ELECTRICAL ENGINEER OF RECORD

MCW Maricor
77 Vaughan Harvey Boulevard, Suite 200
Moncton, New Brunswick
E1C 0K2
Tel. (506) 857-8880

Gardiner MacNeill, P. Eng.
Electrical Engineer of Record

Date: _____

MECHANICAL ENGINEER OF RECORD

MCW Maricor
77 Vaughan Harvey Boulevard, Suite 200
Moncton, New Brunswick
E1C 0K2
Tel. (506) 857-8880

Michael Gillis, P. Eng.
Mechanical Engineer of Record

Date: _____

1.1 DESCRIPTION OF WORK

.1 In general, work under this contract consists of:

1. Replacement of Electric Fire Pumps, and all associated equipment including jockey pump and pump controllers.

1.2 RELATED SECTIONS

.1 Refer to Section 01 35 54 – Site Security Requirements for Contractors limitations within property as well as Section 01 14 10 for regular working hours.

1.3 FAMILIARIZATION WITH SITE

.1 Before submitting a bid, it is suggested that bidders visit the site to review and verify the form, nature and extent of the work, materials needed, the means of access and the temporary facilities required to perform the Work.

.2 Obtain prior permission from the Departmental Representative before carrying out such site inspection.

1.4 CODES AND STANDARDS

.1 Perform work in accordance with the latest adopted National Building Code of Canada (NBC), National Fire Code of Canada (NFC) and any other code of provincial or local application, including all amendments up to bid closing date, provided that in any case of conflict or discrepancy, the more stringent requirement shall apply.

.2 Materials and workmanship must meet or exceed requirements of specified standards, codes and referenced documents.

1.5 INTERPRETATION OF DOCUMENTS

.1 For Federal Government projects, Division 01 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.6 TERM ENGINEER

.1 Unless specifically stated otherwise, the term Engineer where used in the Specifications and on the Drawings shall mean the Departmental Representative as defined in the General Conditions of the Contract.

1.7 COST BREAKDOWN

.1 Before submitting first progress claim submit breakdown of Contract Amount in detail as directed by Departmental Representative and aggregating contract amount. Required forms will be provided for application of progress payment.

.2 List items of work numerically following the same division/section number system of the specification manual and thereafter sub-divide into major work components and building systems as directed by Departmental Representative.

.3 Upon approval, cost breakdown will be used as basis for progress payment.

1.8 DOCUMENTS REQUIRED

.1 Maintain at job site, one copy each of the following:
- .1 Contract Drawings.
- .2 Specifications.
- .3 Addenda and amendments.
- .4 Reviewed Shop Drawings.
- .5 List of outstanding shop drawings.
- .6 Change Orders.
- .7 Other modifications to Contract.
- .8 Field Test Reports.
- .9 Copy of Approved Work Schedule.
- .10 Health and Safety Plan and other safety related documents.
- .11 Other documents as stipulated elsewhere in the Contract Documents.

1.9 PERMITS

.1 In accordance with the General Conditions, obtain and pay for building permit, certificates, licenses and other permits as required by municipal, provincial and federal authorities.

.2 Provide appropriate notifications of project to municipal and provincial inspection authorities.

.3 Obtain compliance certificates as prescribed by legislative and regulatory provisions of municipal, provincial and federal authorities as applicable to the performance of work.

.4 Submit to Departmental Representative, copy of application forms and approval documents received from above referenced authorities.

1.10 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

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

.2 Where security has been reduced by work of Contract, provide temporary means to maintain security.

1.11 ROUGHING-IN

.1 Be responsible for obtaining manufacturer's literature and for correct roughing-in and hook-up of equipment, fixtures and appliances.

1.12 CUTTING, FITTING AND PATCHING

.1 Ensure that cutting and patching required by all trades is included in total bid amount submitted for the work.

.2 Execute cutting, fitting and patching required to make work fit properly.

.3 Where new work connects with existing and where existing work is altered, cut, patch and make good to match existing work. This includes patching of openings in existing work resulting from removal of existing services.

.4 Do not cut, bore, or sleeve load-bearing members, except where specifically approved by Departmental Representative.

.5 Make cuts with clean, true, smooth edges. Make patches inconspicuous in final assembly.

.6 Fit work airtight to pipes, sleeves ducts and conduits.

1.13 LOCATION OF FIXTURES

.1 Location of equipment, shown or specified shall be considered as approximate. Actual location shall be as required to suit conditions at time of installation and as is reasonable.

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

.3 Inform Departmental Representative when impending installation conflicts with other new or existing components. Follow directives for actual location.

1.14 EXISTING SERVICES

.1 Where work involves breaking into or connecting to existing services, carry out work at times directed by governing authorities, with minimum of disturbance to tenant operations.

.2 Before commencing work, establish location and extent of work and notify Departmental Representative of findings.

.3 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service or facility. This includes disconnection of electrical power and communication services to tenant's operational areas. Adhere to approved schedule and provide notice to affected parties.

.4 Provide temporary services to maintain critical building and tenant systems.

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

1.15 BILINGUAL NOTATIONS

.1 Any items supplied and installed under this contract which have operating instructions on them must have such operating instructions in bilingual format - English and French.

.2 Factory embossed or recessed symbols illustrating equipment operation is an acceptable alternate to lettering.

.3 Items supplied with factory - embossed or recessed lettering in one official language with an applied sticker or decal representing the second official language is not acceptable unless the Departmental Representative gives prior approval before any such items are ordered.

.4 Internationally recognized colour coding such as red and blue center pieces for plumbing brass is acceptable.

.5 No extra costs will be paid for re-stocking or re-ordering of materials and equipment due to Contractor's failure to fully meet bilingual signage requirements specified herein.

.6 Ensure that all trades are made aware of above requirements.

1.16 BUILDING SMOKING ENVIRONMENT

.1 Smoking on premises including surrounding parking lots is strictly forbidden.

END OF SECTION

1.1 SUBMITTALS

.1 Upon acceptance of bid and prior to commencement of work, submit to Departmental Representative the following work management documents:
- .1 Work Schedule as specified herein.
- .2 Shop Drawing Submittal Schedule specified in Section 01 33 00.
- .3 Waste Management Plan specified in Section 01 74 21.
- .4 Health and Safety Plan specified in Section 01 35 29.
- .5 Hot Work Procedures specified in Section 01 35 24.
- .6 Lockout Procedures specified in Section 01 35 25.
- .7 List of workers requiring security clearance and those to be placed on Site Security Control list.

1.2 WORK SCHEDULE

.1 Upon acceptance of bid submit:
- .1 Preliminary work schedule within 7 calendar days of contract award.

.2 Schedule to indicate all calendar dates from commencement to completion of all work within the time stated in the accepted bid.

.3 Provide sufficient details in schedule to clearly illustrate entire implementation plan, depicting efficient coordination of tasks and resources, to achieve completion of work on time and permit effective monitoring of work progress in relation to established milestones.

.4 Work schedule content to include as a minimum the following:
- .1 Bar (GANTT) Charts, indicating all work activities, tasks and other project elements, their anticipated durations, planned dates for achieving key activities and major project milestones supported with;
- .2 Written narrative on key elements of work illustrated in bar chart, providing sufficient details to demonstrate a reasonable implementation plan for completion of project within designated time.
- .3 Generally Bar Charts derived from commercially available computerized project management system are preferred but not mandatory.

.5 Work schedule must take into consideration and reflect the work phasing, required sequence of work, special conditions and operational restrictions as specified below and indicated on drawings.

.6 Schedule work in cooperation with the Departmental Representative. Incorporate within Work Schedule items identified by Departmental Representative.

.7 Completed schedule shall be approved by Departmental Representative. When approved, take necessary measures to complete work within scheduled time. Do not change schedule without Departmental Representative's approval.

.8 Ensure that all sub-trades and subcontractors are made aware of the work restraints and operational restrictions specified.

.9 Schedule Updates:
- .1 Submit when requested by Departmental Representative.
- .2 Provide information and pertinent details explaining reasons for necessary changes to implementation plan.
- .3 Identify problem areas, anticipated delays, impact on schedule and proposed corrective measures to be taken.

.10 Departmental Representative will make or coordinate interim reviews and evaluate progress of work based on approved schedule in conjunction with Engineering Consultant. Frequency of such reviews will be as decided by Departmental Representative. Address and take corrective measures on items identified by reviews and as directed by Departmental Representative. Update schedule accordingly.

.11 In every instance, change or deviation from the Work Schedule, no matter how minimal the risk or impact on safety or inconvenience to tenant or public might appear, will be subject to prior review and approval by the Departmental Representative.

1.3 OPERATIONAL RESTRICTIONS

.1 The Contractor must recognize that building occupants will be affected by implementation of this Contract. The Contractor must perform the work with utmost regard to the safety and convenience of building occupants and users. All work activities must be planned and scheduled with this in mind. The Contractor will not be permitted to disturb any portion of the building without providing temporary facilities as necessary to ensure safe and direct passage through disturbed or otherwise affected areas.

.2 Contractor to meet with the Departmental Representative on a weekly basis to identify intended work areas, activities and scheduling for the coming week. An email issued to the Departmental Representative preceding the following week's Work will be required to identify potential impacts on Tenant and maintain communication.

.3 See Section 01 35 54 in regards to:
- .1 Special security requirements which must be observed in the course of work.
- .2 Provision of security personnel by Contractor as part of the Work.

.4 Facility circulation maintained:
- .1 Ensure that entrances, corridors, stairwells, fire exits and other circulation routes are maintained free and clear providing safe and uninterrupted passage for Facility users and public at all times during the entire work.
- .2 Maintain those areas clean and free of construction materials and equipment. Provide temporary dust barriers and other suitable enclosures to ensure users are not exposed to construction activities and are protected from exposure to dust, noise and hazardous conditions.

.3 Provide temporary corridors, walkways, passageways, access to offices, etc. when required due to nature of work. Such circulation routes must be constructed to barrier free requirements unless approved otherwise by Departmental Representative.

.4 Maintain fire escape routes accessible and firefighting access open all times for the duration of the project.

.5 Do not under any circumstances block fire exit doors. Do not leave construction materials or debris in corridors, stairwells building entrances and exits.

.5 Safety Signage:

.1 Provide on-site, and erect as required during progress of work, proper bilingual signage, mounted on self-supporting stands, warning the public and building occupants of construction activities in progress and alerting need to exercise caution in proceeding through disturbed areas of the facility, and directing building occupants through any detours which may be required.

.2 Signage to be professionally printed and mounted on wooden backing, coloured and to express messages as directed by the Departmental Representative.

.3 Generally maximum size of sign should be in the order of 1.0 square meters. Number of signs required will be dependent on number of areas in facility under renovation at any one time.

.4 Include costs for the supply and installation of these signs in the bid amount.

.6 Work in Occupied Areas:

.1 Where work must be carried out in an occupied area beyond the boundaries of the enclosed construction site, perform such work during the non-operational periods of the Facility.

.2 Ensure that all dust, dirt, debris, construction waste, materials, tools and equipment are completely removed at the end of each workshift. Clean and reinstate area ready for daytime use by tenant.

.3 Provide temporary dust barriers around immediate work areas and place fabric drop sheets over workstations, equipment and other furnishings located immediately adjacent to such work.

.4 Conduct work in such a way as to minimize the creation of dust and to avoid contaminating areas beyond the immediate location.

.5 Discuss and obtain Departmental Representative's approval beforehand on the type and extent of dust barriers, protective devices and measures needed.

.6 Be responsible for temporarily moving office furnishings, workstations, computer equipment and other objects as needed to gain access and conduct work. Reinstall all dislocated items at end of each workshift making the area operational again.

.7 Disconnect and reconnect any power and communications systems feeding workstations as required.

.8 Clean such areas as well as those corridors and routes used to gain entry and access.

.7 Cleaning of tenant occupied areas used by Contractor:

.1 Clean lobbies, corridors, stairs and other circulation routes used by workers to gain access to work by conducting cleaning, vacuuming and washing of floors, walls and other soiled surfaces.

1.4 PROJECT MEETINGS

.1 Schedule and administer project meetings, held on a minimum bi-weekly basis for entire duration of work and more often when directed by Departmental Representative as deemed necessary due to progress of work or particular situation.

.2 Prepare agenda for meetings.

.3 Notify participants in writing 4 days in advance of meeting date.

.1 Ensure attendance of all subcontractors.

.2 Departmental Representative will provide list of other attendees to be notified.

.4 Hold meetings at project site or where approved by Departmental Representative.

.5 Preside at meetings and record minutes.

.1 Indicate significant proceedings and decisions. Identify action items by parties.

.2 Distribute to participants by mail or by e-mail within 3 calendar days after each meeting.

.3 Make revisions as directed by Departmental Representative.

