clamp for copper conductors.
 - .3 Stud clamp bolts.
 - .4 Bolts for copper conductors.
 - .5 Sized for conductors as indicated.
- .4 Clamps or connectors for armoured cable, TECK cable, mineral insulated cable, and flexible conduit as required to: CAN/CSA-C22.2 No.18.3.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wire and box connectors installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Consultant and/or Owners Representative.
 - .2 Inform Consultant and/or Owners Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied [and after receipt of written approval to proceed from Consultant and/or Owners Representative.

3.2 INSTALLATION

- .1 Remove insulation carefully from ends of conductors and cables and:
 - .1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.
 - .2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CAN/CSA-C22.2 No.65
 - .3 Install fixture type connectors and tighten to CAN/CSA-C22.2 No.65. Replace insulating cap.
 - .4 Install bushing stud connectors in accordance with EEMAC 1Y-2.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 – Cleaning and Waste Management
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 00 – Cleaning and Waste Management.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 PRODUCT DATA

- .1 Provide product data in accordance with Section 01 33 00- Submittal Procedures.

1.2 DELIVERY, STORAGE AND HANDLING

- .1 Packaging Waste Management: remove for reuse and return by manufacturer of padding, pallets, packaging materials and crates in accordance with Section 01 74 00 – Cleaning and Waste Management.

Part 2 Products

2.1 BUILDING WIRES

- .1 Conductors: stranded for 8 AWG and larger. Minimum #12AWG. Unless otherwise noted:
 - .1 Minimum #12 AWG for runs up to 75 feet.
 - .2 Minimum #10 AWG for runs 75feet to 125feet.
 - .3 Minimum #8 AWG for runs over 125 feet
- .2 Copper conductors: size as indicated on drawings, with 600V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE, Non Jacketed. Where not indicated on drawings conductors shall be copper.
- .3 Copper conductors: size as indicated on drawings, with thermoplastic insulation type T90 Nylon rated at 600 V. Where not indicated on drawings conductors shall be copper.

2.2 TECK 90 CABLE

- .1 Cable: in accordance with Section 26 05 00- Common Work Results for Electrical.
- .2 Conductors:
 - .1 Grounding conductor: copper as indicated on drawings.
 - .2 Circuit conductors: copper as indicated on drawings; size as indicated.
 - .3 Where not indicated on drawings conductors shall be copper.
- .3 Insulation:
 - .1 Cross-linked polyethylene XLPE.
 - .2 Rating: 600V.
- .4 Inner jacket: polyvinyl chloride material.
- .5 Armour: galvanized steel.
- .6 Overall covering: thermoplastic polyvinyl chloride, compliant to applicable Building Code classification for this project.
- .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
- .3 Threaded rods: 6 mm diameter to support suspended channels.
- .8 Connectors:
 - .1 Watertight approved for TECK cable.

2.3 MINERAL-INSULATED CABLES

- .1 Conductors: solid bare soft-annealed copper, size as indicated.
- .2 Insulation: compressed powdered magnesium oxide or silicon dioxide to form compact homogeneous mass throughout entire length of cable.
- .3 Outer covering: annealed seamless copper sheath, Type M1 rated 600 V, 250 degrees C .
- .4 Overall jacket: none.
- .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 on drawings. Where not indicated on drawings conductors shall be copper.
- .2 Type: AC90.
- .3 Armour: interlocking type fabricated from aluminum strip.
- .4 Type: jacket over armour and compliant to applicable Building Code classification for this project.
- .5 Connectors: anti short connectors.

2.5 ALUMINUM SHEATHED CABLE

- .1 Conductors: ACM alloy or aluminum or copper, size as indicated on drawings. Where not indicated on drawings conductors shall be copper.
- .2 Insulation: cross linked polyethylene rated 600 V.
- .3 Sheath: aluminum applied to form continuous corrugated seamless sheath.
- .4 Outer jacket: none.
- .5 Fastenings for aluminum sheathed cable:
 - .1 One hole steel straps to secure surface cables 25 mm and smaller. Two hole steel straps for cables larger than 25 mm. Use aluminum strap only with single conductor cable.
 - .2 Channel type supports for two or more cables at
 - .3 Threaded rods: 6 mm diameter to support suspended channels.

2.6 CONTROL CABLES

- .1 Type: LVT: 2 soft annealed copper conductors, sized as indicated:
 - .1 Insulation: thermoplastic.
 - .2 Sheath: thermoplastic jacket.
- .2 Type: low energy 300 V control cable: stranded annealed copper conductors sized as indicated LVT:2 soft annealed copper conductors, sized as indicated:
 - .1 Insulation: TWH polyethylene.
 - .2 Shielding: braid over conductors group.
 - .3 Overall covering: polyethylene jackets.
- .3 Type: 600 V conductors, sizes as indicated :annealed copper
 - .1 Insulation: RW90 cross-linked polyethylene type.
 - .2 Shielding: conductors.
 - .3 Overall covering: thermosetting jackets.

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 for Consultant and/or Owner Representative and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.

3.2 GENERAL CABLE INSTALLATION

- .1 Lay cable in cable trays in accordance with Section 26 05 36- Cable Trays for Electrical Systems.
- .2 Terminate cables in accordance with Section 26 05 20- Wire and Box Connectors - (0-1000 V).
- .3 Cable Colour Coding: to Section 26 05 00- Common Work Results for Electrical.
- .4 Conductor length for parallel feeders to be identical.
- .5 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.
- .6 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.
- .7 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.
- .8 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, Conduit Fastenings and Conduit Fittings.
 - .2 In surface and lighting fixture raceways in accordance with Section 26 05 33
 - .3 In wireways and auxiliary gutters in accordance with Section 26 05 37

3.4 INSTALLATION OF TECK90 CABLE (0 -1000 V)

- .1 Group cables wherever possible on channels.
- .2 Install cable concealed where required by Architect , securely supported by straps and hangers.

3.5 INSTALLATION OF MINERAL-INSULATED CABLES

- .1 Install cable concealed or exposed as required , securely supported by straps or hangers.
- .2 Support 2 hour fire rated cables at 1 m intervals.
- .3 Make cable terminations by using factory-made kits.
- .4 Cable terminations: use thermoplastic sleeving over bare conductors.
- .5 Do not splice cables unless indicated.

3.6 INSTALLATION OF ARMOURED CABLES

- .1 Group cables wherever possible on channels.

3.7 INSTALLATION OF ALUMINUM SHEATHED CABLE

- .1 Group cables wherever possible on channels.

3.8 INSTALLATION OF CONTROL CABLES

- .1 Install control cables in conduit.
- .2 Ground control cable shield.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 CSA Group
 - .1 CSA C22.1:21, Canadian Electrical Code, Part 1 latest edition, Safety Standard for Electrical Installations.
 - .2 CSA C22.2 No.41-12(R2017), Grounding and Bonding Equipment (Tri-National Standard, with NMX-J-590ANCE and UL 467).
 - .3 CSA C22.2 No.65-18, Wire connectors (Tri-National Standard, with UL 486A-486B NMX-J-543-ANCE).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for connectors and terminations and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Certificates: obtain inspection certificate of compliance covering high voltage stress from inspection authority and include it with maintenance manuals and as-built drawings.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00- Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for connectors and terminations for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance 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 in dry location off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect connectors and terminations from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 CONNECTORS AND TERMINATIONS

- .1 Copper short barrel compression connectors to CSA C22.2 No.65 as required sized for conductors.
- .2 Contact aid for aluminum cables where applicable.
- .3 4-way joint boxes dry location type in accordance with Section 26 05 33- Raceway and Boxes for Electrical Systems.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for connectors and terminations installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of General Contractor.
 - .2 Inform General Contractor of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from General Contractor.

3.2 INSTALLATION

- .1 Install stress cones, terminations, and splices in accordance with manufacturer's instructions.
- .2 Bond and ground as required to CSA C22.2NO.41:22.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 – Cleaning and Waste Management.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 00 – Cleaning and Waste Management.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions in PDF format, printed product literature and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.

1.2 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions and Section 01 61 00- Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors, off ground, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect hangers and supports from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 SUPPORT CHANNELS

- .1 Steel channels, zinc coating, U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted or set in poured concrete walls and ceilings.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for hangers and supports installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Consultant and/or Representative.
 - .2 Inform Consultant and/or Owners Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant and/or Owners Representative.

3.2 INSTALLATION

- .1 Secure equipment to hollow, solid masonry, tile and plaster surfaces with lead anchors.
- .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.
- .7 Suspended support systems.
 - .1 Support individual cable or conduit runs with 6 mm diameter threaded rods and spring clips.
 - .2 Support 2 or more cables or conduits on channels supported by 6 mm diameter threaded rod hangers where direct fastening to building construction is impractical.
- .8 For surface mounting of two or more conduits use channels at 1.5M (5') intervals.
- .9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .11 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Consultant and/or Owners Representative.
- .13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 – Cleaning and Waste Management
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 – Cleaning and Waste Management

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA C22.1:21, Canadian Electrical Code, Part 1.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in PDF format in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Provide shop drawings: in accordance with Section 01 33 00- Submittal Procedures.
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario, Canada.

Part 2 Products

2.1 SPLITTERS

- .1 Construction: sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.
- .2 Terminations: main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.
- .3 Spare Terminals: minimum three spare terminals or lugs on each connection or lug block sized less than 400 A.

2.2 JUNCTION AND PULL BOXES

- .1 Construction: welded steel enclosure.
- .2 Covers Flush Mounted: 25 mm minimum extension all around.
- .3 Covers Surface Mounted: screw-on flat covers.

2.3 CABINETS

- .1 Construction: welded sheet steel hinged door, and catch
- .2 Type E Empty: flush overlapping sides mounting as required.
- .3 Type T Terminal: flush overlapping sides mounting as required containing.

Part 3 Execution

3.1 SPLITTER INSTALLATION

- .1 Mount plumb, true and square to 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 except where indicated otherwise.
- .3 Install terminal block as indicated in Type T cabinets.
- .4 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

3.3 IDENTIFICATION

- .1 Equipment Identification: to Section 26 05 00- Common Work Results for Electrical.
- .2 Identification Labels: size 2 indicating, voltage and phase, system name, fed from.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 Ontario Electrical Safety Code, 28th Edition, 2021.
 - .2 CSA C22.1:21, Canadian Electrical Code,

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.
- .2 Submit samples for floor box in accordance with Section 01 33 00- Submittal Procedures.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00- Common Product Requirements.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for recycling in accordance with Section 01 74 00 – Cleaning and Waste Management.

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.
- .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 One-piece electro-galvanized construction.
- .2 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.
- .3 Utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.
- .4 102 mm square or octagonal outlet boxes for lighting fixture outlets.
- .5 Extension and plaster rings for flush mounting devices in finished plaster and tile walls.

2.3 MASONRY BOXES

- .1 Electro-galvanized steel masonry and multi and single gang boxes for devices flush mounted in exposed block walls.

2.4 CONCRETE BOXES

- .1 Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

2.5 CONDUIT BOXES

- .1 Cast FS boxes with factory-threaded hubs and mounting feet for surface wiring of devices.

2.6 OUTLET BOXES FOR NON-METALLIC SHEATHED CABLE

- .1 Electro-galvanized, sectional, screw ganging steel boxes, minimum size 76 x 50 x 63 mm with two double clamps to take non-metallic sheathed cables.

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 35 mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

2.8 SERVICE FITTINGS

- .1 'High tension' receptacle fitting made of 2 piece die-cast aluminum with brushed aluminum housing finish for two duplex receptacles. Bottom plate with two knockouts for centered or offset installation. 12 x 102 mm extension piece as indicated.

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. Do not install reducing washers.
- .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 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CAN/CSA-C22.2 No.18.1-13(R2018), Metallic Outlet Boxes (Tri-national standard, with UL 514A and ANCE NMX- J-023/1).
 - .2 CSA C22.2 No.18.2-06(R2021), Non-metallic Outlet Boxes.
 - .3 CSA C22.2 No.18.3-12(R2017), Conduit, Tubing, and Cable Fittings (Tri-national Standard, with ANCE NMX-J-017 and UL514B).
 - .4 CSA C22.2 No.18.4-15(R2019), Hardware for the Support of Conduit, Tubing, and Cable (Bi-National Standard, with UL 2239).
 - .5 CSA C22.2 No. 18.5-13, Positioning devices (Bi-national standard, with UL 1565).
 - .6 CSA C22.2 No. 45.1-07(R2017), Electrical Rigid Metal Conduit - Steel (Tri-National standard, with UL 6 and MX-J-534-ANCE-2007)
 - .7 CSA C22.2 No. 56-17, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .8 CSA C22.2 No. 83.1-07(R2017), Electrical Metallic Tubing.
 - .9 CSA C22.2 No. 211.2-06(R2021), Rigid PVC (Unplasticized) Conduit.
 - .10 CSA C22.2 No. 227.3:15(R2019), Non-metallic Mechanical Protection Tubing (NMPT), A National Standard of Canada latest edition.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product data: submit manufacturer's printed product literature, specifications and datasheets.
 - .1 Submit cable manufacturing data.
- .3 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.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling in accordance with Section 01 74 10 – Cleaning and Waste Management.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

Part 2 Products

2.1 CABLES AND REELS

- .1 Provide cables on reels or coils.
 - .1 Mark or tag each cable and outside of each reel or coil, to indicate cable length, voltage rating, conductor size, and manufacturer's lot number and reel number.
- .2 Each coil or reel of cable to contain only one continuous cable without splices.
- .3 Identify cables for exclusively dc applications.
- .4 Reel and mark shielded cables rated 2,001 volts and above.

2.2 CONDUITS

- .1 Rigid metal conduit: to CSA C22.2 No. 45.1 hot dipped galvanized steel threaded.
- .2 Epoxy coated conduit: to CSA C22.2 No. 45.1, with zinc coating and corrosion resistant epoxy finish inside and outside.
- .3 Electrical metallic tubing (EMT): to CSA C22.2 No. 83.1, with couplings.
- .4 Rigid PVC conduit: to CSA C22.2 No. 211.2.
- .5 Flexible metal conduit: to CSA C22.2 No. 56 , liquid-tight flexible metal.
- .6 Flexible PVC conduit: to CSA-C22.2 No. 227.3 .

2.3 CONDUIT FASTENINGS

- .1 One hole steel straps to secure surface conduits 50 mm and smaller.
 - .1 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 5 foot intervals.
- .4 Threaded rods, 6 mm diameter, to support suspended channels.

2.4 CONDUIT FITTINGS

- .1 Fittings: to CSA C22.2 No. 18.3, manufactured for use with conduit specified. Coating: same as conduit.
- .2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.
- .3 Watertight connectors and couplings for EMT.
 - .1 Set-screws are not acceptable.

2.5 EXPANSION FITTINGS FOR RIGID CONDUIT

- .1 Weatherproof expansion fittings with internal bonding assembly suitable for 200 mm linear expansion.
- .2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.
- .3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.6 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 conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Conceal conduits except in mechanical and electrical service rooms in unfinished areas.
- .3 Surface mount conduits except in finished areas.
- .4 Use rigid hot dipped galvanized steel threaded conduit except where specified otherwise.
- .5 Use electrical metallic tubing (EMT) except in cast concrete above 2.4 m not subject to mechanical injury.
- .6 Use rigid PVC conduit in corrosive areas and underground.
- .7 Minimum conduit size for lighting and power circuits: 19 mm.
- .8 Install EMT conduit from computer room branch circuit panel to outlet boxes located in sub floor.
- .9 Install EMT conduit from computer room branch circuit panel to junction box in sub-floor immediately below panel.
 - .1 Run flexible conduit from junction box to outlet boxes for each computer in sub-floor.
- .10 Bend conduit cold:
 - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .11 Mechanically bend steel conduit over 19 mm diameter.
- .12 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .13 Install fish cord in empty conduits.
- .14 Run 2-25 mm spare conduits up to ceiling space and 2-25 mm spare conduits down to ceiling space from each flush panel.
 - .1 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 surface type box.
- .15 Remove and replace blocked conduit sections.
 - .1 Do not use liquids to clean out conduits.

- .16 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 surface or suspended channels.
- .5 Do not pass conduits through structural members except as indicated.
- .6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 CONCEALED CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Do not install horizontal runs in masonry walls.
- .3 Do not install conduits in terrazzo or concrete toppings.

3.5 CLEANING

- .1 Proceed in accordance with Section 01 74 00 – Cleaning and Waste Management.
- .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 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA C22.2 No.42:10(R2020), General Use Receptacles, Attachment Plugs and Similar Devices.
 - .2 CAN/CSA C22.2 No.42.1-13(R2022), Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
 - .3 CSA C22.2 No.55:15(R2020), Special Use Switches.
 - .4 CAN/CSA-C22.2 No.111-18, General-Use Snap Switches (Tri-national standard, with UL 20 and NMX-J-005-ANCE)

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for wiring devices and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario of Canada

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00- Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for wiring devices for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions and Section 01 61 00- Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials indoors off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect wiring devices from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 SWITCHES

- .1 20A, 120 V and 347 V, single pole, double pole, three-way, four-way switches to: CSA C22.2 No.55 and CSA C22.2 No.111-18.
- .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.
- .3 Toggle operated locking fully rated for tungsten filament LED and fluorescent lamps, and up to 80% of rated capacity of motor loads heating loads.
- .4 Switches of one manufacturer throughout project.
- .5 For automatic lighting switch, contractor to verify on site and match existing.

2.2 RECEPTACLES

- .1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, to: CSA C22.2 No.42.1 with following features:
 - .1 White urea 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.
- .2 Single receptacles CSA type 5-15 R, 125 V, 15 A, U ground with following features:
 - .1 White urea moulded housing.
 - .2 Suitable for No. 10 AWG for back and side wiring.
 - .3 Four back wired entrances, 2 side wiring screws.
- .3 Other receptacles with ampacity and voltage as indicated.
- .4 Receptacles of one manufacturer throughout project.

2.3 COVER PLATES

- .1 Cover plates for wiring devices to: CSA C22.2 No.42.1.
- .2 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.
- .3 Plastic white cover plates, thickness 2.5 mm thick cover plates for wiring devices mounted in flush-mounted outlet box.
- .4 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.

- .5 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.
- .6 Weatherproof spring-loaded cast aluminum cover plates complete with gaskets for single receptacles or switches.

2.4 SOURCE QUALITY CONTROL

- .1 Cover plates from one manufacturer throughout project.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wiring devices installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Consultant and/or Owner Representative.
 - .2 Inform Consultant and/or Owner Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied [and after receipt of written approval to proceed from Consultant and/or Owner Representative.

3.2 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 as indicated in accordance with Section 26 05 00 Common Work Results for 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 as indicated in accordance with Section 26 05 00- Common Work Results for Electrical.
 - .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.
 - .4 Install GFI type receptacles as indicated.
- .3 Cover plates:
 - .1 Install suitable common cover plates where wiring devices are grouped.
 - .2 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 – Cleaning and Waste Management.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 – Cleaning and Waste Management.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 00 – Cleaning and Waste Management.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.
- .3 Repair damage to adjacent materials caused by wiring device installation.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA C22.2 No. 5-16(R2021), Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, and NMX-J-266-ANCE-2010).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for circuit breakers and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Include time-current characteristic curves for breakers with ampacity of 100A and over with interrupting capacity of 22,000 A symmetrical (rms) and over at system voltage.
- .4 Certificates:
 - .1 Prior to installation of circuit breakers in either new or existing installation, Contractor must submit in PDF format copies of a production certificate of origin from the manufacturer. Production certificate of origin must be duly signed by factory and local manufacturer's representative certifying that circuit breakers come from this manufacturer and are new and meet standards and regulations.
 - .1 Production certificate of origin must be submitted to Consultant and/or Owners Representative for approval.
 - .2 Delay in submitting production of certificate of origin will not justify any extension of contract and additional compensation.
 - .3 Any work of manufacturing, assembly or installation to begin only after acceptance of production certificate of origin by Consultant and/or Owners Representative. Unless complying with this requirement, Consultant and/or Owners Representative reserves the right to mandate manufacturer listed on circuit breakers to authenticate new circuit breakers under the contract, and to Contractor's expense.
 - .4 Production certificate of origin must contain:
 - .1 Manufacturer's name and address and person responsible for authentication. Person responsible must sign and date certificate.
 - .2 Licensed dealer's name and address and person of distributor responsible for Contractor's account.
 - .3 Contractor's name and address and person responsible for project.
 - .4 Local manufacturer's representative name and address. Local manufacturer's representative must sign and date certificate.
 - .5 Name and address of building where circuit breakers will be installed:

- .1 Project title: [Court Services Renovation– 17150 Yonge St., Newmarket, Ontario]
- .2 End user's reference number: [Contract No: RFTC-3158-25-24091]
- .3 List of circuit breakers: [# - verify on site]

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions and Section 01 61 00- Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store circuit breakers in dry location off ground indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect circuit breakers from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 BREAKERS GENERAL

- .1 Circuit breakers, accessory high-fault protectors Moulded-case circuit breakers, ground-fault circuit-interrupters: to CSA C22.2 No. 5.
- .2 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.
- .3 Common-trip breakers: with single handle for multi-pole applications.
- .4 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.
 - .1 Trip settings on breakers with adjustable trips to range from 3-8 times current rating.
- .5 Circuit breakers with interchangeable trips as indicated.
- .6 Circuit breakers to have minimum interrupting capacity as noted on the drawings.

2.2 THERMAL MAGNETIC BREAKERS DESIGN A

- .1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

2.3 MAGNETIC BREAKERS DESIGN B

- .1 Moulded case circuit breaker to operate automatically by means of magnetic tripping devices to provide instantaneous tripping for short circuit protection.

2.4 CURRENT LIMITING AND SERIES RATED THERMAL MAGNETIC BREAKERS DESIGN C

- .1 Thermal magnetic breakers with current limiters.
 - .1 Time current limiting characteristics of fuses limiters coordinated with time current tripping characteristics of circuit breaker.
 - .2 Co-ordination to result in interruption by breaker of fault-level currents up to interrupting capacity of breaker.
- .2 Series rated breakers to be manufacturer tested and listed. Breakers to be applied following manufacturer's guidelines and accepted best practice.
 - .1 Breakers applied following manufacturer's guidelines and accepted best practice.

2.5 SOLID STATE TRIP BREAKERS DESIGN D

- .1 Moulded case circuit breaker to operate by means of solid-state trip unit with associated current monitors and self-powered shunt trip to provide inverse time current trip under overload condition, long time, instantaneous, short time tripping and for groundphase fault short circuit protection.

2.6 OPTIONAL FEATURES

- .1 Include: as noted on the drawings
 - .1 Shunt trip.
 - .2 Auxiliary switch.
 - .3 Motor-operated mechanism c/w time delay unit.
 - .4 Under-voltage release.
 - .5 On-off locking device.
 - .6 Handle mechanism.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Consultant and/or Owners Representative.
 - .2 Inform Consultant and/or Owners Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant and/or Owners Representative.

3.2 INSTALLATION

- .1 Install circuit breakers as indicated.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 – Cleaning and Waste Management.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 – Cleaning and Waste Management.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 00 – Cleaning and Waste Management.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 CSA Group (CSA):
 - .1 CSA C22.2 No.250.2:20 Lighting Systems.
 - .2 CSA C22.2 No.37:20, Decorative Lighting Products.
 - .3 CSA-E598-2-17-98 (R2017), Luminaires

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Provide complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by consultant.
 - .3 Photometric data to include: VCP Table where applicable and spacing criterion.
- .3 Quality Assurance Submittals: Provide in accordance with Section 01 40 00 - Quality Requirements
 - .1 Manufacturer's Instructions: Submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures, etc.

1.3 QUALITY ASSURANCE

- .1 Provide mock-ups in accordance with Section 01 40 00 - Quality Requirements

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store, and handle materials in accordance with manufacturer's written instructions
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: In accordance with Section 01 74 00 – Cleaning and Waste Management.
- .4 Divert unused metal materials from landfill to metal recycling facility.
- .5 Disposal and recycling of fluorescent lamps as per local regulations.
- .6 Disposal of old PCB filled ballasts.

Part 2 Products

2.1 GENERAL

- .1 New lights to match existing. Verify on site before ordering.

2.2 FINISHES

- .1 Light fixture finish and construction to meet ULC listing [s] and CSA certification [s] related to intended installation.

2.3 OPTICAL CONTROL DEVICES

- .1 As indicated in luminaire schedule.

2.4 LUMINAIRES

- .1 As indicated in luminaire schedule.
- .2 New lights to match existing. Verify on site before ordering.

Part 3 Execution

3.1 INSTALLATION

- .1 Locate and install luminaires as indicated.
- .2 Provide adequate support to suit ceiling system.
- .3 Co-ordinate general purpose room lighting fixture, joists and diffuser layout with mechanical contractor and general contractor. Submit co-ordination drawing to Engineer for approval.
- .4 Refer to Architectural Reflected Ceiling Plans for exact location of luminaires.
- .5 Provide lamps in all luminaires.
- .6 Lamps shall be guaranteed for the rated lamp life.

3.2 WIRING

- .1 Connect luminaires to lighting circuits:
 - .1 Install flexible or rigid conduit for luminaires as indicated.
 - .2 Size conductors for a maximum of 2% voltage drop.
 - .3 Connect to control circuits as per drawing notes. Contractor to coordinate with building operator and verify on site and check existing control wiring diagram and obtain programming sequence.

3.3 LUMINAIRE SUPPORTS

- .1 For luminaires mounted in suspended ceilings, support luminaires independently of ceiling using S-link chain.
- .2 Support luminaires mounted in continuous rows once every 1.0 metre.
- .3 Suspended luminaires to have continuous mounting channel

3.4 LUMINAIRE ALIGNMENT

- .1 Align luminaires mounted in continuous rows to form straight uninterrupted line.

- .2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

3.5 CLEANING

- .1 Remove all debris and tools from the site due to the carrying out of this contract. Leave the site in a neat and clean manner suitable to the Engineer.
- .2 Clean in accordance with Section 01 74 00 – Cleaning and Waste Management.
- .3 Waste Management: Perform in accordance with Section 01 74 00 – Cleaning and Waste Management.

3.6 Tests

- .1 Test each individual luminaire and verify that all lamps are clean and operational.
- .2 Verify that each ballast is functioning within manufacturer's operating criteria. Replace all noisy or faulty ballasts.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 CSA Group (CSA):
 - .1 CSA C22.2 No.141-[10], Emergency Lighting Equipment
 - .2 CSA C860-[11(R2016)], Performance of Internally-Lighted Exit Signs
- .2 National Fire Protection Association (NFPA):
 - .1 NFPA 101-[2024], Life Safety Code

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Submit WHMIS SDS - Safety Data Sheets.
- .4 Quality Assurance Submittals: Submit the following in accordance with Section 01 40 00 - Quality Requirements
 - .1 Instructions: Submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures, etc.

Part 2 Products

2.1 STANDARD UNITS

- .1 Exit Lights: To CSA C22.2 No.141 and CSA C860
- .2 To match existing, verify on site before ordering.

2.2 REFER TO DRAWING SCHEDULE

- .1 Wall and end to wall as indicated.
- .2 Single and double face with arrows indicating exit directions as indicated.

Part 3 Execution

3.1 INSTALLATION

- .1 Install exit lights to manufacturer's recommendations, listing requirements, NFPA standard and local regulatory requirements
- .2 Mount exit luminaire independent of T-bar ceiling. Caddy clips and wood bracing not acceptable.

- .3 Connect fixtures to exit light circuits as indicated.
- .4 Exit lighting wiring to be in separate conduit system.
- .5 Connect emergency lamp sockets to emergency circuits from existing emergency lighting battery unit .
- .6 Ensure that exit light circuit breaker is locked in 'on' position.
- .7 To each exit outlet box as to what AC circuit and battery unit is fed from.

3.2 CLEANING

- .1 Perform in accordance with Section 01 74 00 – Cleaning and Waste Management.

END OF SECTION

READ THE DRAWINGS AND SPECIFICATIONS BELOW IN CONJUNCTION WITH THE YORK REGION STANDARD SPECIFICATION "YORK REGION CORPORATE NETWORK CABLING STANDARD – DECEMBER 11, 2025". IN CASE OF CONFLICT WITH THE YORK REGION STANDARD SPECIFICATION, THE YORK REGION STANDARD SPECIFICATIONS TAKE PRECEDENCE OVER THE SPECIFICATIONS AND DRAWINGS

SECTION 270010 – COMMUNICATIONS GENERAL REQUIREMENTS

1.1 GENERAL

.1 Overview

- .1 This document sets forth the requirements for the work to be undertaken under Division 27.

.2 Work Included

- .1 Complete and fully operational communication system as required by the drawings and as herein specified.
- .2 All work described in these specification and drawings are considered as part of the contract. Be responsible for all parts labour and materials described (unless otherwise stated). No part of the specifications or drawings is to be considered optional or not included.

.3 Related Work as applicable

- .1 General Requirements
- .2 Doors and Windows
- .3 Finishes
- .4 Specialities
- .5 Mechanical
- .6 Electrical

.4 Drawings and Specifications

- .1 Read Division 27 in conjunction with all applicable General Conditions, Supplementary Conditions and other specification Divisions with their respective clauses applied to this division as applicable.

