TERMS OF REFERENCE AND CONSTRUCTION SPECIFICATIONS

FOR

SUPPLY AND INSTALLATION OF THE ELECTRICAL & VENTILATION SYSTEMS AT THE CARPENTER'S SHOP

LOUISBOURG, NOVA SCOTIA

Section	Title	Pages
01 11 00	Summary of Work	8
01 14 00	Work Restrictions	1
01 33 00	Submittal Procedures	3
01 35 29.06	Health and Safety Requirements	3
01 35 43	Environmental Procedures	1
01 41 00	Regulatory Requirements	1
01 45 00	Quality Control	2
01 52 00	Construction Facilities	2
01 74 11	Cleaning	2
01 77 00	Closeout Procedures	2
01 78 00	Closeout Submittals	5
08 31 19	Access Doors for Mechanical Systems	1
21 07 20	Thermal Insulation	3
23 05 00	Mechanical General Requirements	7
23 08 01	Mechanical System Commissioning	1
23 31 14	Ductwork +	1
23 33 00	Duct Accessories	1
23 33 10	Dampers	2
23 34 20	Fans	2
23 37 20	Louvres, Grilles, Registers, and Diffusers	1
26 05 00	Common Work Results for ELECTRICAL	8
26 05 20	Wire 7 Box Connectors (0-1000 V)	2
26 05 21	Wires & cables (0-1000 V)	2
26 05 29	Hangers & Supports for Electrical System	3
26 05 31	Splitters, Junction, Pull Boxes & Cabinets	2
26 05 32	Outlet boxes, Conduit boxes and Fittings	2
26 05 34	Conduits, Fastenings & Conduit Fittings	4
26 27 26	Wiring Devices	4
26 28 23	Disconnec Switches – Fused and Non Fused	1
26 29 00	Wiring of Equipment Supplied by Others	2
26 29 10	Motor Starters to 600V	4

APPENDIX A **DRAWINGS – Louisbourg – Carpenter’s Shop**

Drawing 751 – Mechanical: Ventilation plan
Drawing 752 - Mechanical: Ventilation Details. Schedules and Controls.
Drawing 753 - Mechanical: Ventilation Specifications
Drawing E101 - Electrical: Lightning, Fire, Power, Fire Alarm, Exit
Drawing E102 - Electrical: Mechanical hookups, Specifications

PART 1 - GENERAL

1.1 REFERENCES

.1 Most recent version of the National Building Code of Canada (NBC) including all amendments up to bid closing date.

.2 National Fire Code of Canada

.3 Provincial Government Act and Regulations; including, but not limited to:

- .1 Provincial Building Code Act
- .2 Occupational Health and Safety Act revised Statutes of Nova Scotia 1996, Chapter 7 and regulations
- .3 Worker's Compensation Act
- .4 Fire Prevention Act
- .5 Dangerous Goods Transportation Act

1.2 REFERENCE STANDARDS

.1 Where edition date is not specified, consider that references to manufacturer's and published codes, standards and specifications approved by the issuing organization, current at the date of this Specification.

.2 Reference Standards and specifications are quoted in this Project Manual to establish minimum standards. Work which in quality exceeds these minimum standards shall be considered to conform.

.3 Should the Contract Documents conflict with specified reference standards or specifications the General Conditions of the Contract shall govern.

.4 Where reference is made to manufacturer's directions, instructions or specifications they shall include full information on storing, handling, preparing, mixing, installing, erecting, applying, or other matters concerning the materials pertinent to their use and their relationship to materials with which they are incorporated and written to suit this specific project.

.5 Have a copy of each code, standard and specification and manufacturer's directions, instructions and specifications, to which reference is made in this Project Manual, always available at construction site, when requested by Departmental Representative.

.6 Standards, specifications, associations, and regulatory bodies are generally referred to throughout the project manual by their abbreviated designations.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

.1 Work of this Contract comprises of the complete supply and installation of a complete new ventilation and electrical systems for the Carpentry mill Shop in Louisbourg, NS. A complete description of the scope of work is in included in the attached specifications along with drawings.

Contractor must provide all labor, materials, equipment, etc. to supply, install, inspect, test, balance and commission the ventilation system and electrical system including all required controls and associated electrical for controls at the Carpentry Mill Shop, at the Fortress of Louisbourg, NS. The electrical installation will also include all wiring rough in for the required fire alarm system and devices. Smoke detector and heat sensor device supply and installation will be by other. The work will also include the supply and installation of the warm air furnace, HRV, fuel oil lift pump package and all required controls and material as well as the oil tank, vent alarm, and fuel level switch. Parks Canada will be completing all associated base prep and exterior structure required around the oil tank.

The Contractor will be required to install an entirely new ventilation, heating and electrical system in the main floor and attic space as per Drawings M751, M752,M753, E101 and E102. This will include all new material installation as shown on drawings and any required demolition and debris removal.

Contractor must coordinate with the electrician to ensure voltage and phase of each piece of equipment to ensure it is compatible prior to installation. Failure to do so will not remove contractor's obligation to provide compatible equipment.

This Contractor must install all plumbing and drainage related work needed to ensure the installation of the complete ventilation / heating system.

During construction of this system the contractor should be advised there may be employees in this facility and the contractor should ensure that there are not extended periods of time when the ventilation systems are interrupted.

In addition to ventilation, electrical and heating supply and install, the Contractor will be required to test, balance and commission the new systems. The Contractor will also be required to train Parks Canada staff on the proper operation of the system

& provide necessary operations manuals to park staff.

The Contractor of this project must coordinate schedules with the primary Parks Canada project manager to ensure they are available when installation of the ventilation and heating system is required and can accommodate installation. It is anticipated this work will be required around December 15,2018; however, exact timing will be confirmed upon award of contract.

A site visit will be hosted during the tender period to show the above site locations and conditions.

The Summary of Work is provided as part of this package for information only. **Verification of measurements, site conditions and design requirements are the full responsibility of the Contractor.** It is also the Contractors full responsibility to produce shop drawings for this project.

Sub-contractors and engineers engaged by the Contractor must be fully qualified, accredited professionals, licensed to practice in Nova Scotia. The Consultant's must be identified in the Contractor's proposal.

System is to be installed to meet or exceed all applicable codes and standards including, but not limited to: the most recent copy of National Building Code of Canada, the National Fire Code, Canada Labour Code, The Nova Scotia Standard Specification for Municipal Services, CSA and The Nova Scotia Building Code and Regulations.

Contractors must be prepared to submit a detailed construction schedule and demonstrate that they can meet the deadlines on this schedule.

Contractor is required to submit a site specific health and safety plan, and an environmental protection plan.

The Contractor is cautioned that this is a National Park and every effort should be made to incorporate the new systems with minimal visual impact while still achieving compliancy with current codes and standards.

Execute work with least possible interference to building operations, occupants, and the public.

The Contractor shall use the best available methods of performing the work and shall employ only skilled and competent staff thereon, who will be under the supervision of a senior member of the Contractor's staff.

Drawings and documents or copies thereof required for the work shall be exchanged between the Contractor and the Agency on a reciprocal basis. All drawings and documents prepared by the Contractor for the Agency shall be the property of the Agency, free from all claims by the Contractor of any nature and kind whatsoever.

The Agency may, in writing, at any time increase/decrease or otherwise alter the whole or any part of the work. Payment for the contract adjustment will be subject to price negotiation.

Drawings shall be prepared in SI units in standard size sheets using the title block and format acceptable to the Agency.

The Contractor shall not be entitled to payment in respect to cost incurred by the Contractor in remedying errors and omissions in the services that are attributable to the Contractor, the Contractor's employees, or persons for whom the Contractor has assumed responsibility in performing the services.

1.4 CONTRACT METHOD

.1 Construct Work under a lump sum price contract.

1.5 CODES/STANDARDS

.1 Meet or exceed requirements of:
.1 contract documents
.2 specified standards, codes and referenced documents.

1.6 TOLERANCES

.1 Meet or exceed requirements of:
.1 Unless acceptable tolerances are otherwise specified in standards, codes and referenced documents.
.1 "Plumb and level" shall mean plumb or level within 3mm in 3m (1/8" in 10'0")
.2 "Square" shall mean not in excess of 10 seconds less or greater than 90.
.3 "Straight" shall mean within 3mm under a 3m (1/8" under a 10' -0") long straightedge.

1.7 WORK SEQUENCE

.1 Provide at start-up meeting or within 5 Working Days after award of contract, whichever occurs first, schedule showing anticipated progress stages and final completion of work within time period required by Contract Documents

.2 Provide in form acceptable to Consultant, within 5 working days after Contract award, schedule showing dates for:
.1 Submission of shop drawings.
.2 Delivery of items of equipment and materials to each site.
.3 Final completion date within time period required by Contract documents.

.3 Interim reviews of work progress based on work schedule will be conducted as decided by Departmental Representative.

1.8 CONTRACTOR USE OF PREMISES

.1 Co-ordinate use of premises under direction of Departmental Representative.

.2 The Carpentry Mill Shop is not open to the public during the projected work period; The contractor will be expected to ensure visitors are restricted access from the site during these visits. The Contractor will also attempt to confine all their work and work materials to the building they will be installing the new systems.

.3 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

1.9 OWNER OCCUPANCY

.1 Owner will not have staff in the Carpentry Mill Shop for the duration of the contract but Parks Canada staff will be working on interior upgrades in the building during this period.

.2 Co-operate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage.

1.10 SETTING OUT OF WORK

.1 Assume full responsibility for design and construction of the Work and execute complete layout of work to locations, lines and elevations as indicated in the program.

.2 Provide devices needed to design, layout and construct work.

1.11 EXECUTION OF THE WORK

In general, the work shall be carried out in accordance with the most recent versions of the National Fire Code and National Building Code of Canada (NBCC).

The installation is to be carried out in accordance with the drawings and specifications submitted and approved for construction.

Qualified and experienced trades people shall be employed in the installation of the ventilation system. The work shall be executed under the continuous supervision and direction of a competent supervisor.

The Contractor will provide on-site finished, quality products as specified and shown on the shop drawings. Burning, cutting, welding, or other on-site modifications to the existing building structure will not be permitted unless approved by the Departmental Representative.

Once started, the installation shall be continuous until completion.

The Contractor is to obtain approval from the Departmental Representative for any shutdown or interruption of active service, facility, or operations in the work area. The contractor shall adhere to any approved interruption schedule.

The Contractor shall keep the site free from debris and shall store his equipment and material on site so as to not interfere with the operations on the site.

The Contractor shall be responsible for the storage and security of his own materials and equipment. The Agency will not be held liable for any materials or equipment which are stolen or damaged at the site.

The Contractor shall be responsible for temporary power and water.

The Contractor shall be responsible for the removal and disposal of all materials and debris remaining after the work has been completed and the overall cleanup of the site prior to commissioning the system.

Total performance for the project occurs when the ventilation and heating system is complete and the Departmental Representative has issued notification of acceptance.

Contractor to maintain fire access / control throughout the duration of the project.

Upon completion of the project, two (2) copies of an Operation and Maintenance Manual prepared and written by the Manufacturer shall be supplied to the Owner outlining recommended maintenance, repair, and inspection procedures for the system.