1.5 WORK COORDINATION

.1 General Contractor is responsible for coordinating the work of the various trades and predetermining where the work of such trades interfaces with each other.

.1 Designate one person from own employ having overall responsibility to review contract documents and shop drawings, plan and manage such coordination.

.2 General Contractor shall convene meetings between trades whose work interfaces and ensure that they are fully aware of the areas and the extent of where interfacing is required.

.1 Provide each trade with the plans and specs of the interfacing trade, as required, to assist them in planning and carrying out their respective work.

.2 Develop coordination drawings when deemed required illustrating potential interference between work of various trades and distribute to all affected parties including structural trade.

.1 Pay particularly close attention to overhead work above ceilings and within or near to building structural elements.

.2 Coordination drawings to identify all building elements, services lines, rough-in points and indicate from where various services are coming.

.3 Review coordination drawings at purposely called meetings. Have subcontractors sign-off on drawings and publish minutes of each meeting.

.4 Plan and coordinate work in such a way to minimize quantity of service line offsets.

.5 Submit copy of coordination drawings and meeting minutes to Departmental Representative for information purposes.

.3 Submission of shop drawings and ordering of prefabricated equipment or prebuilt components shall only occur once coordination meeting for such items has taken place between trades and all conditions affecting the work of the interfacing trades has been made known and accounted for.

.4 Work Cooperation:

.1 Ensure cooperation between trades in order to facilitate the general progress of the work and avoid situations of spatial interference.

.2 Ensure that each trade provides all other trades reasonable opportunity for the completion of the work and in such a way as to prevent unnecessary delays, cutting, patching and the need to remove and replace completed work.

.5 No extra costs to the Contract will be considered by the Departmental Representative as a result of Contractor's failure to effectively coordinate all portions of the Work. Disputes between the various trades as a result of their not being informed of the areas and extent of interface work shall be the sole responsibility of the General Contractor to be resolved at own cost.

1.6 OFF HOURS

.1 Regular working hours are from Monday to Friday 7:00 AM – 5:00 PM.

.2 Outside of these hours will require Commissionaires, and it is to be retained by Contractor which will be included in the tendered price.

.3 Visitor’s passes need to be submitted no later than 5:00 PM.

END OF SECTION

1.1 RELATED SECTIONS

.1 Section 01 78 00: Closeout Submittals.

1.2 SUBMITTAL GENERAL REQUIREMENTS

.1 Submit to Departmental Representative for review requested submittals specified in various sections of the specifications including shop drawings, samples, permits, compliance certificates, test reports, work management plans and other data required as part of the work.

.2 Submit with reasonable promptness and in orderly sequence so as to allow for Departmental Representative's review and not cause delay in Work. Failure to submit in ample time will not be considered sufficient reason for an extension of Contract time and no claim for extension by reason of such default will be allowed.

.3 Do not proceed with work until relevant submissions have been reviewed.

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

.5 Where items or information is not produced in SI Metric units, provide soft converted values.

.6 Review submittals prior to submission. Ensure that necessary requirements have been determined and verified and that each submittal has been checked and coordinated with requirements of Work and Contract Documents.

.1 Submittals not stamped, signed, dated and identified as to specific project will be returned unexamined by Departmental Representative and considered rejected.

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

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

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

.10 Submittal format:

.1 Submit paper originals, or alternatively clear and fully legible photocopies of originals. Facsimiles are not acceptable, except in special circumstances pre-approved by Departmental Representative. Poorly printed non-legible photocopies or facsimiles will not be accepted and be returned for resubmission.

.2 Submit in electronic format as pdf files. Forward pdf and in the native program format, MS Word, MS Excel and AutoCAD dwg and photograph jpg files on USB compatible with Departmental Representative encryption requirements or through email or alternate electronic file sharing service such as ftp, as directed by Departmental Representative.

.11 Make changes or revision to submissions which Departmental Representative may require, consistent with Contract Documents and resubmit as directed by Departmental Representative. When resubmitting, identify in writing of any revisions other than those requested.

.12 Keep one reviewed copy of each submittal document on site for duration of Work.

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 The term "shop drawings" means fabrication drawings, erection drawings, diagrams, illustrations, schedules, performance charts, technical product data, brochures, specifications, test reports installation instructions and other data which are to be provided by Contractor to illustrate compliance with specified materials and details of a portion of work.

.2 Shop Drawing Quantities: submit sufficient copies required by the General Contractor and sub-contractors plus 3 copies which will be retained by Departmental Representative.
- .1 Ensure sufficient copies are submitted to enable one complete set to be included in each of the maintenance manuals specified in Section 01 78 00.

.3 Shop Drawings Format:
- .1 Opaque white prints or photocopies of original drawings or standard drawings modified to clearly illustrate work specific to project requirements. Maximum sheet size to be 1000 x 707 mm.
- .2 Product Data from manufacturer's standard catalogue sheets, brochures, literature, performance charts and diagrams, used to illustrate standard manufactured products, to be original full colour brochures, clearly marked indicating applicable data and deleting information not applicable to project.
- .3 Non or poorly legible drawings, photocopies or facsimiles will not be accepted and returned not reviewed.

.4 Shop Drawings Content:
- .1 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where items or equipment attach or connect to other items or equipment, confirm that all interrelated work have been coordinated, regardless of section or trade from which the adjacent work is being supplied and installed.
- .2 Supplement manufacturer's standard drawings and literature with additional information to provide details applicable to project.
- .3 Delete information not applicable to project on all submittals.
- .4 Equipment installation/start-up data: include manufacturer's recommended installation instructions, pre-start and start-up checklists for those pieces of equipment and systems designated to be commissioned.

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

.6 Adjustments or corrections made on shop drawings by Departmental Representative are not intended to change Contract Amount. If adjustments affect value of Work, advise Departmental Representative in writing prior to proceeding with Work.

.7 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections and comments are made, fabrication and installation may proceed upon receipt of shop drawings. If shop drawings are rejected and noted to be "Resubmitted", do not proceed with that portion of work until resubmission and review of corrected shop drawings, through same submission procedures indicated above.

.8 Be advised that costs and expenses incurred by Departmental Representative to conduct more than one review of incorrectly prepared shop drawing submittal for a particular material, equipment or component of work may be assessed against the Contractor in the form of a financial holdback to the Contract.

.9 Accompany each submissions with transmittal letter, in duplicate, containing:
- .1 Date.
- .2 Project title and project number.
- .3 Contractor's name and address.
- .4 Identification and quantity of each shop drawing, product data and sample.
- .5 Other pertinent data.

.10 Submissions shall include:
- .1 Date and revision dates.
- .2 Project title and project 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 Cross references to particular details of contract drawings and specifications section number for which shop drawing submission addresses.
- .6 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.

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

.12 The review of shop drawings by the Departmental Representative or designate is for sole purpose of ascertaining conformance with general concept. This review shall not mean that Canada approves the detail design inherent in the shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting all requirements of the construction and Contract Documents. Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of all sub-trades.

1.4 SAMPLES

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

.2 Deliver samples to Departmental Representative's office or to other address as directed. Do not drop off samples at construction site except for pre-approved circumstances previously approved by Departmental Representative.

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

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

.5 Adjustments made on samples by Departmental Representative are not intended to change Contract Amount. If adjustments will result in a cost increase to the Contract notify Departmental Representative in writing prior to proceeding with Work.

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

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

END OF SECTION

1.1 SECTION INCLUDES

.1 Fire Safety Requirements.

.2 Hot Work Permit.

.3 Existing Fire Protection and Alarm Systems.

1.2 RELATED SECTIONS

.1 Section 01 35 29: Health and Safety Requirements.

1.3 REFERENCES

.1 National Fire Code 2015 edition.

.2 National Building Code 2015 edition.

1.4 DEFINITIONS

.1 Hot Work defined as:
- .1 Welding work.
- .2 Cutting of materials by use of torch or other open flame devices.
- .3 Grinding with equipment which produces sparks.
- .4 Use of open flame torches such as for roofing work.

1.5 SUBMITTALS

.1 Submit copy of Hot Work Procedures and sample of Hot Work permit to Departmental Representative for review, within 14 calendar days of acceptance of bid.

.2 Submit in accordance with section 01 33 00.

1.6 FIRE SAFETY REQUIREMENTS

.1 Implement and follow fire safety measures during Work. Comply with following:
- .1 National Fire Code, latest edition.
- .2 National Building Code, latest edition.
- .3 Federal and Provincial Occupational Health and Safety Acts and Regulations.

.2 In event of conflict between any provisions of above authorities the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, Departmental Representative will advise on the course of action to be followed.

1.7 HOT WORK AUTHORIZATION

.1 Obtain Departmental Representative's written "Authorization to Proceed" before conducting any form of Hot Work on site.

.2 To obtain authorization submit to Departmental Representative:
- .1 Contractor's typewritten Hot Work Procedures to be followed on site as specified below.
- .2 Description of the type and frequency of Hot Work required.
- .3 Sample Hot Work Permit to be used.

.3 Upon review and confirmation that effective fire safety measures will be implemented and followed during performance of hot work, Departmental Representative will give authorization to proceed as follows:
- .1 Issue one written "Authorization to Proceed" covering the entire project for duration of work or;
- .2 Subdivide the work into pre-determined, individual activities, each activity requiring a separately written authorization to proceed.

.4 Requirement for individual authorization will be based on:
- .1 Nature or phasing of work;
- .2 Risk to Facility operations;
- .3 Quantity of various trades needing to perform hot work on project or;
- .4 Other situation deemed necessary by Departmental Representative to ensure fire safety on premises.

.5 Do not perform any Hot Work until receipt of Departmental Representative's written "Authorization to Proceed" for that portion of work.

.6 In tenant occupied Facility, coordinate performance of Hot Work with Facility Manager through the Departmental Representative. When directed, perform Hot Work only during non-operative hours of the Facility. Follow Departmental Representative's directives in this regard.

1.8 HOT WORK PROCEDURES

.1 Develop and implement safety procedures and work practices to be followed during the performance of Hot Work.

.2 Hot Work Procedures to include:
- .1 Requirement to perform hazard assessment of site and immediate work area beforehand for each hot work event in accordance with Safety Plan specified in section 01 35 29.
- .2 Use of a Hot Work Permit system with individually issued permit by Contractor's Superintendent to worker or subcontractor granting permission to proceed with Hot Work.
- .3 Permit required for each Hot Work event.
- .4 Designation of a person on site as a Fire Safety Watcher responsible to conduct a fire safety watch for a minimum duration of 30-60 minutes immediately following the completion of the Hot Work.
- .5 Compliance with fire safety codes, standards and occupational health and safety regulations specified.

.6 Site specific rules and procedures in force at the site as provided by the Facility Manager.

.3 Generic procedures, if used, must be edited and supplemented with pertinent information tailored to reflect specific project conditions. Label document as being the Hot Work Procedures for this contract.

.4 Procedures shall clearly establish responsibilities of:
- .1 Worker performing hot work,
- .2 Person issuing the Hot Work Permit,
- .3 Fire Safety Watcher,
- .4 Subcontractor(s) and Contractor.

.5 Brief all workers and subcontractors on Hot Work Procedures and of Permit system. Stringently enforce compliance.

1.9 HOT WORK PERMIT

.1 Hot Work Permit to include the following:
- .1 Project name and project number;
- .2 Building name and specific room or area where hot work will be performed;
- .3 Date of issue;
- .4 Description of hot work type needed;
- .5 Special precautions to be followed, including type of fire extinguisher needed;
- .6 Name and signature of permit issuer.
- .7 Name of worker to which the permit is issued.
- .8 Permit validity period not to exceed 8 hours. Indicate start time/date and termination time/date.
- .9 Worker's signature with time/date of hot work completion.
- .10 Stipulated time period of safety watch.
- .11 Fire Safety Watcher’s signature with time/date.

.2 Permit to be typewritten form. Industry Standard forms shall only be used if all data specified above is included on form.

.3 Each Hot Work Permit to be completed in full, signed and returned to Contractor's Superintendent for safe keeping on site.

1.10 FIRE PROTECTION AND ALARM SYSTEMS

.1 Fire protection and alarm systems shall not be:
- .1 Obstructed.
- .2 Shut-off, unless approved by Departmental Representative.
- .3 Left inactive at the end of a working day or shift.

.2 Do not use fire hydrants, standpipes and hose systems for purposes other than firefighting.

.3 Costs incurred, from the fire department, Departmental Representative and tenants, resulting from negligently setting off false alarms will be charged to the Contractor in the form of financial progress payment reductions and holdback assessments against the Contract.

1.11 DOCUMENTS ON SITE

.1 Keep Hot Work Permits and Hazard assessment documentation on site for duration of Work.