- .2 Any item or subject omitted from either the specifications or the drawings but which is mentioned or reasonably specified in and by the others shall be considered as properly and sufficiently specified and shall be provided.
 - .3 Provide all minor items and work not shown or specified but which are reasonably necessary to complete the Work.
 - .4 If discrepancies or omissions in the drawings or specifications are found, or if the intent or meaning is not clear, advise the Consultant.
 - .5 Responsibility to determine which Division provides various products and work rests with the Contractor. Additional compensation will not be considered because of differences in interpretation of specifications.
- .5 Submittals
- .1 Within 7 days of award of contract, submit a completed equipment procurement schedule which lists the manufacturer and model of equipment, indicating the projected ordering, shop drawing submittal date and delivery dates of all products to meet the required construction schedule.
 - .2 Delivery of any products to the job site shall be in accordance with the procedures set forth in the Division 1. These requirements address the issue of loading dock space, storage space and the Contractor's responsibility for co-ordination with the Owner.
 - .3 Prior to delivery of any products to job site and sufficiently in advance of requirements to allow 5 working days for checking, submit shop drawings for review.
 - .4 Manufacture of products shall conform to revised shop drawings.
 - .5 Keep one complete set updated and approved shop drawings at job site during construction.
- .6 As-built Drawings
- .1 Retain one complete set of prints at the site office, including all addendums, change orders, site instructions, clarifications and revisions for the purpose of record drawings. As the work on site proceeds, clearly record in Red Pencil all as-built conditions that deviate from the original contract documents. Record drawings to include cable runs (complete with number of cables and ID number) and locations of all communication equipment.
 - .2 Prior to achieving "Substantial Completion" or project completion, the Contractor shall provide all modifications to the communications drawings in the "as built" CAD drawings. This as built information shall include Addenda, Change Orders, Clarifications, Revisions, Site Instructions and Shop Drawings.
 - .3 Upon completion the Contractor shall certify, in writing that the as built records are complete and that they accurately indicate all communication services related to the communications infrastructure. This shall include all visible and all

invisible items. The information shall also correspond with all identifications applied by the Contractor to cables and termination devices in the buildings.

- .4 The Contractor shall forward a letter of certification to the Consultant for final review and record CAD and PDF drawings to the Consultant for final review.
- .5 The contractor may obtain digital copies of the communications contract drawings from the Consultant on request. A release form for the drawings may need to be signed by the contractor.

.7 Operation Manuals

- .1 The manual shall contain the following information:
 - .1 Copy of test data. Must supply a copy to the Communications Consultant in digital form. One copy is to be forwarded directly to the Client in digital form.
 - .2 Include type and accuracy of instruments used to obtain test data. This must be approved by the Communications Consultant, Client, and Manufacturer prior to testing.

.8 Training

- .1 Staff shall be trained in the operation of all infrastructure and systems provided within this contract.

.9 Product Handling

- .1 Use all means necessary to protect the products of this Division before, during and after installation and to protect products and installed work of all other trades.
- .2 Immediately make good any damage by repair or replacement at no additional cost to the Owner and to the approval of the Consultant.
- .3 The Consultant will require that the Contractor remove any "blatant" advertising labels from all equipment. This does not normally constitute "regular labelling". Do not remove identification or certification labels.

.10 Guarantee

- .1 Furnish a written guarantee to the Owner prior to final contract payment, which will be in effect for one year from the date of substantial completion of each major phase of the work. Replace or repair at no cost to the Owner any defective material or workmanship except where, in the opinion of the Consultant, such defects are due to the misuse or neglect by the Owner.
- .2 This general guarantee shall not act as a waiver of any specified or special equipment guarantees which cover a greater length of time.

1.2 PRODUCTS

- .1 Selected Products & Equivalents

- .1 Products and materials provided shall be new and free from all defects. Defective products or materials will be rejected, regardless of previous inspections. The Contractor shall be responsible to remove and replace defective products at their expense, and shall be responsible for any resulting delays and associated expenses that result from defective products being rejected. Related materials shall be of the same manufacturer throughout the project.
 - .2 Products and materials referred to in the specifications by trade names, manufacturer's name and catalogue reference shall be used as the basis for the Tender.
 - .3 The design has been based on the use of different manufacturers of products. (Note: some products specified are manufactured by ADC, AVAYA, Hubbel, Corning, NORDX and Panduit)
- .2 Alternative Products
- .1 All product substitutions must be approved by the Consultant and Clients. Failure to obtain approval from the Consultant will result in the alternative product being rejected, in which case the Contractor shall provide the approved product at no additional cost to the owner.
 - .2 The Contractor shall assume full responsibility for ensuring that when providing alternative products or materials, all space, weight, connections, power and wiring requirements etc. are considered. Any costs incurred for additional components, changes to services, structural or space requirements, layouts and plans, etc. that may be necessary will be borne by the contractor.
 - .3 Following submission of the appropriate change request form, product data form and sample product, the Consultant shall provide a response in writing within 3 working days.
- .3 Samples
- .1 The Contractor shall be responsible for providing samples of each and every item that is to be installed except where otherwise agreed.
 - .2 In the event that a manufacturer changes the model, in any respect, the Contractor shall seek to have the changed model approved and furnish additional samples.
 - .3 The samples will be maintained by the Consultant so as to validate that the items installed within the project correspond with that item which was approved by the Consultant.
 - .4 The Consultant will reject any samples that do not meet the specifications or requirements.
- .4 Change Order
- .1 Any changes to the specification document shall be communicated to the Contractor. The Contractor shall, within 3 working days, notify the Consultant in writing of any cost changes that occur as a result of proposed changes.

- .2 Proposed changes must be authorized by the Architect and each change will be furnished with a number, date and description.
- .3 Any change orders that are implemented without written authorization will not be accepted by the Consultant or approved for payment.
- .4 The Contractor shall at all times maintain as-built documentation and change orders on site.
- .5 Quality of Products
 - .1 All products provided shall be CSA Approved; Canadian Underwriters' Laboratory approved where applicable, and new, unless otherwise specified.
 - .2 If products specified are not CSA approved, obtain special approval from the local regulatory authority. Pay all applicable charges levied and make all modifications required for approval.
 - .3 Products provided, if not specified, shall be new, of a quality best suited to the purpose required and their use subject to approval by the Consultant.
- .6 Uniformity of Manufacture
 - .1 Unless otherwise specifically called for in the Specifications, uniformity of manufacture shall be maintained for similar products throughout the work.
- .7 Product Finishes
 - .1 Touch up all damaged painted finishes with matching lacquer, or, if required by the Consultant, completely repaint damaged surface.
- .8 Use of Products During Construction
 - .1 Any equipment used for temporary or construction purposes shall be approved by the Construction Manager and in accordance with the General Conditions, "Use of Premises." Clean and restore to "as new" condition all equipment prior to the time of substantial completion.
 - .2 The warranty period shall begin with "substantial completion" of each major segment of work.

1.3 EXECUTION

- .1 Site Examination
 - .1 Examine the site of work and become familiar with all features and characteristics affecting this work before submitting tender.
 - .2 Report to the Consultant any unsatisfactory conditions that may adversely affect the proper completion of this work in accordance with the general terms and conditions of the contract.

- .3 Unless explicitly approved in writing, no changes to this document shall be deemed to have occurred.
 - .4 The Contractors shall, validate that all conduits, boxes, raceways, etc., are of appropriate size, location and quality of installation to support the required infrastructure.
 - .5 The Contractor may request modifications to the infrastructure from the Architect if he cannot meet his obligations with the provided infrastructure.
 - .6 Every newly installed EMT conduit end shall be equipped with the PVC bushing and a nylon pull string before communications cables are pulled.
 - .7 It is the responsibility of the Contractor to ensure that all pull boxes, communications outlets and electrical fittings which form part of this work are appropriately closed upon completion of this contract.
- .2 Co-ordination with Other Divisions
- .1 Examine the drawings and specifications of all divisions and become fully familiar with their work. Before commencing work, obtain a ruling from the Consultant if any conflict exists, otherwise no additional compensation will be made for any necessary adjustments.
 - .2 Lay out the work and equipment with due regard to architectural, structural, electrical, A/V and mechanical features. Notify the consultant immediately regarding any discrepancy.
 - .3 Do not cut structural members without approval of the Consultant.
 - .4 Coordinate work with all other Contractors who are installing equipment and services for other divisions so as to ensure that there are no conflicts. The anchors, bolts, pipe sleeves, hanger inserts etc., should be installed ahead of time so as to prevent any delay in the completion of the Contractor's work.
 - .5 Examine previously constructed work and notify the Consultant of any conditions that prejudice the proper completion of this work. Commencement of this work without such notification shall constitute acceptance of other work.
- .3 Location of Outlets
- .1 Outlet and equipment locations shown on the drawings are approximate. Locations may be revised up to 15 ft to suit construction and equipment arrangements without additional cost to the Owner, provided that the Contractor is notified prior to the installation of the outlets, or equipment.
 - .2 Unless otherwise specified or shown, install products in accordance with recommendations and ratings of manufacturers.
- .4 Cable Slack

- .1 All cable pulls which are "home run" (i.e. run from the communication outlet to the local communication room) shall include a reasonable amount of material for re-termination, at each end, if required.
 - .2 The Contractor shall ensure that when stripping cable insulation, insulation of the individual conductors is not in any way "nicked" and the conductors are not damaged when removing wire insulation. Any such conductors shall require that the Contractor replace the entire cable run as described in the manufacturer's installation procedures.
 - .3 All cable runs and loops shall be inspected prior to the closing of pull boxes.
 - .4 Every pull box shall have a loop of spare cable left within it.
 - .5 Where a cable is removed from a conduit for any reason, the Contractor shall be responsible for leaving an appropriate "fish wire" or "nylon pull string" within the conduit as described within Division 26 for new conduit.
 - .6 In the event that any conduit is found to be obstructed, the Contractor shall notify the Consultant and the Division 26 Contractor shall undertake corrective measures.
 - .7 In the event that any conduit is found to be wet, the Contractor shall be responsible for drying it and determining the cause of the previous infiltration.
- .5 Separation of Services
- .1 Maintain separation between electrical wiring system and building piping, ductwork, etc. so that wiring system is isolated (except at approved connections to such systems) to prevent galvanic corrosion.
 - .2 In particular, contact between dissimilar metals, such as copper and aluminium, in damp or wet locations is not permitted.
 - .3 Do not support wiring from pipes, ductwork, etc. Hangers for suspended ceilings may be used for the support of wiring only when approval is obtained from the Consultant and the ceiling installer, and approved clips or hangers are used.
- .6 Equipment Identification
- .1 2.5mm(0.1 inch) thick plastic lamicaid name plates, black face, white core, mechanically attached with self tapping screws, 25mm (1 inch) high lettering, to be attached to the front face of all racks.
 - .2 All cables shall be identifiable by coloured insulation and by permanent labels. These labels shall be applied at each end of the cable and at any intermediate, accessible points.
 - .3 All labels shall be permanent print type. All font must be large enough that it easily readable within reason. Hand written labels of any form will not be accepted.
- .7 Mounting Heights

- .1 Where the Contractor is responsible for installing communications devices for which there is no existing infrastructure, the height of these devices shall be coordinated with already installed devices. The normal height for these devices of not otherwise specified is 30 cm AFF.
- .8 Sealing of Wall and Floor Openings
 - .1 All conduit and cable entries through outside walls of buildings, through partition walls separating communications rooms from other areas, through fire separations, and through floors above grade shall be sealed to prevent passage of moisture, dust, gasses, flame, or to maintain pressurization. The sealing shall be performed by suitably experienced and qualified staff.
 - .2 Openings shall be sealed when all wiring entries shown on the drawings have been completed.
 - .3 Sealing material shall be fire resistant and shall not contain any compounds that will chemically affect the wiring jacket or insulating material. Cable penetrations through fire separations to be sealed with approved fire-stopping material.
 - .4 All fire stopping shall be in accordance with the requirements of Division 078500 as applicable. (3) copies of fire stopping shop drawings with details specific to each penetration type shall be submitted.

***** End of Section 27010 *****

READ THE DRAWINGS AND SPECIFICATIONS BELOW IN CONJUNCTION WITH THE YORK REGION STANDARD SPECIFICATION "YORK REGION CORPORATE NETWORK CABLING STANDARD – DECEMBER 11, 2025". IN CASE OF CONFLICT WITH THE YORK REGION STANDARD SPECIFICATION, THE YORK REGION STANDARD SPECIFICATIONS TAKE PRECEDENCE OVER THE SPECIFICATIONS AND DRAWINGS

SECTION 270010 – COMMUNICATIONS WIRING SYSTEM

PART 1 COMMUNICATION WIRING SYSTEM

1.1 GENERAL

.1 Related Work

.1 The Administrative Section under Division 00 (Bidding and Contract Requirements) and 01 (General Requirements) shall be considered to be part of this specification.

.2 Division 27 always to be read in conjunction with Division 26

.3 Interior Communication Pathways Section 270130

.4 Horizontal Cabling Section 270160

.5 Testing, Identification and Administration Section 270170

.2 General Requirements

.1 General Clean-Up

.2 Shop Drawings

.3 Protect Record Documents (As-Built Drawings) Where Specified

.4 Operating and Maintenance Data Where Specified

.3 Acceptable Manufacturers and Installer Qualifications

.1 All products including cabling are to be provided by the manufacturers listed in this document (unless otherwise stated).

.4 Codes and Standards

- .1 The products, workmanship and installation shall conform to current guidelines contained in the following documents. The Consultant shall provide an interpretation and ruling to the Contractor in the event that any of these documents appear to be in conflict:
 - .1 ANSI/TIA/EIA-568-B.2-1 (or CAN/CSA T529-M latest revision)), Commercial Building Tele-communications wiring standard and all the Communications Bulletin Boards (TSBs') and Addenda issued by the above standard body at the time of tender.
 - .2 CAN/CSA C22.1 Canadian Electrical Code, Part 1 and all the Local Amendments.
 - .3 Ontario Electrical Safety Code 2002 OR LATEST EDITION
 - .4 CAN/CSA C22.2 Canadian Electrical Code, Part 2.
 - .5 CAN/CSA C22.2 No. 232-M Optical Fibre Cables
 - .6 CAN/CSA C22.2 No. 214 Communications Cables
 - .7 TSB-72, Centralized Optical Fibre Cabling Guidelines.
 - .8 TSB-75, Open Office Cabling.
 - .9 TSB-67, Transmission Performance Specifications for Field-Testing of UTP Cabling.
 - .10 ANSI/EIA/TIA-569 (or CAN/CSA T530-M), Commercial Building standard for Communications pathways and spaces.
 - .11 ANSI/EIA/TIA-606 (or CAN/CSA T528-M), Administration standard for Communications infrastructure of commercial buildings.
 - .12 ANSI/EIA/TIA-607 (or CAN/CSA T527), Commercial Building Grounding and Bonding requirements for communications.
 - .13 ANSI/EIA/TIA-455, Test Procedures for Optical Fibres, Cables and Transistors.
 - .14 ANSI/EIA/TIA-598, Colour Coding Of Optical Cables.
 - .15 ANSI/EIA/TIA-604-3, FOCIS 3 Fibre Optic Connector Intermateability Standard.
 - .16 ANSI/ICEA S-83-596, Fibre Optic Premises Distribution Cable.
 - .17 ANSI/ICEA S-83-640, Fibre Optic Outside Plant Communications Cable.
 - .18 ANSI Z136.2, American Standards For The Safe Operation Of Optical Fibre Communication Systems Utilizing Laser Diode And LED Sources
 - .19 Building Industry Consulting Service International (BICSI) TDM Manual latest editions at the time of tender.

.5 Certification

- .1 Upon completion of the project, the Communications Cabling Contractor shall provide a certification for the entire installed communications system.

1.2 PRODUCTS

Refer to York Region Corporate Network Cabling Standard – December 11, 2025.

1.3 EXECUTION

.1 Summary of Work

- .1 The purpose of the following summary is to provide a general review of the design concept and to be read together with the drawings and the specifications.
- .2 The basic workstation communications will be provided through unshielded twisted pair, while the backbone will be provided by a single mode fibre based communications system.
- .3 This will include all Inter-building backbones, horizontal wiring, communications outlets, terminating hardware and selected connectivity devices. The following is a list of components required for supply and installation:
- .1 Fibre backbone cables terminating in communication equipment rooms (C.E.R.).
- .2 Horizontal copper cabling in the work area.
- .3 Label all components with approved mechanical labels.
- .4 Testing of all copper and fibre cabling systems installed.
- .4 Splicing or intermediate termination of UTP cable is strictly prohibited. All horizontal routing will be installed inside conduits, under floor ducts, raised floors, and open cable trays and connected to the applicable communications equipment rooms as outlined in the drawings.
- .1 No horizontal cable run shall exceed 90m (295 ft).
- .2 If any cable run exceeds 90m, the contractor must notify the consultant prior to installations so that corrective measures can be taken.
- .5 Data modules are to be coloured blue and wired to T568A wiring scheme.
- .6 Labels should appear at the following locations with the numbers indicated on the cable schedule and drawings: each end of the cable, front of the termination field and the front of workstation faceplates. As noted elsewhere the communications contractor shall supply these labels. Hand written label will not be accepted.

- .7 All equipment racking must be supplied and installed by communications contractor (unless otherwise stated). This racking must be grounded using a suitable #6 AWG grounding wire, which will be attached to the Communications Main Grounding Bar (CMGB) provided in each C.E.R. using crimp-on and non-potential inducing connectors.
 - .8 Velcro ties shall be used for all cable bundling. Cables shall be bundled in groups of 24 or otherwise as required by Ontario Building Code, when cables are crossing fire separation areas.
 - .9 Communications contractor will be responsible (unless otherwise stated) for the supply and installation of all C.E.R. (7') and work station (14') utp patch cords which shall be Category 6A. Two cables shall be provided per data termination.
- .2 Identification.
- .1 A self-adhesive machine printed label shall be applied to both ends of all cables with both ends of each cable bearing the same number.
 - .2 These labels shall be visible at the connection points when terminations are being applied by any installer.
 - .3 The labels, such as Panduit Part No. PLL-11-Y3-2.5 labels for all 4 pair horizontal copper applications and PST-FO for all fibre applications or equivalent as approved by the site engineer shall contain a transparent self-adhesive window and be of sufficient size that this transparent window overlay the printed portion.
 - .4 The labels shall be suitable for the environment in which the cables are installed.
 - .5 The labels shall be applied after the cables have been pulled.
 - .6 The print shall be clear and legible.
 - .7 12 point type size, solid characters and a bold font are required.
- .3 Refer to York Region ITS Corporate Network Cabling Standard for Cable Labelling Format.

End of Section 27100

READ THE DRAWINGS AND SPECIFICATIONS BELOW IN CONJUNCTION WITH THE YORK REGION STANDARD SPECIFICATION "YORK REGION CORPORATE NETWORK CABLING STANDARD – DECMEBER 11, 2025". IN CASE OF CONFLICT WITH THE YORK REGION STANDARD SPECIFICATION, THE YORK REGION STANDARD SPECIFICATIONS TAKE PRECEDENCE OVER THE SPECIFICATIONS AND DRAWINGS.

SECTION 270130 - INTERIOR COMMUNICATION PATHWAYS

1.1 GENERAL

.1 Related Work

.1	Communication Wiring Systems	Section 27100
.2	Backbone Cabling	Section 27150
.3	Horizontal Cabling	Section 27160
.4	Testing, Identification and Administration	Section 27170

1.2 PRODUCTS

.1 Cable Tray

- .1 Cable Tray and fittings: to EEMAC F5-1.
- .2 Centered type for horizontal, Class C1 to CSA C22.2 No.126. To be supplied by Division 16 Electrical Contractor.
- .3 Barriers where different voltage systems or electrical systems are in the same cable tray, or as indicated.
- .4 Approved Vertical Materials: Unistrut.
- .5 Approved ladder tray.

.2 Supports

- .1 Provide hardened steel (HS) rod hangers, rod hanger clamps and accessories as required.
- .2 Approved materials: Same as cable tray.

.3 Conduit

- .1 All necessary conduits will be supplied and installed by Division 26.

- .2 Conduits shall be sized so that they are never filled beyond 40%.
- .3 Additional conduit requirements shall be identified by the communications contractor prior to commencement of installation.
- .4 The maximum distance between pull boxes will be 27.5M(90') and pull boxes size shall be verified by the Contractor and shall meet all necessary standards and requirements.
- .5 The conduits shall each have previously installed fish wire or nylon pull string.
- .6 In the event that any conduits are left unused by the Contractor of this section, they shall be left with nylon pull string installed.
- .7 The conduits shall be of such length that the necessary criteria pertaining to the communication standards and maximum lengths are fully respected (i.e. horizontal cabling shall not exceed a length of 90 meters).
- .8 The Contractor shall at all times respect the manufacturer's cable requirements for maximum pulling force.
- .9 Only manufacturer approved cable lubricants may be used. Any excess lubricant shall be cleaned so as to leave external conduits and cables suitable for painting.
- .10 The inside of any pull boxes shall also be cleaned of excess lubricant.
- .11 The Contractor shall ensure that all conduits respect the maximum 10 times radius bending requirement and that no more than 180° in bends, including offsets, is to occur between pull boxes. When length of conduit is more than 27.5M(90') , a pull box must be installed. Coordinate size of the pull box with cable type and bending radius for cables.
- .12 The Contractor shall be responsible to ensure that all unterminated conduit ends e.g. where used for transition from conduit to tray, are protected by insulating bushings.
- .13 Wherever conduits pass through fire penetrations they shall be appropriately protected in accordance with the requirements of Division 26.

1.3 EXECUTION

- .1 Cables in Cable Tray
 - .1 Install cables individually.
 - .2 Lay cables into cable tray. Use rollers when necessary to pull cables.
 - .3 Secure cables in cable tray at 4.6M (15 ft). centers, with Velcro ties (min width 12mm (½")).
- .2 Horizontal Cables
 - .1 Route the horizontal cabling to the C.E.R.s as located on plan drawings.

- .2 In the case where the cable is forced to make a 90° bend for routing purposes, the cable must be velcro tied before and after the bend. This will make for a cleaner routing pathway.
- .3 All cable must follow horizontal designated pathways. For modular and lab furniture installation of cables spiral wraps shall be provided and used by the communications contractor.
- .4 Where cable trays and conduit are not used, cables are to be supported in j-hooks or cable supports supplied and installed by the communications contractor. Plastic cable ties are not to be used for supporting cables in any way.

***** End of Section 17130 *****

READ THE DRAWINGS AND SPECIFICATIONS BELOW IN CONJUNCTION WITH THE YORK REGION STANDARD SPECIFICATION "YORK REGION CORPORATE NETWORK CABLING STANDARD – DECEMBER 11, 2025". IN CASE OF CONFLICT WITH THE YORK REGION STANDARD SPECIFICATIONS, THE YORK REGION STANDARD SPECIFICATIONS TAKE PRECEDENCE OVER THE SPECIFICATIONS AND DRAWINGS.

SECTION 270160 – HORIZONTAL CABLING

1.1 GENERAL

.1 Related Work

.1	Communication Wiring Systems	Section 270100
.2	Main Distribution Frames and Service Entrances	Section 270120
.3	Interior Communication Pathways	Section 270130
.4	Testing, Identification and Administration	Section 270170

1.2 PRODUCTS

.1 Horizontal Cabling – Voice and Data Applications

.1 Category 6A UTP cables.

.2 Communications Outlet

.1 Communication Outlet – Wall faceplates

- .1 All outlets will use 2-port face plates in White color.
- .2 If any necessary adaptor plates are required to mate with the wall system, these shall also be approved colour and shall be supplied by the Cabling Contractor.
- .3 For rear and side entry of cable, proper strain relief provisions must be made in order to meet allowable bend radii.

.2 Modular Outlets – 8-position Data

- .1 All of the following parts and components shall be fully compliant with the most recent products available in the manufacturers Category 6A series.
- .2 Acceptable Category 6A 8-position termination modules for all data

applications.

.3 White module to be used for traditional voice applications (such as fax lines).

.4 Pin-out Termination Sequence to T568A.

.3 Patch Panels – 8-position Data

.1 All of the following parts and components shall be fully compliant with the most recent products available in the manufacturers Category 6A series.

.2 Acceptable Category 6A 8-position termination patch panels for all data applications

.3 Pin-out Termination Sequence to T568A.

.4 Horizontal Cable

.1 Horizontal cable must be rated as Category 6A and must be sweep tested and characterized to 350 MHZ. All cables shall be FT6 rated.

.2 Acceptable Category 6A horizontal cable for all data applications.

1.3 EXECUTION

.1 General

.1 Supply and install a complete system as per specification and drawings.

.2 Interference shall be minimized by ensuring that, wherever possible, communications conductors cross sources of interference at right angles.

.3 Install cables, conduit and cable tray, etc. along or at right angles to building lines unless impractical to do so. Verify specific cases of deviation in advance with consultant.

.4 No more than 180° total bends, including offsets, in conduit between pull points. These pull boxes must be sized in accordance with the bending radii of the cables being installed.

.5 Provide pull box for every 27m (90') of conduit (by Division 26).

.6 All conduits shall have a bend radius of at least ten (10) times the conduit diameter.

.2 Installation

.1 Horizontal cables

.1 Do not exceed maximum pulling force as per manufacturers specifications.

.2 Contractor is to price cabling to allow client to move outlet location by up to 3.05M (10'-0") if notified prior to installation.

- .3 Ensure that cable is not flattened, squeezed, or crimped at any point along entire run. No cable splices or intermediate terminations will be permitted.
- .4 Bundle cables neatly into logical bundles with Velcro tie-wrap only (min 12mm($\frac{1}{2}$ ")). No plastic tie wraps are allowed on this project except at termination blocks.
- .5 Label all horizontal cables and the outlets at both ends of the cable with identifications shown on the drawings and specifications. All labels shall be permanent and mechanically printed..
- .6 All patch panels and termination blocks to be labeled with the corresponding label of the cables. Supply all accessories to properly label the patch panels and termination blocks
- .7 In the case where the cable is forced to make a 90° bend for routing purposes, the cable must be Velcro tied before and after the bend. This will make for a cleaner routing pathway.
- .8 Division 26 will supply all flush mounted floor boxes, however, the Installer will be required to supply and install all outlets, back plates, inserts and faceplates required for each box. The Installer shall be required to supply and install all additional components.
- .9 The Contractor is responsible to ensure that transition into the furniture are managed so as to ensure that the cables are fully protected by grommets, etc.
- .10 The amount of cable jacket removed from cable termination must not exceed manufacturer specifications.
- .11 The amount of cable pair twist removed for terminator must not exceed manufacturer specifications.
- .12 The only modular jack configuration to be used in this project is RJ45 terminated in accordance with T568A requirements.

***** End of Section 27160 *****

READ THE DRAWINGS AND SPECIFICATIONS BELOW IN CONJUNCTION WITH THE YORK REGION STANDARD SPECIFICATION "YORK REGION CORPORATE NETWORK CABLING STANDARD – DECEMBER 21, 2025". IN CASE OF CONFLICT WITH THE YORK REGION STANDARD SPECIFICATION, THE YORK REGION STANDARD SPECIFICATIONS TAKE PRECEDENCE OVER THE SPECIFICATIONS AND DRAWINGS.

SECTION 27170 – TESTING, IDENTIFICATION & ADMINISTRATION

1.1 GENERAL

.1 Related Work

.1	Communication Wiring Systems	Section 270100
.2	Interior Communication Pathways	Section 270130
.3	Horizontal Cabling	Section 270160

1.2 PRODUCTS

.1 Labeling Equipment

- .1 Provide labeling for all components of telecommunications wiring system, including labeling of physical pathways and grounding system.

1.3 EXECUTION

.1 Testing

- .1 Testing of all horizontal and vertical copper cabling and all other applicable cabling are to be tested to the communications specification and in accordance with the following:
- .2 Every cabling link in the installation shall be tested in accordance with the field test specifications defined in the most recent draft of the Category 6A cabling system of the Telecommunications Industry Association (TIA). This document will be referred to as the "TIA Category 6A Document."
- .3 The installed twisted pair horizontal links shall be tested from the patch panel in the communication equipment room to the communication wall outlet in the work area against the "Basic Link" performance limits specification as defined in the TIA Category 6A Document.
- .4 100% of the installed cabling links must be tested and must pass the requirements of the standards mentioned. Any failing link must be diagnosed and

corrected. The corrective action shall be followed with a new test to prove that the corrected link meets the performance requirements. The final and passing result of the tests for all links shall be provided in the test results documentation in accordance with Section below.

- .5 Trained technicians who have successfully attended an appropriate training program and have obtained a certificate as proof thereof shall execute the tests.
- .6 The test equipment (tester) shall comply with the accuracy requirements for level III field testers as defined in the TIA Documents.
- .7 The tester shall be within the calibration period recommended by the vendor in order to achieve the vendor-specified measurement accuracy.
- .8 The tester interface adapters must be of high quality and the cable shall not show excessive twisting or kinking resulting from repetitive coiling and storing of the tester interface adapters.
- .9 The Pass or Fail condition for the link-under-test is determined by the results of the required individual tests as detailed in Section below. Any Fail or Fail* result yields a Fail for the link-under-test. In order to achieve an overall Pass condition, the results for each individual test parameter must Pass or Pass*.
- .10 A representative of the end-user shall be invited to witness field testing. The representative shall be notified of the start date of the testing phase five business days before testing commences.
- .11 A representative of the end-user will select a random sample of 5% of the installed links. The representative (or his authorized delegate) shall test these randomly selected links and the results are to be stored in accordance with the prescriptions in Section 1.8. The results obtained shall be compared to the data provided by the installation contractor. If more than 2% of the sample results differ in terms of the pass/fail determination, the installation contractor under supervision of the end-user representative shall repeat 100% testing and the cost shall be borne by the installation contractor.