At the completion of the project the Contractor will be required to provide a training seminar to Parks Canada on the new systems operation which must be scheduled a minimum of 48 hours in advance of training.

1.12 EXISTING SERVICES

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

.2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours' notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to pedestrian, and vehicular traffic.

.3 Provide alternative routes for personnel and vehicular traffic if required.

.4 Establish location and extent of service lines in area of work before starting Work. Notify Departmental Representative of findings.

.5 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.

.6 Provide temporary services when directed by Departmental Representative to maintain critical building systems.

.7 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.

.8 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.

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

1.13 DOCUMENTS REQUIRED

.1 Maintain at job site, one copy each document as follows:
.1 Contract Documents.

.2 Contractor's Consultant's Drawings and Specifications.
.3 Addenda.
.4 Reviewed Shop Drawings.
.5 Change Orders.
.6 Other Modifications to Contract.
.7 Field Test Reports.
.8 Copy of Approved Work Schedule.
.9 Health and Safety Plan and Other Safety Related Documents.
.10 Manufacturers' installation and application instructions
.11 Other documents as specified.

1.14 DRAWINGS

.1 Additional Drawings

Departmental Representative may furnish additional drawings for clarification of the Contract Documents. These additional drawings have same meaning and intent as if they were included with plans referred to in Contract drawings.

.2 Design and Shop Drawings

The Contractor shall allow a minimum of five (5) days for review each shop drawing/submission, etc.

The Contractor is to work closely with the Departmental Representative to ensure total co-ordination of all design aspects of the project.

1.15 RECORD DOCUMENTS

.1 Record information on a set of as built drawings and in a copy of a Project Manual. A digital and hard copy of these drawings are to be supplied to the Department Representative.
.2 Record information concurrently with construction progress. Do not conceal work until required information is recorded.
.3 Specifications: legibly mark each item to record actual construction including manufacturer, trade name, and catalog number of each project actually installed.
.4 Other Documents: Maintain manufacturer's field test records and any other documents required by individual contract documents.

PART 1 GENERAL

1.1 ACCESS AND EGRESS

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

1.2 USE OF SITE AND FACILITIES

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

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

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

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

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

1.3 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

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

.2 No alterations are permitted to existing timbers, structure, or façade without project manager's approval.

1.4 EXISTING SERVICES

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

.2 Where Work involves breaking into or connecting to existing services, give Consultant 48 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.

.3 Provide for personnel, pedestrian and vehicular traffic.

1.5 SPECIAL REQUIREMENTS

.1 Ensure that Contractor personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.

.2 Keep within limits of work and avenues of ingress and egress.

1.6 BUILDING SMOKING ENVIRONMENT

.1 Comply with smoking restrictions.

PART 2 PRODUCTS

1.1 NOT USED

PAST 3 EXECUTION

NOT USED

END OF SECTION

PART 1 GENERAL

1.1 ADMINISTRATIVE

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

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

.3 Present shop drawings and product data in SI Metric units.

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

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

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

.7 Verify measurements in field so as to ensure that adjacent Work is not affected.

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

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

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

1.2 SHOP DRAWINGS AND PRODUCT DATA

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

.2 Submit drawings stamped and signed by professional engineer registered or licensed in Nova Scotia.

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

.4 Allow seven (7) days for Consultant's review of each submission.

.5 Adjustments made on shop drawings by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.

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

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

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

.8 Submissions include:

.1 Date and revision dates.
.2 Project title and number.
.3 Name and address of:
.1 Subcontractor.
.2 Supplier.
.3 Manufacturer.
.4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
.5 Details of appropriate portions of Work as applicable:
.1 Fabrication.
.2 Layout, showing dimensions, including identified field dimensions, and clearances.
.3 Setting or erection details.
.4 Capacities.
.5 Performance characteristics.
.6 Standards.
.7 Operating weight.
.8 Wiring diagrams.
.9 Single line and schematic diagrams.
.10 Relationship to adjacent work.

.9 After Consultant's review, distribute copies.

.10 Submit, one transparency, six (6) prints and an electronic copy of shop drawings for each requirement requested in specification Sections and as Consultant may reasonably request.

.11 Submit six (6) printed copies of test reports for requirements requested in specification Sections and as requested by Consultant.
.1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
.2 Testing must have been within 3 years of date of contract award for project.

.12 Submit six (6) printed copies of certificates for requirements requested in specification Sections and as requested by Consultant.
.1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
.2 Certificates must be dated after award of project contract complete with project name.

.13 Submit six (6) printed copies of manufacturer's instructions for requirements requested in specification Sections and as requested by Consultant.
.1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.

.14 Submit six (6) printed copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Consultant.

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

.16 Submit six (6) printed copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Consultant.

.17 Delete information not applicable to project.

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

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

PART 2 PRODUCTS

1.1 NOT USED

PART 3 EXECUTION

1.1 NOT USED

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 Health and safety considerations required to ensure that the Nova Scotia Department of Transportation and Infrastructure Renewal shows due diligence towards health and safety on construction sites.

1.2 REFERENCES

.1 Province of Nova Scotia
  .1 Occupational Health and Safety Act, S.N.S. 1996.

1.1 SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
.2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
  .1 Results of site specific safety hazard assessment.
  .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
.3 Submit four (4) copies of Contractor's authorized representative's work site health and safety inspection reports to Consultant and/or authority having jurisdiction, daily or weekly.
.4 Submit copies of reports or directions issued by Provincial safety inspectors.
.5 Submit copies of incident and accident reports.
.6 Submit WHMIS MSDS - Material Safety Data Sheets.
.7 Consultant will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within seven (7) days after receipt of plan. Revise plan as appropriate and resubmit plan to Consultant within five (5) days after receipt of comments from Consultant.
.8 Consultant's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
.9 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Consultant.
.10 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

1.1 FILING OF NOTICE

.1 File Notice of Project with Provincial authorities prior to beginning of Work.

1.2 SAFETY ASSESSMENT

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

1.3 MEETINGS

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

1.4 REGULATORY REQUIREMENTS

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

1.5 GENERAL REQUIREMENTS

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

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

1.6 RESPONSIBILITY

.1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.

.2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.7 COMPLIANCE REQUIREMENTS

.1 Comply with Occupational Health and Safety Act, Occupational Safety General Regulations, N.S. Reg.

1.8 UNFORSEEN HAZARDS

.1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province or Territory having jurisdiction and advise Consultant verbally and in writing.

1.9 HEALTH AND SAFETY CO-ORDINATOR

.1 Employ and assign to Work, competent and authorized representative as Health and Safety coordinator. Health and Safety Coordinator must:

.1 Have site-related working experience specific to activities associated with this project.

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

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

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

.5 Be on site during execution of Work and report directly to and be under direction of Registered Occupational Hygienist or Certified Industrial Hygienist and/or site supervisor.

1.10 POSTING OF DOCUMENTS

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

1.11 CORRECTION OF NON-COMPLIANCE

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

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

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

1.12 WORK STOPPAGE

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

PART 2 PRODUCTS

1.1 NOT USED

.1 Not used.

PART 3 EXECUTION

1.1 NOT USED

.1 Not used.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 Definitions:

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

.2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

1.1 ACTION AND INFORMATIONAL SUBMITTALS

.1 Prior to commencing construction activities or delivery of materials to site, complete a review of site conditions and advise Consultant of any existing environmental issues that may affect the Work, or that may be generated as part of the Work.

1.2 FIRES

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

1.3 NOTIFICATION

.1 Consultant will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.

.2 Contractor: after receipt of such notice, inform Consultant of proposed corrective action and take such action for approval by Consultant.

.3 Do not take action until after receipt of written approval by Consultant.

.4 Consultant will issue stop order of work until satisfactory corrective action has been taken.

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

PART 2 PRODUCTS

1.1 NOT USED

PART 3 EXECUTION

1.1 NOT USED

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES AND CODES

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

.2 Meet or exceed requirements of:

.1 Contract documents.

.2 Specified standards, codes and referenced documents.

1.2 HAZARDOUS MATERIAL DISCOVERY

.1 Asbestos: demolition of spray or trowel-applied asbestos is hazardous to health. Stop work immediately when material resembling spray or trowel-applied asbestos is encountered during demolition work. Notify Consultant.

.2 PCB: Polychlorinated Biphenyl: stop work immediately when material resembling Polychlorinated Biphenyl is encountered during demolition work. Notify Consultant.

.3 Mould: stop work immediately when material resembling mould is encountered during demolition work. Notify Consultant.

1.3 BUILDING SMOKING ENVIRONMENT

.1 Comply with smoking restrictions and municipal by-laws.

PART 2 PRODUCTS

1.1 NOT USED

PART 3 EXECUTION

1.1 NOT USED

END OF SECTION

PART 1 GENERAL

1.1 INSPECTION

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

.2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Consultant instructions, or law of Place of Work.

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

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

1.2 INDEPENDENT INSPECTION AGENCIES

.1 Independent Inspection/Testing Agencies will be engaged by Consultant for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Consultant.

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

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

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

1.3 ACCESS TO WORK

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

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

1.4 PROCEDURES

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

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

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

1.5 REJECTED WORK

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

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

.3 If in opinion of Consultant it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner will deduct from Contract Price difference in

value between Work performed and that called for by Contract Documents, amount of which will be determined by Consultant.

1.6 REPORTS

.1 Submit 4 copies of inspection and test reports to Consultant.

.2 Provide copies to subcontractor of work being inspected or tested or to the manufacturer or fabricator of material being inspected or tested.

PART 2 PRODUCTS

1.1 NOT USED

PART 3 EXECUTION

1.1 NOT USED

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES
- .1 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.
  - .2 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
- .2 Canadian Standards Association (CSA International)
  - .1 CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2 CSA-0121-M1978(R2003), Douglas Fir Plywood.
  - .3 CAN/CSA-S269.2-M1987(R2003), Access Scaffolding for Construction Purposes.
  - .4 CAN/CSA-Z321-96(R2001), Signs and Symbols for the Occupational Environment.

1.2 SUBMITTALS
- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

1.3 HOISTING
- .1 Provide, operate and maintain hoists cranes required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for their use of hoists.
- .2 Hoists cranes to be operated by qualified operator.
- .3 All hoists/man lifts, etc. required to elevate workers off of the ground are to be electric. Fuel power hoists/man lifts are not permitted.

1.4 SITE STORAGE/LOADING
- .1 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.
- .2 Do not load or permit to load any part of Work with weight or force that will endanger Work.

1.5 CONSTRUCTION PARKING
- .1 Parking will be permitted on site. Contractor parking must not disrupt the Owners operation of the site.

1.6 EQUIPMENT, TOOL AND MATERIALS STORAGE
- .1 Provide and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.
- .2 Locate materials not required to be stored in weatherproof sheds on site in manner to cause least interference with work activities.

1.7 SANITARY FACILITIES
- .1 The contractor must provide their own portable washroom facilities. The washrooms at the site will NOT be permitted to be used by the contractor.

1.8 CLEAN-UP
- .1 Remove construction debris, waste materials, packaging material from work site daily.
- .2 Clean dirt or mud tracked onto paved or surfaced roadways.
- .3 Store materials resulting from demolition activities that are salvageable.
- .4 Stack stored new or salvaged material not in construction facilities.