.2 Upon request, make available to Departmental Representative or to authorized safety Representative for inspection.

END OF SECTION

1.1 SECTION INCLUDES

.1 Procedures to isolate and lockout electrical facility and other equipment from energy sources.

1.2 RELATED SECTIONS

.1 Section 01 35 29: Health and Safety

1.3 REFERENCES

.1 CSA C22.1, Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.

.2 CAN/CSA-C22.3 No.1-06, Overhead Systems.

.3 CSA C22.3 No.7-06, Underground Systems.

.4 COSH: Canada Occupational Health and Safety Regulations made under Part II of the Canada Labour Code.

1.4 DEFINITIONS

.1 Electrical Facility: means any system, equipment, device, apparatus, wiring, conductor, assembly or part thereof that is used for the generation, transformation, transmission, distribution, storage, control, measurement or utilization of electrical energy, and that has an amperage and voltage that is dangerous to persons.

.2 Guarantee of Isolation: means a guarantee by a competent person in control or in charge that a particular facility or equipment has been isolated.

.3 De-energize: in the electrical sense, that a piece of equipment is isolated and grounded, e.g. if the equipment is not grounded, it cannot be considered de-energized (DEAD).

.4 Guarded: means that an equipment or facility is covered, shielded, fenced, enclosed, inaccessible by location, or otherwise protected in a manner that, to the extent that is reasonably practicable, will prevent or reduce danger to any person who might touch or go near such item.

.5 Isolate: means that an electrical facility, mechanical equipment or machinery is separated or disconnected from every source of electrical, mechanical, hydraulic, pneumatic or other kind of energy that is capable of making it dangerous.

.6 Live/alive: means that an electrical facility produces, contains, stores or is electrically connected to a source of alternating or direct current of an amperage and voltage that is dangerous or contains any hydraulic, pneumatic or other kind of energy that is capable of making the facility dangerous to persons.

1.5 COMPLIANCE REQUIREMENTS

.1 Comply with the following in regards to isolation and lockout of electrical facilities and equipment:
- .1 Canadian Electrical Code.
- .2 Federal and Provincial Occupational Health and Safety Acts and Regulations.
- .3 Regulations and code of practice as applicable to mechanical equipment or other machinery being de-energized.
- .4 Procedures specified herein.

.2 In event of conflict between any provisions of above authorities the most stringent provision will apply.

1.6 SUBMITTALS

.1 Submit copy of lockout procedures, sample of lockout permit and lockout tags proposed for use in accordance with Section 01 33 00. Submit within 14 calendar days of acceptance of bid.

1.7 ISOLATION OF EXISTING SERVICES

.1 Obtain Departmental Representative's written authorization prior to working on existing live or active electrical facilities and equipment and before proceeding with isolation of such item.

.2 To obtain authorization, submit to Departmental Representative the following documentation:
- .1 Written request to isolate the particular service or facility and;
- .2 Copy of Contractor's Lockout Procedures.

.3 Make a Request for Isolation for each event, unless directed otherwise by Departmental Representative, as follows:
- .1 Fill-out standard form in current use at the Facility as provided by Departmental Representative or;
- .2 Where no form exists, make written request indicating:
  - .1 The equipment, system or service to be isolated and its location;
  - .2 Duration of isolation period (i.e.: start time & date and completion time & date).
  - .3 Voltage of service feed to system or equipment being isolated.
  - .4 Name of person making the request.

.4 Do not proceed with isolation until receipt of written notification from Departmental Representative granting the Isolation Request and authorizing to proceed with the work.
- .1 Note that Departmental Representative may designate another person at the Facility being authorized to grant the Isolation Request.

.5 Conduct safe, orderly shut-down of equipment or facility. De-energize, isolate and lockout power and other sources of energy feeding the equipment or facility.

.6 Determine in advance, as much as possible, in cooperation with the Departmental Representative, the type and frequency of situations which will require isolation of existing services.

.7 Plan and schedule shut down of existing services in consultation with the Departmental Representative and the Facility Manager. Minimize impact and downtime of Facility operations. Follow Departmental Representative's directives in this regard.

.8 Conduct hazard assessment as part of the process in accordance with health and safety requirements specified Section 01 35 29.

1.8 LOCKOUTS

.1 De-energize, isolate and lockout electrical facility, mechanical equipment and machinery from all potential sources of energy prior to working on such items.

.2 Develop and implement clear and specific lockout procedures to be followed as part of the Work.

.3 Prepare typed written Lockout Procedures describing safe work practices, procedures, worker responsibilities and sequence of activities to be followed on site by workforce to safely isolate an active piece of equipment or electrical facility and effectively lockout and tag-out it's sources of energy.

.4 Include as part of the Lockout Procedures a system of lockout permits managed by Contractor's Superintendent or other qualified person designated by him/her as being "in-charge" at the site.

- .1 A lockout permit shall be issued to specific worker providing a Guarantee of Isolation before each event when work must be performed on a live equipment or electrical facility.
- .2 Duties of person managing the permit system to include:
  - .1 Issuance of permits and lockout tags to workers.
  - .2 Determining permit duration.
  - .3 Maintaining record of permits and tags issued.
  - .4 Making a Request for Isolation to Departmental Representative when required as specified above.
  - .5 Designating a Safety Watcher, when one is required based on type of work.
  - .6 Ensuring equipment or facility has been properly isolated.
  - .7 Collecting and safekeeping lockout tags returned by workers as a record of the event.

.5 Clearly establish, describe and allocate responsibilities of:

- .1 Workers.
- .2 Person managing the lockout permit system.
- .3 Safety Watcher.
- .4 Subcontractor(s) and General Contractor.

.6 Generic procedures, if used, must be edited and supplemented with pertinent information to reflect specific project requirements.

.1 Incorporate site specific rules and procedures in force at site as provided by Facility Manager through the Departmental Representative.

.2 Clearly label the document as being the Lockout procedures applicable to work of this contract.

.7 Use energy isolation lockout devices specifically designed and appropriate for type of facility or equipment being locked out.

.8 Use industry standard lockout tags.

.9 Provide appropriate safety grounding and guards as required.

1.9 CONFORMANCE

.1 Brief all workers and subcontractors on requirements of this section. Stringently enforce use and compliance.

1.10 DOCUMENTS ON SITE

.1 Post Lockout Procedures on site in common location for viewing by workers.

.2 Keep copies of Request for Isolation forms and lockout permits and tags issued to workers on site for full duration of Work.

.3 Upon request, make available to Departmental Representative or to authorized safety representative for inspection.

END OF SECTION

1.1 RELATED SECTIONS

.1 Section 01 35 24: Special Procedures on Fire Safety Requirements.

.2 Section 01 35 25: Special Procedures on Lockout Requirements.

1.2 DEFINITIONS

.1 COSH: Canada Occupational Health and Safety Regulations made under Part II of the Canada Labour Code.

.2 Competent Person: means a person who is:
- .1 Qualified by virtue of personal knowledge, training and experience to perform assigned work in a manner that will ensure the health and safety of persons in the workplace, and;
- .2 Knowledgeable about the provisions of occupational health and safety statutes and regulations that apply to the Work and;
- .3 Knowledgeable about potential or actual danger to health or safety associated with the Work.

.3 Medical Aid Injury: any minor injury for which medical treatment was provided and the cost of which is covered by Workers' Compensation Board of the province in which the injury was incurred.

.4 PPE: personal protective equipment.

.5 Work Site: where used in this section shall mean areas, located at the premises where Work is undertaken, used by Contractor to perform all of the activities associated with the performance of the Work.

1.3 SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00.

.2 Submit site-specific Health and Safety Plan prior to commencement of Work.
- .1 Submit within 7 work days of notification of Bid Acceptance. Allow for 5-10 days for Department review and recommendations prior to the commencement of work. Provide 3 copies.
- .2 Departmental Representative will review Health and Safety Plan and provide comments.
- .3 Revise the Plan as appropriate and resubmit within 5-10 work days after receipt of comments.
- .4 Departmental Representative's review and comments made of the Plan shall not be construed as an endorsement, approval or implied warranty of any kind by Canada and does not reduce Contractor's overall responsibility for Occupational Health and Safety of the Work.
- .5 Submit revisions and updates made to the Plan during the course of Work.

.3 Submit name of designated Health and Safety Site Representative and support documentation specified in the Safety Plan.

.4 Submit building permit, compliance certificates and other permits obtained.

.5 Submit copy of Letter in Good Standing from Provincial Workers Compensation or other Department of Labour organization.
.1 Submit update of Letter of Good Standing whenever expiration date occurs during the period of Work.

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

.7 Submit copies of incident reports.

.8 Submit WHMIS MSDS - Material Safety Data Sheets.

1.4 COMPLIANCE REQUIREMENTS

.1 Comply with Occupational Health and Safety Act for Province of Nova Scotia, and Regulations made pursuant to the Act.

.2 Comply with Canada Labour Code - Part II (entitled Occupational Health and Safety) and the Canada Occupational Health and Safety Regulations as well as any other regulations made pursuant to the Act.
.1 The Canada Labour Code can be viewed at: www.http://laws-lois.justice.gc.ca/eng/acts/L-2 fulltext.html.
.2 Canadian Occupational Health and Safety Regulations can be viewed at: http://laws-lois. justice.gc.ca/eng/regulations/SOR-86-304/ index.html.
.3 A copy may be obtained at: Canadian Government Publishing Public Works & Government Services Canada Ottawa, Ontario, K1A 0S9 Tel: 819-956-4800 or 1-800-635-7943 Publication No. L31-85/2000 (E or F).

.3 Treasury Board of Canada Secretariat (TBS):
.1 Treasury Board, Fire Protection Standard April 1, 2010 www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=17316&section=text.

.4 Canadian Standards Association (CSA):
.1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.

.5 Observe construction safety measures of:
.1 National Building Code 2015 Edition, Division B, Part 8.
.2 Municipal by-laws and ordinances.

.6 In case of conflict or discrepancy between above specified requirements, the more stringent shall apply.

.7 Maintain Workers Compensation Coverage in good standing for duration of Contract. Provide proof of clearance through submission of Letter in Good Standing.

.8 Medical Surveillance: Where prescribed by legislation or regulation, obtain and maintain worker medical surveillance documentation.

1.5 RESPONSIBILITY

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

.2 Comply with and enforce compliance by all workers, sub-contractors and other persons granted access to Work Site with safety requirements of Contract Documents, applicable federal, provincial, and local by-laws, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.6 SITE CONTROL AND ACCESS

.1 Control the Work and entry points to Work Site. Approve and grant access only to workers and authorized persons. Immediately stop and remove non-authorized persons.

.1 Departmental Representative will provide names of those persons authorized by Departmental Representative to enter onto Work Site and will ensure that such authorized persons have the required knowledge and training on Health and Safety pertinent to their reason for being at the site, however, Contractor remains responsible for the health and safety of authorized persons while at the Work Site.

.2 Isolate Work Site from other areas of the premises by use of appropriate means.

.1 Erect fences, hoarding, barricades and temporary lighting as required to effectively delineate the Work Site, stop non-authorized entry, and to protect pedestrians and vehicular traffic around and adjacent to the Work and create a safe environment. See Section 01 50 00 for minimum acceptable requirements.

.2 Post signage at entry points and other strategic locations indicating restricted access and conditions for access.

.3 Use professionally made signs with bilingual message in the 2 official languages or international known graphic symbols.

.3 Provide safety orientation session to persons granted access to Work Site. Advise of hazards and safety rules to be observed while on site.

.4 Ensure persons granted site access wear appropriate PPE. Supply PPE to inspection authorities who require access to conduct tests or perform inspections.

.5 Secure Work Site against entry when inactive or unoccupied and to protect persons against harm. Provide security guard where adequate protection cannot be achieved by other means.

1.7 PROTECTION

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

.2 Should unforeseen or peculiar safety related hazard or condition become evident during performance of Work, immediately take measures to rectify situation and prevent damage or harm. Advise Departmental Representative verbally and in writing.

1.8 FILING OF NOTICE

.1 File Notice of Project with pertinent provincial health and safety authorities prior to beginning of Work.
  .1 Departmental Representative will assist in locating address if needed.

1.9 PERMITS

.1 Post permits, licenses and compliance certificates, specified in Section 01 10 10, at Work Site.

.2 Where a particular permit or compliance certificate cannot be obtained, notify Departmental Representative in writing and obtain approval to proceed before carrying out applicable portion of work.

1.10 HAZARD ASSESSMENTS

.1 Perform site specific health and safety hazard assessment of the Work and its site.

.2 Carryout initial assessment prior to commencement of Work with further assessments as needed during progress of work, including when new trades and subcontractors arrive on site.

.3 Record results and address in Health and Safety Plan.