.2 Test Result Documentation

- .1 The test results information for each link shall be recorded in the memory of the field tester upon completion of the test.
- .2 The test results records saved by the tester shall be transferred into a Windows™-based database utility that allows for the maintenance, inspection and archiving of these test records. A guarantee must be made that these results are transferred to the PC unaltered, i.e., "as saved in the tester" at the end of each test.
- .3 The database for the completed job shall be stored and delivered electronically, with copy in PDF.
- .4 The identification of the link in accordance with the naming convention defined in the overall system documentation

- .5 The overall Pass/Fail evaluation of the link-under-test including the NEXT Headroom (overall worst case) number
 - .6 The date and time the test results were saved in the memory of the tester
 - .7 General Information to be provided in the electronic data base with the test results information for each link:
 - .8 The identification of the customer site as specified by the end-user
 - .9 The identification of the link in accordance with the naming convention defined in the overall system documentation
 - .10 The overall Pass/Fail evaluation of the link-under-test
 - .11 The name of the standard selected to execute the stored test results
 - .12 The cable type and the value of NVP used for length calculations
 - .13 The date and time the test results were saved in the memory of the tester
 - .14 The brand name, model and serial number of the tester
 - .15 The identification of the tester interface
 - .16 The revision of the tester software and the revision of the test standards database in the tester
 - .17 The detailed test results data to be provided in the electronic database for each tested link.
 - .18 Testing will be considered completed once records show that all installations meet the 100% pass rate.
 - .19 All software used will be updated to the latest standards, and licensed.
- .3 Labeling
- .1 All labeling must be mechanically printed using a laser printer and follow the ANSI/EIA/TIA-606 (CSA T528) guideline for colour codes and be in accordance with the labeling requirements of this specification. Hand written labels are not permitted.
 - .2 Labels should appear at the following locations with the numbers located on the cable schedule and drawings:
 - .1 Each end of cable (both copper and fibre)
 - .2 Front of patch panels and on the BIX Field
 - .3 Front of data termination.
 - .4 Racks

- .5 Faceplates
 - .6 Fibre cable every 15.2M(50'), at each change in elevation and at each intersection
 - .7 Copper backbone cable every 15.2M(50'), at each change in elevation and at each intersection
- .4 Fire stopping
- .1 In accordance with General section section 270010, and "Fire Stopping and Smoke Seals" fire stopping will be required to re-establish the integrity of fire-rated architectural structures and assemblies when these barriers are penetrated by:
 - .1 Pipes
 - .2 Ducts
 - .3 Cables
 - .4 Conduits
 - .5 Inner ducts
 - .2 (3) copies of fire stopping shop drawings, with a drawing specific to each condition must be submitted for approval prior to fire stopping being executed.
 - .3 Fire stopping agents must be applied throughout the duration of the project where needed.
 - .4 The fire stopping shall be installed by an approved and qualified contractor.

End of Section

York Region

Standards & Guidelines



Corporate Network Cabling Standard

Current Published Version

December 11, 2025

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Document History

Revision & Schedule History

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2.7	Simon Yates	March 25, 2020	April, 2021
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Change Summary

Date	Summary
July 28, 2016	Minor grammar and syntax updates. Fax Lines Requirement – Deleted. Appendix D & E updated.
January 9, 2017	Replaced must with shall, and added Document Changes table to document history.
August 28, 2017	Changed cabling 6A to 6A F/UTP.
April 24, 2018	Changed in-building renovations in scope, multimode optical fibre to OM4, added appendix B, changed BAS, Security Panel (Honeywell), rack cabinet installation, and applied new corporate writing style.
May 9, 2018	Updated contact information.
June 28, 2018	Added Appendix K.
January 22, 2019	Updated technical specifications.
December 19, 2019	Renamed from Cabling and Wiring for Voice and Data Communications to Corporate ITS Cabling & Wiring Standard. Updated network equipment.
March 25, 2020	Formatting, grammar, spelling updates.
April 21, 2020	Updated Appendix 2, and general requirements for network equipment.

July 9, 2020	Updated network devices on York Networks, category patch cords, and vertical cable managers.
September 14, 2020	Minor grammar and syntax updates. Removed duplicate heading product specifications n page 18. Promoted second and first level heading, fibre optical cable page 20. Added Appendix L – WAP/Mounting.
November 9, 2020	Updated appendices H with cable talk 2 post rack; M with WAN/ISP duct bank; N with WAN/ISP ducts inside communications room; updated network equipment; and updated communication rack and cabinet.
March 1, 2021	Background & Purpose, Network Devices on York Network, updated to Securing Network Devices on York Network,c, d, and e added. Technical Specifications, updated to Structured Cabling Technical Specifications Termination Hardware, updated to Termination Specification Horizontal Cables, updated to Category Patch Panels Fibre Optic Cable, Connectors moved to section Termination Specification PS Security section updated Enclosure Wiring, changed to Labeling Guidelines Update: Property Services – Security Panel, Building Automation System (BAS)
April 12, 2021	Minor update and changes.
June 28, 2021	The following has sections that have been modified, relocated or deleted: Enforcement Language; Background and Purpose, Contact, Objectives, Scope; Structured Cabling Technical Specification, Recognized Media, Regulatory References & Standards, Waste Management & Disposal, Testing & Commissioning; Product Specification, Backbone Cabling, Conduits, Backbone Interconnect, Fibre Optic Cable, Fibre Optic Connectors, Category Patch Cord; Network Access Closet has been changed to Network Access Room; Execution, Horizontal Cable Installation, Fibre Optic Cable Installation; Appendix; References
July 21, 2021	Further changes to grammar, syntax and tightening of language through the standard.
February 8, 2022	Minor spelling, grammar changes.
February 6, 2023	Updates to the following sections: Site Walk through; Telecom Contractor to provide port count; Structural Cabling Technical Cabling update to include end-to-end by specified color and single contractor for cabling; Cabinets for small deployment and for ENV NEMA4 inserted Appendix F, Category Cabling Color Scheme for Services inserted Appendix L; Sample Matrix of Port Count Report inserted Appendix M; Network Closet Checklist for Standard Sites inserted Appendix N, and remaining adjusted accordingly;
May 12, 2023	Added wall mount cabinet to Appendix D; updated Appendix K, and changed underscore to hyphen.
June 18, 2024	Updates to the Environmental section #3.; Appendix G: removed Hammond and replace with Hoffman Cabinet; and updated the URL in Appendix E.
March 21, 2025	Appendix A, update data drop format; NAC Floor finish epoxy; Patch cable gauge from 26 to 28; correct grammar; change name of file/document to reflect name on title page.
December 11, 2025	Modified Recognized Media; Appendix A added Note; Appendix N added As-Build example

Additional Information

Enterprise Architecture manages annual reviews and promotion of the standard.

Contact

Enterprise Architecture manages all updates to the Corporate Network Cabling Standard working closely with Digital Customer Experience Branch.

Name	Responsibility	Contact

Orville Pitter, Senior Network Analyst	Primary contact & subject matter expert	orville.pitter@york.ca
Simon Yates, Enterprise Architect	Facilitate changes, exemptions & exceptions	simon.yates@york.ca

Consulted Organizations

The following individuals and groups were consulted in the formation of this standard.

Organization Consulted	Division	Branch	Date
Ministry of Government Services	Infrastructure Technology Services	Corporate Architecture Branch	April 2011
Belden			May 18, 2021

Committee or Working Group Consulted	Date
Enterprise Architecture	March 2012
Infrastructure and Operations	March 22, 2011
ITS Branch Review	April, 2012

Enforcement Language

The meaning of the words shall or should or must and recommend are clearly define here:

- Shall: this word, or the terms required or must, means that the statement is an absolute requirement.
- Should: this word, or the adjective recommended, means that there may exist valid reasons in particular circumstances to ignore the recommendations, but the full implications must be understood and carefully weighed.
- Exception: An exception refers to a specific case where a standard does not apply, even though the general rule remains in effect for all other cases. Exceptions are often temporary.
- Exemption: An exemption is the complete release from the standard for specific individuals, groups, or circumstances. An exemption is more permanent and grants full freedom from compliance with a particular rule or requirement.

Cabling and its installation shall comply with the requirements of the authority having jurisdiction (AHJ) and applicable regulations. This includes, but is not limited to, the cabling jacket ratings.

Introduction

Background & Purpose

This standard defines the design minimum technical and quality requirements for wiring of voice and data communications rooms in all buildings that are managed by, or on behalf of The Regional Municipality of York.

This standard includes new developments, revisions, and updates in cabling plant such as Power over Ethernet (PoE) data centre specific standards, cabling for wireless access points, digital signage, security, and other operational technologies (O/T) that use structured cabling for their infrastructure and the administration standard for cabling plant management. Four topic areas include.

1. Data centres that are managed by or on behalf of the Regional Municipality of York. Data centres are included to provide requirements and guidelines for the data centre design and installation. These requirements and guidance are found in ANSI/TIA-942: Telecommunications Infrastructure Standard for Data Centres.
2. The Cabling of buildings for wireless access points. Provides requirements and guidelines on the installation of a customer premises cabling system infrastructure for an array of coverage areas that form a wireless network grid within a building. These requirements and guidelines are found in TIA TSB-162: Telecommunications Cabling Guidelines for Wireless Access Points.
3. Specific adherence to the IEEE 802.3 standards provides for the implementation of power over Ethernet or data lines within the plant owned by, or managed on behalf of the Regional Municipality of York.
4. Specifies a uniform administration approach to the management of a telecommunications cabling system as found in ANSI/TIA -606: Administration Standard for Telecommunications Infrastructure.

This standard applies to all new or major retrofit wiring of data and voice communications in existing Regional Municipality of York buildings.

Network Equipment

1. Project will provide the budget for all network equipment including network switches, wireless access points, wireless controller, uninterrupted power supply, firewalls and any other network equipment that ITS considers mandatory to support the setup and configuration the network to meet ITS standards.
2. ITS will procure all network equipment including network switches, wireless access points, wireless controller, uninterrupted power supply, firewalls and any other network

equipment that ITS considers mandatory to support the setup and configuration of the network to meet ITS standards based on the budget.

3. Telecom contractor shall supply network racks, cables, patch panels, cable trays and any associated supplies for cabling based on ITS Cabling and Wiring Standards.
4. Telecom contractor shall provide port count by network closet and by device type (data/voice, WAP, BAS, Energy, Camera, IoT) to enable Corporate ITS requested quotes for network equipment and to assign IP-addresses (see Appendix M).
5. Telecom contractor shall provide any emulated Wi-Fi surveys with input, review and acceptance for Corporate ITS.
6. Telecom shall install racks, run network cables and terminate to patch panels, install UPS and WAPs based on instructions provided by Corporate ITS.
7. Backbone and horizontal infrastructure cabling shall be completed by an installer certified by the cabling system manufacturer, and the cabling shall be certified upon completion.
8. ITS recommends that category cable patch panels be from manufacturers that meets or exceeds ANSI/TIA 568.2 Category 6A performance requirements and design specifications.

Securing Network Devices on York Network

1. All devices that require connectivity to York Networks shall be direct network run.
2. A list of all devices not issued by York ITS that will connect to the York Network must be provided to Corporate ITS. The list must include the make, model and specification and function.
3. ITS Security must conduct ITS security testing on all devices prior to connection to the York Region Network.
4. If testing of device is not done prior to connection, then it is done when the first device is added to the network.
5. If York ITS identifies security issues, these issues need to be resolved by the vendor.
6. ITS Security and Enterprise Architecture will review and make recommendations as well as provide a path to ensure that the device is a safe device to be on the York Region network.

Objectives

The Objectives of this standard are to:

1. Provide safe, reliable, uniform and up to date facilities for the convenient connection of telephones, computers, computer terminals and other communications related technologies utilizing cabling and wiring in Regional offices.
2. Achieve significant cost savings in the rearrangement of government offices and the relocation of government services and personnel by uniform and flexibly arranged communications connections.
3. Increase the value of the investment in the cabling infrastructure by reducing the labour expense of maintaining the system, extending the useful life of the system and providing effective service to users.

Scope of Standard

The following platforms, and facilities are in scope of this standard.

1. Horizontal and vertical structured cabling platforms
2. Data centre structured cabling platforms
3. In-building facilities including
 - a. Main telecommunications room
 - b. Telecommunications rooms
 - c. Workstations
4. In-building renovations
 - a. If cabling is less than Category 6 standard or older than 10 years, must be replaced with current standard including the patch panel and all related connectivity.

Out of Scope

Electrical cabling is not covered by this standard.

Education & Training

Data Centre and technical staff shall be trained and experienced on the technologies used pertaining to structure cabling infrastructure.

Authority, Exceptions and Exemptions

Any change, exception or exemption to this standard shall be submitted to, and reviewed by the Technology Standards Working Group (TSWG).

Structured Cabling Technical Specification

1. The contractor shall provide a complete and operating Structured Cabling Platform to support existing and future communication systems in the Region's facilities. This includes all horizontal cabling for data applications as well as backbone.
2. All cabling for the network shall be completed by one cabling contractor that is able to provide cable as built and test results.
3. Network (horizontal) cabling shall adhere to York Region Network Standard Category cabling color specification and installed end-to-end including keystone and patch cables.
4. If product specifications, design and installation guidelines are not provided or in conflict with references listed below. The more stringent requirement shall apply.
5. The Horizontal Structured Cabling Platform installed shall meet or exceed the channel requirements for voice and data transmissions as defined by ANSI/TIA-568.2.
6. Any Structured Cabling Platform installed in a Data Centre or Communications Room shall follow the mandatory requirements, guidelines and best practices for data centre cabling systems, pathways and design considerations found in Regulatory References and Standards: Telecommunications Infrastructure Standard for Data Centres.
7. Category 6A UTP (500MHz) 23AWG cabling shall be used as the minimum rated twisted pair cable. Horizontal cabling should be installed point-to-point, no network consolidation point.
8. Cables, associated connecting hardware, jumpers, patch cords, equipment cords and zone area cords shall meet all applicable requirements specified in ANSI/TIA-568.2.2 and ANSI/TIA-568.3.

Recognized Media

1. 100 ohm twisted-pair cable, ANSI/TIA-568.2, Category 6A UTP 23AWG.
2. Patch cables Category 6A F/UTP 28AWG.
3. Patch cables Category 6A F/UTP 24AWG (Security and External AP).
4. Multimode optical fibre cable OM4, ANSI/TIA-568.3.
5. Single-mode optical fibre cable, ANSI/TIA-568.3.

Regulatory References & Standards

The standard defines specific categories of cabling, components, transmission performance, system models, and measurement procedures. These are needed for verification of cabling performance that shall be used at a minimum for any new or major retrofit wiring of data and

voice communications in existing York Region buildings. These are the requirements found in recognized telecommunications industry standards:

Cabling Systems

1. ANSI/TIA-568-C.0: Generic Telecommunications Cabling for Customer Premises
2. ANSI/TIA-568.1: Commercial Building Telecommunications Infrastructure Standard
3. ANSI/TIA-568.2: Balanced Twisted Pair Telecommunications Cabling and Components Standard
4. ANSI/TIA-568.3: Optical Fibre Cabling and Component Standard

Spaces and Pathways

5. ANSI/TIA-569: Telecommunications Pathways and Spaces.

Cabling Administration

6. ANSI/TIA606: Administration Standard for Telecommunications Infrastructure.

Telecommunications Infrastructure Standard for Industrial Premises

7. ANSI/TIA-1005: Telecommunications Infrastructure for Industrial Premises.

Telecommunications Infrastructure Standard for Data Centers

8. ANSI/TIA-942: Telecommunications Infrastructure Standard for Data Centres.

Wireless Access Points

9. TIA TSB-162: Telecommunications Cabling Guidelines for Wireless Access Points

In addition, coverage of this standard includes new developments and updates in cabling plant such as Power Over Ethernet (PoE) data centre specific standards, cabling for wireless access points and the administration standard for cabling plant management.

All work shall conform to industry accepted practices, manufacturer's component installation guidelines, the Ontario building code, the Canadian Electrical Code, and all applicable standards. The following referenced documents are indispensable for the application of this standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document applies. Furthermore, compliance with the AHJ will supersede all other specifications.

This standard applies to all new or major retrofit wiring of data and voice communications in existing Regional Municipality of York buildings.

Documentation

Documentation related to the installation, maintenance and disposal of cabling plant shall be created and maintained by the parties responsible for installing and maintaining the cabling infrastructure on behalf of the Regional Municipality of York. This administration of the cabling plant is governed by the mandatory use of Standard Update to Administration for the telecommunications infrastructure; and the labelling convention described in Regulatory References and Standards under Cabling Administration.

The following line items describe individual requirements that are to be applied to all Communications Cabling projects. The line items are meant to serve as a guideline for the Regional requirements.

All horizontal cabling shall be installed from the workstation location, or on modular patch panels installed into racks or cabinets. For small sites, the customer can specify wall-mounted patch panels in lieu of racks where appropriate due to site constraints and capacity requirements.

Allowances

Devices, racks, cabinets, backboards or outlets may be relocated, prior to installation, from the location shown on the contract drawings, to a maximum distance of 3.05 meters (10 feet) without adjustment to the contract price.

Waste Management & Disposal

1. The cabling contractor shall remove and dispose of all abandoned horizontal voice, data and coaxial cabling.
2. If the cabling contractor is unsure of the status of the cables, they shall confirm the removal with the project manager prior to performing the work.

Testing & Commissioning

1. Provide two copies of testing and commissioning documentation for all items and their related components to the project manager prior to the completion of the project or at the project manager's request.
2. Include maintenance manuals, operating instructions for the Region's staff.
3. All test data, including daily equipment reference checks, shall be submitted in native tester format (e.g. FLW files for Fluke) and summary in PDF.

Warranty

1. The contractor shall provide a complete and operating Structured Cabling Platform to support existing and future communication systems in Regional facilities. This includes all horizontal cabling for data applications as well as backbone.
2. The structure cabling platform in each individual building or site shall be manufactured and warranted by a single manufacturer for all components of the structured cabling platform including backbones.
3. The successful bidder shall install a complete structured cabling platform that is manufactured and warranted by a single vendor.
4. The successful bidder shall be authorized by the cable vendor to install and warranty the system.
5. If a sub-contractor is used for the installation, it is mandatory that the sub-contractor be currently authorized to install and warranty the system.

Site Walkthrough

The cabling contractor shall participate in network cabling walkthroughs:

1. 0% walkthrough: Initial pre-construction walkthrough with ITS, York Region and General Contractor (GC) to ensure that the scope of work is understood and for questions regarding York Region Network Cabling Standards.
2. 50% walkthrough: to confirm the project is on track and the cabling standards are adhered to.
3. 100% walkthrough: for the network closet acceptance (cabling is completed, Network closet is free of all debris, testing results and has builds have been provided, etc) with ITS, York Region, GC and cabling contractor. The acceptance is contingent on satisfying the criteria outlined in "ITS New/Renovated Site Networking Provisioning Checklist" (Appendix N).

Product Specifications

Backbone Cabling

Optical Cabling Backbone

1. OM4 fibre backbone cabling shall comply to ANSI/TIA-568.3.
2. Each Fibre backbone cable shall have a minimum of 12 strands OM4 distribution type fibre. The OM4 distribution type fibre will perform as per industry standards over the required distance defined for the site. Mated connector loss for OM4 shall not to exceed 0.25 dB.

Conduits

1. Conduit fill ratios shall never exceed the recommendations of ANSI/TIA-569.

Backbone Interconnect

1. If there is a requirement for an interconnection between wiring closets on the same floor, or multiple floors, it shall be interconnected with minimum of six fibre OM4 rated fibre optic backbone terminated with LC connectors.
2. All connectors for the termination of the fibre optic backbone cable shall be duplex LC connectors.
3. Fibre optic enclosure shall meet the following requirements:
 - a. Enclosure shall include a slide-out drawer for front access of the terminations.
 - b. Enclosure shall support LC connectors.
4. For multimode fibre optic terminations inside access closets fibre patch panels the connectors shall be preloaded adapters configured with LC duplex multimode adapters.
5. Provide duplex OM4 fibre optic patch cables LC to LC.

Termination Specification

Category Patch Panels

6. All horizontal cables are to be terminated on RJ45 jacks, inserted into modular category patch panels, and placed in the telecommunications room for that floor.
7. The modular patch panel should minimise the rack space used and should not exceed two rack units in height.

Fibre Patch Panels

1. If required, the number of strands to be supplied and installed is a minimum of 12. The project manager, in consultation with the Region, will finalize quantity and type of fibre to be installed.
2. All Fibre backbone is to be terminated using a fibre patch panel on a communications rack.
 - a. The 12 strands of fibre shall be installed in the fibre patch panel and placed in a rack in the telecommunications room for that floor.
 - b. The fibre patch panel should minimize the rack space used, it cannot exceed three rack units in height.
 - c. The fibre patch panel shall be serviceable from the front by allowing the fibre patch panel to slide or pivot away from the rack.
 - d. The fibre patch panels are to be mounted at the upper most position on the racks of each floor.
3. Provide all necessary accessories for a complete fibre patch panel including, but not limited to: clear cover plates, mounting brackets and hardware, LC duplex fibre bulkheads, LC connectors and fibre cable management.
4. The physical fibre optic cabling topology and the type of fibre connectors shall be determined and finalized during design build of project.

Fibre Optic Cable

1. Provide all fibre optic cable, connectors and appurtenances that make up the backbone cable segments.
2. The fibre optic backbone cable segments shall meet the requirements of the TIA/EIA-568.3 specifications.
3. Multi-mode fibre optic backbone cable shall be OM4.
4. Single mode fibre optic backbone cable shall be OS2.

Connectivity

Category Patch Cord

1. Desktop, two 7 feet in length Category 6A F/UTP 28AWG patch cords is required per drop shall be provided on site for the IP phone/desktop connectivity.
2. Network Closet, one Category 6A F/UTP 28AWG patch cord to be provided per drop, length to be determined.
3. Security and External Wireless Access Point (AP) patch cord shall utilize Category 6A F/UTP 24AWG, length to be determined.
4. The project manager, in conjunction with the ITS planner and Network Operations, shall determine the category and fibre patch cable length as needed if not stipulated.
5. Regularly consult with the ITS Planner and Network team to align with specific requirements and standards for optimal performance and organization when patching.

Fibre Patch Cord

1. All fibre patch cords shall be connected to the customer supplied active equipment using LC duplex zip cords.
2. The fibre patch cords are to be seven feet in length. LC duplex zip cords are to be consistent with the grade and manufacturer of the fibre cable that is being warranted.

Communications Rack & Cabinet

1. All racks and cabinets to be supplied and installed to be bolted to the floor or otherwise secured to prevent tipping, 19" floor mounted with 44U of rack mounting space.
 - a. Racks and cabinets shall be tapped both front and back with mounting holes as per EIA-310-C, size 10-32, as well as include a ground lug to accept a #6 AWG grounding wire.
2. All network access spaces dedicated to York Region ITS network and Security should utilize 2-Post open frame rack (see Appendix H).
 - a. If other services beyond ITS Network/Security is to be hosted, types of rack/cabinet installation should be discussed and determined by York Region IT Services.

Vertical Cable Managers

1. Network cabinet shall come complete with two vertical cable managers installed: one mounted on each side.
2. Network rack cable managers shall be one of two dimensions. Micro and small sites four inches wide by four inches deep.
3. Medium and large sites 7.5 inches width by six inches deep.
4. The vertical cable manager shall have hinged front door(s), back and side cut outs to allow for patch cords.
 - a. It shall also have lancets along the back of the cable manager to allow for the fastening of the horizontal cable to the outside of the manager itself.
 - b. Higher density drops may require vertical cable management with increased width and depth.

Overhead Cable Manager & Chimney

1. Each cabinet and rack shall come complete with a hinged overhead cable manager installed, with minimum dimensions of eight inches wide by two inches deep.
 - a. Where racks are ganged, the overhead cable manager is to be continuous across the gang of racks; both ends of the ganged racks are to be completed with end caps.

2. At the right side of each rack a cable management chimney shall be installed. They shall extend from the top of the overhead cable manager to the underside of the ladder tray/ceiling tile above.

Equipment Shelves

1. Each cabinet and rack is to be supplied with, at a minimum, one equipment shelf if requested; this is to be installed at the direction of the customer.
2. The equipment shelf shall be centre mounted and have a minimum of 18 inches of depth.

Vertical Switched Zero PDU

1. Each cabinet and rack is to come complete with two vertical switched Zero U PDU mounted to the back of the rack.
2. Each PDU is to have a minimum of eight outlets rated at 110V, 15A. The power bars are to have a minimum power cord length of six feet.
3. The power bars shall not have reset breakers or an on/off switch.
4. The Customer may require additional power requirements over and above what is detailed above. It is the responsibility of the Project Manager to provide these requirements to the Cabling Contractor.

General Enclosure Requirements

1. All indoor enclosures containing network components are to be installed in a two-post, four-post open rack frame, or cabinet.
2. All screws, bolts, fasteners etc. are to be corrosion resistant stainless steel.
3. All wall-mounted panels are to be separated from the wall by stainless steel spacers or galvanised steel struts.
4. Doors shall have continuous hinges with removable pin and oil resistance cellular neoprene gasket secured by gasket retainers.
5. Door handles shall be recessed type (freestanding enclosures) or three-point external latch wall mount, complete with key locks. All key locks are to be identically keyed. The key number shall be provided to the Contractor during construction.
6. Cable bundles shall be neatly laced, run in ducting or approved cable managers and secured to 19-inch rack or mounting back-panel.
7. All enclosure doors shall open through 180 degrees without restriction.
8. Enclosure layout and equipment spacing shall be constructed to allow for device removal, calibration and maintenance without disassembly of adjacent devices.
9. All freestanding, floor-mounted enclosures shall have removable CSA eyebolts to facilitate sling handling of each enclosure.
 - a. Eyebolt mounting shall be a part of the structural support bracing to distribute stresses and enclosure weight while sling handling enclosures during installation.
10. All enclosures shall have sufficient structural reinforcements to ensure a limited plane surface vibration and to provide rigidity during shipment, installation and operation without distortion or damage to the enclosure, mounting panel or mounted instruments.
11. All enclosure seams shall be continuously welded and ground smooth to be undetectable after painting.
12. Devices shall be installed on the enclosure back-panel or 19-inch rack.
13. There shall be no devices installed on the side plates of the enclosure.

Enclosure Wiring

1. All enclosure wiring shall run through cable management. All cabling is managed, protected, and enclosed.
2. Cable managers shall not be filled to more than 50 percent of their volume upon initial installation.

3. All wires and cables, including spares, shall be identified at each end and at any connection. Use durable non-fading sleeve type wire markers to identify all network cables as follows:
 - a. Labels for cabling shall be laser printed, self-laminating, adhesive, polyester (indoor/outdoor).
 - b. Hand-written labels will not be accepted.
 - c. Lettering shall be black on a white background. Characters shall be a minimum of four millimetre high.
 - d. Wire markers are required on each conductor in panel board gutters, and at load connections. The identification shall include branch circuit or feeder number for power and lighting circuits, and control wire numbers for control wiring.
 - e. All field wires and cables terminated within enclosures shall be identified at each termination with a marking that corresponds with the drawings and supporting documentation.
 - f. Power wiring insulation shall be rated at 600 volts at 90 C and be type RW 90 THHN. Conductors shall be stranded copper. No wire smaller than 12 AWG shall be used for power wiring, unless noted otherwise on the drawings.

Rack & Cabinet Installation

1. All cable is to enter through the bottom or top of the cabinets. If coring of the floor is required for the passage of cable the Contractor is to X-Ray the floor in accordance with Division 1.
2. Provide a 12" wide minimum cable tray segregated for power, fibre and horizontal UTP cables for overhead cabling as shown on the Contract drawings. Cable management is to be provided from the cable tray to the enclosure to ensure that the minimum bend radius for each cable is maintained and the cable is rigidly supported.
3. Electrical
 - a. Provide the electrical distribution for each core and server closet as per the related Electrical Distribution drawings and relevant standards.
 - b. Provide each core and server closet with required number of duplex 15A, 120 VAC.
 - c. The project manager will provide UPS Receptacle specification to the contractor, typically one of the following which will be dependent on Load/Runtime requirement or if building generator/UPS is in scope.

UPS Receptacle Option	UPS Series	Input Power
Option 1	APC UPS 1500	NEMA 5-15R
Option 2	APC UPS 2200	NEMA 5-20R
Option 3	APC UPS 3000	NEMA L5-30R
Option 4	APC UPS 5000	NEMA L6-30R

- d. Secure each rack and cabinet to ground.
- e. The duplex receptacles shall be mounted in such a manner as not to interfere with access to or removal of other equipment within the enclosures.
- f. Power distribution within the enclosure shall be via vertically mounted power bars.
- g. Redundant power supplies, within the same device, shall not be connected to the same UPS circuit.

Network Access Room

1. Network Access Rooms (NAR) shall be large enough to accommodate all of the equipment and wiring that will be placed in it and include extra space to accommodate any future growth.
2. NAR shall meet the requirement of ANSI/TIA-569

Environmental Specifications

1. Shall satisfy environmental requirements that include, but not be limited to power supply, heating, ventilation, and air conditioning.
2. NAR should maintain a room temperature between 19 to 23 degrees Celsius for the cold zone with the assumption that air flow is from front to back (cold to hot) when all LAN equipment is in full operation and a relative humidity of between 30 to 50 percent.
3. Open water sources are prohibited. Sources include but are not limited to hose bibs, slop sinks, plumbing fixtures and maintenance drains in hydronic heating and cooling.
4. The wiring closet shall not double as a storage area for cleaning products, chemicals, equipment, cardboard, or furniture. The wiring closet shall be kept clean and free of any debris.
5. There should be at least one duplex power outlet positioned every 1.8 meters along each wall of the room and should be positioned 15 cm above the floor. A wall switch that controls the room's main lighting should be placed immediately inside the door.
6. Floor finish to be general service, low volatile organic compound (VOC) solid colored (grey) epoxy coating.
7. UPS plug type and BTU for equipment shall be provided by York Region ITS.

Cable Access & Support

1. If data closet serves as a Main Distribution Facility/Facilities (MDF), all cables running from it to Intermediate Distribution Facility/Facilities (IDF), computers and communications rooms on other floors of the same building should be protected by a four inch conduit or sleeved core.
2. The exact amount of conduit that is required is determined by the amount of fibre optic, UTP, and STP cable that shall be supported in each NAR.
3. Cabling should be run through four-inch sleeves that are placed above the door level. To ensure proper support, the cable should be run from the sleeve directly onto a 12-inch ladder racked in the room.

4. Supply and install all horizontal wiring, jack boxes, raceway, wall plates, telephone punch-down blocks and identification labels.
5. Identify all wiring at both ends, at the jack end and in wiring closet.
6. Terminate, test and certify all installed wiring in accordance with industry standards.
7. Include additional lengths of conduit to provide for future growth.