PART 2 PRODUCTS

1.1 NOT USED

PART 3 EXECUTION

1.1 NOT USED

END OF SECTION

PART 1 GENERAL

1.1 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including and other than that caused by Owner or other Contractors.
.2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Consultant. Do not burn waste materials on site, unless approved by Consultant.
.3 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
.4 Provide on-site containers for collection of waste materials and debris.
.5 Provide and use marked separate bins for recycling. Refer to Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
.6 Dispose of waste materials and debris at designated dumping areas within the Province.
.7 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
.8 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
.9 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
.10 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
.11 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.2 FINAL CLEANING

.1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
.2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
.3 Prior to final review remove surplus products, tools, construction machinery and equipment.
.4 Remove waste products and debris other than and including that caused by Owner or other Contractors.
.5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Consultant. Do not burn waste materials on site, unless approved by Consultant.
.6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
.7 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors.

1.3 WASTE MANAGEMENT AND DISPOSAL

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

PART 2 PRODUCTS

1.1 NOT USED

PART 3 EXECUTION

1.1 NOT USED

END OF SECTION

PART 1 GENERAL

1.1 ADMINISTRATIVE REQUIREMENTS

.1 Acceptance of Work Procedures:

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

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

.2 Request Consultant's inspection.

.2 Consultant's Inspection:

.1 Consultant and Contractor to inspect Work and identify defects and deficiencies.

.2 Contractor to correct Work as directed.

.3 Completion Tasks: submit written certificates in English confirming that tasks have been performed as follows:

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

.2 Defects: corrected and deficiencies completed.

.3 Equipment and systems: tested, adjusted and balanced and fully operational.

.4 Operation of systems: demonstrated to Owner's personnel.

.5 Work: complete and ready for final inspection.

.4 Final Inspection:

.1 When completion tasks are done, request final inspection of Work by Consultant, and Contractor.

.2 When Work is incomplete according to Owner and Consultant, complete outstanding items and request re-inspection.

.5 Declaration of Substantial Performance: when Consultant considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.

.6 Commencement of Lien and Warranty Periods: date of Owner's acceptance of submitted declaration of Substantial Performance to be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.

.7 Final Payment:

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

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

1.2 FINAL CLEANING

.1 Clean in accordance with Section 01 74 11 - Cleaning.

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Waste Management: waste removal to be in accordance with Section 01 74 21 - Construction/Demolition Waste Management.

PART 2 PRODUCTS

1.1 NOT USED

PART 3 EXECUTION

1.1 NOT USED

END OF SECTION

PART 1 GENERAL

1.1 ADMINISTRATIVE REQUIREMENTS
- .1 Pre-warranty Meeting:
  - .1 Convene meeting one week prior to contract completion with contractor's representative and Consultant to:
    - .1 Verify Project requirements.
    - .2 Review manufacturer's installation instructions and warranty requirements.
  - .2 Consultant to establish communication procedures for:
    - .1 Notifying construction warranty defects.
    - .2 Determine priorities for type of defects.
    - .3 Determine reasonable response time.
  - .3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.
  - .4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

1.2 ACTION AND INFORMATIONAL SUBMITTALS
- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Two weeks prior to Substantial Performance of the Work, submit to the Consultant four final copies of operating and maintenance manuals in English.
- .3 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.
- .4 Provide evidence, if requested, for type, source and quality of products supplied.

1.3 FORMAT
- .1 Organize data as instructional manual.
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf (219 x 279mm) with spine and face pockets.
- .3 When multiple binders are used correlate data into related consistent groupings.
  - .1 Identify contents of each binder on spine.
- .4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content by systems or process flow, under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab.
  - .1 Bind in with text; fold larger drawings to size of text pages.

1.4 CONTENTS - PROJECT RECORD DOCUMENTS
- .1 Table of Contents for Each Volume: provide title of project;
  - .1 Date of submission; names.
  - .2 Addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.
  - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:

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

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

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

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

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

1.5 AS -BUILT DOCUMENTS AND SAMPLES

.1 In addition to requirements in General Conditions, maintain at site for Consultant and Owner, one record copy of:

.1 Contract Drawings.

.2 Specifications.

.3 Addenda.

.4 Change Orders and other modifications to Contract.

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

.6 Field test records.

.7 Inspection certificates.

.8 Manufacturer's certificates.

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

.1 Provide files, racks, and secure storage.

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

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

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

.1 Do not use record documents for construction purposes.

.5 Keep record documents and samples available for inspection by Consultant.

1.6 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

.1 Record information on set of blue or black line opaque drawings, and in copy of Project Manual, provided by Consultant.

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

.3 Record information concurrently with construction progress.

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

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

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

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

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

.4 Field changes of dimension and detail.

.5 Changes made by change orders.

.6 Details not on original Contract Drawings.

.7 References to related shop drawings and modifications.

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

.1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
.2 Changes made by Addenda and change orders.

.6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, as required by individual specifications sections.

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

1.7 EQUIPMENT AND SYSTEMS

.1 For each item of equipment and each system include description of unit or system, and component parts.
.1 Give function, normal operation characteristics and limiting conditions.
.2 Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

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

.3 Include installed colour coded wiring diagrams.

.4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences.
.1 Include regulation, control, stopping, shut-down, and emergency instructions.
.2 Include summer, winter, and any special operating instructions.

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

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

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

.8 Include sequence of operation by controls manufacturer.

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

.10 Provide installed control diagrams by controls manufacturer.

.11 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.

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

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

.14 Include test and balancing reports as specified in Section 01 45 00 - Quality Control.

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

1.8 MAINTENANCE MATERIALS

.1 Spare Parts:
.1 Provide spare parts, in quantities specified in individual specification sections.
.2 Provide items of same manufacture and quality as items in Work.
.3 Deliver to site or a location as directed; place and store.
.4 Receive and catalogue items.
.1 Submit inventory listing to Consultant.
.2 Include approved listings in Maintenance Manual.
.5 Obtain receipt for delivered products and submit prior to final payment.

1.9 DELIVERY, STORAGE AND HANDLING

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

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

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

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

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

1.10 WARRANTIES AND BONDS

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

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

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

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

.5 Submit, warranty information made available during construction phase, to Consultant for approval prior to each monthly pay estimate.

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

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

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

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

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

.5 Co-execute submittals when required.

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

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

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

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

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

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

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

.1 Name of item.

.2 Model and serial numbers.

.3 Location where installed.

.4 Name and phone numbers of manufacturers or suppliers.

.5 Names, addresses and telephone numbers of sources of spare parts.
.6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
.7 Cross-reference to warranty certificates as applicable.
.8 Starting point and duration of warranty period.
.9 Summary of maintenance procedures required to continue warranty in force.
.10 Cross-Reference to specific pertinent Operation and Maintenance manuals.
.11 Organization, names and phone numbers of persons to call for warranty service.
.12 Typical response time and repair time expected for various warranted equipment.

.4 Contractor's plans for attendance at 4 and 9 month post-construction warranty inspections.
.5 Procedure and status of tagging of equipment covered by extended warranties.
.6 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

.10 Respond in timely manner to oral or written notification of required construction warranty repair work.
.11 Written verification to follow oral instructions.
.1 Failure to respond will be cause for the Consultant to proceed with action against Contractor.

PART 2 PRODUCTS

1.1 NOT USED

PART 3 EXECUTION

1.1 NOT USED

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL

.1 All conditions included in Section 23 05 00, Division 1 and General Conditions form part of this specification and the Contractor shall comply with all and each clause included in these Sections.

PART 2 - PRODUCTS

2.1 GENERAL

.1 All equipment and system components requiring servicing, inspection or adjusting must be easily accessible. Where equipment may be required to be removed for repair or servicing adequate access must be provided. Specifically this shall include but is not limited to valves, water hammer arresters, plumbing cleanouts, trap primers, drain points, automatic and manual air vents, controllers, controlled devices, before and after coils, filters, fans, automatic dampers, at fire dampers, fresh air and exhaust plenums, and the bottom of duct risers.

.2 All openings shall be sufficient size for both removal and maintenance of the concealed equipment, and shall be a minimum size of 610 mm x 610 mm (24" x 24") for body access and 305 mm x 305 mm (12" x 12") for hood access.

.3 Doors shall open 180 degrees, have rounded safety corners, concealed hinges, anchor straps and screwdriver cam locks.

2.2 DUCT ACCESS DOORS

.1 Access doors shall be minimum 610mm x 610mm (24"x24") for person size entry and 300mm x 300mm (12"x12") for service entry.

.2 All hardware shall be equal to Duro Dyne:

Door Sizes	Model No.
Up to 14" x 14"	SP-5
15" x 15" to 24" x 24"	SP-10
25" x 25" and Larger	SP-20

.3 Access doors downstream of heating coils in ducts shall consist of 22 gauge outside frame, 22 gauge door frame, cast vinyl gasket, piano hinge, and cam lock.

PART 3 - EXECUTION

3.1 LOCATION

.1 Location: Ensure that equipment is clearly within view and accessible for operating, inspecting, adjusting, servicing without the need for special tools. Specifically this shall include but is not limited before and after coils, fans, automatic dampers, at fire dampers, fresh air and exhaust plenums, and the bottom of duct risers.

.2 Insulated access panels will be provided there the ducts are to be insulated.

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL

.1 All conditions included in Section 23 05 00, Division 1 and General Conditions form part of this specification and the Contractor shall comply with all and each clause included in these Sections.

1.2 REFERENCE STANDARDS

.1 Conform to CHVAC-1975, CSA B54.1-1972 and ASTM C411-82.

1.3 DEFINITIONS

.1 Unless otherwise specified, terms "exposed ductwork" as used in this section shall refer to ductwork in finished spaces and shall include all areas except: furred spaces, pipe and duct shafts, unheated spaces immediately below roofs, spaces above furred ceilings, spaces over unexcavated areas, and crawl spaces. These latter areas will be referred to as "concealed spaces". Working chases or service cores shall be considered as finished spaces.

PART 2 - PRODUCTS

2.1 RIGID DUCT INSULATION

.1 Rigid duct insulation will be, rigid fibre glass board, having a minimum density of 96.12 kg/m^3 (6.0 lb/ft^3).

.2 Rigid duct insulation vapour jacket will be factory applied foil-scrim-kraft facing consisting of aluminum foil reinforced with fibre glass yarn mesh and laminated to 13.6 kg (6 lb.) chemically treated fire resistant kraft.

2.2 FLEXIBLE DUCT INSULATION

.1 Flexible duct insulation will be fibre glass, formed into a flexible blanket, having a nominal density of 12 kg/m^3 (0.75 lb/ft^3).

.2 The insulation will be furnished with a factory applied foil-scrim-kraft facing consisting of aluminum foil reinforced with fibre glass yarn mesh and laminated to 18 kg (8 lb.) chemically treated fire resistant kraft.

2.3 INSULATION COVER

.1 Canvas:

.1 Canvas insulation cover shall be ULC listed, plain weave 220 g/m^2 (8 oz.) cotton fabric.

.2 Valve bodies, elbows and fittings shall have premoulded P.V.C. or 220g/m^2 (8 oz.} canvas or pre-fabricated insulation pads.

.3 Acceptable Products: Alpha Moritea 3451-RW, Clairmont Deplay 60, S. Fattal Thermo canvas.