.4 Keep documentation on site for entire duration of the Work.

1.11 MEETINGS

.1 Attend pre-construction health and safety meeting, convened and chaired by Departmental Representative, prior to commencement of Work, at time, date and location determined by Departmental Representative. Ensure attendance of:
  .1 Superintendent of Work.
  .2 Designated Health & Safety Site Representative.
  .3 Subcontractors.

.2 Conduct regularly scheduled tool box and safety meetings during the Work in conformance with Occupational Health and Safety regulations.

.3 Keep documents on site.

1.12 HEALTH AND SAFETY PLAN

.1 Prior to commencement of Work, develop written Health and Safety Plan specific to the Work. Implement, maintain, and enforce Plan for entire duration of Work and until final demobilization from site.

.2 Health and Safety Plan shall include the following components:
- .1 List of health risks and safety hazards identified by hazard assessment.
- .2 Control measures used to mitigate risks and hazards identified.
- .3 On-site Contingency and Emergency Response Plan as specified below.
- .4 On-site Communication Plan as specified below.
- .5 Name of Contractor's designated Health & Safety Site Representative and information showing proof of his/her competence and reporting relationship in Contractor's company.
- .6 Names, competence and reporting relationship of other supervisory personnel used in the Work for occupational health and safety purposes.

.3 On-site Contingency and Emergency Response Plan shall include:
- .1 Operational procedures, evacuation measures and communication process to be implemented in the event of an emergency.
- .2 Evacuation Plan: site and floor plan layouts showing escape routes, marshalling areas. Details on alarm notification methods, fire drills, location of firefighting equipment and other related data.
- .3 Name, duties and responsibilities of persons designated as Emergency Warden(s) and deputies.
- .4 Emergency Contacts: name and telephone number of officials from:
  - .1 General Contractor and subcontractors.
  - .2 Pertinent Federal and Provincial Departments and Authorities having jurisdiction.
  - .3 Local emergency resource organizations.
- .5 Harmonize Plan with Facility's Emergency Response and Evacuation Plan. Departmental Representative will provide pertinent data including name of Facility Management contacts.

.4 On-site Communication Plan:
- .1 Procedures for sharing of work related safety information to workers and subcontractors, including emergency and evacuation measures.
- .2 List of critical work activities to be communicated with Facility Manager which have a risk of endangering health and safety of Facility users.

.5 Address all activities of the Work including those of subcontractors.

.6 Review Health and Safety Plan regularly during the Work. Update as conditions warrant to address emerging risks and hazards, such as whenever new trade or subcontractor arrive at Work Site.

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

.8 Post copy of the Plan, and updates, prominently on Work Site.

1.13 SAFETY SUPERVISION

.1 Employ Health & Safety Site Representative responsible for daily supervision of health and safety of the Work.

.2 Health & Safety Site Representative may be the Superintendent of the Work or other person designated by Contractor and shall be assigned the responsibility and authority to:
- .1 Implement, monitor and enforce daily compliance with health and safety requirements of the Work
- .2 Monitor and enforce Contractor's site-specific Health and Safety Plan.
- .3 Conduct site safety orientation session to persons granted access to Work Site.
- .4 Ensure that persons allowed site access are knowledgeable and trained in health and safety pertinent to their activities at the site or are escorted by a competent person while on the Work Site.
- .5 Stop the Work as deemed necessary for reasons of health and safety.

.3 Health & Safety Site Representative must:
- .1 Be qualified and competent person in occupational health and safety.
- .2 Have site-related working experience specific to activities of the Work.
- .3 Be on Work Site at all times during execution of the Work.

.4 All supervisory personnel assigned to the Work shall also be competent persons.

.5 Inspections:
- .1 Conduct regularly scheduled safety inspections of the Work on a minimum bi-weekly basis. Record deficiencies and remedial action taken.
- .2 Conduct Formal Inspections on a minimum monthly basis. Use standardized safety inspection forms. Distribute to subcontractors.
- .3 Follow-up and ensure corrective measures are taken.

.6 Cooperate with Facility's Occupational Health and Safety representative should one be designated by Departmental Representative.

.7 Keep inspection reports and supervision related documentation on site.

1.14 TRAINING

.1 Use only skilled workers on Work Site who are effectively trained in occupational health and safety procedures and practices pertinent to their assigned task.

.2 Maintain employee records and evidence of training received. Make data available to Departmental Representative upon request.

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

1.15 MINIMUM SITE SAFETY RULES

.1 Notwithstanding requirement to abide by federal and provincial health and safety regulations; ensure the following minimum safety rules are obeyed by persons granted access to Work Site:
- .1 Wear appropriate PPE pertinent to the Work or assigned task; minimum being hard hat, safety footwear, safety glasses and hearing protection.
- .2 Immediately report unsafe condition at site, near-miss accident, injury and damage.
- .3 Maintain site and storage areas in a tidy condition free of hazards causing injury.
- .4 Obey warning signs and safety tags.

.2 Brief persons of disciplinary protocols to be taken for noncompliance. Post rules on site.

1.16 CORRECTION OF NON-COMPLIANCE

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

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

.3 Departmental Representative will stop Work if non-compliance of health and safety regulations is not corrected in a timely manner.

1.17 INCIDENT REPORTING

.1 Investigate and report the following incidents to Departmental Representative:
- .1 Incidents requiring notification to Provincial Department of Occupational Safety and Health, Workers Compensation Board or to other regulatory Agency.
- .2 Medical aid injuries.
- .3 Property damage in excess of $10,000.00,
- .4 Interruptions to Facility operations resulting in an operational lost to a Federal department in excess of $5,000.00.

.2 Submit report in writing.

1.18 HAZARDOUS PRODUCTS

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS).

.2 Keep MSDS data sheets for all products delivered to site.
  .1 Post on site.
  .2 Submit copy to Departmental Representative.

1.19 CONFINED SPACES

.1 Abide by occupational health and safety regulations regarding work in confined spaces.

.2 Safety for Inspectors:
  .1 Provide PPE and training to Departmental Representative and other persons who require entry into confined space to perform inspections.
  .2 Be responsible for efficacy of equipment and safety of persons during their entry and occupancy in the confined space.

1.20 SITE RECORDS

.1 Maintain on Work Site copy of safety related documentation and reports stipulated to be produced in compliance with Acts and Regulations of authorities having jurisdiction and of those documents specified herein.

.2 Upon request, make available to Departmental Representative or authorized Safety Officer for inspection.

1.21 POSTING OF DOCUMENTS

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

.2 Post other documents as specified herein, including:
  .1 Site specific Health and Safety Plan.
  .2 WHMIS data sheets.

END OF SECTION

1.1 GENERAL

.1 Due to nature of this Facility, and client operations therein, security regulations pertaining to site will be in place during the work resulting in need for:
- .1 Control and limit movement of construction workers inside building;
- .2 Escort and continuous supervision of workers by security personnel;
- .3 Workers must undergo a security clearance process;
- .4 Specific rules and regulations as specified in this section and as directed by the Departmental Representative to be stringently followed.

.2 It is the Contractor's responsibility to:
- .1 Submit necessary documentation required and obtain security clearances for all workers;
- .2 Become familiar with and abide by security rules and regulations;
- .3 Brief all workers and subcontractors in respect of the security regulations and ensure that they abide by all rules and directives.

.3 The Departmental Representative will coordinate a pre-construction meeting between Contractor, Facility Management and Security Personnel who will provide details and directives on control and movement on site.

.4 Any infraction of site security regulations on the part of the Contractor, members of work force or any Subcontractor in his employ, could result in:
- .1 Financial penalties in the form of progress payment reduction or holdback assessments being levied against the Contractor and;
- .2 Demand immediate removal of offending party from the site.

1.2 SECURITY PERSONNEL

.1 Obtain and pay for the services of security personnel, employed by the Canadian Corps of Commissionaires to provide escort and security supervision of all workers during the work of this contract.

.2 Commissionaires employed on this project must have a current Enhanced Security Clearance status issued by PWGSC.

.3 Provide minimum of 1 Commissionaire to be on site at all times when work is carried out, having the following responsibilities:
- .1 Limit movement of workers to within the boundaries established by the Departmental Representative for each work phase;
- .2 Maintain security control list of workers authorized to be on site as determined by Contractor and the Departmental Representative;
- .3 Manage the distribution and control of worker ID tags;
- .4 Escort workers who need to circulate on site beyond the established boundaries of work, including the corridors, stairwells and elevators used for access to and from work areas.

.5 Escort and supervise short term visitors who need access to the work site such as for material deliveries or to conduct inspections.

.4 Provide additional commissionaires when required to perform supervision or escort function as may be needed due to Contractor's work operations in order that no worker is left unsupervised on beyond main lobby.

.5 Ensure Commissionaire(s) are present on site for entire work shift including work breaks and time period after workshifts until all workers have left site.

.6 Commissionaire must stay within the actual construction area and provide surveillance of all workers ensuring that security rules and requirements are obeyed and to limit movement to approved work areas of site.

.7 Commissionaire must also escort workers from approved entrance doors and work area(s).

.8 Escort and supervision of workers by Commissionaire is required at all times regardless as to whether work shifts are in the daytime or during Facility off hours.

.9 Commissionaire shall report directly to the Departmental Representative and to the Facility security personnel and ensure that site security directives are obeyed by all workers.

.1 Empower Commissionaire with authority to remove any worker deemed non-compliant with security directives.

.10 Ensure Commissionaire is fitted, and wears approved safety hard hat, safety footwear and other personnel protective equipment appropriate to work in accordance with applicable Occupational Health and Safety requirements specified.

1.3 SECURITY CLEARANCE REQUIREMENTS

.1 All persons employed by Contractor or by subcontractors who will be working on site must undergo the following check:

.1 Apply for PWGSC personnel security clearance screening and obtain a Reliability Status.

.2 Persons do not have security clearance, as specified above, will not be allowed to circulate freely in restricted areas of site and must be under constant escort and surveillance by security personnel.

.1 Restricted area defined as: all interior areas of building beyond the public lobby.

1.4 SECURITY CLEARANCE APPLICATION

.1 Within one (1) week following notification of acceptance of bid, submit application form for all workers who require security clearance.

.1 Make application for all workers as one submission to facilitate processing and minimize delays.

.2 To obtain the PWGSC Reliability Status clearance, the following information is required for each applicant:

.1 "Personnel Screening, Consent and Authorization Form" (Form No. TBS/SCT #330-23E (Rev. 2006/02) completed by each worker, http://www.tbs-sct.gc.ca/tbsf-fsct/330-23a-eng.asp

.2 Contractor Declaration to Public Works & Government Services Canada (PWGSC Security Form "A") completed by Contractor attesting to having conducted an assessment of reliability for each worker applicant verifying employment and other reference data.

.3 Proof of applicant's identity consisting of a picture ID such as a Canadian Motor Vehicle Driver's License or other similar official ID card.

.4 Proof of applicant's Canadian citizenship consisting of a provincial issued birth certificate, baptismal certificate, citizenship certificate or passport.

.5 Include both forms along with a clear legible photocopy of the citizenship and identity documents submitted as one complete package for each applicant.

.3 A sample of the abovementioned forms are included at the end of this Specification Manual for reference purposes and marked Appendix "A".

.1 Information on filling out form TBS/SCT # 330-23E are as follows:

.1 Part A: by PWGSC Project Manager;

.2 Part B: by applicant. Provide full name, including middle name (not simply and initial). Ensure addresses listed represent last five (5) years of residence and each address is fully completed including postal code. Print data in clear, legible manner.

.3 Part C: only boxes 1, 2 & 3 need to be completed, requiring applicant's initials. Name of official requested here can be PWGSC Project Manager or PWGSC Regional Security Agent provided that Contractor submits the PWGSC Security Form "A" specified above.

.4 Fingerprinting will also be required if:

.1 Applicant indicates that he/she has a previous criminal conviction on Form #330-23E;

.2 Security clearance search process results in two persons with same identity and/or same name/initials, such as having the same name.

.5 Departmental Representative will provide details as to what procedures, location and time where workers must go should fingerprints are needed.

.6 Processing Time:

.1 The PWGSC departmental processing time to obtain all security clearances is estimated to be 6-8 weeks from date of receipt of required documentation.

.2 To avoid delays, prepare worker documentation as soon as possible, however submit documentation for each applicant as one package and send information for entire workforce as one submission. Ensure forms are fully completed, signed and that all information and photo identification is clear and legible.

.3 Be aware that processing time for applicants with criminal convictions

may take longer and could extend to 6 months duration.

.1 An interview with such applicant may also be required as part of the security clearance process.

.7 Facilitate workers security clearance process as follows:

.1 Prepare comprehensive list of workers who will require security clearance throughout project, including those of subcontractors.