Property Services — Security Panel

1. Lenel solutions is used for access control, Bosch for Intrusion and Milestone for CCTV for all new sites. CCTV system is a requirement for facilities accessed by the public unless otherwise specified (examples. Court Services, YRT, ENV and Corporate Sites). This will include an onsite video server, UPS back-up and the XProtect application connected to the database servers at 17250 Yonge Street, Newmarket.
2. Security cabinets shall be placed in the NAR or Electrical room and will require a standard wall space of four feet high by eight feet wide. This may increase depending on the size of the facility and requirements for card access and panic alarms.
3. The following requirements shall be adhered to:
 - a. There shall be 32 square feet of wall space.
 - b. Be eight-inch in depth, and require an additional 28 inches of clearance for a total of three feet.
 - c. Panel area should be situated three feet vertically from the floor and the panel should be installed on fire retardant backboard.
 - d. Security panels should not be placed in mechanical rooms, or general areas opened to staff or other personal.
 - e. Security panels are to be supplied with dedicated emergency power.
4. Category 6A cable, Purple in color should be used for end-to-end horizontal cabling, patch cable and keystone.
5. Facilities with on-site security guards will require a XProtect Smart Client workstation with monitors. The quantity referenced in site specific design and are to be in the security office.

Building Automation System (BAS)

1. Building automation equipment may be in various locations including, but not limited to the NAR, ceiling, mechanical room and the electrical Room.
2. Typical cabinet size that would be expected to be in the NAR.

- a. Two feet wide by three feet high and six inches in depth with a door swing of two feet, seven inches
 - b. Eighteen inches wide by eighteen inches high and six inches in depth with a door swing of nineteen inches
 - c. Quantity maybe one to three depending on number of points Panels should be situated six feet vertically from the panel top to floor and should be installed on fire retardant backboard.
3. Conduits should be used to join the larger cabinets.
4. Power Supply to BAS panel should be separate and has its own junction box or panel.
5. Category 6A cable, Orange in color should be used for end-to-end horizontal cabling, patch cable and keystone.
6. All BAS Category 6A drops shall be terminated to a patch panel in the network rack.
7. Requirement of one data jack per IP device located beside the cabinets in which the devices are located.
8. If placed in the vicinity of a network racks, there should be an additional two feet of clearance.
9. All enclosure wiring shall run through cable management. All cabling is managed, protected, and enclosed.
10. Cable managers shall not be filled to more than 50 percent of their volume upon initial installation.

Labeling Guidelines

1. All wires and cables shall be identified at each end, and at any connection. Use durable non-fading sleeve type wire markers to identify all network cables as follows:
 - a. Labels for cabling shall be laser printed, self-laminating, adhesive, polyester suitable for indoor and outdoor use.
 - b. Hand-written labels will not be accepted.
 - c. Lettering shall be black on a white background. Characters shall be a minimum of four millimeters high.
 - d. Wire markers are required on each conductor in panel board gutters, and at load connections. The identification shall include branch circuit or feeder number for power and lighting circuits, and control wire numbers for control wiring.

- e. All field wires and cables terminated within enclosures shall be identified at each termination with a marking that corresponds with the drawings and supporting documentation.

Category & Fibre Patch Panel Identification

1. York Region Category and fibre patch panels identification shall follow the standards outlined below. Any exceptions to the following requirements shall be approved by the Region's project manager.
 - a. Labels for patch panels shall be laser printed, self-laminating, adhesive, and polyester or polyolefin.
 - b. Hand-written labels will not be accepted.
 - c. Lettering shall be black on a white background and shall be a minimum of six millimetres high.
 - d. Labels shall be applied to be readily visible, and not obscured by structured cabling or patch cords.
 - e. The tagging convention for network closet patch panels will employ a six-character alphanumeric tag. The first three characters will indicate location consisting of floor and access closet identifier. The last three characters shall use a unique number incrementing with each drop within each closet.

Face Plate

1. York Region UTP patch panel termination point identification shall follow the standards outlined below. Any exceptions to the following requirements shall be approved by the Region's project manager.
 - a. Labels for faceplate shall be laser printed, self-laminating, adhesive, and polyester or polyolefin.
 - b. Hand-written labels will not be accepted.
 - c. Lettering shall be black on a white background and shall be a minimum of four millimetres high.
 - d. A label shall be applied to the top of each faceplate indicating the destination of the faceplate.

Fibre Optic Patch Panel

1. York Region fibre optic patch panel termination point identification shall follow the standards outlined below. Any exceptions to the following requirements shall be approved by the Region's project manager.
 - a. Terminate all fibres of each fibre optic cable in either 36/72 Fibre Enclosures for access closets, or 36/72/144 Fibre Enclosures for core closets.
 - b. The ordering and colour of individual fibres will be the same for each fibre cable and compliant with ANSI/EIATIA-568.3.
 - c. Labels shall be laser printed, self-laminating, adhesive, and polyester or polyolefin.
 - d. Hand-written labels will not be accepted.
 - e. Lettering shall be black on a white background and shall be a minimum of four millimetres high.
 - f. A label shall be applied to the top of the fibre duplex adapter modules associated with a single fibre cable indicating the destination of the cable.

Backbone & Horizontal

1. York Region network cable identification shall follow the standards outlined below. Any exceptions to the following requirements shall be approved by the Region's project manager.
 - a. Use durable non-fading sleeve type wire markers to identify all network cables.
 - b. Labels for cabling shall be laser printed, self-laminating, adhesive, and polyester for indoor and outdoor use.
 - c. Hand-written labels will not be accepted.
 - d. Lettering shall be black on a white background and shall be a minimum of four millimetres in height.
 - e. Fibre Optic Backbone Cables
 - i All fibre optic backbone cables are to be labelled at both ends of the cable.
 - ii The fibre backbone cables are to be labelled at each transition. A transition is defined as: a change in ducting (e.g. cable tray to conduit), a change in direction of more than 45 degrees, or an entrance and exit of ducting through a wall or floor.
 - iii If the fibre cable is run in conduit, then the transition labels shall be applied to the conduit.

- iv The tagging convention for identification of fibre optic backbone cables shall indicate the source and destination of the cable.

- b. Horizontal Cables

- i As a minimum, all horizontal Category 6A UTP cable is to be labelled at both ends of the cable.
- ii The tagging convention for identification of horizontal cables shall indicate the drop sequence and Telecommunications Room (TR) of the cable.

Execution

1. Provide all components and appurtenances necessary to ensure that the network closets are functional and meet the intent of this specification.
2. Locate work area outlets where the length of the horizontal cable runs from the access closet interconnect to the work area outlet shall be less than 90 meters. For work area outlets where this proves impossible the Contract Administrator will authorize in writing an exception if the link still meets the performance requirements of this specification.
3. The Contract Administrator reserves the right to relocate access closets and work area outlets within three metres of the locations identified in the contract drawings at no additional cost to the Region.
4. The contractor is responsible to size all power supply cables to meet the requirements of the Ontario Hydro Safety Code based on field verified length of cable run and power supply load.
5. Cable & Conduit
 - a. Provide one Category 6A UTP, horizontal cables to each work area outlet from an access closet in a Electric Magnetic Tube (EMT) conduit, sized to accommodate quantity of cabling and a minimum trade size of 35 1-1/4.
 - b. Conduit carrying horizontal cables shall enter the work area outlet through the top or bottom.
 - c. Conduit shall be Electric Magnetic Tube conduit (EMT). Corrosive environments will be noted on the access closet Installation drawings. Conduit running through corrosive environments shall be Rigid PVC.

Work Area Outlets

1. Work Area Outlets
 - a. Horizontal cabling installed using wall outlets and floor boxes are to use single gang, or double gang if required, and they are to match the decora straps. Each

decora style strap is to have a minimum of two positions for communications modules. Each outlet is to be equipped with the appropriate modules. Any unused communication positions in wall outlets shall be filled with a blank. The colours of the UTP modules and furniture adapter plates may be changed at the discretion of the project manager.

- b. Provide one one-port, single-gang, metal work-area outlets, connectors and appurtenances for termination of the horizontal Category 6A UTP cables. If four Category 6A UTP cables are consolidated at the Work Area Outlet, then one four-port work-area outlet is required. If eight Category 6A UTP cables are consolidated at the Work Area Outlet, then one eight-port work-area outlets is required.
- c. Each work-area outlet will be associated with a one-port, snap-in faceplate installed in the access closet or Core Closet patch panel.
- d. All Category 6A UTP connectors shall be modular jacks and wired for a T568A wire-map.
- e. All Category 6A UTP shielded connectors shall be bonded to ground.

Horizontal Cable Installation

- 1. All horizontal cabling from the access closet to the work area shall comply with the manufacturer's certification requirements and recommendations; as well as meet the performance parameters of ANSI/TIA-568.2 and the design requirements of ANSI/TIA-568.1.
- 2. Pathways shall be in EMT conduit minimum trades size 1-1/4 or as specified by the AHJ. Pathways shall be sized according to the requirements of the AHJ in addition to the recommendations of ANSI/TIA-569 with a planned capacity threshold of initial installation requirements +20%.
- 3. All labeling to confirm to ANSI/TIA-606 and a sample of the proposed labeling scheme to be submitted to the client for approval.

Fibre Optic Cable Installation

- 1. All fiber optic cabling from the access closet to the work area shall comply with the manufacturer's certification requirements and recommendations. They shall meet the performance parameters of ANSI/TIA-568.3 and the design requirements of ANSI/TIA-568.1. For outside plant installations, the requirements of ANSI/TIA-758 shall be followed. No cable splices are allowed for inbuilding fiber optic cabling.
- 2. Indoor pathways shall be in EMT conduit minimum trades size 1-1/4 or as specified by the AHJ. Pathways shall be sized according to the requirements of the AHJ in addition to

the recommendations of ANSI/TIA-569 with a planned capacity threshold of initial installation requirements +20%.

3. All labeling to confirm to ANSI/TIA-606 and a sample of the proposed labeling scheme to be submitted to the client for approval.

Appendix A – Horizontal Cable Labelling Format

First Floor with one data closet

D1-0001 to D1-nnnn

First Floor with multiple data closets

D1A-0001 to D1A-nnnn D1B-0001 to D1B-nnnn

Second Floor with one data closet

D2-0001 to D2-nnnn

Second Floor with multiple data closets

D2A-0001 to D2A-nnnn D2B-0001 to D2B-nnnn

Multiple Floors with multiple data closets

Increment the 2nd position of the format above for each floor.

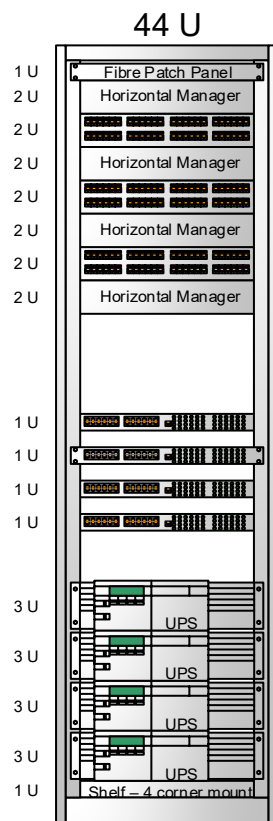
The following should be placed on dedicated patch panels.

1. Data Drops (e.g. D1A-001)
2. Security (e.g. SEC-001)
3. Wi-Fi AP Drops.. (e.g. AP-01)
4. IOT (e.g. IOT-001)
5. BAS (e.g. BAS-601)
6. ENERGY (e.g. EGY-001)

Depending on the number of drops, items 2 to 6 maybe combined on the same patch panel, and must maintain the associated labeling format for the specific service. The project manager, in conjunction with the ITS planner will be required to approve.

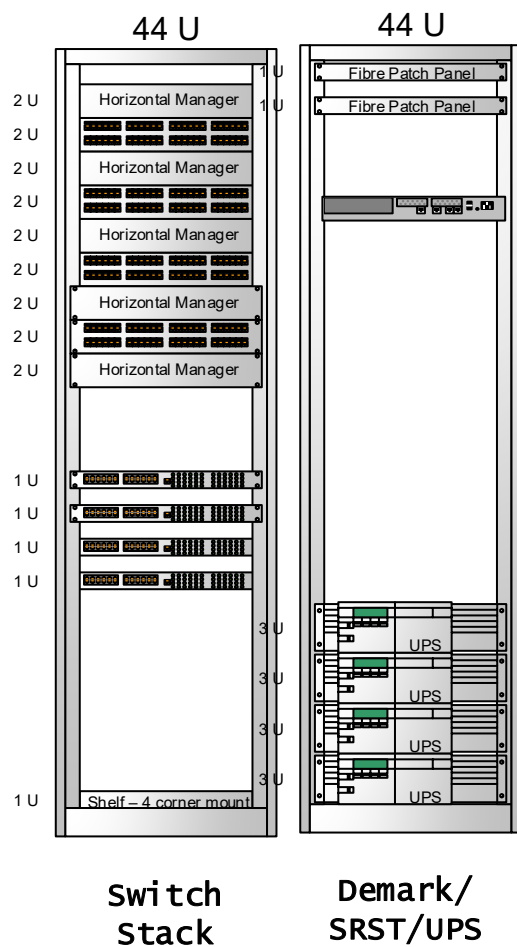
Appendix B — Network Rack/Cabinet Layout (Single)

Typical Single Network rack/cabinet layout.



Appendix C — Network Rack and Cabinet Layout (Dual Rack)

Typical Dual Network rack/cabinet layout.



Appendix D — Network CableTalk Cabinets

<https://www.cabletalk.com/cabinet-solutions>

30"x 42"x 83" - 44U

CTC3-3042K-03PF-B		
CTC3-3042K-B	Cabinet Frame 30"x 42"x 83" - 44U	1
CTC3-30-05-PF-B	Perf Lockable Front Door	1
CTC3-30-03-PF-B	Perf Lockable Split Door	1
CTC3-42-11-B	Solid Side Panels	2
CTC3-MA-16L-B	19" EIA Mounting Angles - Tapped 10/32	2
CTC3-CMS-11-B	Vertical Cable Management	1
CTPBV-1277-B	12 Outlet 15A PowerBar	2

30"x 36"x 83" - 44U

CTC3-3036K-03PF-B		
CTC3-3036K-B	Cabinet Frame 30"x 36"x 83" - 44U	1
CTC3-30-05-PF-B	Perf Lockable Front Door	1
CTC3-30-03-PF-B	Perf Lockable Split Door	1
CTC3-36-11-B	Solid Side Panels	2
CTC3-MA-16L-B	19" EIA Mounting Angles - Tapped 10/32	2
CTC3-CMS-11-B	Vertical Cable Management	1
CTPBV-1277-B	12 Outlet 15A PowerBar	2

Network Wall Mount Cabinet

<https://www.cabletalk.com/wall-mount-solutions>

CTCWH-2524-DSO-B		
CTCWH-2524-DSO-B	Commercial Wall Mount Cabinet 11U	1
CTPBH-069-B	6 Outlet 15A Powerbar	1
CTC-FS-2	2 Fan Assembly	1

CTCWH-3428-DSO-DR		
CTCWH-3428-DSO-DR	3428 WINDOW FROND DOOR	1
CTCWH-3428-DSO-MB	MID-BODY, 3428-DSO	1
CTCWH-3428-DSO-004	REAR BODY	1
CTCWH-3428-CMS	3428 WALL MOUNT CMS	2

Corporate Network Cabling Standard v4.1

eDOCS: 5708119

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Last Reviewed: January 5, 2026
Approved by: TSB

MTG ANGLE		2
CTCWD-D-HINGE-BKT	HINGE BKT MALE	2
CTCWH-2524-DSO-B-014	MID HOUSING, BOLT-ON-HINGE, FEMALE	2
CTC-44-B	COVER PLATE	4

Appendix E — Network CableTalk 4-Post Open Frame Racks

<https://www.cabletalk.com/4-post-racks>

30"x 36"x 83

CTC3-3036-03-B		
CTC3-3036K-B	Cabinet Frame 30"x 36"x 83" - 44U	1
CTC3-MA-16L-B	19" EIA Mounting Angles - Tapped 10/32	2
CTC3-CMS-11-B	Vertical Cable Management	1
CTPBV-1277-B	12 Outlet 15A PowerBar	2

30"x 42"x 83"

CTC3-3042-03-B		
CTC3-3042K-B	Cabinet Frame 30"x 42"x 83" - 44U	1
CTC3-MA-16L-B	19" EIA Mounting Angles - Tapped 10/32	2
CTC3-CMS-11-B	Vertical Cable Management	1
CTPBV-1277-B	12 Outlet 15A PowerBar	2

Appendix F — Network Small Site Deployment Cabinets

Where wall space is limited utilize Hammond HLP Series Low-Profile Wall Mount Rack Cabinet of application-appropriate size and configuration **complete with HWCF Cabinet Sealing and Filter Kit and padlock/lock hasp or equivalent to be approved by York Region.**

<https://www.hammfg.com/dci/products/wall-mount/hlp#similar-products>



Appendix G — Network Environmental Services Facilities NEMA4

For Environmental Services' facilities, utilize Nema4 Hoffman ProTek Double-Hinge Solid Door PTHW242424G4 (or other application appropriate size). Complete with rack-mount, steel shelf vented, back plate, cable management and padlock handle.

<https://hoffman.nvent.com/products/protek-single-door-ul-and-nema-type-4-12-0>

https://hoffman.nvent.com/sites/g/files/hdkjer316/files/acquiadam_assets/2021-09/Spec-00713.pdf?asset_type=Data%20Sheet

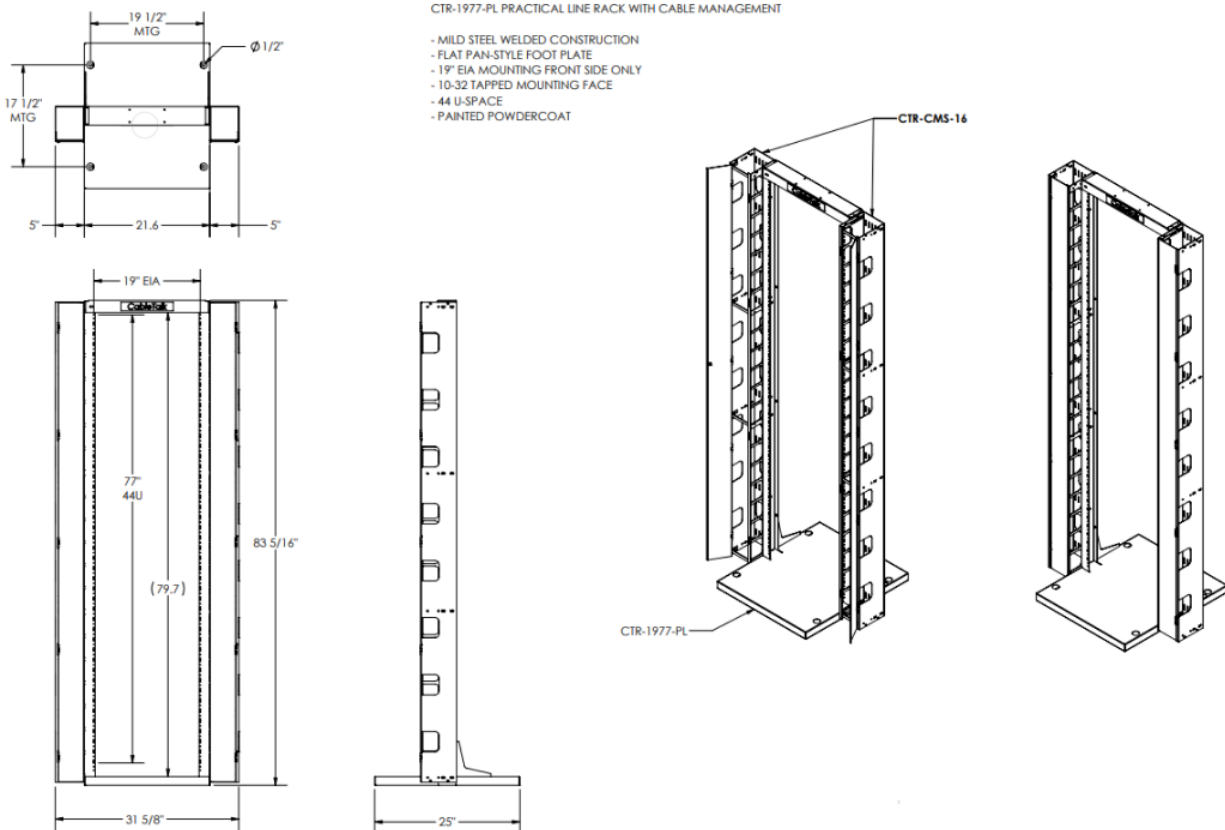


Appendix H — HP Server Rack

HP 42U 600mm x 1075mm Enterprise Pallet Rack		
HPE-P9K37A	HPE 42U 600x1075 Ent G2 Pallet Rack	1
HPE-P9L15A	HPE G2 Rack 42U 1075mm Side Panel Kit	1
Option - Shelves for HP		
234672-B21	HP 100Kg Sliding Shelf (Sliding)	1
253449-B21	HP Mon/Util Shelf (Fixed)	1

Appendix I — Network CableTalk 2-Post Rack

Part Number and Description: CTR-1977-PL Practical Line Rack with Cable Management



Appendix J — Naming Convention for Wi-Fi Access Point (AP)

Staff Wi-Fi

1. AP should be labelled: Site-FL-RM-AP#. Where Site is Site Name, FL is the floor, RM is the Network Closet Room Number, AP# is the number of AP on that floor and numbering should restart on each floor.
 - a. Ie: AP number 16 on the first floor in the Annex that is cabled back to room 1-006 would be labelled as follows: ANNEX-1-1-006-AP16
2. Data Jack labelling: RM-AP#
 - a. Ie: data jack that is used for AP number 16 on the first floor of the Annex that is cabled back to room 1-006 would be labelled as follows: 1-006-AP16
3. Patch Panel should be labelled: AP#
 - a. Ie: patch panel that is used for AP number 16 on the first floor of the Annex that is patched back to room 1-006 would be labelled as follows: AP16

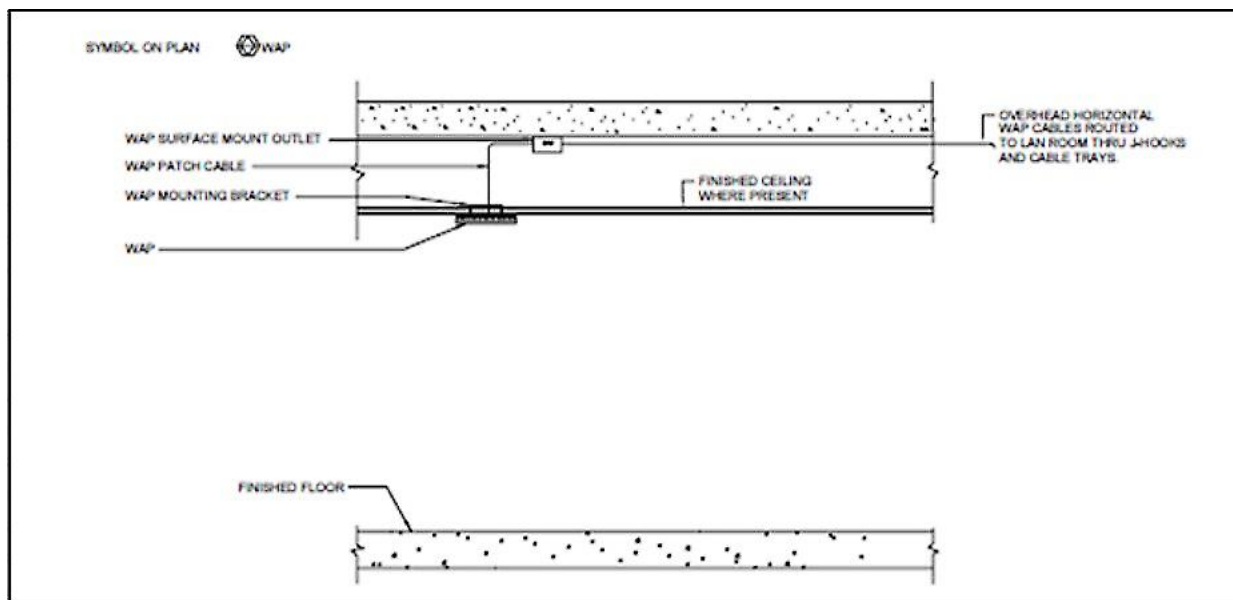
Public Wi-Fi

4. Public AP should be labelled: PUB-FL-RM-AP#. Where PUB represents Public Wi-Fi, FL is the floor, RM is the Network Closet Room Number, AP# is the number of AP on that floor and numbering should restart on each floor.
 - a. Ie: Public Wi-Fi AP number 16 on the first floor in the Annex that is cabled back to room 1-006 would be labelled as follows: PUB-1-1-006-AP16
5. Data Jack labelling: PUB-RM-AP#
 - a. Ie: data jack that is used for Public Wi-Fi AP number 16 on the first floor of the Annex that is cabled back to room 1-006 would be labelled as follows:
PUB-1-006-AP16
6. Patch Panel should be labelled: PUB-AP#
 - a. Ie: patch panel that is used for Public AP number 16 on the first floor of the Annex that is patched back to room 1-006 would be labelled as follows:
PUB-AP16
7. Cabling for Public Wi-Fi shall on a separate patch panel from the York Region internal network.

Appendix K – Wireless Access Point (WAP) Installation & Mounting

Installation of WAP shall meet the requirements of manufacturer and follow recommendations of TIA-TSB-162.

1. The communication contractor shall install all wireless access points (WAP) which shall be supplied by York Region.
2. Provide patch cable and all necessary hardware to mount WAP's as shown.
3. Communication contractor shall
 - a. Receive WAP's
 - b. Unpack the WAP's
 - c. Attach the WAP's mounting bracket
 - d. Mount the WAP's
 - e. Patch the WAP's at both ends
 - f. Record AP MAC address and WAP Cable ID that AP was patched into. Record this into the AP Connectivity Table that shall be submitted upon AP installation completion of each floor.



Appendix L — Category Cabling Color Scheme for Services

Blue	Data/WiFi/Clock/IoT Category Cable and anything that is not specified.
Purple	Security Category Cable
Orange	BAS Category Cable
Green	Energy Category Cable

Appendix M — Sample Matrix of Port Count Report

For ITS and Cabling Contractor Use

NAC	Data					WAP	IoT	Security Camera		BAS			Energy			TOTAL DATA
Network Access Closets	1-DATA OUTLETS	2-DATA OUTLETS	3-DATA OUTLETS	4-DATA OUTLETS	DATA DROPS		CLOCK/IOT	SECURITY DEVICE	INTERCOM	BAS	ELEVATOR CONTROL RM	ELECT HOT WATER HEATER	WATER METER	GAS METER	METERS FOR ELECT PANELS	
- N.A. -	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TEL P1-006																0
TEL G-006																0
TEL 1-108																0
TEL 2-108																0
TEL 2-109																0
TEL 2-006																0
TEL 3-021																0
TEL 3-022																0
TEL 3-006																0
TR located on 4th floor																0
TR located on 5th floor																0
TR located on 6th floor																0
TR located on 7th floor																0
TR located on 8th floor																0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix N – Network Closet Checklist for Standard Sites

For ITS and Cabling Contractor Use

Walkthrough: 100% ☐ Final ☐

Network Closet : New/Renovated Closet *			
Details (Y/N)	T1	T2	Comment
Cabling Trays or J hooks			
Fire Rated Plywood Wallboard			
Power Receptacles NEMA L5-20R			
HVAC (with central monitoring)			
Rack Installation (clearance for vertical and horizontal cable management)			
Patch Panels			
Fibre Backbone (York Net Sites Only) (shielded/protected/labeled)			
Copper/analog line installed			
Verify that network closets are secure by lock or proximity scanners			
Electrical Grounding			
Room sweep/clean and all refuse/garbage is removed			
Network Closet ready for setup			
Network Closet setup complete			
Cabling Test Submitted and Accepted			
As-Built Diagram Submitted & Accepted			

* Each network closet must have a completed checklist

Appendix N — As-Built Diagram

Example of the as-built Floorplan, showing all data drop locations with corresponding labels. Required for all new builds and major renovations, and followed for one-off data drop additions/relocations as much as possible.



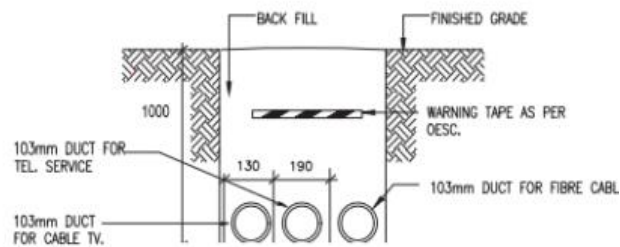
As-builds shall be submitted in electronic format as well as plotted on appropriate size paper and posted in the corresponding data closet for reference.