2.4 ACCESSORIES

.1 Stainless steel wire, 18 gauge, Type 304, dead soft annealed.

.2 Galvanized wire, 15 gauge, annealed.

.3 Stainless steel mesh, hexagonal mesh, 20 gauge, Type 204.

.4 Galvanized mesh, hexagonal mesh, 15 gauge, galvanized annealed.

.5 Aluminum straps, will be 13 mm x 0.51 mm (2" x 0.02").

.6 Stainless steel straps, will be 13 mm x 0.51 mm (2" x 0.02"), Type 304, dead soft.

.7 Lagging adhesive, will be Permastik 2001 or Sealfast 30.36.

.8 Vapour barrier mastic, will be Benjamine Foster 8207 or Flintkote 23004.

2.5 STANDARD OF ACCEPTANCE

.1 Products of the following manufacturers are acceptable:
Fibreglass Canada
Schuller
Knauf Fibre Glass
Manson
Bakor
Premier Refractories (Ceramic Fibre)
Johns Manville

PART 3 - EXECUTION

3.1 RIGID DUCT INSULATION

.1 Application:
.1 50mm (2") thick on all exposed Fresh Air ductwork.
.2 25mm (1") thick on all exposed Exhaust Air.

.2 Rigid duct insulation with canvas covering and lagging will be used on exposed ducts.

.3 Insulation will be applied with edges tightly butted and sealed with a 76mm (3") wide strip of the vapour barrier material, applied with a compatible adhesive.

.4 The insulation will be impaled on stick clips or pins welded to the duct, and secured with speed washers. Maximum spacing of pins will be 10 pins per square metre (1 pin per square foot).

.5 Penetrations of the vapour barrier will be patched with a strip of vapour barrier material.

.6 Duct insulation and vapour barrier, where applicable, shall be continuous through walls and floor openings, except at fire dampers.

.7 Where more than one thickness of insulation is required, stagger both longitudinal and horizontal joints.

3.2 FLEXIBLE DUCT INSULATION

.1 Application:
.1 25mm (1") thick on all concealed Exhaust Air ductwork located in attic spaces.

.2 Cut insulation slightly longer than the circumference of the duct to ensure full thickness at corners.

.3 Tightly stretch edges with staples and cover with a 76mm (3") wide strip of pressure sensitive aluminum foil tape.

.4 On ducts 457mm (18") and wider the insulation will be secured to the bottom of the ducts by means of welded pins and speed clips. Cut pins flush after the clip has been applied.

.5 Seal all joints and penetrations of the vapour barrier, including locations where it is penetrated by securing pins, with 76mm (3") pressure sensitive aluminum foil tape.

3.3 ACCESSORIES

.1 Where vapour barriers are used, wire, wire mesh and straps will be stainless steel.

.2 Where no vapour barrier is required wire, and wire mesh will be galvanized steel. Straps may be galvanized steel or aluminum.

3.4 WORKMANSHIP

.1 Install insulation in first class manner with smooth and even surfaces. Outline of pipe and round duct insulation shall be true circular and concentric shape. Outline of fitting insulation shall be shaped to blend with adjacent covering. Do not use scrap pieces of insulation where full length section will fit.

END OF SECTION

PART 1 GENERAL

1.1 GENERAL

.1 The word "provided" shall mean "supply and install" unless otherwise indicated.

.2 Provide new materials, equipment and plant of proven design and quality and of current models with published ratings for which replacement parts are readily available.

1.2 DRAWINGS AND SPECIFICATIONS

.1 Not intended to show structural details or architectural features.

.2 Except where dimensioned, indicates general mechanical layouts only. Do not scale.

.3 The Mechanical Trade Contractor shall check the content of all architectural, structural, mechanical and electrical drawings and specifications, and review these documents for coordination of clearances available for equipment and services, required equipment power supplies and equipment quantities. Before proceeding, report to the Engineer any error or omission, or lack of coordination between the plans and specifications.

.4 These specifications are to be considered as an integral part of the drawings which accompany them, neither the drawings nor the specifications shall be used alone. Any item which is omitted in one but which is reasonably implied in the other, shall be considered properly and sufficiently specified and must, therefore, be provided under the Contract. The decision of the Engineer shall be final, if interpretation is required.

.5 Misinterpretation of drawings and specifications shall not relieve the Mechanical Trade Contractor of responsibility.

.6 All Mechanical Trade Contractors shall make themselves familiar with the overall intended operation of the mechanical systems prior to installation so that all necessary accessories such as dampers, vents, valves, controls, etc., can be installed during the normal progress of the work. Failure to do so will result in Mechanical Trade Contractor's responsibility in providing such devices, at his expense when the need of such devices becomes apparent during start-up.

1.3 GUARANTEES

.1 This Mechanical Trade Contractor shall guarantee all his work free from defects for a period of one (1) year, unless specifically noted otherwise, after final acceptance of such work by the Owner and shall make good all defects other than normal wear and tear during the life of the guarantee. This Mechanical Trade Contractor shall guarantee all work and equipment supplied by him to work quietly and satisfactorily and to accomplish the work for which it was installed during the life of the above guarantee. At any time during this period, he shall make any necessary changes and adjustments or replacements, to accomplish this at his own expense.

.2 Submit manufacturers' written guarantees to Architects.

.3 Bind guarantees in hard cover report binder suitable for 212 mm x 275 mm (8-1/2" x 11") sheets. Label cover "Guarantees" and show project name. Provide title sheet and table of contents.

.4 Each guarantee shall include:

- .1 Project name and address.
- .2 Guarantee time period (commencement date shall be as date shown on Project Final Certificate of Completion unless otherwise indicated).
- .3 Clear and concise definition of what is guaranteed and remedial action provided.

.4 Signatures of Mechanical Trade Contractor and a company officer of the manufacturing firm.

.5 Include all extended guarantees (and service contracts) as specified in individual sections.

1.4 PERMITS AND REGULATIONS

.1 All Mechanical Trade Contractors shall comply with all regulations of Authorities having jurisdiction, where applicable, including but not limited to the following:
- Provincial Department of Labour
- Provincial Fire Marshal
- Provincial Department of Health

.2 The Mechanical Trade Contractor shall obtain and pay for any permits required by Local Codes and Regulations and arrange for inspections.

.3 Any additional materials or labour required to conform to any of these rules and regulations will be furnished under the Contract with no additional cost to the Owner.

1.5 REFERENCE STANDARDS

.1 Use following latest editions and amendments in effect on date of Tender call:

AABC	Associated Air Balance Council
ADC	Air Diffusion Council
AMCA	Air Moving and Conditioning Association
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
CHVAC	Canadian Heating, Ventilation and Air Conditioning Code (NRC)
CSA	Canadian Standards Association
HRA	Heating, Refrigeration and Air Conditioning Institute of Canada
NBC	National Building Code of Canada
NFPA	National Fire Protection Association
SMACNA	Sheet Metal and Air Conditioning Contractors National
UL	Underwriters' Laboratories
ULC	Underwriters' Laboratories of Canada
CGSB	Canadian Government Standards Board

1.6 CO-ORDINATION

.1 Co-ordinate work with other trades to avoid conflict.

.2 Locate distribution systems, equipment and materials to provide minimum interference and maximum useable space.

.3 Co-ordinate location of duct drops, pipe drops and risers with trades erecting walls and ceilings to ensure that all pipes and ducts are concealed in walls or ceilings spaces. If space is not available in walls or ceilings, locate ducts and pipes so that they can be easily boxed in by the relevant trades. Where pipes are shown rising in concrete block walls, placement of the pipe shall be done in conjunction with the erection of the wall.

.4 Each Mechanical Trade Contractor shall consult with structural requirements and other Mechanical Trade Contractors where their respective installations conflict and shall re-route pipes or ducts or re-locate equipment as required subject to the approval of the Engineer.

.5 The Mechanical Trade Contractor shall obtain co-ordination drawings showing main conduits and piping from sprinkler, electrical and other Trades and shall be responsible for pointing out any discrepancies or reasons why they cannot be adhered to.

1.7 ALTERNATES

.1 Wherever an item or class of material is specified exclusively by trade name of maker or by catalogue reference or under "Acceptable Products", only such item shall be used unless the Architect's or Engineer's approval for an alternative is secured in writing.

.2 Should the Mechanical Trade Contractor desire to substitute another material for one or more specified by name, he shall apply in writing for such permission at least two (2) calendar days before closing date of Mechanical Trade Tenders. He shall also provide data and/or samples for the Engineer's consideration. Alternate requests will not necessarily be addressed through addendum, but will be confirmed or rejected by the Engineer in writing.

.3 Equipment submitted as alternate to that specified on the drawings or in the specifications by model number or catalogue reference must be capable of meeting the full range of operating parameters as the specified equipment. It must also be configured and set to meet the specific design point parameters as called for on the plans or in the specifications.

.4 The Mechanical Trade Contractor shall note that all layouts on the mechanical drawings are based on the specified equipment and any changes necessitated in service connections, etc., will be done at the Mechanical Trade Contractor's expense. Furthermore, if it is found that the provisions made regarding space conditions are not met, the right is reserved by the Engineers to require installation of the equipment used on the layout.

.5 Definitions:

.1 Acceptable Products - Any product mentioned may be used provided it meets or exceeds the quality, performance capability, and space requirements of the equipment shown and called for on the plans and in the specifications.

.2 Standard of Acceptance - Only the product mentioned may be used unless alternate products are approved by the Engineer.

1.8 ELECTRICAL CONNECTIONS, MOTORS AND STARTERS

.1 Where motors for fans, pumps, or other mechanical equipment is connected to Variable Speed Drives, premium efficiency inverter duty type motors are to be installed.

.2 Electrical equipment shall bear CSA Label. Obtain special inspection labels required by Provincial Authority having jurisdiction.

.3 The Mechanical Trade Contractor is to review electrical drawings and ensure that equipment power supplies match those indicated on the Electrical Trade Contractors drawings and specification. Bring all discrepancies to the attention of the Engineer prior to ordering equipment.

.4 Use 1750 rpm, open drip-proof, ball bearing motors manufactured to CEMA standard for 40oC temperature rise and designed for continuous service and vibration free, quiet operation.

.5 Conform to requirements of Canadian Electrical Code, Local and Municipal and Provincial Authorities, and specified standards.

.6 All equipment not located in mechanical rooms shall be supplied complete with a disconnect switch. Where exposed to the weather, "weatherproof" disconnects shall be provided.

1.9 CUTTING AND PATCHING

.1 Cutting and patching to be performed by the Mechanical Trade Contractor.

.2 Make every effort to minimize cutting and patching and provide dimensions, locations and other data for bases, sleeves, boxes, etc., to be built in as construction proceeds. Set sleeves and make openings in concrete forms and masonry before placing

concrete and masonry.

1.10 SLEEVES AND ESCUTCHEONS

.1 Penetrations of Fire Separations:

.1 Where ducts pass through walls or floors which provide either rated or non rated (smoke barriers), seal around openings with ULC classified fire stop material. Material shall be installed to manufacturers' recommendations and shall provide a fire rating equal to that of the separation which has been penetrated.