.2 Provide copy of list to Departmental Representative.

.3 Coordinate and expedite submission of various subcontractors.

.4 Brief and assist applicants in preparing and submitting documentation.

.5 Review documentation of each applicant for completeness before submission.

.6 Have each worker keep a copy of their completed application form in case the initial submission gets lost.

.7 Submit documentation in an organized manner with transmittal letter clearly identifying project for which worker clearance is required.

.8 Send submission(s) directly to Departmental Representative or to the approved mailing address as directed by Departmental Representative.

.9 Persons who have not been successful in obtaining security clearance, upon documentation review by PWGSC, will not be allowed further access on site and cannot work on project any longer.

1.5 SECURITY PASSES

.1 Visitor or worker ID Tags are required for all personnel requiring access inside the building beyond the main public lobby.

.2 ID Tags will be provided by the Facility Security, issued to Contractor for distribution to authorized workers which shall also be placed on the Security Control List specified below.

.3 All persons while on site, must wear the ID Tag issued to him regardless of daytime or nighttime work.

.4 Be responsible to obtain ID Tags before work commences, including those required by subcontractors, and continually control their distribution and use by workers. Submit request for tags as early as possible prior to commencement of work.

.5 For the duration of this contract, anyone not in possession of the ID Tag will not be allowed access on site.

.6 At end of project, return to Departmental Representative all tags issued to workers and to subcontractors.

.1 The Departmental Representative will levy a financial penalty in the form of a holdback assessment against the Contract for each pass not returned regardless of the reason the pass is not returned.

.7 Immediately report any lost, stolen or destroyed ID Tags to the Departmental Representative.

1.6 SECURITY CONTROL LIST

.1 Provide a list of employee names from workforce and from subcontractors who will be present at site during the course of work.

.2 List to include each person's name, address and telephone number.

.3 Submit copy of list to Departmental Representative and to Security Commissionaire for control of workers.

.4 Update list as work progresses.

.5 Ensure that each worker can provide proof of identity upon demand, when requested by Facility's Security Personnel, Departmental Representative or by Facility Management.

1.7 BUILDING ACCESS

.1 Keys and door security access cards necessary for access to restricted areas may be issued at the discretion of the Building Manager and the Departmental Representative. Follow all instructions in regard to use, care and disposition of all keys and access cards so issued.

.2 Keys and security access cards given to the Commissionaire for his sole possession, as determined by Departmental Representative, shall not under any circumstances be given to any worker or subcontractor.

.3 Do not, under any circumstances, make or allow workers to make duplicates of keys issued.

.4 At end of project, return to Departmental Representative all keys and access cards issued. Departmental Representative will deduct from final contract payment, $25.00 for each item not returned, regardless of the reason.

.5 Immediately report to Departmental Representative any lost, stolen or destroyed keys and door security access cards.

1.8 SITE SECURITY

.1 Where work of this contract requires use of a permanently locked door, it is Contractor's responsibility to ensure that door is unlocked and locked after each use or provide a competent security guard, posted at door, when door must remain open for an elongated period of time during a particular work shift.

.1 Notify Building Security when security doors will be used and stringently follow all directives to ensure building security is effectively maintained.

.2 Where work of this contract results in removal of doors or walls (providing security to the exterior or between spaces and suites), erect temporary security hoarding over openings constructed in such a way to provide the same degree of security as doors/walls removed.

.3 When work must be carried out during Off Hours or beyond the work hours previously agreed upon at start of work, provide notice within 48 hours beforehand to minimize impact on Facilities security and tenant operations.

.4 Off Hours are defined in section 01 14 10.

END OF SECTION

1.1 ABBREVIATIONS AND ACRONYMS

.1 The abbreviations and acronyms are commonly found in the Project Manual and represent the associated organizations or terms.

1.2 MATERIALS, EQUIPMENT AND METHODS

.1 A:
- .1 AC: acoustic.
- .2 AFF: above finished floor.
- .3 ADH: adhesive.
- .4 ADJ: adjustable.
- .5 A/C: air conditioner.
- .6 AL: aluminum.
- .7 AB: anchor bolt.
- .8 ANOD: anodized.
- .9 ARCH: architecture.

.2 B:
- .1 B: base.
- .2 BM: beam.
- .3 BOT: bottom.
- .4 B PL: base plate.
- .5 BRG: bearing.
- .6 BRK: brick.
- .7 BSMT: basement.
- .8 BUR: built-up roof.

.3 C:
- .1 CAL: caliper.
- .2 CB: catch basin.
- .3 CC: centre to centre.
- .4 CCN: contemplated change notice.
- .5 CEC: Canadian Electrical Code.
- .6 CL: centreline.
- .7 CLG: ceiling.
- .8 CLR: clear.
- .9 COL: column.
- .10 CONC: concrete.
- .11 CONT: continuous.
- .12 CM: centimetre. (Nursery stock).
- .13 C/W: complete with.

.4 D:
- .1 D: deep.
- .2 DEG: degree.
- .3 DIA: diameter.
- .4 DIM: dimension.

.5 E:
- .1 EA: each.
- .2 EL: elevation.
- .3 ELEC: electric.
- .4 ELEV: elevator.
- .5 EXH: exhaust.
- .6 EXIST: existing.
- .7 EXT: exterior.

.6 F:
- .1 FD: floor drain.
- .2 FEXT: fire extinguisher.
- .3 FH: fire hose.
- .4 FHC: fire hose cabinet.
- .5 FHR: fire hose rack.
- .6 FIN: finish.
- .7 FL: floor.
- .8 FLD: field.
- .9 FLUOR: fluorescent.
- .10 FR: frame.
- .11 FRR: fire resistance rating.

.7 G:
- .1 GALV: galvanized steel.
- .2 GC: General Conditions.
- .3 GFCI: ground fault circuit interrupter.

.8 H:
- .1 HB: hose bib.
- .2 HD: hand dryer.
- .3 HOR: horizontal.
- .4 HP: hydro pole.
- .5 HPA: Hamilton Port Authority.
- .6 HR: hour.
- .7 HRV: heat recovery ventilator.
- .8 HT: height.
- .9 HTR: heater.
- .10 HWT: hot water tank.
- .11 HYD: hydrant.

.9 I:
- .1 ID: inside diameter.
- .2 INS: insulation.
- .3 INTLK: interlock.

.10 J:
- .1 JT: joint.

.11 L:
- .1 LAV: lavatory.
- .2 LG: long.
- .3 LT: light.

.12 M:
- .1 MAX: maximum.
- .2 MBG: metal bar grating.
- .3 MECH: mechanical.
- .4 MET: metal.
- .5 MET FL: metal flashing.
- .6 MIN: minimum.

.13 N:
- .1 NBC: national building code.
- .2 NFC: national fire code.
- .3 NIC: not in contract.
- .4 NO: number.
- .5 NRC: noise reduction coefficient.
- .6 NTS: not to scale.

.14 O:
- .1 OC: on centre.
- .2 OD: outside diameter.
- .3 OPNG: opening.
- .4 OPR: operator.
- .5 OVHD: overhead.
- .6 OWSJ: open web steel joist.

.15 P:
- .1 PL: plate.
- .2 PREFAB: prefabricated.
- .3 PREFIN: prefinished.
- .4 PVC: polyvinyl cholide.

.16 R:
- .1 R: radius.
- .2 RA: return air.
- .3 RCPT: receptacle.
- .4 RD: roof drain.

.5 REINF: reinforced/reinforcing.
.6 REQD: required.
.7 REQT: requirement.
.8 RM: room.
.9 RO: rough opening.
.10 RTU: roof top unit.
.11 RWL: rain water leader.

.17 S:
.1 SAN SEW: sanitary sewer.
.2 SCHED: schedule.
.3 SD: smoke developed.
.4 SECT: section.
.5 SIM: similar.
.6 SL: sliding.
.7 SLR: sealer.
.8 SPEC: specification.
.9 SS: stainless steel.
.10 STD: standard.
.11 STL: steel.
.12 STC: sound transmission class.
.13 STL PL: steel plate.
.14 STR: structure or structural.
.15 ST SEW: storm sewer.

.18 T:
.1 T: top.
.2 T&B: top and bottom.
.3 TEL: telephone.
.4 THKNS: thickness.
.5 TRANSV: transverse.
.6 TYP: typical.

.19 U:
.1 U: urethane.
.2 UGRD: underground.
.3 UNO: unless noted otherwise.
.4 UOS: unless otherwise specified.
.5 U/S: underside.
.6 UR: urinal.

.20 V:
.1 VERT: vertical.

.21 W:
.1 WC: water closet.
.2 WD: wood.
.3 WH: wall hydrant.

.4 WHMIS: workplace hazardous materials information system.
.5 WP: waterproofing.
.6 WR: washroom.
.7 WT: weight.

1.3 STANDARDS ORGANIZATIONS

.1 Standards writing organizations:
.1 AA - Aluminum Association.
.2 ACPA - American Concrete Pipe Association.
.3 ANSI - American National Standards Institute.
.4 ASHRAE - American Society of Heating and Refrigerating and Air-Conditioning Engineers.
.5 ASTM - American Society for Testing and Materials.
.6 AWI/AWMAC - Architectural Woodwork Institute/Architectural Woodwork Manufacturers Association of Canada.
.7 AWPA - American Wood Preservers' Association.
.8 AWWA - American Water Works Association.
.9 BHMA - Builders Hardware Manufacturers Association.
.10 CCDC - Canadian Construction Documents Committee.
.11 CCMPA - Canadian Concrete Masonry Producers Association.
.12 CGSB - Canadian General Standards Board.
.13 CNTA - Canadian Nursery Trades Association.
.14 CPCA - Canadian Painting Contractors Association.
.15 CRCA - Canadian Roofing Contractors Association.
.16 CSA - Canadian Standards Association.
.17 CSC - Construction Specifications Canada.
.18 CSDMA - Canadian Steel Door Manufacturers Association.
.19 CSI - Construction Specifications Institute.
.20 CSSBI - Canadian Sheet Steel Building Institute.
.21 CRCA - Canadian Roofing Contractors Association.
.22 DHI - Door and Hardware Institute.
.23 EEMAC - Electrical and Electronic Manufacturer's Association of Canada.
.24 ESA - Electrical Safety Authority.
.25 FCC - Fire Commissioner of Canada.
.26 FSC - Forest Stewardship Council.
.27 GANA - Glass Association of North America.
.28 HMMA - Hollow Metal Manufacturers Association.
.29 IEEE - Institute of Electrical and Electronics Engineers Inc.
.30 ISO - International Organization for Standardization.
.31 IWFA - International Window Film Association.
.32 LEED - LEED Canada, Leadership in Energy and Environmental Design.
.33 MPI - Master Painters Institute.
.34 NAAMM - National Association of Architectural Metal Manufacturers.
.35 NCPI - National Clay Pipe Institute.
.36 NEMA - National Electrical Manufacturers Association.
.37 NFPA - National Fire Protection Association.
.38 OPSD - Ontario Provincial Standard Drawings.

.39 OPSS - Ontario Provincial Standard Specifications.
.40 PPI - Plastics Pipe Institute.
.41 SDI - Steel Door Institute.
.42 SCAQMD - South Coast Air Quality Management District.
.43 TIA - Telecommunications Industry Association.
.44 TIAC - Thermal Insulation Association of Canada.
.45 TTMAC - Terrazzo Tile and Marble Association of Canada.
.46 UL - Underwriters Laboratories.
.47 ULC - Underwriters Laboratories of Canada.
.48 US EPA - United States Environmental Protection Agency.
.49 WH - Warnock Hersey.

1.4 FEDERAL GOVERNMENT DEPARTMENTS AND AGENGIES

.1 Departments, agencies and crown corporations.
.1 CEAA - Canadian Environmental Assessment Agency.
.2 CSC - Correctional Service Canada.
.3 CRA - Canada Revenue Agency.
.4 DND - Department of National Defence.
.5 EC - Environment Canada.
.6 FHBRO - Federal Heritage Buildings Review Office.
.7 HC - Health Canada.
.8 HCD - Heritage Conservation Directorate.
.9 LC - Labour Canada.
.10 PC - Parks Canada.
.11 PWGSC - Public Works and Government Services Canada.
.12 RCMP - Royal Canadian Mounted Police.
.13 TBS - Treasury Board Secretariat.
.14 TC - Transport Canada.

1.5 UNITS OF MEASURE METRIC

.1 The following abbreviations of units of measure are commonly found in the Project Manual:
.1 C: Celsius.
.2 cm: centimetre.
.3 kg: kilogram.
.4 kg/mü: kilogram per cubic metre.
.5 kN: kilonewton.
.6 kPa: kilopascals.
.7 kw: kilowatts.
.8 l/s: litre per second.
.9 m: metre.
.10 mü: cubic metre.
.11 mg/kg: milligrams per kilogram.
.12 mg/L: milligrams per litre.
.13 mm: millimetres.
.14 MPa: megapascal.