Appendix O – WAN/ISP Duct Bank

Communication conduits can be placed on top of electrical conduits

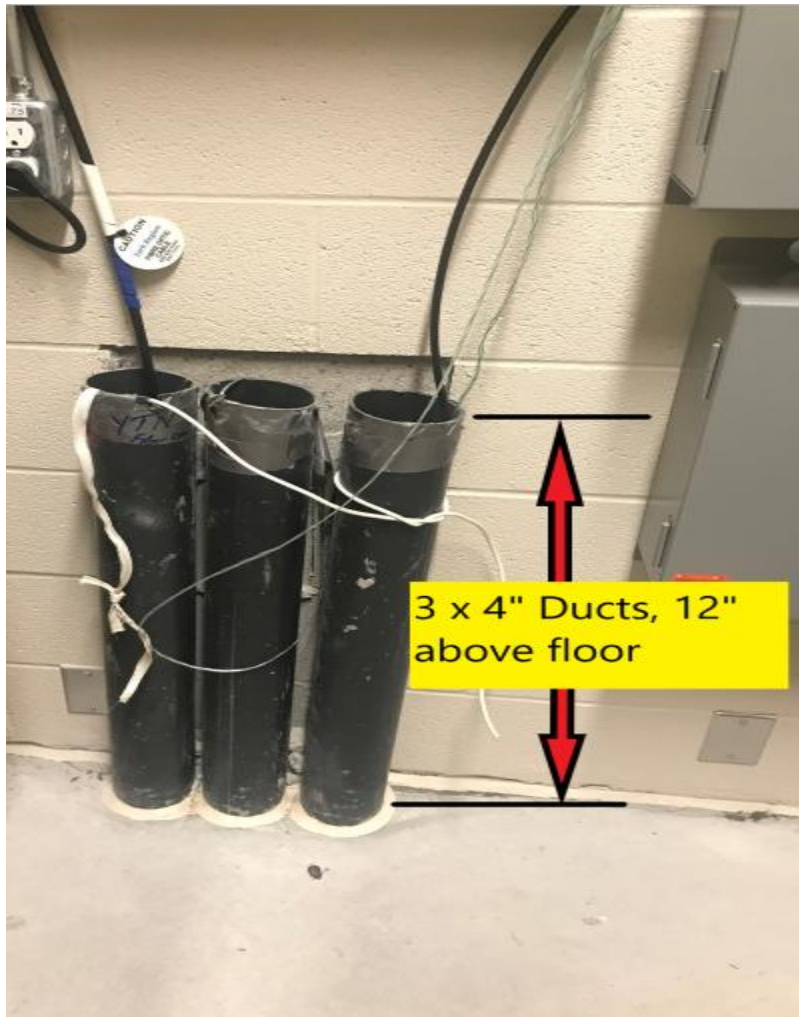
NOTES:

- .1 PROVIDE DUCTBANK TO OESC STANDARDS AND APPROVAL.
- .2 PROVIDE BELL FITTINGS AT EACH END. PROVIDE DUCT SPACERS AT 1.0M INTERVALS.
- .3 REFER TO SPECIFICATIONS FOR DETAILED DESCRIPTION.
- .4 ALL DIMENSIONS ARE TYPICAL IN MM.



Appendix P — WAN/ISP Ducts Inside Communication Room

Three four-inch ducts stubbed inside communication room, preferred height minimum 12" above the floor.



References

York Region Transit local area network	eDocs: 1027531
American National Standards Institute	http://www.ansi.org
Canadian Standards Association	http://www.csa.ca
Construction Specifications Institute/Construction Specifications Canada	http://www.masterformat.com
European Committee for Electrotechnical Standardization (ECES)	http://www.cenelec.eu/Cenelec/Homepage.htm
International Electrotechnical Commission (IEC)	http://www.iec.ch
International Organization for Standardization	http://www.iso.ch/iso/en/ISOOnline.frontpage
Internet Engineering Task Force	http://www.ietf.org
IEEE	http://www.ieee.org
Ontario Realty Corporation	http://www.orc.on.ca/site3.aspx
Telecordia Technologies Inc.	http://telecom-info.telecordia.com
Telecommunications Industry Association	http://www.tiaonline.org
Underwriters Laboratories Inc.	http://www.ul.com

1 GENERAL

1.1 General Requirements

- 1.1.1 Conform to Sections of Division 28 as applicable.
- 1.1.2 Conform to York Region Security System Specifications as outlined below. Where any discrepancies may exist between the York Region Documentation and the Division 28 documents contained herein, the York Region Documentation shall take precedence.
- 1.1.3 The proceeding is a comprehensive specification for the design and resulting requirements of an Access Control and Alarm Monitoring System and Duress Alarm System Expansion to be provided for the York Region 17150 Yonge Street, 2nd floor, Newmarket ON.
- 1.1.4 The Security Contractor which shall provide the systems specified herein is referred to as the 'Contractor'. Where multiple contractors are involved with the provision of a particular requirement, the Division shall be indicated for clarification. Where the Division or contractor is not indicated, the responsibility and scope shall be provided by Division 28.
- 1.1.5 The Contractor shall observe, understand and comply with all Sections of this document. Unless indicated otherwise, the Contractor shall include for all requirements stipulated within this section in their scope of work.
- 1.1.6 These performance specifications are to read in conjunction with the Electrical drawings, riser diagrams and details and shall be translated into specific devices, equipment and systems which the Contractor proposes to provide in order to produce a fully functional expansion to the existing Integrated Security System (ISS).
- 1.1.7 The Contractor is responsible to review all design documentation relevant to the provision of the security system including Division 1 [General Requirements], Division 8 [Door Hardware], and Division 26 [Electrical], visit the site prior to bidding to become aware of site conditions and extent of work required and request any scope clarifications during the tendering stage. In the event of discrepancies within or between the tender documentation, which includes drawings, risers, details and specifications, or between Contract Documents and site conditions, the Contractor shall either raise the issue via the RFI process before the project is awarded or include for the most onerous requirement.
- 1.1.8 The Contractor shall be responsible to coordinate all security requirements with Division 8 and Division 26.
- 1.1.9 The Contractor shall be responsible to coordinate all of the security requirements with the York Region IT.
- 1.1.10 The Owner reserves the right to modify, adjust and append the scope and extent of work described within this document at any time.

1.2 Related Work

- 1.2.1 Refer to the following Sections of this Division for related work:
 - 1.2.1.1 Section 28 00 05 – York Region Security System Specifications
 - 1.2.1.2 Section 28 00 10 – System Integrations
 - 1.2.1.3 Section 28 13 00 – Access Control and Alarm Management System

1.3 References

- 1.3.1 Perform Work in accordance with the active and most current revision of the following standards:
 - 1.3.1.1 National Building Code of Canada
 - 1.3.1.2 Ontario Building Code
 - 1.3.1.3 National Fire Code of Canada
 - 1.3.1.4 National Electric Code
 - 1.3.1.5 Ontario Electrical Safety Code
 - 1.3.1.6 Applicable Municipal Electrical Regulation
 - 1.3.1.7 All Electrical/Electronic Security devices shall be CSA Certified and comply with ULC.
 - 1.3.1.8 National Fire Protection Association (NFPA)
 - 1.3.1.8.1 NFPA 71- Standard from the Installation, Maintenance and Use of Signaling Systems for Central Station Services.
 - 1.3.1.8.2 NFPA 70, Article 517, National Electric Code.
 - 1.3.1.8.3 NFPA 101, Life Safety Code.
 - 1.3.1.9 Underwriter's Laboratories Canada (ULC)
 - 1.3.1.9.1 CAN/ULC-S302, Installation and Classification of Burglar Alarm Systems for Financial and Commercial Premises, Safes and Vaults.
 - 1.3.1.9.2 CAN/ULC-S303, Local Burglar Alarm Units and Systems.
 - 1.3.1.9.3 CAN/ULC-S304, Intrusion Detection.
 - 1.3.1.9.4 CAN/ULC-S306, Intrusion Detection Units.
 - 1.3.1.9.5 ULC-S318, Power Supplies for Burglar Alarm Systems.
 - 1.3.1.10 Telecommunications Industry Association (ANSI/TIA)
 - 1.3.1.10.1 ANSI/TIA 568-C.0 - Generic Telecommunications Cabling for Customer Premise
 - 1.3.1.10.2 ANSI/TIA/EIA 568-C.1 – Commercial Buildings Telecommunications Cabling Standard
 - 1.3.1.10.3 ANSI/TIA/EIA 569 – Commercial Building Standard for Telecommunications Pathways and Spaces
 - 1.3.1.11 National Electrical Manufacturers Association (NEMA)
 - 1.3.1.11.1 N.E.M.A.ICS 1- General Standards for Industrial Control and Systems.
 - 1.3.1.11.2 N.E.M.A.ICS 2- Standards for Industrial Control Devices, Controllers, and Assemblies.
 - 1.3.1.11.3 N.E.M.A.ICS 3- Industrial Systems.
 - 1.3.1.11.4 N.E.M.A.ICS 6- Enclosures for Industrial Controls and Systems.
 - 1.3.1.12 ANSI/TIA/EIA 607A – Commercial Building Grounding and Bonding Requirements for Telecommunications
 - 1.3.1.13 ANSI/TIA 942 – Data Center Cabling Standard

1.4 Abbreviations and Acronyms

ACAMS	Access Control and Alarm Management System
CSA	Canadian Standards Association
DGP	Data Gathering Panel
EMC	Electromagnetic Compatibility
IP	Internet Protocol
LAN	Local Area Network
LCD	Liquid Crystal Display
LED	Light Emitting Diode
NEMA	National Electrical Manufacturers Association
OBC	Ontario Building Code
ONVIF	Open Network Video Interface Forum
PC	Personal Computer
PIN	Personal Identification Number
PoE	Power over Ethernet
POTS	Plain Old Telephone Service
RF	Radio Frequency
RFI	Request for Information
RH	Relative Humidity
SMS	Security Management System
TCP	Transmission Control Protocol
ULC	Underwriters' Laboratories of Canada
UPS	Uninterruptible Power Supply
VMS	Video Management System
VOIP	Voice Over Internet Protocol
WAN	Wide Area Network

1.5 General Project Overview

- 1.5.1 This work covers the upgrades of various security systems within the York Region, 17150 Yonge Street, 2nd floor, Newmarket ON
 - 1.5.1.1 Provide (Supply, Install, Program, Test, and Commission) a fully functional expansion to the existing Honeywell Access Control Systems. The system expansion shall be comprised of all additional hardware, field devices, card readers, door contacts, request-to-exit motion detectors, electric strikes, workstations, monitors, power supplies, battery backups, low voltage wiring, terminations, connections, firmware, software, licenses, configuration, programming, and testing as required to fully expand the existing system.
 - 1.5.1.2 Provide (Supply, Install, Program, Test, and Commission) a fully functional expansion to the existing Honeywell Duress Alarm Systems. The system expansion shall be comprised of all additional hardware, field devices, enclosures, panic/duress buttons, input/output modules, relays, power supplies, battery backups, low voltage wiring, terminations, connections, firmware, software, licenses, configuration, programming, and testing as required to fully expand the existing system.

1.6 Scope of Work

- 1.6.1 This project encompasses the expansion of the existing Access Control and Alarm Management System and Duress Alarm System:
 - 1.6.1.1 For details regarding the Access Control and Alarm Management System scope refer to section 28 13 00.
 - 1.6.1.2 All existing security systems shall be programmed and configured as required in order to function as one unified Integrated Security System. Refer to section 28 00 10 for system integration requirements.
- 1.6.2 The responsibilities of the Contractor shall include the following:
 - 1.6.2.1 Managing the development and implementation of Division 28 components.
 - 1.6.2.2 Submittals on all Division 28 systems and equipment listed under this project.
 - 1.6.2.3 Installation of all Division 28 systems and equipment listed under this project.
 - 1.6.2.4 Coordination of all Division 28 systems and equipment (including all coordination required with other trades) under this project.
 - 1.6.2.5 All wiring for all Division 28 systems and equipment needed under this project.
 - 1.6.2.6 Wiring termination for all Division 28 systems and equipment. Reference Division 26 Electrical specifications for raceway, conduit and identification requirements to Division 28 except where specific requirements are contained in Division 28.
 - 1.6.2.7 Testing and commissioning of all Division 28 systems and equipment replaced under this project.
 - 1.6.2.8 Coordinate with Division 26 Electrical for conduits and back boxes requirements.
 - 1.6.2.9 Coordinate all Division 26 Electrical work as indicated on the drawings.
- 1.6.3 This series of Sections of the Specifications covers the modifications and upgrades of the security and alarm systems described in Division 28 and diagrammatically indicated on the SE-Series Drawings. Provide all labour, materials, equipment and supervision to install systems described in these documents.
- 1.6.4 All required new door hardware such as electrified locks, lock status, and door status switches as required for proper functioning of the door shall be provided by the Division 8 contractor. Power supplies for electric strikes, maglocks, electric-latch retraction or crash-bars shall be provided by the Division 28 contractor.

- 1.6.5 All required conduit, back-boxes, junction boxes and 120VAC power, circuit breakers and sub-power panels required to meet the intent and requirements of the design and specifications shall be provided by the Division 26 Subcontractor. Division 28 shall coordinate with Division 26 Subcontractor to ensure all electrical infrastructure required is provided.
- 1.6.5.1 At the option of the Contractor, portions of this Series 28 00 00 of the Specifications may be provided by Division 26 and shall be limited to the following:
- 1.6.5.1.1 The Integrated Security Systems raceways may be provided and installed by Division 26 provided the raceway requirements are fully coordinated with the Contractor to ensure all raceways necessary for functional systems are provided.
- 1.6.5.1.2 All power circuitry for equipment specified within this division of work shall be on the existing standby emergency power system. All additional circuits as required are to be provided by Division 26.
- 1.6.5.1.3 All wiring associated with the security systems, provided the wiring requirements are fully coordinated with the Contractor.
- 1.6.6 All required network and communications equipment including CAT6A cabling, patch panels, and PoE network switches, shall be provided by the Division 28 Contractor.
- 1.6.7 All required low voltage cabling for security field devices shall be provided by the Division 28 Contractor.
- 1.6.8 Contractor is to remove the existing equipment made redundant (including field devices and headend equipment) and return to the Owner. At the option of the owner, the contractor shall safely and securely dispose of this equipment at no additional cost to the owner. Existing surface mount conduit and associated cabling shall be removed and cut in the ceiling space with appropriate junction box.
- 1.6.9 All work is to take place after hours and on weekends to minimize any disruption to court operations. Courthouse and all existing courthouse security systems are to remain operational at all times, until the new systems are ready to replace the existing to perform the same function as the existing. Every effort possible should be made to ensure there is minimal or no downtime during transition periods. Full coordination with courthouse representatives and the local Police Services is required for any work that may cause disruption or downtimes to operations.
- 1.6.10 All cabling shall be enclosed in conduit unless noted otherwise. All conduit shall be concealed behind walls and ceilings where possible unless noted otherwise. No new cabling is permitted to be exposed.
- 1.6.11 Security Contractor to verify the number of field-devices shown on the drawings and raise any discrepancy to the consultant's attention prior to bidding, otherwise the more onerous requirement will apply. Ensure equipment manufacturer provides all information regarding wiring, conduit runs and components requirements before tendering. Owner will not be responsible for added cost and changes due to additional manufacturer's requirements.
- 1.6.12 Upon completion and directly preceding the initiation of manufacturer warranties, the Contractor is to update all system related software with the most current available edition (which must be confirmed with the consultant and Owner) devoid of added expense to the Owner. Owner must approve any software upgrades that shall be implemented to the system.
- 1.6.12.1 Supply and install all required ancillary equipment, including, but not limited to, the following:
- 1.6.12.1.1 Wire and Cable-Splices and Terminations
- 1.6.12.1.2 Boxes
- 1.6.12.1.3 System Wiring

1.7 Quality Assurance

- 1.7.1 All work specified under this Division of the Specifications shall be in accordance with the following codes and agencies:
 - 1.7.1.1 Ontario Electric Safety Code
 - 1.7.1.2 Ontario Building Code
 - 1.7.1.3 Applicable Municipal Electrical Regulation
 - 1.7.1.4 All Electrical/Electronic Security devices shall be CSA Certified and comply with ULC.

1.8 Manufacturers Qualifications

- 1.8.1 The equipment furnished under Division 28 of the specifications shall be the standard product of manufacturers who have been supplying equipment similar to that specified for a period of not less than 5 years.
- 1.8.2 Where approved manufacturers are not specified, supply equipment manufactured by experienced, reputable manufacturers, recognized as industry leaders with a global presence whose installations have rendered satisfactory service for a minimum five (5) years at other facilities of comparable size and complexity and who will provide local factory trained technicians as required.

1.9 Contractor Qualifications

- 1.9.1 Only prequalified contractors, as determined by the York Region, shall be eligible to supply, install, and program the Integrated Security Systems and components. Refer to Section 28 00 05 – York Region Security System Specifications.

1.10 Warranty

- 1.10.1 For the Warranty Requirements the Contractor shall refer to the RFQ provided. Conform to the warranty requirements of Division 1.

1.11 Submittals

- 1.11.1 Submit for review by the Consultant complete engineering data for each system for evaluation of the proposed system with respect to specification requirements. Submittals for each system shall consist of engineering data sheets, schedules, and manufacturer's descriptive catalogue sheets for each system component and manufacturers' product cut sheets for required equipment and major components to be provided. The product cut sheets shall be annotated to clearly identify only those specific make/models, functions and features that are applicable to the product in order to indicate conformance with the contract documents.
- 1.11.2 System submittals shall also include riser block diagrams indicating single-line inter-connection of all integrated and interfaced systems and the major components of each system and number of conductors and size of raceway required. An overall system riser wiring diagram shall be provided identifying control equipment, initiating circuits, output circuits, terminations, terminal numbers, cables and raceways. Complete electrical characteristics and physical dimensions shall be provided for individual system components and components group mounted. Block diagrams submitted for approval shall be for this specific system and project; standard manufacturer's diagram indicating options are not acceptable.

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- 1.11.3 The Consultant reserves the right to require a sample of equipment submitted for approval or to require a demonstration of any specific system. All items submitted for approval will be returned. Where system demonstrations are required, such demonstrations shall be locally conducted at a time and place as designated by the Consultant.
- 1.11.4 The Contractor shall set up a meeting with the Consultant to review the operational functionality of the systems. The Contractor shall explain the entire system operation, equipment and other items as called for in this specification. Drawings required will be submitted and reviewed at this meeting. This meeting will be held in the Owner's office or other location indicated by the Owner.
- 1.11.5 Each individual design submittal, and subsequent shop drawing submittal item for materials and equipment shall be marked to show specification section and paragraph number which pertains to the item. Each operational feature of the systems included shall be addressed in narrative form and relate to specific system requirements described in the plans and specifications. All shop drawing submittals shall be submitted on same size sheets, identified by system, and sequentially numbered throughout the entire set. Any deviation from the approved drawings and specifications shall be noted on the submittals by the Contractor.
- 1.11.6 Submit shop drawings in accordance with the General Conditions of the Contract prior to and following commencement of installation. Do work in accordance with reviewed shop drawings.
- 1.11.7 Provide system information and description in check-list form.
- 1.11.8 Provide details and performance specifications for control, annunciation and peripherals with item cross reference to specification for compliance.
- 1.11.9 Provide Step-by-step operating sequence, cross referenced to logic flow diagram.
- 1.11.10 Provide conceptual drawings of proposed equipment layouts within each equipment rack. Provide drawings of each type of panels and camera location identifying the proposed mounting detail and any interconnection points with supplied conduit and cables.
- 1.11.11 Prior to submitting shop drawings, review submittal for compliance with the approved drawings and specifications and place a stamp or other confirmation thereon which states that the submittal complies with Contract requirements. Submittals without such verification will be returned disapproved without review. Any resubmittals required shall be labelled "RESUBMITTAL".
- 1.11.12 Submittals shall be made for all major security system components, including but not limited to the following:
- 1.11.12.1 Access Control Submittals:
- 1.11.12.1.1 All Access Control and Alarm Management System Software
 - 1.11.12.1.2 Card Reader Controllers and Associated Power Supplies and Data Gathering Panels (DGP)
 - 1.11.12.1.3 Card Readers
 - 1.11.12.1.4 Access Cards
 - 1.11.12.1.5 All Door Hardware and Associated Power Supplies not provided by Div. 8.
 - 1.11.12.1.6 Wiring diagrams for each door type
 - 1.11.12.1.7 Wiring diagrams for each DGP
 - 1.11.12.1.8 Elevation diagrams for each equipment room indicating connections between DGPs
 - 1.11.12.1.9 Wiring diagrams showing connections to fire alarm system and maglock riser
- 1.11.12.2 Duress System Submittals:

- 1.11.12.2.1 Desk Mounted Duress Pushbutton
- 1.11.12.2.2 Wall Mounted Duress Pushbutton
- 1.11.12.2.3 Strobe Light

1.11.13 All shop drawings shall be submitted at the same time, in one packaged submittal. Partial submittal will not be acceptable.

1.12 Project Close Out Documentation and Record Drawings

1.12.1 Provide As-Built Drawings as follows:

1.12.1.1 At the time of substantial performance, provide complete data on Security equipment used in this project. This data shall be in bound form and shall include all shop drawings required for this project. The record drawings shall also be provided in AutoCAD format, in compliance with the latest IO CAD standards, including associated layering report, and pdf formats.

1.12.2 Provide system interconnect drawings depicting the cabling information between each piece of equipment in the form of a system block diagram. As a minimum, this drawing shall contain the following information for each piece of equipment:

- 1.12.2.1 Installed location
- 1.12.2.2 Incoming cable numbers
- 1.12.2.3 Outgoing cable numbers
- 1.12.2.4 Incoming jack/terminal block numbers
- 1.12.2.5 Outgoing jack/terminal block numbers

1.12.3 Provide wiring lists presenting all system interconnect wiring detail in tabular form. As a minimum, the lists shall contain the following information for each wire:

- 1.12.3.1 Associated cable number
- 1.12.3.2 Originating equipment jack/terminal block number
- 1.12.3.3 Terminating equipment jack/terminal block number
- 1.12.3.4 Wire colour code
- 1.12.3.5 Functional description

1.12.3.6 Provide conduit layout drawing(s) as an accurate record of the interconnecting facilities provided by the Contractor. As a minimum, this drawing (s) shall contain the following information:

- 1.12.3.6.1 Conduit location to scale
- 1.12.3.6.2 Junction box, pull box and cabinet locations
- 1.12.3.6.3 Conduit size and type
- 1.12.3.6.4 Conduit run numbering plan

1.12.4 Provide a cable pull schedule which identifies the cable content of each conduit run in tabular form. As a minimum, the schedule shall provide the following information for each cable run:

- 1.12.4.1 Cable type(s) pulled
- 1.12.4.2 Quantity of each type of cable
- 1.12.4.3 Function of each cable
- 1.12.4.4 Cable number/identification

1.12.5 Provide a list of installed equipment which itemizes the quantity, model number and serial number of all installed equipment.

1.12.6 Cable and Equipment Labelling

1.12.7 Close-Out Documentation:

1.12.7.1 In addition to the above noted drawings, contractor to provide the following information:

- 1.12.7.1.1 Warranty Letter.
- 1.12.7.1.2 Complete verification and testing sheets for all systems.
- 1.12.7.1.3 Cable test results for all network cabling.
- 1.12.7.1.4 Datasheets and Operations Manuals for all equipment provided.
- 1.12.7.1.5 Recorded videos of training sessions
- 1.12.7.1.6 Field of View Screenshots for all Cameras
- 1.12.8 Maintenance Manual
- 1.12.8.1 Submit four (4) hard copies as well as digital PDF copy of maintenance manual to the Owner containing the following:
 - 1.12.8.1.1 A detailed description and block diagram(s) illustrating the function, interaction and signal flow between all system and subsystem elements.
 - 1.12.8.1.2 Detailed charts which lead the technician through system trouble shooting and restoration; one chart shall be supplied for each system failure symptom: each chart shall branch through all necessary tests and indicate the required corrective action of any possible failure.
 - 1.12.8.1.3 The Manufacturer's Service Manual for all off-the-shelf equipment.
 - 1.12.8.1.4 The recommended preventative maintenance routine for all system elements; as a minimum, define the frequency of each routine and provide a step-by-step procedures; a record sheet shall be provided for each routine; this sheet will be maintained by the maintenance technician.
 - 1.12.8.1.5 Step-by-step procedures for all set-up and alignment routines which are required to return repaired equipment to service.
 - 1.12.8.1.6 A list of all special test equipment and tools required to maintain the system.
 - 1.12.8.1.7 System functional description and sequence of operation of actual installation.
 - 1.12.8.1.8 Detailed maintenance instruction, schedule and trouble-shooting guide.
 - 1.12.8.1.9 Pictorial drawing of control equipment layout, showing location of components, modules and parts, indicating their catalogue numbers. Schematic diagrams of controls equipment, except modules which can be exchanged as unit and internal interconnecting cables and wires.
 - 1.12.8.1.10 Fully documented copies (hard copy and soft copy via PDF on flash drive) of the system control program. Program documentation shall consist of an English text description of the function and logic associated with each line of the control program. Description shall be written to be understood by the user group.
 - 1.12.8.1.11 Name, address and telephone number of service representative of manufacturer to be contacted.
- 1.12.9 Operations Manual
- 1.12.9.1 Submit four (4) hard copies as well as digital PDF copy of the Operations Manual to the Owner.

2 PRODUCTS

2.1 Materials

- 2.1.1 Materials or equipment specified by manufacturer's name shall be provided, unless approval of other manufacturers is listed in addendum to these specifications. Any materials or equipment approved in addendum shall function the same as the equipment specified.
- 2.1.2 All material within this Division shall be new and shall conform to the applicable standards. Publications and standards of the organizations listed below are applicable to those materials specified within this Division:

- 2.1.2.1.1 Canadian Standards Association (CSA)
- 2.1.2.1.2 Underwriters Laboratories Canada (ULC)
- 2.1.2.1.3 Ontario Electric Safety Code
- 2.1.2.1.4 Ontario Building Code
- 2.1.2.1.5 National Fire Protection Association (NFPA)
- 2.1.2.1.6 ULC listed material shall bear ULC label.
- 2.1.2.1.7 All like materials shall be of the same manufacturer.
- 2.1.2.1.8 All materials and connections shall be installed in strict accordance with all applicable codes, UL-C standard and manufacturer's written requirements.
- 2.1.2.1.9 All electrical devices shall be CSA Certified.
- 2.1.2.1.10 Ontario Electrical Safety Code (Canadian Electrical Code and Ontario Hydro Supplements).
- 2.1.2.1.11 Ontario Fire Code.
- 2.1.2.1.12 National Electrical Manufacturers Association (NEMA)
 - 1. N.E.M.A.ICS 1- General Standards for Industrial Control and Systems.
 - 2. N.E.M.A.ICS 2- Standards for Industrial Control Devices, Controllers, and Assemblies.
 - 3. N.E.M.A.ICS 3- Industrial Systems.
 - 4. N.E.M.A.ICS 6- Enclosures for Industrial Controls and Systems.
- 2.1.2.1.13 Electrical and Electronic Manufacturers Association of Canada (EEMAC).
- 2.1.2.1.14 Joint Industrial Council (JIC).
- 2.1.2.1.15 Boards, Service Companies or other Authorities having jurisdiction.

2.1.3 Systems shall be designed for the maximum reliability possible with the technology selected, and a minimum of downtime due to scheduled or unscheduled maintenance. Failure of any single component or subsystem shall not cause failure or degradation in the operation of any other part of the system or its components.

2.1.4 Any elements likely to fail during the useful life of the systems shall be parts of field replaceable units, designed to be replaced with a minimum of downtime. The systems shall be designed to minimize the number of unique field replaceable unit parts.

2.1.5 Components of the system which may be accessible to inmates shall be highly resistant to damage, tampering or interference. To the maximum extent possible, all field wiring and devices shall be electronically supervised to detect tampering attempts, wire cut and wire shorted conditions.

2.1.6 Each system component shall be provided with fuses or resettable breakers, to prevent internal short circuits from affecting equipment on the same power circuit. The system shall be adequately protected against damage or improper operation caused by such power impairments that commonly occurs in commercial power.

2.2 Cable Colours

2.2.1 Unique cable colours shall be used for all major security systems. The following cable colours are proposed to be used for each system wiring:

2.2.2 ACS, Duress: Category 6A cable used for end-to-end horizontal cabling shall be purple in color including patch cable and keystone.

2.3 Conduit & Backboxes

2.3.1 The minimum conduit size for all systems shall be 3/4 inch (20 mm) unless otherwise noted.

- 2.3.2 Exposed cabling is only allowed above drop ceilings or where otherwise approved. All exposed cabling must carry an FT6 fire rating. All exposed security wiring outside of those areas which are approved shall be installed in conduit.
- 2.3.3 Exterior Conduit requirements are as follows:
- 2.3.4 Exterior conduit shall be PVC coated and rated for outdoor use while maintaining the requirements outlined in this section.
- 2.3.5 Exterior conduit entry into wall mounted exterior junction boxes shall be via the side or bottom of the box and not through the top.
- 2.3.6 Provide non-toxic paint to match existing and/or surrounding colour for all exposed raceways.
- 2.3.7 Refer to Div 26 for additional Details.

2.4 Uninterruptible Power Supply (UPS)

- 2.4.1 All new Security equipment is to be installed on UPS power. Refer to Division 26 for additional information.

3 EXECUTION

3.1 Phasing

- 3.1.1 The installation of the security systems shall be phased in a way to minimize disruption to the operations of the facility. The existing systems and devices must remain operational at all times, until the new systems are ready to replace the existing to perform the same function as the existing. Every effort possible should be made to ensure there is minimal downtime during the transition period.
- 3.1.2 The security contractor shall work with the consultant and site representatives to determine the exact phasing scheme that will work for the site.
- 3.1.3 While the headend system is being programmed, the conduit and wiring for all the new devices shall be installed.
- 3.1.4 Electronically controlled doors and controllers shall be transitioned on a door by door, area by area basis afterhours in order to minimize downtime on the system. While the system is being transitioned, the existing system and new system will be running concurrently. Provide any temporary measures as required to make the transition period seamless with minimal disruption.

3.2 Installation

- 3.2.1 Conform to manufacturer's instructions as to correct installation and wiring of all equipment.
- 3.2.2 Connections in the system shall be made by qualified electronic technicians.
- 3.2.3 Provide necessary wiring for interconnection of all equipment as required and as shown and noted on Drawings.
- 3.2.4 All wiring to be clear of shorts, opens and grounds on completion of work.
- 3.2.5 Identify all circuits and other wiring at terminal blocks and equipment.
- 3.2.6 All wiring shall be concealed in conduits. No new cabling is permitted to be exposed. Refer to section 2.3 for additional details.
- 3.2.7 Each cable shall be installed without any splices, cuts or breaks, in order to preserve the shielding provided in the cable.