.2 Acceptable Products:
Dow Corning Fire Stop System
3M Fire Barrier Penetration Sealing System
Bio-Fire Biotherm or Bio-K10 (Supplied by Wormald)
Hilti Fire Stop System

1.11 BASES AND SUPPORTS

.1 Where equipment is suspended from the structure provide appropriately sized hanger rods, channel iron or angle iron hangers. Distribute the weight of the units uniformly across the structure, consistent with the design loading for the structure and as approved by the Engineer.

.2 Where structure has not been designed to support equipment, this Mechanical Trade Contractor shall provide pipe stands or angle iron supports to support the equipment from the floor.

1.12 PAINTING

.1 Ductwork and equipment identification, glue and sizing and touch-up painting is the responsibility of Division 15 Contractors.

.2 Apply to hangers, supports and equipment fabricated from ferrous metals at least one (1) coat of corrosion resistant paint before shipment to job site.

.3 Touch-up damaged finish surfaces to satisfaction of Engineer. Use primer or enamel to match original. Do not paint over nameplates.

1.13 SPECIAL TOOLS AND SPARE PARTS

.1 Furnish spare parts as follows:

.1 One fusible link per five fire dampers.

.2 Identify spare parts containers as to contents and replacement parts number.

.3 Provide one set of all tools required to service equipment as recommended by manufacturers.

.4 Furnish one grease gun and adapters to suit different types of greases and grease fittings.

.5 Upon handover of spare parts to the Owner, obtain the signature of the Owner's representative on the list of spare parts confirming receipt of the spare parts. Provide a copy of the signed list to the Engineer.

1.14 OPERATING INSTRUCTIONS AND MAINTENANCE MANUALS

.1 Provide factory trained personnel to instruct operating staff on maintenance, adjustment and operation of mechanical equipment. Instruct staff on changes or modification in equipment made under terms of guarantee.

.2 Provide instruction during regular work hours prior to acceptance and turn over to operating staff for regular operation.

.3 Prepare a maintenance schedule which will advise the Owner's staff what maintenance must be done and the suggested intervals at which it should be done.

.4 Provide three (3) copies to the Owner of the maintenance manual suitably bound with hard covers, 216mm x 279mm (8½" x 11").

Binders shall be thick enough to hold literature flat. Where necessary, provide two (2) binders.

.5 The maintenance manual shall include the following:
- .1 Have a title sheet, or sheets, preceding data on which shall be recorded Project name, date, list of contents, and Trade Contractor's name.
- .2 Be organized into applicable Sections of work with each Section separated by hard paper dividers with plastic covered tabs marked by Section.
- .3 Contain a list of local (or nearest) representative of each piece of equipment including address and phone number.
- .4 One (1) copy of each final approved shop drawing on which have been recorded changes made during fabrication and installation.
- .5 Typed or printed information and notes, and neatly drafted drawings.

.6 Maintenance and operating instructions on all building equipment supplied by the Mechanical Trade Contractor.

.7 Maintenance instructions as by the equipment manufacturer.

.8 Brochures and parts lists on all equipment as supplied by the equipment manufacturer.

.9 Sources of supply for all proprietary products used in the work.

.10 Lists of supply sources for maintenance of all equipment in the project of which more detailed information is not included above.

.11 List of recommended spare parts.

.12 Submit all guarantees and extended guarantees together in a separate binder.

.13 Material Safety Data Sheets (MSDS) for all chemicals remaining as part of the finished building (e.g. glycol, pipe treatment, etc.).

.14 Material Safety Data Sheets (MSDS) for all chemicals supplied including, but not limited to, boiler treatment, water treatment, materials in neutralizing tanks and grease interceptors, glycol, refrigerants, fuel oil, and fire extinguishing agents.

1.15 RENOVATIONS

.1 Co-ordinate the removal or shutdown of existing services with the Owner or the Owner's representative. Indicate intent to remove, disconnect existing services or equipment, and receive an affirmative written reply prior to start of such work.

.2 The drawings do not necessarily show all existing piping, ducts or equipment. Where such items are not shown to be re-used or re-located, the Contractor upon confirmation that such items are redundant shall remove them. All equipment removed shall be brought to the attention of the Owner, or his representative, who shall take possession of such items. If the Owner or his representative deems such equipment redundant, the Contractor shall remove and dispose of such items at his own cost.

.3 Maintain services to, and re-connect all equipment, ducts and pipes that remain should such services be disrupted during the renovation work.

.4 It is assumed that all pipe, duct and equipment being retained is safe and adequate. Should the Contractor discover faulty or questionable material, equipment or workmanship, he shall notify the Engineer for further instructions.

1.16 COMPLETION

.1 Nothing herein contained can be constructed to relieve the Trade from making good and perfect work in all usual details of construction and in accordance with best standard practice and in strict compliance with provisions of any and all laws and ordinances, and the rules and regulations of any duly constituted

public body having jurisdiction over this work.

.2 This Trade shall be held responsible to provide and furnish all necessary labour and to bear all expenses incidental to the satisfactory completion of the work.

1.17 CLEANING MECHANICAL EQUIPMENT BEFORE USE

.1 If ductwork is not wiped clean during installation and is not adequately sealed to prevent entry of dust and debris during construction, the Contractor will be required to properly clean the ducts prior to acceptance by the Owner.

1.18 RECORD DRAWINGS

.1 One (1) set of white prints and one (1) set of reproducibles will be provided for record drawing purposes. Maintain project "as-built" record drawings and accurately record significant deviations from the Contract Documents, caused by site condition or Contract change. Mark changes on white prints in "RED". At the completion of the projects, and prior to final inspection, neatly transfer "as-built" corrections and notations to reproducible transparencies, and submit to the Engineer for review.

.2 Record drawings shall show inverts at the beginning and end of main storm and sanitary branches, and at the exit from the building. The dimensions off column centre lines shall also be indicated.

1.19 DEMONSTRATION OF COMPLETE SYSTEMS

.1 At the conclusion of the job, the Mechanical Trade Contractor shall review and demonstrate to the Owner all equipment and their respective functions and operation. Such demonstration shall be provided for such reasonable periods of time as the complexity of the job warrants, and as approved by the Engineer. Such review and demonstration shall be made by an authorized representative of the Mechanical Trade Contractor, fully knowledgeable of the project, it's installation and operation.

.2 Provide the Engineer with a schedule of system demonstration at least two (2) weeks prior to demonstration.

1.20 MANUFACTURERS REVIEW

.1 It shall be the responsibility of the Mechanical Contractor to have the equipment supplier or his representative to review all proposed connections, clearances, sizes, valves, breakers, etc. including wire and pipe sizes to his equipment before installation commences. At that time, he shall inform the Engineer of any changes required to make the equipment function satisfactorily.

.2 Provide the Mechanical Trade Contractor with a letter accepting all connections as proposed and where required recommend necessary changes.

.3 If any changes or additional material and labour are required to make the equipment function properly to capacity and the manufacturer has not pointed out this work prior to commencement of work, the additional and/or corrective work shall then be done at the expense of the equipment supplier.

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL

.1 Trade contractor is responsible for proper performance of Work. Provide all labour, materials, products, equipment and services for commissioning of all new ventilation/exhaust and heating systems to ensure they are operating according to requirements of Contract Documents.

.2 Commissioning of the mechanical systems will be the responsibility of the Mechanical Trade Contractor.

.3 The Trade Contractors are required to bring the services of qualified, factory trained personnel on-site with respect to inspections, start-up, testing, commissioning and training where specified in the Tender document specifications and as recommended by the Manufacturer.

1.2 REFERENCES

.1 ASHRAE Guideline 0-2005-Guideline for Commissioning of HVAC Systems.

.2 SMACNA.

1.3 COMMISSIONING SUMMARY

.1 Commissioning is a prerequisite requirement for Substantial Performance of the Work application. It includes, without limitation, activities such as startup, verification, adjusting and balancing, demonstration and instructions of Owner's authorized representative(s) or other personnel designated by Engineer regarding each building system.

1.4 DEMONSTRATION AND TRAINING

.1 Instructions - General:

.1 Thoroughly instruct Owner's authorized representative(s) in safe operation of systems and equipment after installation of Work.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL

.1 All conditions included in Section 23 05 00, Division 1 and General Conditions form part of this specification and the Contractor shall comply with all and each clause included in these Sections.

PART 2 - PRODUCTS

2.1 DUCTWORK

.1 General:

.1 All ductwork and hangers shall be constructed to ASHRAE and SMACNA low pressure duct construction standards unless otherwise noted.

.2 The following duct construction is based on a maximum of 2" w.g. static pressure in the ducts.

.3 Alternate construction and reinforcing may be used provided it meets the same rigidity class that the following specification complies with.

.2 Rectangular Ductwork:

.1 Rectangular duct shall be galvanized steel. Ducts shall be fabricated according to the schedule in Appendix 15810A at the end of Part 3 of this section.

.2 Reinforcing must be attached to the duct within 2" of the corners and elsewhere at 48" centres maximum. Attachment may be spot welds, rivets or screws.

.3 Exhaust ductwork from dishwashers shall be fabricated from aluminum sheet one gauge heavier than for the same size galvanized steel duct.

.4 Hangers for rectangular duct shall be as follows:

Longest Side	Trapeze Shelf Angle	Hanger Rods	Hanger Spacing
Up to 30"	1" x 1" x 1/8"	1/4"	8'-0"
31" - 42"	1.1/4" x 1.1/4" x 1/8"	1/4"	8'-0"
43" - 60"	1.1/2" x 1.1/2" x 1/8"	3/8"	8'-0"
61" - 84"	2" x 2" x 1/8"	3/8"	5'-0"
85" and Up	2" x 2" x 1/4"	3/8"	5'-0"

.5 Hanger rods must be attached to the shelf angle within 2" of the duct on both sides.

.6 For ducts 20" and smaller, 1" wide strap hangers extending down two sides of the duct and a minimum of 6" under the bottom of the duct may be used instead of trapeze angers.

.7 Strap hangers must be attached to the duct a maximum of 2" from the corner and at maximum of 48" centres.

.8 Longitudinal joints shall be Pittsburg locked or Button punch snap lock and shall meet SMACNA Low Pressure Duct Construction Standards.

.9 Ducts 18" wide and larger shall be cross broken or beaded. Beading shall be provided a maximum of 6" from joints and at a maximum spacing of 12".

.10 On ducts which will be under negative pressure ducts will be

cross broken for inward deflection.

.11 Hangers shall be the same material as the duct.

.3 Round Duct:

.1 Round ductwork shall be galvanized steel of the following U.S. Standard gauges.

Duct Diameter	Spiral Duct Gauge	Plain Duct Gauge
3" - 8"	28	26
9" - 14"	26	26
15" - 26"	24	22
27" - 36"	22	20
37" - 50"	20	18

.2 On concealed ducts up to 16" diameter longitudinal joints are permitted, in accordance with SMACNA Type RL4 or SMACNA Type RL5.

.3 Concealed round ducts over 16" diameter and all exposed round ducts shall be factory fabricated conduit consisting of helically would galvanized iron strips with spiral lock seams. Fittings for these conduits shall be fabricated of 20 gauge galvanized sheet steel with butt welded seams of standard dimensions.

.4 Transverse joints beaded crimp joints with at least 1" lap to accommodate screws at 15" centres or a minimum of 3 per joint.