.15 NTU: nephelometric turbidity unit.
.16 ppm: parts per million.
.17 ug/L: micrograms per litre.
.18 ug/mü: micrograms per cubic metre.

1.6 UNITS OF MEASURE IMPERIAL

.1 The following abbreviations of units of measure are commonly found in the Project Manual:
.1 F: Fahrenheit.
.2 ft: foot/feet.
.3 ga: gauge.
.4 gpm: gallons per minute.
.5 in: inches.
.6 lbs: pounds.
.7 NTU: nephelometric turbidity unit.
.8 psi: pounds-force per square inch.
.9 ppm: parts per million.

END OF SECTION

1.1 INSPECTION

.1 Give timely notice requesting inspection of Work designated for special tests, inspections or approvals by Departmental Representative or by inspection authorities having jurisdiction.

.2 In accordance with the General Conditions, Departmental Representative may order any part of Work to be examined if Work is suspected to be not in accordance with Contract Documents.

.3 If Contractor covers or permits to be covered Work designated for special tests, inspections or approvals before such is made, uncover Work until particular inspections or tests have been fully and satisfactorily completed and until such time as Departmental Representative gives permission to proceed.

.4 Pay costs to uncover and make good work disturbed by inspections and tests.

1.2 TESTING

.1 Tests on materials, equipment and building systems as specified in various sections of the Specifications is the responsibility of the Contractor except where stipulated otherwise.
  .1 Provide all necessary instruments, equipment and qualified personnel to perform tests.

.2 At completion of tests, turn over 2 sets of fully documented tests reports to the Departmental Representative. Submit in accordance with Section 01 33 00.
  .1 Obtain additional copies for inclusion of a complete set in each of the maintenance manuals specified in Section 01 78 00.

.3 Unspecified tests may also be made by Departmental Representative, at the discretion of the Departmental Representative. The costs of these tests will be paid for by the Departmental Representative.

.4 Where tests or inspections reveal work not in accordance with contract requirements, Contractor shall pay costs for additional tests and inspections incurred by Departmental Representative as required to verify acceptability of corrected work.

1.3 ACCESS TO WORK

.1 Facilitate Departmental Representative's access to Work. If part of Work is being fabricated at locations other than construction site, make preparations to allow access to such Work whenever it is in progress.

.2 Furnish labour and facility to provide access to the work being inspected and tested.

.3 Co-operate to facilitate such inspections and tests.

1.5 REJECTED WORK

.1 Remove and replace defective Work, whether result of poor workmanship, use of defective or damaged products and whether incorporated in Work or not, which has been identified by Departmental Representative as failing to conform to Contract Documents.

.2 Make good damages to new and existing construction and finishes resulting from removal or replacement of defective work.

END OF SECTION

1.1 SITE ACCESS AND PARKING

.1 The Departmental Representative will designate Contractor's access to project site as well as parking facilities for equipment and workers.

1.2 BUILDING ACCESS

.1 Use only access doors, and circulation routes within building as designated by Departmental Representative to access interior work.

1.3 CONTRACTOR'S SITE OFFICE

.1 Be responsible for and provide own site office, if required, including electricity, heat, lights and telephone. Locate site office as directed by Departmental Representative.

1.4 MATERIAL STORAGE

.1 Locate site storage trailers where directed by Departmental Representative. Place in location of least interference with existing Facility operations. Limited space may be available at the back of the building adjacent to loading docks.

.2 Material storage space on site does not exist. Coordinate delivery to minimize storage period on site before being needed for incorporation into work.

.3 Make arrangements elsewhere in the city as deemed required and pay all costs for storage of materials not ready for incorporation into work.

1.5 SANITARY FACILITIES

.1 Sanitary facilities are available at the site and may be used by Contractor's work force. Make arrangements for the use of such facilities through the Departmental Representative.

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

1.6 POWER

.1 Power supply is available and will be provided for construction usage at current cost rates.
  .1 Make arrangements for the use of such services through the Departmental Representative.
  .2 Departmental Representative will designate and approve each location of existing power source to which connections can be made to obtain temporary power service.
  .3 Connect to existing power supply in accordance with CSA C22.1, Canadian Electrical Code.

1.7 WATER SUPPLY

.1 Water supply is available in existing building and will be provided for construction usage at no cost. Make arrangements for the use and transportation of such services to work area through the Departmental Representative.

.2 Permanent water supply system installed under this Contract can be used for construction requirements provided that guarantees are not affected thereby. Make good damage.

1.8 SCAFFOLDING

.1 Design, construct and maintain scaffolding in rigid, secure and safe manner in accordance with CSA Z797-09, Code of Practice for Access Scaffold.

.2 Erect scaffolding independent of walls. Remove when no longer required.

1.9 HEATING AND VENTILATING

.1 Supply, install and pay for costs of temporary heat and ventilation used during construction, including costs of installation, fuel, operation, maintenance and removal of equipment. Use of direct-fired heaters discharging waste products into work areas will not be permitted.

.2 Provide temporary heat and ventilation in enclosed areas as required to:
- .1 Facilitate progress of work.
- .2 Protect work and products against dampness and cold.
- .3 Prevent moisture condensation on surfaces.
- .4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
- .5 Provide adequate ventilation to meet health regulations for safe working environment.

.3 Maintain minimum temperature of 10°C, or higher where specified, as soon as finishing work is commenced and maintain until acceptance of structure by Departmental Representative.
- .1 Maintain ambient temperature and humidity levels as required for comfort of office personnel.

.4 Ventilating:
- .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
- .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
- .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
- .4 Ventilate storage spaces containing hazardous or volatile materials.
- .5 Ventilate temporary sanitary facilities.
- .6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.

.5 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
- .1 Conform to applicable codes and standards.
- .2 Enforce safe practices.
- .3 Prevent abuse of services.
- .4 Prevent damage to finishes.
- .5 Vent direct-fired combustion units to outside.

.6 Upon acceptance of bid, Departmental Representative may permit use of permanent system providing agreement can be reached on:
- .1 Conditions of use, special equipment, protection and maintenance.
- .2 Saving on Contract price.
- .3 Provisions relating to warranties on equipment.

1.10 CONSTRUCTION SIGN AND NOTICES

.1 Upon request by Departmental Representative, erect a self-supporting project sign in location indicated.

.2 Contractor or subcontractor advertisement signboards are not permitted on site.

.3 Safety and Instruction Signs and Notices:
- .1 Signs and notices for safety and instruction shall be in both official languages or commonly understood graphic symbols conforming to CAN/CSA-Z321-96(R2006).

.4 Maintenance and Disposal of Site Signs:
- .1 Maintain approved signs and notices in good condition for duration of project and dispose of off-site on completion of project or earlier if directed by Departmental Representative.

1.11 REMOVAL OF TEMPORARY FACILITIES

.1 Remove temporary facilities from site when directed by Departmental Representative.

END OF SECTION

1.1 GENERAL

.1 Use new material and equipment unless otherwise specified.

.2 Within 7 days of written request by Departmental Representative, submit following information for any materials and products proposed for supply:
- .1 Name and address of manufacturer.
- .2 Trade name, model and catalogue number.
- .3 Performance, descriptive and test data.
- .4 Compliance to specified standards.
- .5 Manufacturer's installation or application instructions.
- .6 Evidence of arrangements to procure.
- .7 Evidence of manufacturer delivery problems or unforeseen delays.

.3 Provide material and equipment of specified design and quality, performing to published ratings and for which replacement parts are readily available.

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

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

1.2 PRODUCT QUALITY

.1 Contractor shall be solely responsible for submitting relevant technical data and independent test reports to confirm whether a product or system proposed for use meets contract requirements and specified standards.

.2 Final decision as to whether a product or system meets contract requirements rest solely with the Departmental Representative in accordance with the General Conditions of the Contract.

1.3 MANUFACTURERS INSTRUCTIONS

.1 Unless otherwise specified, comply with manufacturer's latest printed instructions for materials and installation methods to be used. Do not rely on labels or enclosure provided with products. Obtain written instructions directly from manufacturers.

.2 Notify Departmental Representative in writing of any conflict between these specifications and manufacturer’s instructions so that Departmental Representative will designate which document is to be followed.

1.4 AVAILABILITY

.1 Immediately notify Departmental Representative in writing of unforeseen or unanticipated material delivery problems by manufacturer. Provide support documentation as per clause 1.1.2 above.

1.5 WORKMANSHIP

.1 Ensure quality of work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed.

.2 Remove unsuitable or incompetent workers from site as stipulated in the General Conditions of the Contract.

.3 Ensure cooperation of workers in laying out work. Maintain efficient and continuous supervision on site at all times.

.4 Coordinate work between trades and subcontractors.

.5 Coordinate placement of openings, sleeves and accessories.

1.6 FASTENINGS - GENERAL

.1 Provide metal fastenings and accessories in same texture, colour and finish as base metal in which they occur. Prevent electrolytic action between dissimilar metals. Use non-corrosive fasteners, anchors and spacers for securing exterior work and in humid areas.

.2 Space anchors within limits of load bearing or shear capacity and ensure that they provide positive permanent anchorage. Wood or organic material plugs not acceptable.

.3 Keep exposed fastenings to minimum, space evenly and lay out neatly.

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

.5 Do not use explosive actuated fastening devices unless approved by Departmental Representative. See section on Health and Safety Requirements in this regard.

1.7 FASTENINGS - EQUIPMENT

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

.2 Use heavy hexagon heads, semi-finished unless otherwise specified.

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

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

1.8 STORAGE, HANDLING AND PROTECTION

.1 Deliver, handle and store materials in manner to prevent deterioration and soiling and in accordance with manufacturer's instructions when applicable.

.2 Store packaged or bundled materials in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work. Provide additional cover where manufacturer's packaging is insufficient to provide adequate protection.

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

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

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

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

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

.8 Immediately remove damaged or rejected materials from site.

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

END OF SECTION

1.1 GENERAL

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

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

.3 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.

1.2 MATERIALS

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

1.3 CLEANING DURING CONSTRUCTION

.1 Maintain work areas in a tidy condition, free from accumulations of waste material and debris. Clean areas on a daily basis.

.2 Keep building entrances, corridors, stairwells and tenant occupied areas of building in a clean dust free condition at all times. Conduct thorough cleaning of these areas at end of each work shift when used by workers or affected by the Work.

.3 Use separate collection bins, clearly marked as to purpose, for source separation and recycling of waste and debris in accordance with waste management requirements specified.

.4 Remove waste materials, and debris from site on a daily basis.

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

.6 Immediately clean all dust, dirt, smears, scuffs and soiled surfaces within tenant occupied areas resulting from the Work.

.1 Perform cleaning, dusting and washing operations, carpet vacuuming (including shampooing if deemed required by Departmental Representative) and floor washing as necessary to thoroughly clean all soiled surfaces.

.7 Remove snow and ice from access doors used by workforce.

1.4 FINAL CLEANING

.1 In preparation for acceptance of the completed work, perform final cleaning.

.2 Remove grease, dust, dirt, stains, labels, fingerprints, marks and other foreign materials, from interior and exterior finished surfaces.

.3 Inspect finishes, fitments and equipment. Ensure specified workmanship and operation.

.4 Broom clean and wash exterior paved surfaces and walks; rake clean other surfaces of grounds.

.5 Remove debris and surplus materials from crawl areas, roof areas and other accessible concealed spaces.

END OF SECTION

1.1 RELATED SECTIONS

.1 Section 01 10 10: General Instructions.

1.2 GENERAL

.1 Carry out work placing maximum emphasis on the areas of:
- .1 Waste reduction;
- .2 Diversion of waste from landfill and;
- .3 Material Recycling.

1.3 WASTE MANAGEMENT PLAN

.1 Prior to commencement of work, prepare waste Management Workplan.

.2 Workplan to include:
- .1 Waste audit.
- .2 Waste reduction practices.
- .3 Material source separation process.
- .4 Procedures for sending recyclables to recycling facilities.
- .5 Procedures for sending non-salvageable items and waste to approved waste processing facility or landfill site.
- .6 Training and supervising workforce on waste management at site.

.3 Workplan to incorporate waste management requirements specified herein and in other sections of the Specifications.

.4 Develop Workplan in collaboration with all subcontractors to ensure all waste management issues and opportunities are addressed.

.5 Implement and manage all aspects of Waste Management Workplan for duration of work.

.6 Revise Plan as work progresses addressing new opportunities for diversion of waste from landfill.