- 3.2.8 All cables shall be routed so as to bypass, by the largest practical distance, all electric motors, AC power sources and cables, and any other major sources of electrical noise.
- 3.2.9 Raceways and cables to be terminated with adequate length to reach controls in console.
- 3.2.10 Where screw type terminals are on equipment, use solder lugs on wiring, use special tools where necessary to fasten coaxial cable connectors.
- 3.2.11 Locations of equipment as shown are nominal. Exact locations shall be determined on site, with the approval of Consultant having due regard to the function of the equipment and best practical placement.
- 3.2.12 Supply lamicoid plates to designate function and controls where necessary. All interconnecting wires shall be identified using Brady type labels.
- 3.2.13 Functional or alpha-numerical labelling shall be installed on all equipment including racks and cabinets.
- 3.2.14 All visible wires and cables typically accessed for service shall be labelled at both ends. As well, all connecting strips, terminal blocks, plugs and sockets shall be labelled. The marking on the labels shall be consistent with the As-Built Drawings.
- 3.2.14.1 Approved materials for labels include alphanumeric labels protected by clear heat shrink material, tywrap labels, lamacoid strips, etched metal or indelible ink. The use of "Dymo" tape (or equivalent) labelling is not permitted.
- 3.2.15 Install transient suppressor in the control panels and opto isolators to other devices as required and as recommended by manufacturers.

3.3 Cutting, Patching and Remedial Work

- 3.3.1 The Contractor is fully responsible to repair and correct any and all damages caused by the completion of the Work. Remedial work including, but not limited to, patching, painting, re-finishing shall be included for. The Contractor is fully responsible to ensure that the surface shall be neat, clean and even after installation.
- 3.3.2 All areas requiring repainting shall be painted 5 feet from the opening in all directions and feathered out. The Contractor is fully responsible to ensure that the surface shall resemble its appearance before device/infrastructure installation.
- 3.3.3 Provide labour, products, equipment, services, tools, and supervision necessary for cutting, patching and remedial work in accordance with the Contract Documents.
- 3.3.4 Obtain Consultant's approval prior to cutting, boring or sleeving load-bearing members.
- 3.3.5 Obtain Consultant's review of proposed method of cutting prior to proceeding with the Work.
- 3.3.6 Properly prepare surfaces to receive patching and finishing. Paint the entire wall affected by the Work.
- 3.3.7 Refinish surfaces to match adjacent finishes; for continuous surfaces refinish to nearest intersection; for an assembly, refinish entire unit.
- 3.3.8 Re-install all subsurface and bases to match existing adjacent subsurface and bases.
- 3.3.9 The Contractor shall provide all fire-stopping measures to maintain existing fire stopping effectiveness.

3.4 Field Quality Control

- 3.4.1 The system shall have a good quality signal free from signal loss, crosstalk, and other interference or problems resulting from an improperly wired system. The Contractor shall be held fully responsible for the elimination of such problems should it become evident and take whatever corrective measures that are needed to rectify the problem at no additional cost to the Owner.
- 3.4.2 On completion of the installation of the system, tests shall be carried out in the presence of the Consultant to show that these Specifications have been met both physically and functionally. All defects shall be rectified before final acceptance of the system. Thoroughly instruct the users in the proper operation of the system. Provide catalogues, operating instructions, service and repair manuals and schematics.

3.5 Commissioning and Systems Verification Testing

- 3.5.1 Prior to the time of substantial performance the Contractor shall conduct verification testing of all new equipment associated with each system to determine full compliance with the contract documents. The Contractor shall provide all personnel, equipment, instrumentation and communication equipment and shall include all costs of testing in the base contract.
- 3.5.2 Prior to commissioning, the Contractor shall prepare and submit commissioning test scripts for review and approval by the Consultant. The commissioning test scripts shall include all the parameters of the security systems that are to be tested and commissioned to ensure a fully functional system.
- 3.5.3 Upon the completion of verification testing, the Contractor's project manager shall provide a verification testing report and certify in writing that the systems are installed in compliance with the manufacturers' recommendations, comply with the requirements of the contract documents and are operating correctly. These written certifications shall be submitted to the Consultant and shall signify that the security and communication system is operational and ready for substantial performance testing by the Consultant.
 - 3.5.3.1 At minimum, the verification testing report shall include the following information:
 - 3.5.3.1.1 A complete list of all verification tests performed and the results of those tests.
- 3.5.4 It is expected that all verification testing report documentation will be submitted to and reviewed by the Consultant to ensure that full compliance with the contract documents has been met and any found deficiencies have been corrected prior to the initiation of final acceptance testing.

3.6 Final Inspection and Acceptance Testing

- 3.6.1 Inspect and check each individual device in entire system for proper installation, connection, supervision and function. Obtain an inspection certificate and inspection report from equipment manufacturer showing each device checked, and that this work has been carried out.
- 3.6.2 Inspect only when entire system is fully operational and no subsequent work will be performed on the system.
- 3.6.3 If such subsequent work is required, the entire final inspection must be performed again.
- 3.6.4 Issue certificate of inspection after all deficiencies noted during inspection have been corrected.
- 3.6.5 After completion of above final inspection, make arrangement with the Consultant and manufacturer of equipment to have a final functional acceptance test, giving ample notice to all parties concerned to be present.

- 3.6.6 At substantial performance of the total security and communication systems, final acceptance testing shall be conducted by the Contractor as directed by the Consultant. The Contractor shall provide all personnel, equipment, instrumentation and communication equipment and shall include the cost of final acceptance testing in the base contract. These final acceptance tests shall generally consist of but are not limited to the following:
- 3.6.6.1 Access Control and Alarm Management System shall be tested such that each card reader door is unlocked through the access card and provides accurate status identification on the monitoring station. Door alarm functionality shall also be tested. Associated camera call-ups on alarm shall be tested.
- 3.6.6.2 Duress Alarm System shall be tested such that each duress button is activated and provides accurate identification and annunciates correctly on the monitoring screen and is tied to the associated panic strobe light. Associated camera call-ups on alarm shall be tested.
- 3.6.6.3 After the final Acceptance Testing has been completed, the Contractor shall correct any deficiencies found, retest the system and conduct a demonstration of the completed system.
- 3.6.6.4 The Consultant shall be present at each demonstration and shall direct the Contractor to make additional tests at that time.

3.7 Electrical

- 3.7.1 Unless otherwise specified, all equipment shall be designated to operate in a continuous unattended state and the performance of the equipment shall be maintained under varying voltage, current and environmental conditions. All components shall operate within their stated tolerance.
- 3.7.2 The quality of parts and materials supplied, or used in the equipment design, shall meet or exceed the requirements specified herein or in the application functional specification.
- 3.7.3 The equipment shall operate without damage to any part regardless of the setting of any control or adjustment within that equipment.
- 3.7.4 The equipment shall contain protective devices such as fuses or circuit breakers for all power supplies and other appropriate circuits. These devices shall be readily accessible for maintenance purposes. Only cartridge type fuses and magnetic non-thermal circuit breakers shall be used.
- 3.7.5 Printed circuits boards (PCB) in equipment shall be of a commercially accepted standard. PCBs shall be mounted in card cages and appropriate keying methods shall be employed.
- 3.7.6 All PCBs shall have an extraction device at the front of each card assembly. PCBs of the non-plug-in type shall be mounted on stand offs and attached with screws and clips such that the boards are readily removable. The use of double sided tape as a mounting device is not acceptable.
- 3.7.7 Sufficient slack in the wiring to the PCB shall be provided for easy removal. All PCBs shall be guided and supported in a manner such that physical interference does not occur between adjacent boards during insertion or removal. An extension board for each plug-in type of PCB shall be provided to enable maintenance work to be carried out at the equipment location.
- 3.7.8 Use of light emitting diodes (LEDs) is preferred to incandescent lamps. Indicator lights and controls shall be combined to save space on control panels and to avoid ambiguity. Distinctive colouring of the lights and illuminated controls shall indicate different uses and groupings. Replacement of lamps shall be possible from the front of the unit. Lamps shall not be wired in series.

- 3.7.9 The controls located on the front panel of any equipment shall be easily manipulated without mechanical aids, be clearly labelled and grouped appropriately.

- 3.7.10 Refer to Div 26 for additional details.

3.8 Mechanical

- 3.8.1 In general, equipment shall be designed as electronic assemblies, and/or sub-assemblies, which shall be easily replaced by the use of plug-in techniques, detachable cables, or other methods to permit rapid access to, and replacement of, the assemblies.

3.9 Grounding and Shielding

- 3.9.1 When required, signal grounds shall be used to provide a ground potential reference, which is independent of the frame ground or the power equipment ground. Signal grounds shall terminate on a single ground plate, which in turn shall be connected to the main ground connection point by a single insulated copper ground wire.
- 3.9.2 Frame grounds are required on each frame and shall be grounded by means of an insulated ground wire to a common frame ground plate, which in turn shall be grounded to the Main Ground Connection Point, by a single insulated copper ground wire.
- 3.9.3 Shielding on wire or cable shall be grounded to a frame or chassis. The shield shall not be exposed to any circuit or metal apart from the point at which it is terminated.
- 3.9.4 The equipment shall be protected against electrostatic discharge to the extent that interference from that type of source shall not interfere or degrade the system performance. Lightning discharge protection shall be required for outdoor cabling and circuits.

3.10 Environmental

- 3.10.1 Indoor equipment installed in a sheltered and heated environment shall be capable of operating in a continuous unattended mode under the following conditions:
- 3.10.1.1 Ambient Temperature: 0°C to +50°C
- 3.10.1.2 Ambient Humidity: 20% to 90% RH
- 3.10.2 Outdoor equipment installed in an exposed environment shall be capable of operating in a continuous unattended mode under the following conditions:
- 3.10.2.1 Ambient Temperature: -40°C to +50°C
- 3.10.2.2 Ambient Humidity: up to 100% RH
- 3.10.2.3 Adverse Weather: wind up to 165 km/hr. And 5cm of ice loading
- 3.10.2.4 Sand and Dust: fine dust up to 150 microns

3.11 Power Wiring

- 3.11.1 All AC and DC power wiring shall conform to CSA Standard C22.1 and other applicable provincial and local codes. Guards shall be provided over high voltage or high current terminations.

3.12 Wire and Cable

- 3.12.1 All wires and cables shall be formed, neatly laced or tie wrapped, and clamped in position. No adhesive or stick-on clamps are permitted. The use of masking tape or electrical tape is not acceptable.

- 3.12.2 Sufficient slack shall be provided to prevent undue stress and strain on connectors and cables, to allow easy disconnection of equipment and to allow a minimum of three re-terminations of each cable or wire in the event of breakage.
- 3.12.3 Where wires run through holes, they shall be protected by suitable grommets.
- 3.12.4 Wires and cables external to equipment and enclosures shall be run in conduit or wireway. Where free movement of equipment is required, flexible conduit shall be employed.
- 3.12.5 Wires and cables shall be continuous between termination and connection points. Connectors and splices shall be located within secure enclosures and are not permitted inside conduit or wireway.
- 3.12.6 Wires and cables shall be located so that inductive and capacitive effects do not degrade system operation.
- 3.12.7 Either solid or stranded wire may be used, subject to good engineering practice. Where wire is normally flexed during servicing or during the use of the equipment, stranded wire shall be used.
- 3.12.8 All shielded wiring shall be jacketed with PVC and shall have the shield braid terminated so that the insulation is not damaged by soldering, heat or mechanical pressure.
- 3.12.9 All wires shall be terminated by soldering or by the use of solderless terminals. Crimp lug terminals shall only be used on stranded wire. Solid wire shall be soldered to the terminal and the soldered portion insulated. No more than one wire per lug is permitted.
- 3.12.10 Terminal lugs shall be suitably electroplated or treated by commercially acceptable methods to ensure good electrical contact and prevent corrosion.

3.13 Cable Connectors

- 3.13.1 No more than one wire shall be connected to each pin of a cable connector unless that pin has been designed to accept more than one wire. All strands of the wires shall fit into the pin receptacle. All cable connectors shall be field replaceable. Provision shall be made to fix the cable connector covers to a chassis or to each other by means of screws.

END OF SECTION

1. GENERAL REQUIREMENTS

1.1 INTRODUCTION

- .1 This document provides General Requirements applicable to security related projects undertaken by or on behalf of York Region. These requirements are at all times subordinate to the requirements as defined in the Project Specifications and related documents.
- .2 The *Security Contractor* shall be responsible for the supply, installation, configuration, testing and commissioning of the fully operational ACAMS to the satisfaction of the Region, or designate.
- .3 The General Contractor shall only use one of the Region's pre-approved *installers* to perform the installation of the ACAMS, including supply of cabling; see [Appendix A: Prequalified Security System Vendors](#).
- .4 The General Contractor shall only use one of the Region's pre-approved *Integrators* to program a Lenel ACAMS and to supply hardware, equipment, and licencing of a Lenel ACAMS; see [Appendix A: Prequalified Security System Vendors](#).
- .5 The General Contractor shall only use Honeywell Building Automation to program a Honeywell ACAMS and to supply hardware, equipment, and licencing of a Honeywell ACAMS; see [Appendix A: Prequalified Security System Vendors](#).

1.2 ABBREVIATIONS

- .1 ACAMS Access Control and Monitoring System, see definitions
- .2 ACS Access Control System
- .3 ADO Automatic Door Operator
- .4 CR Card Reader
- .5 CS York Region Corporate Security Team
- .6 DC Door Contact
- .7 IDS Intrusion Detection System, see definitions
- .8 IP Internet Protocol
- .9 ITS York Region Information Technology Services Team
- .10 LAN Local Area Network
- .11 MAG Electromagnetic Lock
- .12 NEMA National Electrical Manufacturers Association
- .13 POE Power Over Ethernet
- .14 PTZ Pan, Tilt and Zoom Camera
- .15 REX Request to Exit Sensor, see definitions
- .16 RFA Request for Assistance, see definitions
- .17 SCADA Supervisory Control And Data Acquisition, see definitions
- .18 TLS Transport Layer Security Protocol
- .19 UPS Uninterruptible Power Supply, see definitions
- .20 VMS Video Management System
- .21 WAN Wide Area Network, see definitions

1.3 DEFINITIONS

- .1 ACAMS: integrated security system including an ACS, IDS and VMS.
- .2 Access Level: customizable set of permissions granted to a user or group to access secure spaces or perform specific actions. Permissions may be further customized using schedules.
- .3 Alarm: is a status in the ACS or IDS when a situation occurs which requires immediate on-site investigation.
- .4 Alert: a notification from the ACAMS to notify of unusual conditions. Alerts may escalate to alarms if the situation worsens.
- .5 Arming Station: consists of an arming button, arming CR and keypad. Used for local arming of IDS.
- .6 Bond Sensor: device used to measure the force required to hold an object in place or the force exerted by an object when held. Used to ensure that a MAG maintains the necessary force to properly secure doors.

- .7 *Explosion Proof*: refers to the certification required of electrical and related safety devices used in hazardous locations.
- .8 *Fail Safe*: system or mechanism designed to automatically default to an open or unlocked condition in the event of a failure or malfunction.
- .9 *Fail Secure*: system or mechanism designed to maintain security by remaining locked or secure in the event of a failure or power loss.
- .10 *Forced Entry*: An alarm that is generated on the ACS when a door monitored by the ACS is opened without prior authorization from the ACS.
- .11 *Hold Open*: An alarm that is generated on the ACS when a door monitored by the ACS remains open for an extended duration after an authorized opening.
- .12 *IDS*: is a system to monitor, detect and notify unauthorised access or the deviation of sensor observations from acceptable values.
- .13 *Integrator*: is a pre-qualified contractor responsible for programming and supplying hardware, equipment, and licences for the ACAMS.
- .14 *Installer*: is a pre-qualified contractor responsible for installing the ACAMS and its components.
- .15 *Intrusion Alarm*: An alarm generated by the IDS immediately after any *intrusion zone* faults while the IDS is fully armed.
- .16 *Intrusion Zone*: area monitored by the IDS with 1 or more DC and/or glass break sensors
- .17 *RFA button*: security device designed to be activated quickly and easily by staff in emergency situations to notify appropriate personnel. Device may be wired or wireless.
- .18 *RFA*: an alarm triggered by activation of a *RFA button* or Universal Washroom Emergency Call button.
- .19 *REX*: a component in the ACAMS that allows individuals to exit a secured area without triggering an alarm or compromising security protocols.
- .20 *Security Contractor*: is inclusive of both the *integrator* and *installer*
- .21 *Supervision*: refers to the continuous monitoring and self-checking of the system's components to ensure they are functioning correctly and are not compromised.
- .22 *SCADA*: is a system used for monitoring and controlling industrial processes and infrastructure, gathering real-time data from remote locations.
- .23 *UPS*: is a device that provides backup power to electrical equipment in the event of a power outage or fluctuation, ensuring continuous operation and protection against data loss or hardware damage.
- .24 *Valid Card Swipe*: Presentation of proximity card or tag to a CR and subsequent authentication of user *Access Level* by the ACS.
- .25 *WAN*: is York Region's telecommunications network that extends throughout the Region, connecting multiple smaller networks at remote sites, such as *LANs*, to facilitate communication and data exchange across the Region.

1.4 ACAMS OPERATION - GENERAL

- .1 The ACAMS automatically uploads/downloads information to/from the control panels while the control panels are in communication with the central server. Data transfer does not interfere with normal operations.
- .2 User Interface
 - a. Graphical interface has a multilayer hierarchy where the highest level is a map of York Region showing each connected facility on the map using appropriate icon based on the facility designation (eg: corporate, environmental, paramedic).
 - b. Each connected facility has a dedicated graphical display or series of displays. Dedicated facility graphics:
 - i. are based on applicable architectural floor plan for that facility;
 - ii. include the current real-time status of the Facility and all field devices, including cameras, RFA buttons, strobes and remote release buttons;
 - iii. allow direct control of system functions at the site, such as arming, disarming, and door control; and
 - iv. Show the AC power status using the facility's main panel power fail input to monitor AC power status.
- .3 Audit Trail / Event Log

- a. The central server maintains a consolidated event log for every connected site within the Region's portfolio.
 - b. Event Log includes:
 - i. All access card activities including name, and action granted or denied
 - ii. Logging in and out of operators
 - iii. Scheduled activations and deactivations
 - iv. Trouble and alarm reports
 - v. All failures, arming and disarming of systems
 - vi. System resets and restarts
 - vii. Intrusion detection alarms
 - viii. All system events on the IDS
 - ix. For elevators on ACS, all card swipes and subsequent button presses for floor(s) selected / elevator call.
 - x. For parking controls on ACS, the parking control open/close status information.
 - c. The local system at each site holds at least 24 hours or 5,000 events in a rolling log. New records overwrite the oldest records once the log capacity is reached.
 - d. Upon loss of communication with central server, alarms continue to sound locally, and events continue to be recorded in the local event log. Once communication is restored, these records are automatically transferred to, and saved on, the consolidated event log on the central server.
- .4 Third Party Monitoring
- a. Each *IDS* panel has at least 2 paths of communication to the 3rd party monitoring service including hard-wire *LAN* and cellular.
 - b. All arming and disarming events are communicated to the 3rd party monitoring service.
 - c. All *alarms* are communicated to the 3rd party monitoring service.
 - d. *Alerts* are not communicated to the 3rd party monitoring service.
 - e. Each *IDS* panel sends receiver supervision time signals to the 3rd party monitoring service following the 1 hour NFPA 72 standard.
 - f. *IDS* reports power loss to 3rd party monitoring service.
- .5 ACS
- a. Authentication on the *ACS* is based on *access levels*. *Access levels* are managed by *CS*.
 - b. Upon *valid card swipe*, at a pedestrian door, the *ACS* authorizes entry and temporarily releases the electric locking device allowing the door to be opened.
 - c. Upon *valid card swipe*, at a vehicle entry point (gate or door), the *ACS* authorizes entry and commands the entry point to automatically open temporarily.
- .6 Arming and Disarming of *IDS*
- a. Arming at each Facility only occurs when the system is Ready to Arm, as indicated on the *IDS* keypad. This arming process may proceed if *alerts* are present.
 - b. Local arming is triggered following a *valid card swipe* on a dedicated arming *CR*, followed by a press of the dedicated arming button. System then fully arms after exit delay of 45 seconds.
 - c. *IDS* automatically disarms, upon an authorized entry to the facility. The door does not have to be opened for the *alarm* system to be disarmed.
 - d. *IDS* can also be armed and disarmed remotely (either manually or automatically) via the central server.
 - e. Arming *CR* cannot be used to disarm *IDS*.
- .7 Alarms and Alerts
- a. Each door controlled by the *ACS* generates *forced entry* and *hold open alarms*.
 - i. A forced entry alarm is generated when a *forced entry* occurs.
 - ii. Manual key entry to a facility is treated as a *forced entry*.
 - iii. A *forced entry* is not generated, if the *REX* associated with the door is triggered or activated prior to the door opening.

- iv. An *alert* is generated if a door remains open for 45 seconds following an authorized entry/exit from a secured space.
 - v. A *hold open* is generated if a door, without *ADO*, remains open for 10 seconds following an *alert* from that door. Integral beeper on the CRs associated with the held open door will sound and continue to sound until the door is closed.
 - vi. A *hold open* is generated if a door, with *ADO*, remains open for 10 seconds beyond the *ADO* cycle time following an authorized entry/exit from/to a secured space. Integral beeper on the CRs associated with the held open door will sound and continue to sound until the door is closed.
 - vii. *Forced entry* and *hold open alarms* on doors for Corporate and SCADA data centres are treated as *intrusion alarms*.
 - b. ACAMS signals a “tamper trouble” *alert* when any supervised wires are cut or short circuited.
 - c. *Intrusion Alarms* are only triggered when the *IDS* is fully armed.
 - d. All *intrusion alarms* are annunciated:
 - i. Locally on all keypad(s) at the Facility;
 - ii. On the ACS Alarm Monitor application;
 - iii. To the 3rd party monitoring station; and
 - iv. To the SCADA system, where applicable.
- .8 *IDS* Keypads
- a. Display the name of the facility and the nature of any faults in the system.
 - b. Are not used for Arming, Disarming, or clearing of any faults.
 - c. Indicate ‘Ready to Arm’ while the *IDS* is disarmed and all intrusion points are “fault free”
 - d. During the “Exit Delay” after initiating arming sequence, sounders beep slowly and display shows “Exit Delay in Progress”
 - e. When the *IDS* is fully armed, sounders are silent and the “armed” status indicator is illuminated.
- .9 *VMS*
- a. Camera stream recordings are stored on remote recording servers via the WAN.
 - b. Camera streams record at different frame rates depending on if there is motion in the field of view.
 - c. Video recordings include a burn in of the date, time and the camera description on every frame of the recording.
 - d. Privacy Masks are added:
 - i. For staff spaces, directly above the staff member’s chair, to cover the person however leaving hand activity visible.
 - ii. For resident room doorways in long term care facilities, to cover the door.
 - iii. For exterior cameras that capture public’s homes, to cover the public’s entire homes
 - iv. For holding cells, to cover the toilets.
 - v. For safes, to cover the code entry keypad
 - vi. As directed by CS
 - e. Following a loss and subsequent restoration of communication between camera and server, local recordings of cameras with local storage, are uploaded to the remote recording server to recover any gaps in recording coverage.
- .10 Intercom Systems

- a. When activated, the remote intercom initially calls an associated intercom master station, where provisioned, and, if unanswered or not provisioned, routes the call to a designated phone number.
- b. When the remote intercom is activated, video from the intercom is recorded on VMS.
- .11 *RFA*
 - a. *RFA* is triggered any time an *RFA button* or Emergency Call Button in a washroom is activated.
 - b. *RFA* remains active until the *alarm* is acknowledged using the 'panic all clear' button on the associated graphic.
 - c. When a *RFA* is triggered, the graphic map on the ACS shows the exact location of the *RFA button* (either actual or assigned) and a description of the *alarm*.
 - d. When a *RFA* is triggered, the associated strobes light and piezo buzzers sound.
 - e. Strobes in security offices are associated with all panic buttons in the facility
 - f. Strobes in employee only program spaces are associated with the *RFA buttons* in the facility associated with that program area.
 - g. Strobes outside designated rooms are only associated with *RFA buttons* within the room.
 - h. Wireless *RFA buttons* are each assigned to a specific room.
- .12 Universal Washroom
 - a. Each Emergency Call Button is connected to both ACS and IDS for monitoring.
 - b. Activation of Emergency Call Button triggers an *RFA* on the ACS graphic and IDS.
- .13 Lockdown Button
 - a. When a Lockdown button is activated, schedules are ignored, and all associated doors default to locked state and are only accessible by *valid card swipe*.
 - b. When the Lockdown button is deactivated, all associated door schedules resume normal operation.
- .14 Glass Break Sensor
 - a. Glass break sensors trigger an *alarm* on the ACS whenever the sensor is triggered.
 - b. When an *alarm* is generated on the ACS from a glass break sensor, the graphic map shows the exact location of the sensor and a description of the *alarm*.
 - c. *Alarms* from glass break sensors on the ACS remain active until the alarm is acknowledged using the 'glass break all clear' button on the associated graphic.
 - d. Glass break sensors trigger an *Intrusion Alarm* on the IDS only if the sensor is triggered while the system is fully armed.
- .15 *REX*
 - a. Motion *REX*
 - i. Motion *REX* are configured to shunt *forced entry* only; triggering of a motion *REX* does not release the electric door strike.
 - b. Exit Button *REX*
 - i. Activation of Exit Button *REX* temporarily releases associated *MAG*, activates secure side *ADO* activation device, where present, and allows associated door to be opened.
- .16 Remote Release button
 - a. Activation of a remote release button associated with an automatic gate or overhead door causes the portal to temporarily open automatically.
 - b. Activation of a remote release button on a door without *ADO*, temporarily releases the electric locking device. The door can then be opened manually.
 - c. Activation of a remote release button on a door with *ADO*, temporarily releases the electric locking device, and temporarily activates the non-secure activation device. The door can temporarily be opened manually or automatically, by triggering the non-secure side activation device to activate the *ADO*.
- .17 *MAG*
 - a. The Bond sensor reports if the corresponding door is improperly closed.
 - b. Where installed on a double door, both doors are treated as a single opening.
 - c. Upon power loss to the magnet, the Bond sensor reports the door as *forced open* irrespective of whether the door opened.

.18 ADO

- a. For all ADOs installed on doors with ACS Control:
 - i. CR on the insecure side of the door is always active.
 - ii. ADO activation device on non-secure side of the door is inactive, except following a *valid card swipe* on associated CR, activation of associated remote release button or if door is unlocked by schedule.
 - iii. The door is normally closed and locked unless scheduled otherwise.
 - iv. If there is no maglock on the door, the ADO activation device on the secure side of the door is always active.
 - v. If there is a maglock on the door, the ADO activation device on the secure side of the door is normally inactive.
- b. When a person is entering a secure space via a door with ADO installed:
 - i. Upon valid card swipe, non-secure side activation device is temporarily activated, and the electric locking device released.
 - ii. The door can then be opened manually or automatically, by triggering the non-secure side activation device to activate the ADO.
 - iii. After opening or time delay, the door will relock, and the non-secure side activation device will become inactive.
- c. When a person is leaving a secure space via door with ADO installed:
 - i. Door without MAG: The door can be opened manually or automatically, by triggering the secure side activation device to activate the ADO. The door relocks after opening.
 - ii. Door with MAG: The secure side activation device is normally inactive. Exit button REX activation is required to release MAG and activate the secure side activation device. After Exit button REX activation, the door can temporarily be opened manually or automatically, by triggering the secure side activation device to activate the ADO. The door relocks after opening or time delay and the secure side activation device becomes inactive.
 - iii. Motion REX, if present, is integrated with ADO activation device.

.19 Elevator Access Control Integration

- a. Where a CR is installed in an elevator cab, upon *valid card swipe*, the floor buttons corresponding to authorized floors are temporarily unlocked in that elevator cab only, for the user to select.
- b. Where a CR is installed in an elevator lobby, upon *valid card swipe*, the elevator is called to that lobby.
- c. The ACS does not affect the service, or fire mode operation of the elevator.
- d. If the CR loses communication with the controller, floors remain in fail secure condition.
- e. ACAMS does not monitor or capture elevator operational alarms.
- f. Each elevator with ACS control has a toggle switch (or key switch) to bypass ACS. In bypass mode, the elevator operates as if there was no ACS.

.20 Parking Controls

- a. ACS Integration
 - i. All control functions for barrier operation are controlled through the ACS.
- b. Parking Operator
 - i. Entrance barrier opens automatically via signal from the ACS upon *valid card swipe* at either CR on the access control pedestal or via ultra long-range CR (where present).
 - ii. Entrance barriers may also be opened remotely through the ACS graphical interface, intercom system or, where present, by remote release button.
 - iii. Parking controls at an exit open on vehicle departure when the departure loop senses the vehicle.
 - iv. Barriers reclose when the associated reset loop detects the vehicle passing beyond the barrier or timer elapses.
 - v. Parking control loops do not function in reverse.
- c. Barrier Arm

- i. If a barrier arm encounters an object while closing, the barrier arm immediately signals an *alarm* to the ACS and completely opens.
 - ii. Barrier arm can be manually operated locally in the event of a power or communications failure.
- .21 Monitor Points
 - a. Main Incoming Power Status
 - i. Monitor main incoming 120VAC supply to ACS and reflect status on site graphic.
 - b. Generator Run Status
 - i. Monitor generator run status on ACS and reflect run status on site graphic.
 - c. Vaccine Fridges and Freezers Alarm
 - i. Monitor the alarm point on ACS and IDS and reflect alarm status on site graphic.
 - ii. *Alarms* are triggered and communicated to the 3rd party monitoring station irrespective of the arming status of the IDS.