.5 Long radius elbows shall be used where space permits. Where 90deg. Take-offs are necessary, conical T=s shall be used.

.4 Mechanical Joint Ductwork:

.1 In lieu of the construction specified for galvanized rectangular ductwork, transverse joints may be made using a mechanical joint system.

.2 Installation shall be in accordance with manufacturers' recommendations.

.3 Where manufacturers' recommendations suggest sheet metal gauges lighter than that specified in Appendix 15810A, the gauges shall be equal to that specified or one (1) gauge lighter.

.4 All gaskets shall have adhesive on both sides.

.5 Acceptable Products: Ductmate 25R for up to 30_, Ductmate 35R for 31_ and larger or Nexus G and J with neoprene gaskets and HM572 sealant for bolted assemblies.

PART 3 - EXECUTION

3.1 DUCTWORK

.1 General:

.1 Ductwork at all fresh air intake and exhaust louvres from the connection at the louvre where moisture may collect, shall be welded or made suitably water tight. At these places ductwork shall be sloped towards a low point where a 1.1/4" drain with a deep seal trap shall be provided, discharging through a copper pipe to a funnel floor drain.

.2 At all locations where splitter dampers are indicated on the drawings, furnish splitter dampers with manufactured control and linkage devices. A 6.35mm (1/4") diameter steel rod shall be provided to connect the bracket and the ball joint control device for positioning the damper.

.3 At each main branch take-off and in such other locations where required to properly balance the air distribution system, furnish and install volume dampers which shall be provided with damper regulators. Where regulators are mounted on insulated ducts the regulator shall be mounted on top of the insulation.

.4 Provide access doors for access to fire dampers, dampers, coils, at intake and exhaust plenums, and where shown or directed. Access doors shall be gasketed and tight fitting.

.5 Ductwork shall be free from pulsation or objectionable noises. Should these defects appear, they shall be corrected by replacing or reinforcing the work as directed by the Engineer at the site and without charge.

.6 The dimensions of any duct must be as indicated on the drawings, except wherever any construction impediment or requirement renders such dimensions impossible, in which case it must be altered to give an effective cross sectional area equal to that which could have been obtained from the original at no cost to the Owner. Where conflicts occur with other trades, the Architect reserves the right to make changes in site and locations without extra cost.

.7 Install ductwork in so as to retain ceiling heights. Consult with the Owner.

.8 Install duct elbows having a throat radius 1.1/2 times the diameter or fabricated with square throats and backs, fitted with duct turns. Duct turns shall be fabricated with blades of approved construction.

.9 All duct joints shall be coated with duct sealer applied according to manufacturer's recommendations before assembling.

.10 Where ducts are shown passing through fire separations and at the floor, there shall be provided a continuous 38mm (1.1/2") x 38mm (1.1/2") x 6.35mm (1/4") galvanized angle iron frame which shall be bolted to the construction and made air tight to the same by applying caulking compound. Sheet metal at these locations shall be bolted to the angle iron.

.11 All ductwork shall be securely hung from the building structure using approved hangers.

.12 Where ducts over 610mm (24") wide pass through masonry walls, provide lintels and a continuous (12" x 12" x 1/4") galvanized steel angle from bolted to the construction and sealed with caulking compound. Bolt ductwork to angle iron.

.2 Round Ductwork:

.1 Where space permits round ducts of equal air carrying capacity may be used in place of rectangular ducts.

.2 Long radius elbows shall be used where space permits. Where space is limited use maximum radius possible.

.3 90 degree branch take-offs shall be made with conical "T"'s.

.4 Where space permits branch 45 degree conical branch take-offs shall be used.

.5 Balancing dampers shall be provided in all take-offs from mains or branch mains.

3.2 CONSTRUCTION

.1 Galvanized Steel Ducts:

For Low Pressure Up to (2") S.P.

Duct Size		Transverse Joints		Reinforcing	
Longest Side	Duct Gauge	Short Side	Longest Side	Size	Spacing
Up to (12") (305 mm)	28	T1, T6	T1, T6	None	
13"-18") (330-457 mm)	22	T1, T6	T1, T6	None	
	26	T1, T6	T1, T6	(3/4" x ¾") (19 x 19 mm) x 20 Ga. L	Each Joint Max. (8'-0")(2438 mm)
	26	T10	T10	None	
(19"-30") (483-762 mm)	24	T10	T10	None	
		T1, T6	T1, T6	(1" x 1")(25 x 25 mm) x 20 Ga. L	Each Joint Max. (8'-0")(2438 mm)
(31"-48") (787-1219 mm)	24	T10	T10	None	Each Joint Max. (5'-0")(1524 mm)
		T1, T6	T1, T6	(1¼" x 1¼") (32 x 32 mm) x 20 Ga. L	Each Joint Max. (5'-0")(1524 mm)
(49"-60") (1245-1524 mm)	22	T1, T6	T1, T6	(1¼" x 1 ¼"x 1/8")(32 x 32 x 3.18 mm) L	Each Joint Max. (5'-0")(1524 mm)
(61"-84") (1549-2134 mm)	20	T1, T6	T1, T6	(2" x 2" x 1/8")(50 x 50 x 3.18 mm) L	Each Joint Max. (4'-0")(1219 mm)

T1 - Drive slip
T6 - Hemmed S slip
T10 - Standing S

Reinforcing must be maximum of (3")(75 mm) from the joint.
"T" joints must be used in place of the T10 joints.

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL
- .1 Contractor shall comply with all and each clause included in these Sections.

PART 2 - PRODUCTS

2.1 DUCT SEALERS AND TAPES
- .1 Duct sealers will consist of woven fabric material coated with a sealant which will be:
  - .1 Water resistant.
  - .2 Compatible with duct materials.
  - .3 Suitable for the service involved.
  - .4 Meet ULC S102 (1975).
  - .5 Flame spread ratings of 25 and maximum smoke developed rating of 50.
  - .6 Non toxic.
- .2 Acceptable Products: Hardcast #321, Trans Continental Tough-Bond, Flexmaster Ductbond, Bakor Duck-Seal.

2.2 FLEXIBLE CONNECTIONS
- .1 Flexible connections shall be as follows:
  - .1 Heavy glass fabric double coated with neoprene.
  - .2 Non-combustible.
  - .3 Weatherproof and air tight.
  - .4 Resistant to acids, grease, alkaline, oil and gasoline.
  - .5 Acceptable for temperatures of up to 93°C.
- .2 The flexible connections will be pre-assembled of 24 gauge galvanized metal clinched by means of a double lock seam to each side of the fabric.
- .3 Acceptable Products: Duro Dyne, Neoprene.

PART 3 - EXECUTION

3.1 DUCT SEALERS AND TAPES
- .1 Surfaces will be cleaned and treated in accordance with manufacturer's recommendations.
- .2 Sealer will be spread on one side of the tape. The tape will be wrapped around the area to be sealed (activated side to the metal) and overlapped 50mm(2"). The exposed side of the tape will then be covered with sealer.

3.2 FLEXIBLE CONNECTIONS
- .1 Flexible connections shall be located on the inlet and outlet connections of each fan Flexible connections shall provide a minimum 3" of fabric between the metal ends whether the equipment is on or off and a ground strap.

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL

.1 All conditions included in Division 1 and General Conditions form part of this specification and the Contractor shall comply with all and each clause included in these Sections.

PART 2 - PRODUCTS

2.1 DAMPERS

.1 Control and shut-off dampers shall be as follows:

.1 Minimum 12 gauge extruded aluminum frames and air foil blades. Frames shall be 4" deep. Blades shall be 16 gauge and shall not exceed 6" wide or 4ft long. Modular maximum size is 4ft x 4ft. Multiple sections shall have stiffening mullions and jack shafts.

.2 Extruded synthetic rubber blade and frame seals.

.3 Aluminum and corrosion resistant zinc plated steel linkage located out of the air stream.

.4 Celcon inner bearing in a polycarbonate outer bearing complete with a 2" shaft..

.5 Leakage shall not exceed 0.6% of rated air flow at 10" w.g. across damper.

.6 Pressure drop shall not exceed 0.036" w.g. at 1000 fpm face velocity for a 24" x 24" damper.

.7 Standard of Acceptance: Tamco Series 1000, Nailor Industries, Ruskin.

2.2 BACK DRAFT DAMPERS

.1 Backdraft dampers meeting the following specifications shall be furnished and installed where shown on plans:

.1 Dampers shall consist of: 6063T5 extruded aluminum channel frame (0.063 in. [1.6mm] thick) with 2 in. (51mm) depth;

.2 Blades from 0.050 in. (1.3mm) 6063T5 extruded aluminum; synthetic polycarbonate axle bearings;

.3 Damper shall be equipped with extruded vinyl blade seals; and internal in. (3mm) aluminum linkage.

.4 Damper shall be suitable for pressures to 2.5 in. wg (623 Pa), velocities to 2000 fpm (10.2m/s) and temperatures to 180°F (82°C).

.5 Testing and ratings to be in accordance with AMCA Standard 500-D.

2.3 FIRE DAMPERS & FIRE STOP FLAPS

.1 Fire dampers and fire stop flaps shall be made of the same materials as the duct. Blades shall be hinged on brass or bronze bearings and shall be counter weighed when necessary to ensure closing. Damper shall close against an angle stop with a spring catch. Dampers shall close in the direction of the air flow.

.2 Fire dampers and fire stop flaps shall be held open by suitable approved fusible links.

.3 Where supply and/or return registers are installed in fire partitions, the opposed blade volume damper part of the register may be use as a fire damper provided dampers are steel, c/w fusible link and of approved gauges as noted above.

.4 Fire dampers and fire stop flaps shall be ULC approved.

.5 Shop fabricated dampers will not be accepted.

.6 Acceptable Products: Fire Ball, Canadian Advance Air, Penn, Farr, Air Balance of Canada, Controlled Air, Ruskin, Nailor Industries.

PART 3 - EXECUTION

3.1 DAMPERS

.1 Control dampers shall be as called for in control section. All control dampers not part of manufactured mixing boxes shall be supplied by the Control Supplier and installed by this Section.

.2 Opposed blade balancing dampers with locking quadrant shall be provided where shown.

.3 All exhaust air systems, including roof and wall exhausters, shall be complete with automatic backdraft dampers supplied and installed by the Contractor or motorized dampers.

.4 Install dampers at fresh air intakes and exhaust louvers, goosenecks, hoods, etc..

3.2 BACKDRAFT DAMPERS

.1 Install backdraft dampers in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.

.2 All dampers are to be vibration free and supported at both ends.

3.3 FIRE DAMPERS

.1 Supply and install fire dampers in all ductwork penetrating fire rated separations, such as Boiler Rooms.

.2 Each damper shall be provided with a suitably located access door to allow resetting of dampers. Access doors shall be supplied with removable covers.

.3 Where guillotine dampers are used on ducts less than 457mm (18"), the blades shall be completely out of the air stream when open.

.4 Fire dampers shall be located within the fire separation.

.5 Fire stops shall be provided where ceilings forming part of the fire rated assembly are penetrated. Protect the steel flange of diffusers installed in this application with a fire blanket.

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL

.1 All conditions included in Division 1 and General Conditions form part of this specification and the Contractor shall comply with all and each clause included in these Sections.