1.4 WASTE AUDIT

.1 At project start-up, conduct waste audit of:
- .1 Site conditions identifying salvageable and non-salvageable items and waste resulting from demolition and removal work.
- .2 Projected waste resulting from product packaging and from material leftover after installation work.

.2 Develop written list. Record type, composition and quantity of various salvageable items and waste anticipated, reasons for waste generation and operational factors which contribute to waste.

1.5 WASTE REDUCTION

.1 Based on waste audit, develop waste reduction program.

.2 Structure program to prioritize actions, with waste reduction as first priority, followed by salvage and recycling effort, then disposal as solid waste.

.3 Identify materials and equipment to be:
- .1 Protected and turned over to Departmental Representative when indicated.
- .2 Salvaged for resale by Contractor.
- .3 Sent to recycling facility.
- .4 Sent to waste processing/landfill site for their recycling effort
- .5 Disposed of in approved landfill site.

.4 Reduce construction waste during installation work. Undertake practices which will minimize waste and optimize full use of new materials on site, such as:
- .1 Use of a central cutting area to allow for easy access to off-cuts;
- .2 Use of off-cuts for blocking and bridging elsewhere.
- .3 Use of effective and strategically placed facilities on site for storage and staging of left-over or partially cut materials (such as gypsum board, plywood, ceiling tiles, insulation etc.) to allow for easy incorporation into work whenever possible avoiding unnecessary waste.

.5 Develop other strategies and innovative procedures to reduce waste such as minimizing the extent of packaging used for delivery of materials to site etc.

1.6 MATERIAL SOURCE SEPARATION PROCESS

.1 Develop and implement material source separation process at commencement of work as part of mobilization and waste management at site.

.2 Provide on-site facilities to collect, handle and store anticipated quantities of reusable, salvageable and recyclable materials.
- .1 Use suitable containers for individual collection of items based on intended purpose.
- .2 Locate to facilitate deposit but without hindering daily operations of existing building tenants.
- .3 Clearly mark containers and stockpiles as to purpose and use.

.3 Perform demolition and removal of existing building components and equipment following a systematic deconstruction process.
- .1 Separate materials and equipment at source, carefully dismantling, labelling and stockpiling alike items for the following purposes:
  - .1 Reinstallation into the work where indicated.
  - .2 Salvaging reusable items not needed in project which Contractor may sell to other parties. Sale of such items not permitted on site.
  - .3 Sending as many items as possible to locally available recycling facility.

.4 Segregating remaining waste and debris into various individual waste categories for disposal in a "non-mixed state" as recommended by waste processing/landfill sites.

.4 Isolate product packaging and delivery containers from general waste stream. Send to recycling facility or return to supplier/ manufacturer.

.5 Send leftover material resulting from installation work for recycling whenever possible.

.6 Establish methods whereby hazardous and toxic waste materials, and their containers, encountered or used in the course work are properly isolated, stored on site and disposed in accordance with applicable laws and regulations from authorities having jurisdiction.

.7 Isolate and store existing materials and equipment identified for re-incorporation into the Work. Protect against damage.

1.7 WORKER TRAINING AND SUPERVISION

.1 Provide adequate training to workforce, through meetings and demonstrations, to emphasize purpose and worker responsibilities in carrying out the Waste Management Plan.

.2 Waste Management Coordinator: designate full-time person on site, experienced in waste management and having knowledge of the purpose and content of Waste Management Plan to:

.1 Oversee and supervise waste management during work.

.2 Provide instructions and directions to all workers and subcontractors on waste reduction, source separation and disposal practices.

.3 Post a copy of Plan in a prominent location on site for review by workers.

1.8 CERTIFICATION OF MATERIAL DIVERSION

.1 Submit to Departmental Representative, copies of certified weigh bills from authorized waste processing sites and sale receipts from recycling/reuse facilities confirming receipt of building materials and quantity of waste diverted from landfill.

.2 Submit data at pre-determined project milestones as determined by Departmental Representative.

.3 Compare actual quantities diverted from landfill with projections made during waste audit.

1.9 DISPOSAL REQUIREMENTS

.1 Burying or burning of rubbish and waste materials is prohibited.

.2 Disposal of waste, volatile materials, mineral spirits, oil, or paint thinner into waterways, storm, or sanitary sewers is prohibited.

.3 Dispose of waste only at approved waste processing facility or landfill sites approved by authority having jurisdiction.

.4 Contact the authority having jurisdiction prior to commencement of work, to determine what, if any, demolition and construction waste materials have been banned from disposal in landfills and at transfer stations. Take appropriate action to isolate such banned materials at site of work and dispose in strict accordance with provincial and municipal regulations.

.5 Transport waste intended for landfill in separated condition, following rules and recommendations of Landfill Operator in support of their effort to divert, recycle and reduce amount of solid waste placed in landfill.

.6 Collect, bundle and transport salvaged materials to be recycled in separated categories and condition as directed by recycling facility. Ship materials only to approved recycling facilities.

.7 Sale of salvaged items by Contractor to other parties not permitted on site.

END OF SECTION

1.1 SECTION INCLUDES

.1 Administrative procedures preceding inspection and acceptance of Work by Departmental Representative.

1.2 RELATED SECTIONS

.1 Section 01 78 00: Closeout Submittals.

1.3 INSPECTION AND DECLARATION

.1 Contractor's Inspection: Coordinate and perform, in concert with subcontractors, an inspection and check of all Work. Identify and correct deficiencies, defects, repairs and perform outstanding items as required to complete work in conformance with Contract Documents.

.1 Notify Departmental Representative in writing when deficiencies from Contractor's inspection have been rectified and that Work is deemed to be complete and ready for Departmental Representative's inspection of the completed work.

.2 Departmental Representative's Inspection: Accompany Departmental Representative during all substantial and final inspections of the Work.

.1 Address defects, faults and outstanding items of work identified by such inspections.

.2 Advise Departmental Representative when all deficiencies identified have been rectified.

.3 Note that Departmental Representative will not issue a Certificate of Substantial Performance of the work until such time that Contractor performs following work and turns over the specified documents:

.1 Project record as-built documents;
.2 Final Operations and Maintenance manuals;
.3 Maintenance materials, parts and tools;
.4 Compliance certificates from applicable authorities;
.5 Reports resulting from designated tests;
.6 Demonstration and training complete with user manuals;
.7 Manufacturer's Guarantee certificates.
.8 Testing, adjusting and balancing of equipment and systems complete with submission of test reports.
.9 Commissioning of equipment and systems specified.

.4 Correct all discrepancies before Departmental Representative will issue the Certificate of Completion.

END OF SECTION

1.1 SECTION INCLUDES

.1 Project Record Documents.

.2 Operations and Maintenance data.

1.2 RELATED SECTIONS

.1 Section 01 79 00: Demonstration and Training.

1.3 PROJECT RECORD DOCUMENTS

.1 Departmental Representative will provide 2 white print sets of contract drawings and 2 copies of Specifications Manual specifically for "As-Built" purposes.

.2 Maintain at site one set of the contract drawings and specifications to record actual As-Built site conditions.

.3 Maintain up-to-date, real time as-built drawings and specifications in good condition and make available for inspection by the Departmental Representative upon request.

.4 As-Built Drawings:

- .1 Record changes in red ink on the prints. Mark only on one set of prints and at completion of work, neatly transfer notations to second set (also by use of red ink).
- .2 Submit both sets to Departmental Representative prior to application for Certificate of Substantial Performance.
- .3 Stamp all drawings with "As-Built". Label and place Contractor's signature and date.
- .4 Show all modifications, substitutions and deviations from what is shown on the contract drawings.
- .5 Record following information:
  - .1 Location of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure;
  - .2 Field changes of dimension and detail;
  - .3 Location of all capped or terminated services and utilities.
  - .4 Reflected ceiling plan condition showing finished layout of all ceiling-mounted services and devices;
  - .5 Plumbing, heating, air conditioning and ventilation, sprinkler and electrical service installation locations; all to be dimensioned and referenced to building columns or load bearing walls;
  - .6 All design elevations, sections, floor plans and details dimensioned and marked-up to consistently report finished installation conditions;
  - .7 Any details produced in the course of the contract by the Departmental Representative to supplement or to change existing design drawings;
  - .8 All change orders issued over the course of the contract must be documented on the finished As-Built documents, accurately and consistently depicting the changed condition as it applies to all affected drawing details.

.5 As-Built Specifications: legibly mark in red each item to record actual construction, including:
- .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly items substituted from that specified.
- .2 Changes made by Addenda and Change Orders.
- .3 Mark up both copies of specifications; stamp "As-Built", sign and date similarly to drawings as per above clause.

.6 Maintain As-Built documents current as the contract progresses. Departmental Representative will conduct reviews and inspections of the documents on a regular basis. Failure to maintain as-builts current and complete to satisfaction of the Departmental Representative shall be subject to financial penalties in the form of progress payment reductions and holdback assessments.

.7 Submit on paper and in electronic format as pdf files. Forward pdf and in the native program format, on USB compatible with DEPARTMENTAL REPRESENTATIVE encryption requirements or through email or alternate electronic file sharing service such as ftp, as directed by Departmental Representative.

1.4 REVIEWED SHOP DRAWINGS

.1 Provide a complete set of all shop drawings reviewed for project to incorporate into each copy of the Operations and Maintenance Manuals.

.2 Submit full sets at same time and as part of the contents of the Operation and Maintenance Manuals specified.

.3 Schedule of Products and Systems, shall be indexed to content of volume using provided CSC CMMS Form. Provide information on all new equipment as per CSC CMMS form.

1.5 OPERATIONS & MAINTENANCE MANUAL

.1 O&M Manual - Definition: an organized compilation of operating and maintenance data including detailed technical information, documents and records describing operation and maintenance of individual products or systems as specified in individual sections of the specifications.

.2 Manual Language: final manuals to be in English.

.3 Number of copies required:
- .1 Upon review and acceptance by Departmental Representative, submit 3 final copies and one electronic copy on USB stick. Interim copies are not to be considered as part of the final copies unless they have been fully revised and are identical to the final approved version.

.4 Submission Date: submit complete operation and maintenance manual to Departmental Representative 3 weeks prior to application for Certificate of Substantial Performance of the work.

.5 Binding:
- .1 Assemble, coordinate, bind and index required data into Operation and Maintenance Manual.
- .2 Use vinyl, hard covered, 3 "D" ring binders, loose leaf, sized for 215 x 280 mm paper, with spine pocket.
- .3 Where multiple binders are needed, correlate data into related consistent groupings.
- .4 Identify contents of each binder on spine.
- .5 Organize and divide data following same numerical system as the section numbers of the Specification Manual.
- .6 Dividers: separate each section by use of cardboard dividers and labels. Provide tabbed fly leaf for each individual product and system and give description of product or component.
- .7 Type lists and notes. Do not hand-write.
- .8 Drawings, diagrams and manufacturers' literature must be legible. Provide with reinforced, punched binder tab. Bind in with text; fold larger drawings to size of text pages.

.6 Manual Contents:
- .1 Cover sheet containing:
  - .1 Date submitted.
  - .2 Project title, location and project number.
  - .3 Names and addresses of Contractor, and all Sub-Contractors.
- .2 Table of Contents: provide full table of contents in each binder(s), clearly indicate which contents are in each binder.
- .3 List of maintenance materials.
- .4 List of spare parts.
- .5 List of special tools.
- .6 Original or certified copy of warranties and product guarantees.
- .7 Copy of approval documents and certificates issued by Inspection Authorities.
- .8 Copy of reports and test results performed by Contractor as specified.
- .9 Product Information (PI Data) on materials, equipment and systems as specified in various sections of the specifications. Data to include:
  - .1 List of equipment including manufacturer's name, supplier, local source of supplies and service depot(s). Provide full addresses and telephone numbers.
  - .2 Nameplate information including equipment number, make, size, capacity, model number and serial number.
  - .3 Parts list.
  - .4 Installation details.
  - .5 Operating instructions.
  - .6 Maintenance instructions for equipment.
  - .7 Maintenance instructions for finishes.

.7 Shop drawings:

.1 Include complete set of reviewed shop drawings into each copy of the operations and maintenance manual.

.2 Fold and bind material professionally in a manner that corresponds with the specification section numbering system.

.3 When large quantity of data is submitted, place into separate binders of same size as O&M binders.

.8 Equipment and Systems Data: the following list indicates the type of data and extent of information required to be included for each item of equipment and for each system:

.1 Description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with Departmental Representative data and tests, and complete nomenclature and commercial number of replaceable parts.

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

.3 Include installed colour coded wiring diagrams.

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

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

.6 Servicing and lubrication schedule, and list of lubricants required.

.7 Manufacturer's printed operation and maintenance instructions.

.8 Sequence of operation by controls manufacturer.

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

.10 Provide installed control diagrams by controls manufacturer.