1.5 SECURITY SYSTEM SUBMITTALS

- .1 General
 - a. All submittals shall be provided in electronic format. Submittals shall be provided in PDF, without electronic locks, encryption, or restrictions. Drawings shall also be provided in AutoCAD (DWG) format.
 - b. All submittals must adhere to the Region defined naming convention (see [Appendix B: Security System Naming Convention Standards](#)) for all system components and must be consistent with the names used in the software and on site.
 - c. Submittals shall include at least the following:
 - i. System riser diagram(s)
 - ii. System layout/floorplan
 - iii. Network connectivity diagrams
 - iv. Vertical and horizontal wiring diagrams
 - v. Site Specific point-to-point wiring diagrams and schematics
 - vi. Device landing schedule(s)
 - vii. System integration schematic(s) and wiring diagrams
 - viii. Tub/enclosure layout diagram(s)
 - ix. 120 VAC Line Voltage Electrical connections and wiring diagrams
 - x. Addressing and dip switch setting charts
 - xi. Product specifications and cut-sheets
 - xii. Complete Bill of Materials
- .2 Shop Drawings
 - a. The *integrator* shall produce the complete set of shop drawings for approval by CS or designate.
 - b. The security contractor shall NOT start any implementation work until the shop drawings are approved.
 - c. Shop drawings shall cover the entire scope of the Work and shall include all submittal items identified under [1.5.1 General](#) and also the following:
 - i. Any dependencies which are not included in these Drawings, such as wall space, electrical requirements, and air conditioning.
 - ii. Any compatibility issues between the existing installation and the proposed new equipment.
- .3 As-Built Documentation
 - a. The as-built documentation for the ACAMS installation shall be submitted for approval by CS or designate, as a requirement to achieve substantial performance of the Work.
 - b. As-built documentation shall cover the entire scope of the Work that was completed under the Contract Documents, and shall include all submittal items identified under [1.5.1 General](#) and also the following:

- i. All technical notes, software scripts, firmware details and other documentation covering the IT portion of the Work covered under this Contract.
 - ii. IDS configuration files
 - iii. List of serial numbers for all supplied parts
 - iv. List of IP and MAC addresses for networked devices
 - v. Lists of all usernames and passwords used for the installation and configuration of the system and devices
 - vi. Splice box locations marked on the wiring diagram
 - vii. Commissioning documentation (see [Appendix C: Security System Commissioning Forms](#)). The commissioning documentation must be completed by the *integrator* and signed by the Consultant, if applicable, and Regional representative.
- c. Hard copy of approved documents shall be included inside main security enclosure.

1.6 TESTING AND QUALITY ASSURANCE

- .1 ITS Software and Hardware Penetration Testing
 - a. The *integrator* shall work with ITS to perform security penetration testing for supplied hardware and/or software, as required by ITS.
 - b. The *integrator* shall supply, if requested, copies of all network device specifications and data sheets to ITS in preparation for the penetration testing.
 - c. The *integrator* shall supply, if requested, a demo of each device type to ITS for penetration testing.
- .2 Site Testing
 - a. Site testing shall be performed by the *integrator* following installation of, or modification to, the ACAMS at a facility.
 - b. During site testing, the *integrator* shall complete the Region's commissioning forms (see [Appendix C: Security System Commissioning Forms](#)) to confirm that all hardware and software components of the system are installed and functioning as intended.
 - c. Following successful testing (i.e. no remaining failed tests), the *integrator* shall submit completed forms to Region, or designate.
- .3 Commissioning
 - a. After site testing has been completed, commissioning shall be scheduled with the Consultant, if applicable, and Regional representative(s).
 - b. The *integrator* shall demonstrate, to the satisfaction of CS, that the system and all of its components are functioning, as per the contract documents. This approval process shall be performed in 2 phases:
 - i. A virtual commissioning with the Region's Security System Administrator
 - ii. A final in-person commissioning with CS.
 - c. All failed tests shall be corrected, and retested until successful test is achieved, prior to the Consultant approving, and the Region accepting the system.

1.7 WARRANTY & TECHNICAL SUPPORT

- .1 The Security Contractor shall provide all warranty services for ACAMS for a period of twenty-four (24) months from the date of Total Performance of the Work and shall provide all necessary material required to replace any defective products during this period.
- .2 The beneficiary of the Warranty shall be the Regional Municipality of York.
- .3 The *integrator* shall always have qualified technical support available during normal working hours and emergency support available throughout the warranty period.

1.8 CLOSE OUT

- .1 Project Close Out process requires that the following documents and miscellaneous items are completed and provided to the Region:

- a. Assignment of all warranties, licences and product registrations to the “Regional Municipality of York” and documentation to this effect;
- b. All associated work is reported to, and permits are closed out with, appropriate Authority Having Jurisdiction;
- c. Ensure that all temporary configurations are returned to their permanent “operational” status and appropriate documentation is provided confirming this status;
- d. All installation software, accessory cables, calibration units and any other material accompanying the installed equipment; and
- E. All keys, special tools, spare parts, unused components, permits, approvals, as-built documentation and project related documentation.

1.9 NETWORK TCP/IP COORDINATION

- .1 Configuration and activation of *LAN* equipment maintained by *ITS* is to be co-ordinated by the Region. The *integrator* shall provide two weeks advance notification to the Region for configuration of network ports.
- .2 IP addresses shall be provided by *ITS* on request from the *integrator* to the Region.
- .3 Communications between all distributed security devices on the *WAN* shall use TCP/IP protocol. Communications between the security devices that does not involve the Region’s network may use any appropriate protocol.

2. PRODUCTS

2.1 GENERAL

- .1 The *security contractor* is responsible to supply all equipment identified in the contract documents, unless otherwise noted.
- .2 The *security contractor* shall supply all necessary wiring, termination equipment/devices and other necessary miscellaneous components which are not specified in the Contract Documents, but which are necessary to implement a fully functional, and networked, *ACAMS*.
- .3 The *Installer* shall provide new wiring for all new and reused security devices.
- .4 The *Installer* shall provide wire and cable according to the drawings and *ACAMS* requirements; see [Appendix D: Cabling](#).
- .5 The *integrator* shall review the versions of software, firmware and hardware currently in service and validate the compatibility of new installations with the existing system.
- .6 The *integrator* shall supply and install all necessary software licencing to operate the security solution based on the Contract Documents, including integration, camera and CR licenses.

2.2 REGIONAL SECURITY SYSTEM INTEGRATED PLATFORMS

- .1 The Region has 2 *ACAMS* platforms, Lenel and Honeywell
- .2 The Region’s Lenel *ACAMS* is constituted by the following systems:
 - i. ACS is Lenel OnGuard.
 - ii. IDS is Bosch RPS
 - iii. VMS is Lenel Milestone XProtect® Expert.
- .3 The Region’s Honeywell *ACAMS* is constituted by the following systems:
 - i. ACS is Honeywell Enterprise Buildings Integrator.
 - ii. IDS is Honeywell Vista
 - iii. VMS is Honeywell Digital Video Manager.

2.3 NETWORK EQUIPMENT

- .1 All servers and network switches connected to the *LAN* or *WAN* shall be provided by the Region.

2.4 SECURITY SYSTEM DEVICES

- .1 Pre-approved devices and solutions shall be used wherever possible; see [Appendix E - Pre-approved security devices](#).
- .2 The use of any equipment which is not approved by the Region, or designate, is strictly prohibited.
- .3 All ADO sequencing boards and electric strikes for doors controlled by ACS shall be supplied by the *integrator*.
- .4 All security devices supplied under this contract shall meet the environmental requirements as identified in [Appendix F - Environmental Requirements](#).
- .5 Power supplies shall be provided from a single manufacturer, who must be approved by the security system manufacturer.
- .6 Each MAG shall:
 - a. be Plate Magnet style with a minimum holding force of 540 kg.
 - b. have indicator LED's showing if they are closed or open
 - c. have integral hold force sensors (Bond sensor)
 - d. have integral double pole door contacts.
 - e. where installed on a double door, be equipped with separate magnet and plate for each door and enclosed in a single housing.
- .7 RFA Strobes shall be blue in colour.

3. EXECUTION

3.1 GENERAL

- .1 The *security contractor* is responsible to install all equipment identified in the contract documents, unless otherwise noted.
- .2 The *security contractor* shall identify and report all pre-existing or related construction defects which will affect the progress of the Work to the Region and the Consultant, if applicable, before commencing construction work.
- .3 The *installer* shall install and wire all ACAMS equipment according to the manufacturer's recommendations. Any instances where *installer* fails to follow manufacturer's recommendations shall be corrected by *installer* with no additional cost to the Region.
- .4 Redundant ACAMS components and cabling shall be completely removed.
- .5 The security contractor shall limit switchover time to one day when replacing existing ACAMS or components, minimizing ACAMS down time for the facility. No facility shall remain unsecured overnight.
- .6 Modification of the fire alarm system, and signage is included in the scope of work.
 - a. The *integrator* shall retain appropriate fire company, typically the Region's Fire Alarm System contractor of record for that location, to complete fire system tie-in and testing.
- .7 Permits
 - a. The *integrator* is responsible for permits, and associated coordination (including approvals and inspections, engineered drawings and fire alarm interconnections) associated with MAG installation.
 - b. CS, or designate, shall be present for final permit inspection for MAG installation.
 - c. Electrical permits are not required for retrofit security projects; *security contractor* may report electrical installation work through the Region's Continuous Safety Services (CSS) Program with the Electrical Safety Authority at no cost to the contractor.
- .8 Work at Regional Water and Wastewater facilities
 - a. All work undertaken in hazardous locations shall be coordinated and scheduled with the Region in advance of the work, to have a Regional representative present during the work.
 - b. The Security Contractor shall contact the Region's Remote Operations Centre daily at 905-895-2143 or 905-895-2144 prior to entering or performing any work at the facility.

3.2 SOFTWARE/SYSTEM CONFIGURATION

- .1 The *integrator* shall ensure that the new/updated ACAMS under this contract is configured to follow the requirements outlined in [Section 1.4 - SECURITY SYSTEM OPERATION - GENERAL](#)
- .2 All programming and configurations of the ACAMS completed under this Contract shall be consistent with existing programming.
- .3 All security related work under this Contract shall be reflected in the ACAMS database and associated graphics.
- .4 The *integrator* shall provide their own cellular connectivity to connect to the Region's network for any work under this Contract.
- .5 The *integrator* shall use client applications on a Region provided virtual machine to program, configure and test the system.
- .6 Naming of ACAMS and components
 - a. All system components shall be configured and named as outlined in [Appendix B: Regional Security System Naming Convention Standards](#).
 - b. Component naming shall be consistent throughout the system.
 - c. All alarm points shall have a unique and unambiguous name;
 - d. Name camera with patch panel information in software.
- .7 User Interface
 - a. The *integrator* shall use the existing dynamic icons, approved by CS, to populate the graphical interface or, if necessary, create additional custom dynamic icons.
 - b. The *integrator* shall create custom alarms for each facility which shall clearly display any intrusion and/or alarm events using the ACS Alarm Monitor application.
 - c. The *integrator* shall follow the standard graphic template, at resolution 1920x1080, for facility graphics for Lenel ACAMS (See [Appendix G – Sample Graphics](#))
 - d. The *integrator* shall create hover messages for each item added to the graphical interface.
- .8 Monitor Zones
 - a. The *integrator* shall update existing or, if necessary, create new monitor zones.
 - b. Each facility shall be assigned a single unique monitor zone.
 - c. Each facility monitor zone shall be added to the master monitor zone for the Region.
- .9 The *integrator* to create/update master *access level* for the site which includes all CRs at the site.
- .10 The *integrator* shall update all system hardware components, including cameras, with the latest manufacturer approved firmware versions prior to final commissioning.
- .11 The *integrator* shall change all camera passwords from their factory defaults to a password provided by the Region.
- .12 Server Software and configuration
 - a. The *integrator* will not be provided with direct access to database servers.
 - b. The *integrator* shall work with ITS to perform application or database server programming and configuration.
 - c. All work requiring access to the database and/or application servers must be coordinated with the Region a minimum of one week in advance.
 - d. All changes to the network configuration and network attached devices must be approved by ITS.
- .13 Cameras
 - a. Configure camera settings as provided by ITS and as per [Appendix H: Camera Settings](#).

3.3 INSTALLATION - ELECTRICAL

- .1 The General Contractor's Electricians are responsible to supply and install all new electrical raceways and junction boxes for ACAMS installation. Existing raceways may be reused.
- .2 Install exposed raceways parallel or perpendicular to building lines and group neatly.
- .3 Seal around all conduit penetrations.

- .4 Where emergency power is available at a site, the *installer* shall use dedicated 120VAC emergency circuits for ACAMS installation.
- .5 Where emergency power is not available at a site, *installer* shall use dedicated 120VAC circuits for ACAMS installation.
- .6 Electricians shall not work on “hot circuits” without special permission from the Region.
- .7 Install circuit breaker lockout, in energized position, on each circuit breaker serving the ACAMS

3.4 INSTALLATION – WIRES AND CABLES

- .1 *Installer* is responsible to install cable for ACAMS installation.
- .2 Label all wiring infrastructure, including fibre optic cabling, with wire markers in accordance with [Appendix I: Security System Labelling Requirements](#).
- .3 Cabling in open areas shall be run within raceways.
- .4 Where raceways are available, install cables in raceway.
- .5 Exposed cabling is only allowed above drop ceilings or where otherwise approved by CS.
- .6 Install exposed cables parallel or perpendicular to building lines and group neatly.
- .7 Arrange cables in parallel rows on cable trays.
- .8 Install through-wiring in junction boxes and pull boxes leaving a minimum of 300 mm of slack inside box.
- .9 Install cables in electrical boxes and equipment enclosures located in outdoor, wet or sprinklered areas with watertight cable connectors.
- .10 Use direct burial rated cable for all outdoor applications.
- .11 Where security low voltage wiring is run in parallel to ≥ 110 VAC electrical wiring or conduit, provide minimum of 300 mm separation between the wires.
- .12 Cable Splicing
 - a. All cable runs should be continuous and splice-free.
 - b. If splices are required, approval from CS is required for each splice.
 - c. Each approved splice or junction must be identified and accessible after project completion.
 - d. Splices shall be made in junction boxes utilizing DIN rail-mounted terminal blocks.
- .13 Field device cabling
 - a. For Regional Water and Wastewater facilities shall be home run to security control panel in designated IT room.
 - b. For access control at small facilities (with <10 doors on ACS) shall be home run to security control panel in designated IT room.
 - c. For access control at large facilities (with ≥ 10 doors on ACS) shall be run to local control enclosures.

3.5 INSTALLATION – SECURITY SYSTEM DEVICES

- .1 Label every serviceable component of the ACAMS in accordance with [Appendix I: Security System Labelling Requirements](#).
- .2 All exterior mounted ACAMS components shall be appropriately sealed to prevent intrusion by water or pests.
- .3 A minimum quantity of 10% of inputs, 10% of relay outputs and 10% of CR ports are to remain available for use in all systems which are being affected by the project.
- .4 The location of equipment shown on the Drawings may be revised during construction, but prior to its installation, and the Security Contractor shall not be entitled to any additional costs for the relocation of equipment if the new location is within 1000 mm of the original location.
- .5 All removed equipment shall be immediately delivered to CS upon removal. The Security Contractor to dispose of equipment that CS determines is not required for Region to retain.
- .6 All temporarily removed equipment shall be immediately delivered to CS for temporary storage.
- .7 All surplus equipment shall be delivered to CS upon contract completion.
- .8 Install snubbing diodes in all security devices incorporating electro-magnetic operation including electric strikes and MAGs.

- .9 Install all power supplies and transformers with a back plate and use a common ground wire.
- .10 Electric locks shall be powered from dedicated and independently fused 24VDC power supplies
- .11 All access control board power to be on dedicated 12VDC power supplies
- .12 Install a relay on main incoming 120VAC supply to ACS; connect relay contact to power fail input on the ACS main panel.
- .13 Enclosures
 - a. All control panels and modules shall be housed in enclosures.
 - b. Each enclosure containing a control panel and/or module shall:
 - i. Be wall mounted and located as shown on the drawings.
 - ii. Have key operated lock on the cabinet door, keyed to the Region's designated keyway;
 - iii. Have a monitored cabinet tamper mechanically mounted on the cabinet door;
 - iv. Have NEMA rating suitable for the installed environment, as identified in the contract documents; and
 - v. Be sized sufficiently to ensure ease of maintenance, adequate ventilation, and space for 20% expansion
 - c. Each enclosure containing one or more ACAMS control panels shall:
 - i. Include power back-up from a smart UPS (with network and power monitoring software functionality);
 - ii. Include a dedicated network jack for maintenance purposes;
 - iii. Have residential style light switch for local power disconnect inside the enclosure
 - iv. Have a switched LED light inside panel, upstream of local power disconnect, for Water and Wastewater facilities only; and
 - v. Be fed from dedicated 120VAC power circuit.
 - d. Cabinets containing local door control modules shall be installed on secure side, in vicinity to the door and at most, 2500 mm above the floor.
 - e. If enclosure is installed above finished drywall ceiling, access hatch shall be installed for servicing.
- .14 Supervision
 - a. Install supervision on all *DC* and *REX* connected to *ACS* at the remote end of the detection line using 2 resistors to provide 4 state monitoring.
 - b. Install supervision on each field device monitored by the *IDS* at the remote end of the detection line using 1 resistor to provide 2 state monitoring.
- .15 Third Party Monitoring
 - a. The *integrator* shall program and test the *IDS* connection, along each communication path, to the 3rd party monitoring.
 - b. The *integrator* shall coordinate configuration and testing of the system for each relevant signal with the Region's 3rd party monitoring service.
 - c. Cellular antenna shall be installed appropriately to ensure a consistent and reliable signal. Minimum acceptable signal strength is 'good'.
- .16 *RFA*
 - a. Hard-wired *RFA buttons* connected to fixed furniture shall be located facing away from the user and in a discreet location, but easily accessible to the employee.
 - b. Hard-wired *RFA buttons* in first aid rooms shall be located near the bed and clearly identified.
 - c. Piezo buzzers shall be located in the ceiling space, in proximity to its associated strobe.
- .17 *CR*
 - a. All conductors in *CR* cables shall be connected both at the *CR* and its associated control board reader port as per the following layout:
 - Red – 12VDC
 - Black – Ground (RTN)
 - White – Wiegand Data 1 / Clock / RS485-A
 - Green – Wiegand Data 0 / Data / RS485-B
 - Orange – LED Input (Green)

Yellow – Beeper Input
Blue – Hold Input / LED Input (Blue)
Brown – LED Input (Red)
Bare – Drain

- .18 MAG
 - a. Where possible, *installer* shall install *MAG* on secure side of door.
 - b. For all interior doors, connect the *Bond Sensor* to the *ACS* only.
 - c. For all perimeter doors, connect the *Bond Sensor* to the *ACS* and *IDS*.
 - d. Integration of exit button with *MAG* shall be with physical wiring only.
- .19 DC
 - a. *DC* associated with doors controlled by *ACS* shall be directly connected to *ACS*.
 - b. *DC* associated with perimeter access doors, exterior hatches, and data centres shall be directly connected to *IDS*.
 - c. *DC* installed on a hollow door with trough to be secured with silicone.
 - d. *DC* installed on an overhead door to be installed at height specified in door detail drawing.
- .20 ADO
 - a. *ADO* is typically supplied and installed by others.
 - b. Install door interface relay on each *ADO* with *ACS* control to integrate the *ADO* operation with the *ACS*.
 - c. Door interface relay shall be powered via power supply for *ACS* and not *ADO*.
- .21 REX
 - a. Locate motion *REX* on secure side of door so that the sensor is triggered by all individuals exiting through the door.
 - b. *REX* associated with door that has *DC* or *MAG* connected to *IDS* shall also be connected to *IDS*.
- .22 Electric Strikes
 - a. Shall be configured to fail secure.
 - b. Install in-line power controller for each electric strike.
 - c. Install appropriate face plate for electric strike to ensure full operation of door latch.
- .23 Glass Break Sensor
 - a. Shall be installed within 6100mm of the glass that the sensor monitors
- .24 Access Control Pedestal for Parking Controls
 - a. Keypad CR, and remote intercom shall be installed at appropriate height for use by driver of passenger vehicles
 - b. CR shall be installed at appropriate height for use by bus and/or truck driver.
 - c. Ultra long-range CR shall be installed on a separate pole; pole to be located as indicated on drawings.
- .25 Cameras
 - a. Each camera shall have a single ethernet connection for video feed, power, and camera control through the *LAN*.
 - b. Video signals/images must not be affected by any elevator systems interference.
 - c. Cameras to be zoomed out to the widest viewing angle to maximize coverage or otherwise as directed by *CS*.

3.6 INSTALLATION – SECURITY SYSTEM INTEGRATIONS

- .1 System Integration
 - a. Integration between the *ACS* hardware, software and *IDS* shall be seamless in both online and offline modes.
 - b. The *ACS* and *IDS* are integrated locally via hard-wire inputs and outputs (see [Appendix J: Typical Lenel Security System Wiring Schematics](#)) and in software via the *WAN*.
 - c. The *ACS* and *VMS* applications are integrated via the *WAN*.
- .2 SCADA Integration

- a. The *integrator* shall provide 3 dry contact outputs from the IDS to the SCADA system for all Regional Water and Wastewater facilities:
 - i. Intrusion Alarm
 - ii. IDS Armed/Disarmed
 - iii. Spare
 - b. Outputs shall be configured and wired fail safe.
 - c. The Security Contractor shall coordinate integration to the Region's SCADA system with the Region 2 weeks in advance of the integration to have appropriate Regional representative present and to assist with the integration.
- .3 Elevator Access Control Integration
 - a. The Security Contractor shall break the "control signal" and not the "common supply" for the call button.
 - b. The *installer* shall use the spare conductors in the travelling cable, where available, when integrating ACS to an existing elevator.
- .4 Overhead Door and Bi-Fold door Controller Integration
 - a. The Security Contractor shall supply and install a momentary dry contact output 'request to exit' signal from door controller to associated card reader board on ACS for doors that are controlled by ACS.
- .5 Parking Controls Integration
 - a. The Security Contractor shall supply and install a momentary dry contact output from the ACS to activate the parking controls and shall monitor status of parking controls via dry contacts inputs (position status and alarm).
 - b. All points shall be wired fail safe.

APPENDICES

Appendix	Contents
A	Prequalified Security System Vendors
B	Security System Naming Convention Standards
C	Security System Commissioning Forms
D	Cabling
E	Pre-Approved Security Devices
F	Environmental Requirements
G	Sample Graphics
H	Camera Settings
I	Security System Labelling Requirements
J	Typical Lenel Security System Wiring Schematics

4.1 Appendix A – Prequalified Security System Vendors

- .1 The Region's only Honeywell ACAMS *integrator* is Honeywell Building Automation:

Honeywell Building Automation	Callum Marshall callum.marshall@honeywell.com (647) 455-3365

- .2 Lenel ACAMS *integrators* prequalified under Request for Supplier Qualification Number RFSQ-755-22 (as of July 28, 2023):

360 Advanced Security Corporation	Andrew Pierce Andrew.p@360asc.com (647) 212-9654
Chubb, UTC Fire and Security Canada Inc.	Stephen Yates stephen.yates@chubbsfs.ca (416) 659-1754
Paladin Technologies Inc.	Greg Cowan gcowan@paladintechologies.com (437) 684-7963
Securitas Electronic Security (Canada) Inc.	Tom Nanou Tom.nanou@securitasES.com (416) 678-7353

- .3 *Installers* pre-qualified under Request for Supplier Qualifications Number RFSQ-756-22 (as of October 31, 2023):

AC Electric	Chambers, Alex estimating@acelectricinc.ca (416) 939-0244
CEC Services Inc.	Kyle Feinstein kyle.feinstein@multitechcorp.ca (905) 713-3711
Electro-Works Ltd.	Dondi Keough dondi@tcsecure.ca (416) 529-7180
Ampere Limited	Michael Calitri michael@ampere.ca (416) 992-4398

4.2 Appendix B – Security System Naming Convention Standards

All components and interconnections are to be identified by a unique name which shall be used in software (database), and on drawings, documentation and labels.

These names are to be assigned in compliance with the following parameters:

- Do not use full name on graphics, rather use device type and number.
- Commence allocation of sequential numbers/addresses from “1” for each site.

System Controllers and Panels:

E005A01 **E005** = Site Number (provided by Region)
E005I01 **A** = ACS Controller
 I = IDS Panel
 01 = Panel Sequential Number

Door:

E005D001 Z001 **E005** = Site Number
 D = CR/Door
 001 = Door Sequential Number.
 Z001 = IDS Zone Number (if applicable)

Camera:

E005C001 **E005** = Site Number
 C = Camera
 001 = Camera Sequential Number.

Glass Break:

E005GB001 Z001 **E005** = Site Number
 GB = Glass Break
 001 = Glass Break Sequential Number.
 Z001 = IDS Zone Number (if applicable)

Intercom:

E005IRS001 **E005** = Site Number
E005IMS001 **IRS** = Remote Intercom Station
 IMS = Intercom Master Station
 001 = Intercom Sequential Number.

4.3 Appendix C – Security System Commissioning Forms

The commissioning procedure is described in [Section 1.6 Testing and Quality Assurance](#).

Note that the forms are available in Excel format and should be submitted in that format. There are 11 forms:

- 1) Cover Page
- 2) ACS - Access Control System
- 3) IDS - Intrusion Detection System
- 4) Video Surveillance
- 5) Doors - Pedestrian Doors, Overhead Doors & Hatches
- 6) Gate Control (to be reviewed)
- 7) Glass Break Sensors
- 8) RFA Buttons
- 9) RFA Strobes and Piezo Buzzers
- 10) Remote Release Buttons
- 11) Video Intercom

4.4 Appendix D – Cabling

1. **General**

- .1 Refer to Corporate ITS Cabling & Wiring Standard for network and video cabling requirements.
- .2 Cabling shall follow the wiring guide in Table 2 below:

Table 1 - Security System wiring guide

Purpose	Cable type	Gauge	Conductors	Description	Belden number*
RS-485	Non-plenum	24	2 Pairs	Overall shield	9842
	Plenum	24	2 Pairs	Overall shield	88102
RS-232	Non-plenum	24	5	Overall shield	9610
	Plenum	24	6	Overall shield	83506
Reader drops	Non-plenum	22	8	Overall shield	5506FE
	Plenum	22	8	Overall shield	6506FE
	Non-plenum	18	8	Overall shield	5306FE
	Plenum	18	8	Overall shield	6306FE
12 VDC power	Plenum	24	6	Overall shield	83506
	Plenum	18	2	Overall shield	6300FE, 88760
Instrumentation	Non-plenum	18	2	Overall shield	8760

*Belden cables are provided as a design basis, the *installer* may also use an approved equivalent cable

- .3 All exposed cabling must carry an FT6 fire rating.