PART 2 - PRODUCTS

2.1 FANS - GENERAL

.1 Where fan motors are to be connected to Variable Frequency Drives, the motors are to be premium efficiency inverter duty type.

.2 Fans shall be of the size and capacity as indicated. Motor sheave shall be adjustable and sized so that specified speed is in the mid range of the pulley.

.3 Provide fan curves and acoustic data as part of shop drawings.

.4 Motors shall be sized so that they draw no more than 75% of their rated maximum amp draw at design conditions.

.5 All units shall have spring type vibration isolators so that vibration cannot be transmitted to building from structure. Fans to be complete with flexible connections as specified.

.6 Unit shall be suitable for mounting as shown on the drawings and where required shall be complete with adequate structural legs. Casings shall be constructed of heavy gauge steel panels, suitably reinforced with steel channels and angles to prevent vibration and noise.

.7 Provide units 3 HP and larger with multi-belt V-belt drive including belts and variable pitch sheaves. Grease lubricated ball bearings with nipples extended to an accessible location.

.8 All fan wheels will be dynamically balanced.

.9 All fans will be complete with factory applied primer.

.10 All internal bearings to have extended grease lines to the casing exterior.

.11 All exhaust air systems shall be complete with bird screen and low leakage backdraft dampers. Exhaust air systems over 150cfm shall be complete with motorized backdraft dampers although these are not required for recycle room fans witch run continuously, assistive care washrooms fans, range hood exhaust fans and laundry exhaust fans.

2.2 INLINE FANS

.1 Duct-mounted fans shall be of the centrifugal direct drive type. The fan housing shall be constructed of heavy-gauge galvanized steel.

.2 The housing interior shall be lined with 1/2 inch (13 mm) acoustical insulation.

.3 The outlet duct collar shall include an aluminum backdraft damper and shall be adaptable for horizontal or vertical discharge.

.4 Access for wiring shall be external and the motor disconnect shall be internal and of the plug-in type.

.5 The motor shall be mounted on vibration isolators.

.6 The fan wheel shall be of the forward-curved centrifugal type and dynamically balanced. All fans shall bear the AMCA Certified Ratings program AMCA Air Performance Seal and shall be UL/cUL Listed.

.7 Acceptable Products: Fantech, Greenheck, Cook, Penn Ventilators and Twin City.

PART 3 - EXECUTION

3.1 FANS

.1 All units will be provided with suitably sized spring type vibration isolators to limit the vibration transmission to the structure to 5%.

.2 Units suspended from the structure will be provided with suitably sized hanger rods and channel iron will be provided to distribute the weight of the units over an appropriate number of joists. Hangers to use a nut and a lock-nut at the bolted connections to equipment and structure.

.3 Fans will be mounted in such a manner so that maximum space is available for access to all parts requiring periodic maintenance. Co-ordinate with all other trade Contractors to ensure that maximum access is maintained.

3.2 INLINE FANS

.1 Fans shall be supported by spring vibration isolators.

.2 Install flexible connections on the inlet and outlet of the fan.

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL

.1 All conditions included in Division 1 and General Conditions form part of this specification and the Contractor shall comply with all and each clause included in these Sections.

PART 2 - PRODUCTS

2.1 LOUVRES

.1 Louvres shall be equal in performance and quality to Airolite Model 6774 or 6776 as required. Louvres will storm proof design. Louvres will be complete with bird screen. All fastening to be stainless steel or aluminum. .

.2 Louvres to be finished in a C/S Kynor-Fluorpen coating in a colour to be selected by the Architect.

.3 Louvres shall have an extended sill frame.

.4 Acceptable Products: Penn, Aerolite, Construction Specialties, Alumavent Industries, Ruskin.

PART 3 - EXECUTION

3.1 LOUVRES

.1 Fresh air intake and exhaust louvres shall be supplied by the Mechanical Contractor and installed by the General Contractor.

.2 All louvres and screens shall be attached to ductwork in a manner to give a weather-tight joint.

.3 Blank off any unused portions of louvres with a "sandwich panel" consisting of 50mm (2") thick rigid insulation between 20 gauge galvanized steel sheets.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

1.2 REFERENCES

.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.

.2 Reference Standards:
.1 Canadian Electrical Code, 23rd Edition, 2015.
.2 CSA Group
.1 CSA C22.2 No. 7-2015, Underground Systems.
.3 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 material and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Submit for review, a copy of the electrical panel distribution schedule drawings and place a set of drawings inside the distribution panel.

.4 Shop drawings:
.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Nova Scotia, Canada, where indicated.
.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 on drawings clearances for operation, maintenance, and replacement of operating equipment devices.
.5 Submit drawings to New Brunswick Electrical Safety Authority.
.6 If changes are required, notify Departmental Representative of these changes before they are made.

.7 Pay all associated fees for Electrical Permit.

.5 Certificates:

.1 Provide CSA certified equipment and material.

.2 Where CSA certified equipment and material is not available, submit such equipment and material to authority 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 Departmental Representative.

.6 Manufacturer's Field Reports: submit to Departmental Representative manufacturer's written report, within 3 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 for incorporation into manual.

.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 Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

.4 Develop Waste Reduction Workplan related to Work of this Section.

.5 Packaging Waste Management: remove for reuse pallets, crates, padding, and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235.

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
.1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

.3 Language operating requirements: provide identification nameplates and labels for control items in English and French.

.4 Use one nameplate or label for each language.

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 is are not available, obtain special approval from 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. CSA certification required for the entire assembly.

2.3 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

.1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.

2.4 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of Nova Scotia Electrical Safety Authority and Departmental Representative.

.2 Aluminum composite decal signs, minimum size 175 x 250 mm.

.3 Provide Arc Flash and Shock Hazard warning sign on electrical equipment in accordance with Nova Scotia Electrical Safety Code.

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: plastic laminate lamicoid 3 mm thick plastic engraving sheet melamine, black matt white finish face, black white 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 to be approved by Departmental Representative prior to manufacture.

.4 Allow for minimum of twenty-five (25) letters per nameplate.

.5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.6 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

.7 Terminal cabinets and pull boxes: indicate system and voltage.

.8 Panels, controllers: indicate type of equipment, voltage, phase, pole, current, point of supply and load controlled.

.9 Receptacles: indicate panel and branch circuit number. Locate on wall immediately above receptacle.

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 15 m intervals.

.3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

	Prime	Auxiliary
up to 250 V	Yellow	
Other	Green	Blue
Communication Systems		
Other	Red	Yellow
Security Systems		

2.9 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

.1 Paint indoor distribution enclosures light gray to EEMAC 2Y-1-1958.

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 Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Do complete installation in accordance with Canadian Electrical Code except where specified otherwise.

.2 Do underground systems in accordance with CAN/CSA-C22.3 No.7 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 50 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.

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 Wall receptacles:
  - .1 General: 300 mm.
  - .2 In mechanical rooms: 1400 mm.
- .2 Panelboards: as required by Code or as indicated.

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 Provide upon completion of work, load balance report as directed in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS, phase and neutral currents on panelboards, 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 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.

.4 Insulation resistance testing:
- .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
- .2 Check resistance to ground before energizing.

.3 Carry out tests in presence of Departmental Representative.

.4 Provide instruments, meters, equipment and personnel 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 Departmental Representative and operating personnel in operation, care and maintenance of systems, system equipment and components.

.2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

.3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

3.10 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 21 - Wires and Cables (0-1000 V).

1.2 REFERENCES

.1 CSA International
.1 CAN/CSA-C22.2 No. 18.4-15, Hardware For The Support Of Conduit, Tubing and Cable.
.2 CAN/CSA-C22.2 No.65-13, Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).

.2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
.1 EEMAC 1Y-2-1961, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

.3 National Electrical Manufacturers Association (NEMA)

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect wire and box connectors from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return packaging materials in accordance with Section 01 74 21 - Construction /Demolition Waste Management and Disposal.

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 Bushing stud connectors: to EEMAC 1Y-2 to consist of:
- .1 Connector body and stud clamp for stranded copper conductors.
- .2 Clamp for copper bar.
- .3 Stud clamp bolts.
- .4 Bolts for copper bar.
- .5 Sized for conductors and bars as indicated.

.3 Clamps or connectors for armoured cable, TECK cable, flexible conduit, as required to: CAN/CSA-C22.2 No.18.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors and cables and:
- .1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CAN/CSA-C22.2 No.65.
- .2 Install bushing stud connectors in accordance with EEMAC 1Y-2.

3.2 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
- .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 11 - Cleaning..
- .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 20 - Wire and Box Connectors (0-1000 V).

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).
.1 CSA C22.2 No. 0.3-09(R2014), Test Methods For Electrical Wires and Cables.

1.3 PRODUCT DATA

.1 Provide product data in accordance with Section 01 33 00 - Submittal Procedures.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Packaging Waste Management: remove for reuse packaging materials in accordance with Section 01 74 11 - Cleaning.

PART 2 - PRODUCTS

2.1 BUILDING WIRES

.1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.

.2 Copper conductors: size as indicated, with 600 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE for indoor and RWU90 XLPE for outdoor (in underground conduits) installations.

2.2 CONTROL WIRING

.1 The Contractor is responsible for the selection and routing of control cables.

.2 Control cables shall be run in conduit whereever possible.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Perform tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

3.2 GENERAL CABLE INSTALLATION

.1 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1000 V).

.2 Cable Colour Coding: to Section 26 05 00 - Common Work Results for Electrical.

.3 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.

.4 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.

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 Provide dedicated neutral for each branch circuit.

.3 In underground ducts in accordance with Section 26 05 43.01 - Installation of Cables in Trenches and in Ducts.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results For Electrical.

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 hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect hangers and supports from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

.4 Develop Waste Reduction Workplan related to Work of this Section.

.5 Packaging Waste Management: remove for reuse pallets, crates, padding, and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 SUPPORT CHANNELS

.1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted or suspended

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 Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Secure equipment to solid masonry, tile and plaster surfaces with lead anchors or nylon shields.

.2 Secure equipment to poured concrete with expandable inserts.

.3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.

.4 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

.5 Fasten exposed conduit or cables to building construction or support system using straps.
.1 One-hole malleable iron 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.

.6 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.

.7 For surface mounting of two or more conduits use channels at centre spacing in accordance with Canadian Electrical Code.

.8 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.9 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.10 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.11 Do not use supports or equipment installed for other trades for conduit or cable support.

.12 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 11 - Cleaning.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

1.2 REFERENCES

.1 Canadian Electrical Code.

1.3 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.

.3 Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures.

1.4 DELIVERY, STORAGE AND HANDLING

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

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 one spare terminals or lugs on each connection.

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 turned edge covers.

2.3 CABINETS

.1 Construction: welded sheet steel hinged door, handle, lock 2 keys, catch and sheet steel backboard.

.2 All connectors in cabinets shall be made on din rail mounted terminals.

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 Only main junction and pull boxes are indicated. Install additional pull boxes as required by Canadian Electrical Code.

3.3 IDENTIFICATION

.1 Equipment Identification: to Section 26 05 00 - Common Work Results for Electrical.

.2 Identification Labels: size 2 indicating system name voltage and phase or as indicated.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

1.2 REFERENCES

.1 Canadian Electrical Code.

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 reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 OUTLET AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with Canadian Electrical Code.

.2 102 mm square or larger outlet boxes as required.

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 Extension and plaster rings for flush mounting devices in finished plaster tile walls.

2.3 CONDUIT BOXES

.1 Cast FS or FD aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of devices.

2.4 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 35mm and pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

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 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 CAN/CSA C22.2 No. 18.1-13, Metallic Outlet Boxes.
- .2 CSA C22.2 No. 45.1-07(R2012), Electrical Rigid Metal Conduit.
- .3 CS C22.2 No. 56-13, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
- .4 CSA C22.2 No. 83-M1985(R2013), Electrical Metallic Tubing.
- .5 CSA C22.2 No. 211.2-06(R2016), Rigid PVC (unplasticized) Conduit.

1.3 WASTE MANAGEMENT AND DISPOSAL

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

.2 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 CONDUITS

.1 Rigid metal conduit: to CSA C22.2 No. 45, galvanized steel threaded.

.2 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.

.3 Rigid pvc conduit: to CSA C22.2 No. 211.2.

.4 Flexible metal conduit: to CSA C22.2 No. 56, steel aluminum or liquid-tight flexible metal.

2.2 CONDUIT FASTENINGS

.1 One hole steel straps to secure surface conduits NPS 2 50 mm and smaller.
- .1 Two hole steel straps for conduits larger than NPS 2 50 mm.

.2 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for two or more conduits at spacing in accordance with Canadian Electrical Code.

.4 Threaded rods, 6 mm diameter, to support suspended channels.

2.3 CONDUIT FITTINGS

.1 Fittings: to CAN/CSA C22.2 No. 18, 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 with insulated throat connectors and couplings for EMT.
.1 Set-screws are not acceptable.

2.4 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 unfinished areas.

.3 Surface mount conduits except in finished areas and after approval from Departmental Representative.

.4 Use rigid galvanized steel threaded conduit where specified.

.5 Use electrical metallic tubing (EMT) except in cast concrete.

.6 Use rigid pvc conduit underground.

.7 Use flexible metal conduit for connection to motors in dry areas.

.8 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.

.9 Minimum conduit size for lighting and power circuits: 21 mm.

.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 21 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 Remove and replace blocked conduit sections.
.1 Do not use liquids to clean out conduits.

.15 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 channels.

.5 Do not pass conduits through structural members except as indicated.

.6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Do not install horizontal runs in masonry walls.

.3 Do not install conduits in terrazzo or concrete toppings.

3.5 CONDUITS UNDERGROUND

.1 Slope conduits to provide drainage.

.2 Waterproof joints (pvc excepted) with heavy coat of bituminous paint.

3.6 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 26 05 00 - Common Work Results For Electrical.

1.2 REFERENCES

.1 CSA International
.1 CSA C22.2 No.42-10(R2015), General Use Receptacles, Attachment Plugs and Similar Devices.
.2 CAN/CSA C22.2 No.42.1-13, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
.3 CSA-C22.2 No. 55-15, special Use Switches.
.4 CSA-C22.2 No. 111-10(R2015), General Use Snap Switches (Bi-national Standard with UL 20).

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 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 Province of Nova Scotia, Canada.

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 wiring devices for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect wiring devices from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 RECEPTACLES

.1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, to: CSA C22.2 No.42 with following features:
.1 Ivory 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 Ivory 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.

2.2 SWITCHES

.1 20 A, 347 V single pole switches to: CSA-C22.2 No. 55 and CSA-C22.2 No. 111.

.2 15 A, 120 V single pole switches to: CSA-C22.2 No. 55 and CSA-C22.2 No. 111.

.3 Manually operated general purpose as switches with following features:
.1 Terminal holes approved for No. 10 AWG wire.
.2 Silver alloy contacts.
.3 Urea of melamine moulding for parts subject to carbon tracking.
.4 Suitable for back and side wiring.
.5 Ivory toggle.
.6 Horsepower rated up to 1.0 HP.

.4 Switches 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 ivory cover plates, thickness 2.5 mm for wiring devices mounted in flush-mounted outlet box.

.4 Cast cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.

.5 Weatherproof spring-loaded cast aluminum cover plates complete with gaskets for GFCI receptacles.

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 Departmental Representative.
.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

.1 Receptacles:
.1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
.2 Mount receptacles at height in accordance with Section 26 05 00 - Common Work Results for Electrical and as indicated.
.3 Install GFCI type receptacles as indicated.

.2 Switches
.1 Install single throw switches with handle in "UP" position when switch is closed. Mount toggle switches at height in accordance with Section 26 05 00 - Common Work Results - Electrical.

.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 11 - Cleaning.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
.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 RELATED REQUIREMENTS

.1 Section 26 05 00 – Common Work Results For Electrical.

PART 2 - PRODUCTS

2.1 DISCONNECT SWITCHES

.1 Fusible and non-fusible, disconnect switch in CSA Enclosure type 3R (unless noted otherwise on drawings).

.2 Provision for padlocking in on-off switch position by three locks.

.3 Mechanically interlocked door to prevent opening when handle in ON position.

.4 Fuses: size as indicated, to Section 26 28 13.01 – Fuses – Low Voltage.

.5 Fuseholders: suitable without adaptors, for type and size of fuse indicated.

.6 Quick-made, quick-break action.

.7 ON-OFF switch position indication on switch enclosure cover.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results For Electrical.

.2 Indicate name of load controlled on size 4 nameplate.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install disconnect switches complete with fuses as indicated.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 – Common Work Results For Electrical.

1.2 GENERAL

.1 This section describes the extent of services to be provided for wiring of equipment supplied by others.

.2 Within the context of this section, Others means:
.1 Other divisions of this specification (i.e.: Division 25 – Integrated Automation).
.2 The Owner, as defined in the Contract.
.3 Other contractors supplying and installing equipment to the contract.

1.3 EXTENT OF SERVICES PROVIDED

.1 The work of this contract is to include all power and control wiring of equipment which is provided by Division 26.

.2 All power and control wiring above 50 V for equipment supplied by Division 25 will be the responsibility of this contractor. Coordinate with Integrated Automation contractor for exact requirements.

.3 All control wiring 50 V and less for equipment supplied by Division 25 will be the responsibility of Division 25 - Integrated Automation Contractor. Conduit and wire associated with this is the responsibility of Division 25.

.4 All power and control wiring associated with equipment supplied by Division 01 will be the responsibility of this Contractor. Coordinate with general Contractor for exact requirements.

.5 Final connection of all wiring to equipment provided by others (except control wiring below 50 V associated with Division 25 equipment) will be by division 26. Coordinate with the provider for connection instructions.

1.4 RESPONSIBILITY OF DIVISION 26

.1 It is the responsibility of the Division 26 subcontractor to verify final requirements for wiring of all equipment noted. Verification of wiring requirements to include:
.1 Confirmation of electrical characteristics.
.2 Location of connection point.
.3 Method of connection (i.e. direct or plug-in etc.)

.2 Obtain and become familiar with shop drawings for all relevant equipment

.3 No claim for extra will be entertained for wiring equipment which has been indicated, or changes to installed wiring where installation proceeded prior to verification of electrical requirements.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not used.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 – Common Work Results For Electrical.

.2 Section 26 24 19 – Motor Control Centres.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)
- .1 CSA C22.2 No. 12 – Industrial Control Equipment.

1.3 SUBMITTALS

.1 Indicate:
- .1 Mounting method and dimensions.
- .2 Starter size and type.
- .3 Layout of identified internal and front panel components.
- .4 Enclosure types.
- .5 Wiring diagram for each type of starter.
- .6 Interconnection diagrams.

.2 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Nova Scotia.

1.4 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance data for motor starters for incorporation into manual specified in Division 01 (Schedule D).

.2 Include operation and maintenance data for each type and style of starter.

1.5 EXTRA MATERIALS

.1 Provide maintenance materials in accordance with Division 01 (Schedule D).

.2 Provide listed spare parts for each different size and type of starter:
- .1 2 contacts, stationary.
- .2 2 contacts, movable.
- .3 1 contact, auxiliary.
- .4 1 control transformer.
- .5 1 operating coil.
- .6 2 fuses.
- .7 10% indicating lamp bulbs used.
- .8 overload relays.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Starters: in accordance with CSA C22.22 No. 14.

2.2 MANUAL MOTOR STARTERS

.1 Single phase manual motor starters of size, type, rating, and enclosure type as indicated, with components as follows:
- .1 Switching mechanism, quick make and break.
- .2 Overload heaters in each phase, as indicated, manual reset, trip indicating handle.

.2 Accessories:
- .1 Toggle switch or pushbutton: heavy duty labelled as indicated.
- .2 Indicating light: heavy duty type and colour as indicated.
- .3 Locking tab to permit padlocking in "ON" or "OFF" position.

2.3 FULL VOLTAGE COMBINATION MAGNETIC STARTERS

.1 Combination magnetic starters of size, type, rating and enclosure type as indicated with components as follows:
- .1 Contactor solenoid operated, rapid action type.
- .2 Intelligent motor overload protective device in each phase, manually reset from outside enclosure.
- .3 Wiring and schematic diagram inside starter enclosure in visible location.
- .4 Identify each wire and terminal for external connections, within starter, with permanent number marking identical to diagram.

.2 Combination type starters to include moulded case circuit breaker with operating lever on outside of enclosure to control disconnect, and provision for:
- .1 Locking in "OFF" position with up to 3 padlocks.
- .2 Independent locking of enclosure door.
- .3 Provision for preventing switching to "ON" position while enclosure door open.

.3 Accessories:
- .1 Pushbuttons and selector switches: heavy duty, oil tight, labelled as indicated.
- .2 Indicating lights: heavy duty, oil tight type and color as indicated.
- .3 1-N/O and 1-N/C spare auxiliary contacts unless otherwise indicated.

2.4 OVERLOAD PROTECTION RELAY

.1 NEMA rated electronic, intelligent motor protection relay with the following features:
- .1 Self-powered electronic overload protection.
- .2 Adjustable trip class (NEMA 10, and NEMA 20).

.3 Phase loss (single phasing) protection.
.4 Current unbalancing protection.
.5 Monitoring capabilities to include:
.1 Motor status: running, stopped, tripped.
.2 Individual RMS phase currents

2.5 CONTROL TRANSFORMER

.1 Single phase, dry type, control transformer with primary voltage as indicated and 24 V secondary, complete with secondary fuse, installed in with starter as indicated.

.2 Size control transformer for control circuit load plus 25% spare capacity.

2.6 FINISHES

.1 Apply finishes to enclosure in accordance with Section 26 05 00 – Common Work Results - Electrical.

2.7 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results - Electrical.

.2 Manual starter designation label, white plate, black letters, size 1, engraved as indicated.

.3 Magnetic starter designation label, white plate, black letters, size 2 engraved as indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install starters, connect power and control as indicated.

.2 Ensure correct fuses and overload devices elements installed.

.3 Confirm motor nameplate and adjust overload device to suit.

3.1 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 – Common Work Results - Electrical, manufacturer's instructions and ***Division 01 (Schedule D)***.

.2 Operate switches, contactors to verify correct functioning.

.3 Perform starting and stopping sequences of contactors and relays.

.4 Check that sequence controls, interlocking with other separate related starters, equipment, control devices, operate as indicated.

END OF SECTION