4.5 Appendix E – Pre-approved Security Devices

APPENDIX E: PRE-APPROVED SECURITY DEVICES										
Component Type	Manufacturer	Part #	Description	Honeywell	Lenel	IDS	ACS	VMS	Intercom	
Arming Button	RCI	R991RBPTD9	Pneumatic Time Delay Pushbutton	X	X	X	X			
Button REX	RCI	991E-PTD-32D	Pneumatic Time Delay Pushbutton REX	X	X		X			
Card Reader	HID	20NKS-00-01BD08	Signo 20 Reader (mullion-mount style)	X	X		X			
Card Reader	HID	40KNKS-00-01BD08	Signo 40 Keypad Reader (single gang box mount style)	X	X		X			
Card Reader	HID	40NKS-00-01BD08	Signo 40 Reader (single gang box mount style)	X	X		X			
Communication Module	Bosch	B426	Ethernet Communication Module		X	X				
Communication Module	Bosch	B444-A	Plug-in cell communication module, 4G LTE		X	X				
Controller	Bosch	B9512G	Control Panel, IP		X	X				
Controller	Honeywell	TS3	Temaline Control Panel	X			X			
Controller	Honeywell	128BPE	Vista Commercial Intrusion Panel	X		X				
Controller	Lenel	LNL-2220	Intelligent Dual Reader Controller		X		X			
Diode	N/A	1N 4007	High Voltage Rectifier Diode	X	X		X			
Door Contact	K M Thomas	TA-4106-ES	Magnetic Door Contact, Explosion Proof	X	X	X				
Door Contact	Magnasphere	HSL-1.5-101	Door Contact, Surface Mount (UL 634 LEVEL 1) SPST			X				
Door Contact	Magnasphere	HSL-1.5-111	Door Contact, Surface Mount (UL 634 LEVEL 1) DPST			X	X			
Door Contact	Magnasphere	MSS-19C	Magnetic Door Contact, Recessed Standard Door, SPST				X			
Door Contact	Nascom	N78X/STDD	Magnetic Door Contact, Recessed Standard Door, DPDT		X	X	X			
Door Contact	Nascom	N78X/STSD	Magnetic Door Contact, Recessed Standard Door, SPDT	X	X		X			
Door Contact	Tane Alarm	SD-82	Magnetic Door Contact, Recessed Steel Door, SPDT	X	X		X			
Door Contact	Tane Alarm	SD-84	Magnetic Door Contact, Recessed Steel Door, DPDT		X	X	X			
Door Interface Relay	Camden	CX-12	Door interface relay / sequencing board	X	X		X			
Electric Strike	Assa Abloy HES	1006 xx 630	Electric Strike, Recessed	X	X		X			
Electric Strike	Assa Abloy HES	HES 9500-630	Electric Strike, Surface Mounted, Fire Rated	X	X		X			
Electric Strike	Assa Abloy HES	HES 9600-630	Electric Strike, Surface Mounted	X	X		X			
Enclosure	Bosch	B56	Keypad Surface Mount Box		X	X				
Enclosure	LifeSafety Power	E4M1	Enclosure with door and backplate		X	X	X			
Glass Break Detector	Honeywell	FG-1625F	Honeywell FlexGuard glass break detector	X	X	X				
Input/Output Module	Bosch	B208	SDI2 8-Input Expansion		X	X				
Input/Output Module	Bosch	B308	SDI2 8-Output Expansion Module		X	X				
Input/Output Module	Honeywell	RTU-A01	Digital I/O Module for up to 4 Inputs/Outputs	X			X			
Input/Output Module	Lenel	LNL-1100	Input Control Module		X		X			
Input/Output Module	Lenel	LNL-1200	Output Control Module		X		X			
Intercom Station	Zenitel	ITSV-4	HD IP Video Phone with 5" Screen	X	X				X	
Keypad	Bosch	B930	ATM Style-Alpha Numeric Keypad (SD12)		X	X				
Keypad	Honeywell	6160	Vista Series Remote Keypad	X		X				
Motion REX	Honeywell	IS320	REX Motion PIR	X	X	X	X			
Overhead Door Contact	Nascom	N205AU	Door Contact, Overhead Door	X	X	X				
Overhead Door Contact	Tane Alarm	MET-44 WG	Door Contact, Overhead Door (SPDT)	X	X	X				
Parking Gate control	Autogate	FLEX-18	Automatic Arm and Loop Sensor	X	X		X			
Pedestal	Batko	FRP-8443	Double Pedestal Pole Mount (84"/43")	X	X		X		X	
Pedestal Hood	Batko	FRH-2316	Pedestal Hood Housing for Access or Intercom	X	X		X		X	
Power Control Module	LifeSafety Power	C4/C8	Power control module 4/8 output		X		X			
Power Controller	Assa Abloy HES	2005M3	SMART Pac® III, Electric Strike In-Line Power Controller	X	X		X			
Power Distribution Module	LifeSafety Power	D8	Power distribution module		X		X			
Power Supply	LifeSafety Power	FPO series	FPO series power supply		X		X			
Reader Interface Module	Honeywell	RTU-A08	Weigand Interface Unit	X			X			
Reader Interface Module	Honeywell	TK_S014	Lonworks Weigand Interface Unit	X			X			
Reader Interface Module	Lenel	LNL-1320	Dual Reader Interface Module		X		X			
Relay	Phoenix Contact	2900329	General Purpose Relay DPDT (2 Form C)	X			X			
Relay	Phoenix Contact	2966906	General Purpose Relay SPDT (1 Form C)	X			X			
RFA Wireless Button	Bosch	RFPB-SB	Mobile Panic Button RF Transmitter		X					
RFA Wireless Button	Honeywell	F5802WXT	Mobile Panic Button RF Transmitter	X		X				
RFA Wireless Reciever	Bosch	B810	Mobile Panic Button RF Receiver		X					
RFA Wireless Reciever	Honeywell	5881EN	Mobile Panic Button RF Receiver	X		X				
Surveillance Cabinet	AXIS Communications	T98A18-VE	Surveillance Cabinet	X	X			X		
Ultra Long Range Reader	Nedap	9215689	Ultra Long-Range Vehicle RFID Reader	X	X		X			
Ultra Long Range Tag	Nedap	9882650	Ultra Long-Range Vehicle ID Window Button	X	X		X			
Video Camera	AXIS Communications	P3268-LV	Fixed Indoor Dome Camera, 3.4mm lens	X	X			X		
Video Camera	AXIS Communications	P3268-LVE	Fixed Outdoor Dome Camera, 3.4mm lens	X	X			X		
Video Camera	AXIS Communications	P3738-PLE	Fixed 360/Panoramic Indoor/Outdoor Camera	X	X			X		
Video Camera	AXIS Communications	P4708-PLVE	Dual Sensor Panoramic Camera	X	X			X		
Video Camera	AXIS Communications	P9117-PV	Dome Corner Camera, 3.4mm lens	X	X			X		
Video Camera	AXIS Communications	Q6078-E	PTZ Indoor/Outdoor Camera	X	X			X		
Video Decoder	AXIS Communications	D1110	4k Video Decoder with HDMI output	X	X			X		
Video Intercom	Zenitel	TCIV-2	IP and SIP Video Intercom	X	X				X	
Video Surveillance Monitor	ORION Image	43RCE	42.5" Full HD LED LCD Monitor	X	X			X		

4.6 Appendix F – Environmental Requirements

All security devices supplied under this contract shall meet the following environmental requirements, unless otherwise identified.

Note that these specifications are intended to address only the requirements in “normal” spaces and do not extend to the special requirements which may exist in “special” locations, such as sewage or water treatment facilities.

Outdoor Operational Environments

Air Temperature:	-40°C to +40°C
Ambient Humidity	10% to 80% RH
Wind	0 to 240 km/hr (150 mph)
Rain / Snow	up to 6 mm/min
Solar Radiation	up to 1000 W/m ²
Vibration	1.5 mm displacement, 20 m/s ² acceleration, 2 – 200 Hz
Dust	3.0 mg / m ² h

Indoor Operational Environments

Air Temperature:	+10°C to +35°C
Ambient Humidity	10% to 80% RH)
Vibration	1.5 mm displacement, 20 m/s ² acceleration, 2 – 200 Hz

Storage Environments

Air Temperature:	-45 °C (-50 °F) to 45 °C (115 °F)
Ambient Humidity	10% to 90% (RH)

4.7 Appendix G – SAMPLE GRAPHICS

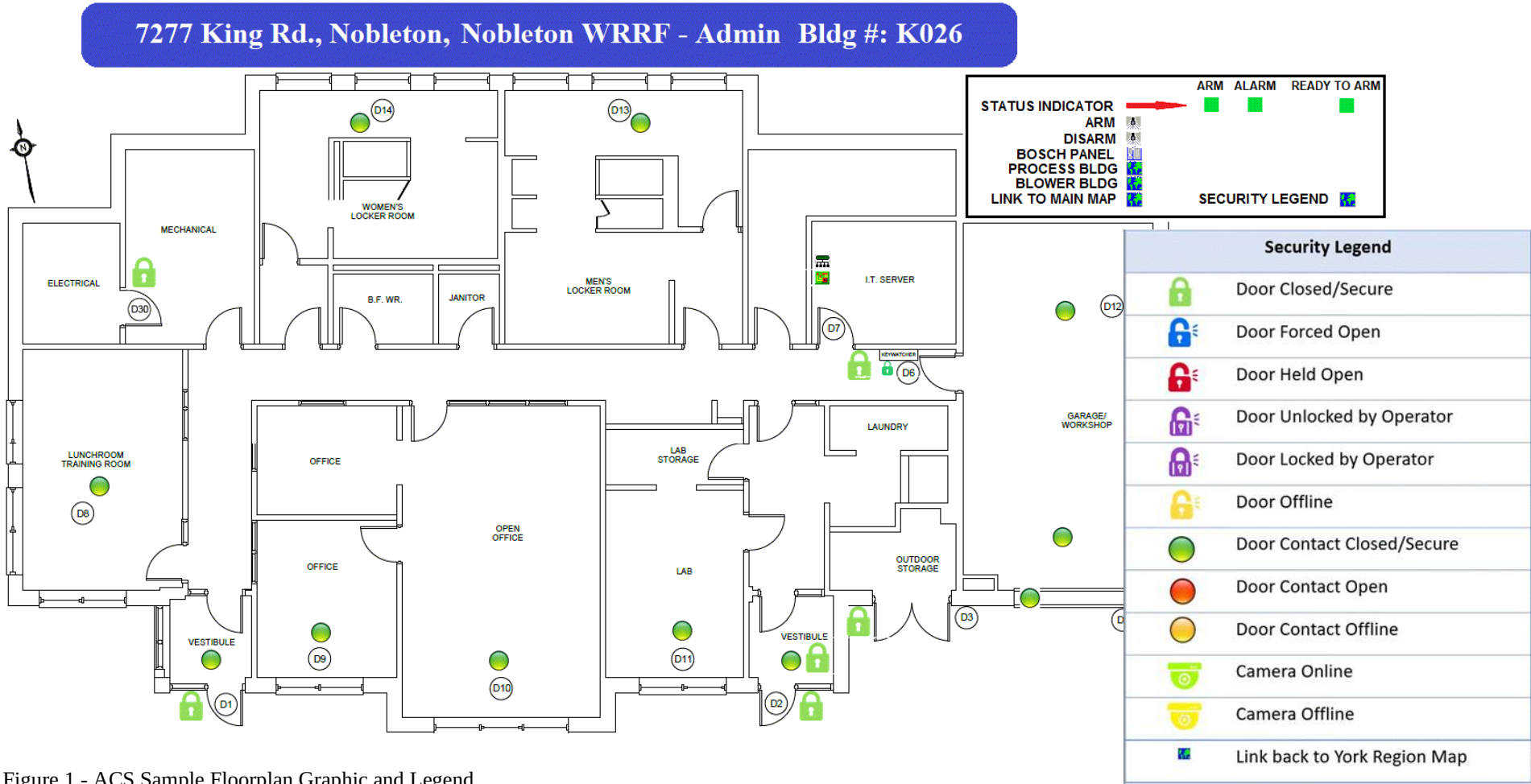


Figure 1 - ACS Sample Floorplan Graphic and Legend

4.8 Appendix H – Camera Settings

Table 2 identifies the standard settings for security cameras connected to the WAN:

Table 2 - Camera Settings

Field	Setting
Background (Stream 1) record frame rate, with motion	30 fps
Background (Stream 1) record frame rate, without motion	6 fps
Live View (Stream 2) frame rate	15 fps
Background recording duration	24 hours
Background delete after	30 days
Compression format	H.264
Compression Ratio	Medium
Resolution for PTZ	1920 x 1080
Resolution for fixed camera	1920 x 1080
PTZ preset speed	20
PTZ preset dwell time	1 second
NTP Server	172.16.1.46 & 172.16.19.47
HTTPS TLS	Disabled
Dot1x	Disabled
SNMP V2c only	Enabled
ReadCommunity: (case sensitive)	ykregion
WriteCommunity: (case sensitive)	Region Standard

4.9 Appendix I – Security System Labelling Requirements

1. General

- .1 The *installer* shall identify and label every serviceable component of the ACAMS including:
 - a. enclosures
 - b. cameras
 - c. network components
 - d. overhead DC
 - e. CR
 - f. cables
 - g. main alarm outputs and relays
 - h. batteries
 - i. power supplies
 - j. other components which are installed to support the ACAMS
- .2 All labelling shall be consistent on site, in as-built documentation and in software.
- .3 All labelling is to be permanent and legible:
 - a. Label printing shall be machine generated, at least 12-point Arial font and with black lettering on white background
 - b. Labels shall not fade or deteriorate due to exposure to the environment.
 - c. Labels to be harsh environment permanent adhesive laminated tape

2. Card Readers

- .1 Labels to be adhered to the side of the CR that is facing the door or gate.

3. Enclosures

- .1 Labels shall be centred from left to right.
- .2 Security cabinet shall include:
 - a. Exterior Label (on cabinet door/cover)
 - Cabinet name, as shown on the drawings
 - Cabinet purpose / nature of the equipment within.
 - b. Interior Device Labels
 - All Networked equipment is to be labelled with corresponding IP information
 - Type of Application
 - Signal source (Relay Output / Circuit / Port Number)
 - Power source (including Voltage, type of power, distribution panel and circuit number or power supply)
- .3 Junction boxes and pull boxes shall be identified with at least:
 - Nature of enclosure content, e.g., Security, Power

4. Cables

- .1 Cable labels shall be flexible cable labels of the “wraparound self-sealing” variety and of suitable size to fit the cables to which they are applied.
- .2 Identify all controller wiring at terminal blocks and connection points with the controller terminal (I/O) address numbers.
- .3 Inter-connection and terminal strips for elevator integration.

5. T-bar and ceiling

- .1 Label t-bar or finished ceiling, where equipment is installed above the ceiling.

6. Batteries

- .1 Each installed battery shall be labelled
- .2 Battery labels shall identify the date of battery install, with the date format: YYYY-MM-DD.

4.10 Appendix J – Typical Lenel Security System Wiring Schematics

1. **LENEL SECURITY PANEL WIRING AND TERMINATIONS**
 - .1 Lenel ACAMS status integration
 - a. Alarm: Connect output 1 from Bosch main panel to input 7 on Lenel site controller via contact 1 on relay 1
 - b. Armed/Disarmed: Connect output 2 from Bosch main panel to input 8 on Lenel site controller via contact 1 on relay 2
 - c. Ready to Arm: Connect output 3 from Bosch main panel to input 3 on Lenel site controller via contact 1 on relay 3
 - .2 Lenel ACAMS disarming integration
 - a. Connect output 4 on Lenel site controller to Bosch main panel input 2
 - b. Upon valid card swipe from any exterior *CR*, output 4 on Lenel site controller to fire momentarily
 - .3 Lenel ACAMS arming integration
 - a. Connect output 2 on Lenel site controller to Bosch main panel input 1 and in series with arming button and relay 3
 - b. Upon valid card swipe from any arming *CR*, output 2 on Lenel site controller to fire for 15 seconds
 - .4 NC contact on each cabinet tamper to be wired in series, to tamper input on Lenel site controller
 - .5 Connect power supply AC fault output to Lenel site controller power fault input and *IDS* via relay.
 - .6 Perimeter door hardware wiring for Lenel ACAMS
 - a. 1st pole from *DPDT* relay on *DC* for perimeter door to be connected to associated input on Lenel door controller
 - b. 2nd pole from *DPDT* relay on *DC* connected in parallel with auxiliary NO contact on associated motion *REX* and intrusion input on *IDS*
 - c. Any single pole intrusion point that also needs to be connected to ACS via relay output from *IDS*.
 - .7 Use on board ethernet for Bosch System Integration

1 GENERAL

1.1 General Requirements

- 1.1.1 Conform to Sections of Division 0 as applicable.
- 1.1.2 Conform to Sections of Division 1 as applicable.
- 1.1.3 Conform to Sections of Division 8 as applicable
- 1.1.4 Conform to Sections of Division 26 as applicable.

1.2 Related Work

- 1.2.1 Refer to other Sections of this Division for related work.

1.3 Description of Work

1.3.1 System Integrations

- 1.3.1.1 The security system consists of many different sub-systems and interfaces with other building systems. In order to streamline interaction between the different sub-systems and with other building systems, automate certain functionalities, and ensure ease-of-use, the following integrations shall be provided.
- 1.3.1.2 The Contractor shall provide all required materials, low voltage wiring, licenses, software, configuration, programming and testing required for the following subsystem integrations.
- 1.3.1.3 ACAM System with Duress System
 - 1.3.1.3.1 The existing ACAMS and Duress System shall maintain their existing level of integrations in the existing Honeywell system. The system shall be expanded upon for all additional ACAM doors.
 - 1.3.1.3.2 The access control and alarm management system shall be capable of displaying a graphic map showing the location of the initiating duress alarm. The graphic map for the applicable area shall be immediately displayed without any additional intervention from the operator required.

2 PRODUCTS

2.1 MATERIALS

- 2.1.1 The Contractor is responsible to provide any ancillary equipment such as I/O modules, relays, patch cables, etc. in order to achieve the required integrations.
- 2.1.2 The Contractor is responsible to provide any licensing required for the security systems in order to achieve the required integrations.

3 EXECUTION

3.1 SYSTEM OPERATION (TESTING)

- 3.1.1 Acceptance Test Plan
- 3.1.2 As a minimum, the following tests for the integrations shall be performed:
 - 3.1.2.1 Verify integration of the Duress System with the ACAM System to ensure duress alarm activations trigger the required actions within the ACAM System.
 - 3.1.2.2 Verify system operations during main power failure, emergency power activation, UPS activation and main power restoration.

END OF SECTION

1 GENERAL

1.1 General Requirements

- 1.1.1 Conform to Sections of Division 28 as applicable.
- 1.1.2 Conform to York Region Specifications and Standards as outlined below. Where any discrepancies exist between York Region documentation and the Division 28 documentation contained herein the York Region documentation shall take precedence.
- 1.1.3 York Region Security System Specifications Version 1 (June 16, 2025) including but not limited to:
 - 1.1.3.1 Appendix A – Prequalified Security Systems Vendors
 - 1.1.3.2 Appendix C – Security System Commissioning Forms
 - 1.1.3.3 Appendix E – Pre-Approved Security Devices
- 1.1.4 York Region Corporate Network Cabling Standard (December 11, 2025)
- 1.1.5 Division 00 and Division 01 for related Work
- 1.1.6 Refer to other Sections of this Division for related work.

1.2 System Description

- 1.2.1 Provide (supply, install, program, configure, test and commission) a complete and fully functional expansion to the existing Honeywell Access Control and Alarm Management System (ACAMS) comprised of, but not limited to, the following scope of work:
 - 1.2.1.1 Provide new card readers, software upgrades, additional licenses, electronic door hardware, lockdown buttons, duress buttons and all other equipment as required for the monitoring and control of the ACAMS across the facility. Contractor to verify quantities prior to bidding.
 - 1.2.1.2 Provide client terminals for database management, including credential management, adding users, deleting users, alarm management, and door management in the following locations as shown on the electrical drawings.
 - 1.2.1.3 Provide all hardware, low voltage wiring, terminations and connections, card readers, data gathering panels, door contacts, request-to-exit motion devices, locking devices, frame modifications, keying, power supplies, UPS, battery backups, software, licenses, programming, configuration and testing required for a fully functional ACAM system.
 - 1.2.1.4 Provide all CAT 6A cable, testing/certifications and terminations/connections to the LAN.
 - 1.2.1.5 Provide new Panic/Duress push buttons as shown on the drawings. These devices shall generate and alarm on the ACAM system via graphic map and the corresponding camera view displayed on video monitors. These duress buttons shall also trigger an alarm on the corresponding strobe light as demonstrated on the Electrical Drawings.
 - 1.2.1.6 Provide card readers on access doors as shown on the drawings which are designed to monitor and restrict access to secure areas. The ACAM should be able to generate door alarms for door forced open, door held open and invalid credential, and the corresponding camera view should be displayed on video monitors.
 - 1.2.1.7 The access control system shall be interfaced with the video surveillance system to camera call-up for the ACAMS events. Refer to integration specifications 28 00 10 for details.

- 1.2.1.8 Provide an expansion for the graphic maps for all building floors, where new equipment shall be installed. The graphic maps for the access control system shall show the status of all controlled and monitored door on the access control system. When any access control alarm is generated the corresponding map and door icon should be displayed.
- 1.2.1.9 Door hardware shall be provided as follows:
 - 1.2.1.9.1 Div. 28 to provide required door hardware, including but not limited to electric strikes, lock status, door status switches as required for proper functioning of the door.
 - 1.2.1.9.2 The Div.8 subcontractor is responsible for providing a door hardware schedule with all devices and locksets as required for each door.
 - 1.2.1.9.3 Div.28 shall provide power supplies for locking devices, including but not limited to, electric strikes.
 - 1.2.1.9.4 Security contractor is required to coordinate the door functionality with the associated door hardware contractor.
 - 1.2.1.9.5 Security contractor to provide request-to-exit motion sensors as required.
- 1.2.2 The ACAMS shall be programmed to accommodate automatic locking and unlocking of doors for multiple periods of times during the day based on the operational requirements.
- 1.2.3 The system shall have a “mustering” feature and functionality.
- 1.2.4 The ACAM shall utilize the existing network switches in equipment rooms to connect to the fiber-optic based security LAN. The contractor shall coordinate the installation of new network devices and terminations with the York Region. The Contractor shall provide all hard-wired, homerun connections to patch panels, and provide patch cords to be terminated by York Region.
- 1.2.5 Security contractor is responsible to coordinate any ancillary work like electrical outlets etc. for a complete functioning ACAM with the corresponding division. All new security equipment is to be installed on UPS power.
- 1.2.6 The system shall be designed such that it uses an open peer-to-peer communications protocol for control network. This approach shall provide an interoperable platform for control elements available from a number of different manufacturers
- 1.2.7 The system shall be designed to operate from the commercial 120 VAC power.
- 1.2.8 The ACAM shall be fully programmed in the field to meet the Client’s operational and security requirements. The ACAM shall allow for loading and editing special instructions and operating sequences as required to accommodate system expansion. All software operations shall be stored in a non-volatile programmable memory in the server terminal. Loss of primary and secondary power shall not erase the data stored in memory.
- 1.2.9 For additional general requirements refer to Specification Section 28 00 00.

1.3 Submittals

- 1.3.1 For Submittal requirements refer to Specification Section 28 00 00, 1.11.

1.4 Quality Assurance

- 1.4.1 For Quality Assurance requirements refer to Specification Section 28 00 00, 1.7.
- 1.4.2 For Manufacturer qualifications requirements refer to Specification Section 28 00 00, 1.8.
- 1.4.3 For Installer qualifications requirements refer to Specification Section 28 00 00, 1.9.

- 1.4.4 For Warranty requirements refer to Specification Section 28 00 00, 1.10.
- 1.4.5 For Equipment Regulatory Requirements refer to Specification Section 28 00 00, 2.1.2.

2 PRODUCTS

2.1 Equipment

- 2.1.1 Manufacturers' names and product model numbers referred to are intended to indicate the technical specification, operating features and parameters required in these specifications. Products of other manufacturers can be used where indicated "or approved equal", provided they meet or exceed all the requirements stated in these specifications.

2.2 Access Control Door Functionality

- 2.2.1 Interview Rooms (Lockdown Programming)
 - 2.2.1.1 Secure Interview Room Door:
 - 2.2.1.1.1 The Secure Interview Room doors shall be equipped with new Electric Strike hardware which is released via a new card reader, a new door contact, and a new request-to-exit motion detectors.
 - 2.2.1.1.2 The Secure Interview Room door shall be programmed to include all door alarms to conform with and record all the existing system alarms (all Door Forced Open, Door Held Open, Valid and Invalid card swipe attempts).
 - 2.2.1.1.3 The door shall operate such that a valid card swipe will release the electric strike and shunt the door contact to allow entry. The handle of the door will allow free egress from the room. The request-to-exit motion detector shall disable the door contact, but shall not release the electric strike.
 - 2.2.1.2 The Contractor shall provide all dedicated lockdown buttons as outlined on the electrical drawings.
 - 2.2.1.3 Public Interview Room Door:
 - 2.2.1.3.1 The public Interview Room door shall be equipped with new electric strike hardware which is released via a new card reader, a new door contact, and a request-to-exit motion detector.
 - 2.2.1.3.2 The public Interview Room doors shall be programmed on a schedule such that, during regular business hours (9:00AM – 5:00PM, exact timing to be confirmed with the site) the electric strike is released to allow free entrance and egress. After hours the electric strike shall be secured, and released through a valid card swipe. The handle of the door will allow free egress from the room. The request-to-exit motion detector shall disable the door contact, but shall not release the electric strike.
 - 2.2.1.3.3 The lockdown buttons within the new Interview rooms shall have the following programming:
 - 1. When a Lockdown button, within the secure side of the Interview Room, is pressed, the electric strike shall be secured on the Public Interview Room door.
 - 2. While the Lockdown functionality is activated, the door will act in the same function as After Hours. (Valid card swipe to release the strike, request-to-exit device to shunt door alarms).

- 2.2.1.3.4 The existing lockdown buttons within each corresponding Interview Room Courtroom shall additionally be programmed to Lockdown the Public Interview Room Doors.
- 2.2.1.3.5 All Lockdown programming shall adhere to current Courtroom lockdown button functionality.

2.3 ACAMS Security Enclosures and Cabinets

- 2.3.1 Existing lockable cabinets shall be used where possible for all ACAMS hardware located within equipment rooms including power supplies, credential reader controllers, I/O modules, etc. Where existing space is insufficient, new enclosures and cabinets shall be provided.
- 2.3.2 All ACAMS and intrusion cabinets, enclosures, and housings having doors or removable covers and containing terminals, P/C hardware or their power supplies, shall be provided with cover operated, corrosion resistant, tamper switch devices connected and monitored from the ACAMS. Tamper devices shall be arranged to actuate an alarm signal when the door or covers are moved as little as 1 cm (3/8") from its normally closed position.
 - 2.3.2.1 Tamper switch unit shall remain inaccessible until the switch is activated and shall have concealed mounting hardware so that its location cannot be visually detected from the exterior of the enclosure.
 - 2.3.2.2 The switches shall remain under supervision at all times, whether or not their circuits are in the authorized access or secure modes.
- 2.3.3 All ACAMS enclosures and cabinets shall be mounted on minimum ¾" fire retardant plywood backboard.
- 2.3.4 All controls which affect unit sensitivity shall be located inside the tamper resistant enclosure.
- 2.3.5 All cabinets shall be lockable with mechanical locks/keys. Provide high security key locks or key operated cabinet switches.
- 2.3.6 Refer to 'Enclosure' for ACS noted in Appendix E: Pre-Approved Security Devices of York Region Security System Specifications.

2.4 ACAMS Data Gathering Panel (DGP) Controllers

- 2.4.1 The approved manufacturers for the data gathering panels shall be Honeywell (no exceptions).
- 2.4.2 Refer to Honeywell 'Controller', 'Input/Output Module', 'Reader Interface Module', for ACS noted in Appendix E: Pre-Approved Security Devices of York Region Security System Specifications.

2.4.3 ACAMS Server Requirements (Existing)

- 2.4.3.1 The Contractor shall utilize the existing off-site York Region Central Security System ACS server and provide all required software, licensing and network configuration for a fully functional system.

2.4.4 Access Control Operator Workstation (Existing)

- 2.4.4.1 The Contractor shall provide all required software, licensing and configuration for the monitor and control the ACS for the existing security workstations.

2.5 Graphical Maps

- 2.5.1 The Contractor shall provide graphic maps for each floor within the ACS software. Individual icon shall be configured for each control and monitor point with distinct icons used to differentiate between controlled and monitored doors, cameras, intercoms and shall display the status of each. In addition, intrusion detection system disarming and arming capabilities shall be configured in the ACS graphic maps.
- 2.5.2 The maps shall contain room names, numbers, and be clear and legible to read.
- 2.5.3 The icons shall display the current alarm status of each controlled and monitor doors and duress buttons.
- 2.5.4 For controlled doors the system shall be capable of unlocking or locking a door directly from the specific map icon.
- 2.5.5 Refer to York Region Security System Specifications for requirements of the graphic maps.

2.6 Smart Card Readers

- 2.6.1 The approved manufacturer for smart card readers is HID Signo, refer to Appendix E: Pre-Approved Security Devices of York Region Security System Specifications for York Region specific model numbers.

2.7 Access Cards (Existing)

- 2.7.1.1 York Region (Owner) Shall utilize the existing access cards.

2.8 Egress Motion Detector

- 2.8.1 Egress motion detector shall employ passive infrared (PIR) technology and incorporating an adjustable lens to allow adjustment of the detection field.
- 2.8.2 For ACS only Doors: Provide request-to-exit infrared motion detectors for detecting authorized exits through card reader controlled doors as indicated on the security drawings. The egress motion detector shall shunt the door alarm. It shall not unlock the door, unless noted otherwise.
- 2.8.3 Refer to Appendix E: Pre-Approved Security Devices of York Region Security System Specifications for York Region specific model numbers.

2.9 Electric Strikes (Fail Secure)

- 2.9.1 The fail secure electric strikes provided shall be 24 VDC.
- 2.9.2 The Security Contractor shall ensure the ULC classified units designed for rated doors and frames are utilized where required.
- 2.9.3 Refer to Appendix E: Pre-Approved Security Devices of York Region Security System Specifications for York Region specific model numbers.

2.10 Door Status Switch (Concealed Mount)

- 2.10.1 The door status switch shall be a concealed type switch, which shall operate with up to a 1/2" gap between the switch and magnet when mounted in a steel or wooden door frame. The contact configuration shall be normally closed when the door is closed. The switch and magnet shall mount into a 15/16" diameter hole.

- 2.10.2 If concealed status switches are not feasible based on existing site conditions, surface mount status switches may be installed upon Engineer/Consultant approval.
- 2.10.3 Refer to Appendix E: Pre-Approved Security Devices of York Region Security System Specifications for York Region specific model numbers.

2.11 Tamper Switch

- 2.11.1 Tamper switches shall be a normally closed plunger type switch designed to be mounted to an enclosure to sense the removal or opening of the enclosure cover.

2.12 Duress Alarm Pushbuttons

- 2.12.1 Duress buttons are to be removed and reinstalled in new locations as demonstrated on the electrical drawings. All new duress alarm push buttons are to match existing.

3 EXECUTION

3.1 Installation

- 3.1.1 ACAMS Installations shall conform to the following requirements:
 - 3.1.1.1 Manufacturer's written instructions
 - 3.1.1.2 Approved shop drawings and submittals
 - 3.1.1.3 Applicable codes, standards, and AHJ requirements
 - 3.1.1.4 York Region Security System Specifications
 - 3.1.1.5 Appendix J of York Region Security System Specifications
- 3.1.2 ACAMS Installations shall conform to the installation requirements outlined in specification section 28 00 00 – Integrated Security Systems – General.

3.2 System Operation (Testing)

- 3.2.1 Acceptance Test Plan
- 3.2.2 As a minimum, the following tests for the ACAMS shall be performed:
 - 3.2.2.1 Verify system tested (and passed) in online and offline operation modes.
 - 3.2.2.2 Verify main alarm window clear of all device alarms.
 - 3.2.2.3 Verify all site graphics, including the updated graphic maps, device icon
 - 3.2.2.4 Verify VMS server integrations.
 - 3.2.2.5 Verify A/C power monitoring.
 - 3.2.2.6 Verify Tamper locks installed and reporting status on system.
 - 3.2.2.7 Verify all system configurations:
 - 3.2.2.7.1 Verify main panel user/password is set to York Region standard.
 - 3.2.2.7.2 Verify All devices are configured to York Region Network Security Requirements.
 - 3.2.2.7.3 Verify there is consistent naming across all software components of the system.
 - 3.2.2.7.4 Verify the latest firmware is installed and all panels and modules are labelled.
 - 3.2.2.8 Conform to Appendix C of the York Region Security System Specifications.

END OF SECTION