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

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

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

.14 Include test and balancing reports.

.15 Additional requirements as specified in individual specification sections.

.9 Materials and Finishes Maintenance Data:

.1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations.

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

.3 Moisture-protection and Weather-exposed Products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.4 Additional Requirements: as specified in individual specifications sections.

1.6 SPARE PARTS, TOOLS AND MAINTENANCE MATERIALS

.1 Provide spare parts, special tools and extra materials for maintenance purposes in quantities specified in individual specification sections.

.2 Tag all items with associated function or equipment.

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

.4 Deliver to site in well packaged condition. Store in location as directed by Departmental Representative.

.5 Clearly mark as to contents indicating:
- .1 Part number.
- .2 Identification of equipment or system for which parts are applicable.
- .3 Installation instructions or intended use as applicable.
- .4 Name, address and telephone number of nearest supplier.

.6 Prepare and submit complete inventory list of items supplied. Include list within Maintenance Manual.

END OF SECTION

1.1 RELATED SECTIONS

.1 Operations and Maintenance Manual: Section 01 78 00.

1.2 DESCRIPTION

.1 Demonstrate scheduled operation and maintenance of equipment and systems to Departmental Representative's personnel prior to date of final inspection.

.2 Departmental Representative will provide a list of Departmental Representative's personnel to receive instructions,

.3 Cooperate with Departmental Representative in coordinating time and attendance of Departmental Representative's personnel with manufacturer's training Representative(s).

1.3 QUALITY CONTROL

.1 Ensure that only personnel from own forces, Subcontractors or Suppliers competent and fully knowledgeable in the particular material component, equipment or system installation are used to provide training and demonstrations.

.2 When specified in individual Sections, obtain the manufacturers authorized Representative to demonstrate operation of equipment and systems, instruct Departmental Representative's personnel, and provide written report that demonstration and instructions have been completed.

.3 Upon request, provide evidence to Departmental Representative of individual Trainer's knowledge and qualifications.

1.4 SUBMITTALS

.1 The following systems will require demonstration and training:
- .1 Fire pumps and fire pump controllers – minimum 8 hours.
- .2 Backflow preventers – minimum 2 hours.
- .3 Fire alarm system – minimum 2 hours.

.2 Submit schedule of time, date and complete list of equipment and systems for which demonstration and training sessions will be provided. Submit schedule a minimum of 2 weeks prior to designated dates, for Departmental Representative's approval.

.3 Submit report within 1 week after completion of demonstration, that demonstration and instructions have been satisfactorily completed. Provide time and date of when each demonstration was actually given, with list of persons present.

1.5 CONDITIONS FOR DEMONSTRATIONS

.1 Prior to carrying out demonstration and training, ensure that equipment has been inspected and tested, is fully operational, has been performance verified and TAB has been carried out.

.2 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.6 PREPARATION

.1 Verify that conditions for demonstration and instructions comply with requirements.

.2 Verify that designated personnel are present.

1.7 DEMONSTRATION AND INSTRUCTIONS

.1 Include the following items within the demonstration and training:

- .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each of equipment.
- .2 Instruct personnel in all phases of operation and maintenance using operation and maintenance manuals as the basis of instruction.
- .3 Review contents of manual in detail to explain all aspects of operation and maintenance.
- .4 Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent during instructions.
- .5 Provide other specific training and instructions as specified in trade sections.

1.8 TIME ALLOCATED FOR INSTRUCTIONS

.1 Observe the allocated time period specified in trade sections. Provide additional time when required to ensure all personnel fully understand all aspects of the information and instructions being provided. Allow for questions by participants.

END OF SECTION

1.1 SECTION INCLUDES

.1 This section deals with commissioning activities to occur during the construction stage and the early period of facility occupancy stage.

.2 Section includes:
- .1 Commissioning activities to be performed by the Contractor.

.3 In general, Contractor's commissioning activities consists of performing specified tasks and functions to assist the Commissioning Agent, along with other members of the commissioning team who will commission various components and systems of the Facility.

1.2 RELATED SECTIONS

.1 Operations and Maintenance Manuals: Section 01 78 00.

.2 Demonstration and Training: Section 01 79 00.

1.3 BACKGROUND INFORMATION

.1 Historically, the term commissioning has been used in reference to the process used to conduct testing, adjusting and setting in operation, facility mechanical system.

.2 Commissioning (or the commissioning process), as understood by DEPARTMENTAL REPRESENTATIVE, is a planned program of activities conducted in concert with other activities performed during each stage of project delivery.
- .1 The commissioning process identifies issues during the Planning and Design stages which are addressed during the Construction and Occupancy Stages of a Facility to ensure that the built facility is constructed and proven to operate satisfactorily under all weather, environmental and occupancy conditions to meet operational and user requirements.
- .2 Commissioning activities during the Construction stage incorporates a third party verification process and a transfer of critical operational knowledge to Facility personnel.

1.4 COMMISSIONING OBJECTIVES

.1 The commissioning activities have the following objectives:
- .1 Collect data on equipment and systems being supplied and document their installation;
- .2 Conduct checks and tests on fully installed building components, equipment, systems and integrated systems to:
  - .1 Verify whether they operate in accordance with requirements of Contract Documents;
  - .2 Verify performance against design criteria and user requirements and measure peak capacities;

.3 Prepare a Building Management Manual (BMM) which contains operations and maintenance data, as-built record documents, commissioning reports, training data and other critical information for future use by Facility operational staff;

.4 Ensure transfer of knowledge on the operations, maintenance and management of the Facility to Tenant and Operational personnel by means of appropriate training.

.2 Work to achieve the above objectives requires a collaborative effort from all members of the commissioning team.

.1 Contractor's commissioning activities and responsibilities are described in Clause 1.7 below.

.3 Commissioning activities performed by the Commissioning Agent and the Design Departmental Representative does not replace checks, tests, adjustments, balancing and other performance verification procedures to be carried out by the Contractor as an integral part of performing the Work of this contract as specified in other sections of the Specifications.

1.5 SYSTEMS TO BE COMMISSIONED

.1 The following systems and controls, complete with associated equipment and components, will be commissioned by the Commissioning Agent and requires related commissioning activities to be performed by Contractor as specified herein and in section(s):

.1 FP-1 and FP-2.
.2 Fire pump controllers.
.3 Jockey pump.
.4 Automatic Transfer Switches #1 and #2.
.5 Fire pump integrated system functional performance by ensuring that the system is inspected/tested on both normal power status and emergency power status.

1.6 DEFINITIONS

.1 For the purpose of this contract, the various terms listed below, as they relate directly or indirectly to the commissioning process, shall be deemed to have the following meaning.

.2 Commissioning Process: a planned program of tasks, activities and procedures carried out systematically during the Construction and Occupancy Stages in accordance with the commissioning objectives, specified in clause 1.4.2 above, to:

.1 Verify whether the fully installed equipment, systems and integrated systems operate in accordance with contract documents and design criteria and;
.2 Ensure that appropriate documentation is compiled to effectively train O& M staff and prepare a comprehensive Building Management Manual (BMM).

.3 Commission to be conducted on all systems for fully installed, functional and Contractor's Performance Verification responsibilities shall be completed and approved.

.1 Contractor shall by operating equipment and systems, by troubleshooting and making adjustments as may be required.

.2 Systems are run under their full operation and under various modes to determine if they function correctly, consistently, at peak efficiency and interactively with each other as intended in accordance with Contract Documents and design criteria.

.3 During these checks, adjustments may be made enhancing performance to meet environmental or user requirements.

.4 Installation/Start-up Checks: (sometimes referred to as pre-functional checks) A written compilation of checks and inspections to be performed by Contractor during the pre-start-up and start-up of a particular equipment or system component.

.1 Checklist sheets are produced which include the following data:

.1 Product manufacturer's installation instructions and recommended checks and;

.2 Special procedures as specified in relevant sections of Specifications;

.3 Other items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.

.2 Standard Installation/Start-Up Checklist sheets prepared by equipment manufacturer are acceptable for use. However, supplement with additional data representative of specific project conditions as deemed required by Consultant/ Engineer.

.3 Use Checklist sheets for all equipment installation. Document in writing on checklist the various checks made, deficiencies noted and corrective action taken.

.4 Installer to sign Checklist sheets upon completion, certifying that stated checks and inspections have been performed.

.5 Use of Installation/Start-Up Checklists shall not be considered part of the commissioning process but shall be stringently used for all equipment pre-start and start-up procedures.

.6 Return completed Installation/Start-Up Checklist sheets after use to the Departmental Representative. Checklists will be included in the BMM manual at completion of project.

.5 Performance Verification: (sometimes referred to Functional Testing) checks, running dynamic tests and adjustments carried out by Contractor on equipment and systems, upon their installation, to ensure they operate correctly, efficiently and function independently and interactively with other systems as intended in accordance with contract documents and manufacturer's recommendations.

.1 Performance Verification shall not be considered part of the commissioning process. It is however considered an essential and integral part of Contractor's responsibilities in the equipment installation process which must be stringently conducted, successfully completed and approved by Consultant/Engineer before a piece of equipment or system is considered fully installed and functional.

.6 Performance Verification Report Sheets (PV sheets): forms developed by Manufacturer for Contractor's use to record measured data and readings taken during functional testing and Performance Verification procedures.

.7 Product Information (PI Data): a compilation of data gathered on a particular piece of equipment, typically produced by manufacturer, which includes nameplate information, installation/startup instructions, parts list, operating instructions, maintenance guidelines and other pertinent technical data and recommended checks that is necessary to prepare for start-up and functional testing and used during operation and maintenance of such equipment. This documentation is included in the Building Management Manual (BMM) at completion of work.

1.7 CONTRACTOR'S COMMISSIONING ACTIVITIES

.1 General:
- .1 Organize and arrange for the services of subcontractors, their specialists and manufacturer's technical representatives to perform commissioning activities.
- .2 Ensure that personnel forming part of the Commissioning Team are qualified and knowledgeable of installed equipment and systems and with design intent.
- .3 Notify Departmental Representative in writing when Facility is ready for be commissioned. Give 14 calendar day notice.
- .4 Note that Certificate of Substantial Performance will only be issued when:
  - .1 All commissioning documentation has been received and found suitable by Departmental Representative;
  - .2 Designated equipment and systems have been commissioned and;
  - .3 Training has been completed.
- .5 Performance faults:
  - .1 Equipment and systems found not operating correctly or not performing as intended during commissioning shall be re-verified by checking 100% of all equipment and components of the un-functional system, including related controls as required to rectify the deficiencies and ensure correct performance.
  - .2 Costs to conduct additional tests and inspections, as deemed required by Departmental Representative, to determine acceptability and proper performance of such item to be paid for by Contractor.

.2 Upon completion of Facility Commissioning:
- .1 Provide training to maintenance & operational personnel as specified in clause 1.12 below.
- .2 Turn over any filled-in checks sheets or reports resulting from commissioning. .

1.8 TRAINING

.1 Commence process of familiarizing Tenant and O&M personnel in the early stages of work on purpose and operation of various equipment and systems. Continue process throughout the entire construction duration.
- .1 Provide informal briefings during occasional site visits, at planned commissioning meetings and during the final commissioning site activities.

.2 Conduct formal demonstration and training sessions only after all identified systems have been commissioned by Commissioning Agent and Departmental Representative has given approval to proceed with the training process.

.3 Carryout training in accordance with requirements of section 01 79 00.

.4 Submit training manuals for review 2 weeks prior to actual training.

.5 Ensure required tools and O&M Manuals are on site for training and system demonstration.

.6 As a minimum, the training sessions to cover the following information:
- .1 Introduction.
- .2 Description of the system with factory personnel being involved at appropriate times.
- .3 Instructions on start-up procedures including seasonal procedures, system check-lists and emergency procedures.
- .4 Operational procedures, including occupancy considerations, seasonal change-over, manual and automatic operations and emergency modes.
- .5 Instruction on system shutdowns, including checklists.
- .6 Instructions on all aspects of system maintenance, including routine servicing, lubrication, overhaul and factory servicing.
- .7 Information concerning the scope of warranties and their use.
- .8 A description of spare parts in stock and their service.
- .9 A description of normal tools required for servicing the systems/equipment.

.7 Submit typewritten record of training sessions given and list of attendees. Use forms of format approved by Departmental Representative.

1.9 COMMISSIONING DOCUMENTATION

.1 Submit the following documentation for use during commissioning and for incorporation thereafter into a Building Management Manual (BMM):
- .1 Operations and Maintenance Manuals, Project Record Documents and other data as specified in Section 01 78 00. Data to include:
  - .1 Equipment Product Information (PI Data) complete with:
    - .1 Nameplate info.
    - .2 Installation instructions.
    - .3 Operating procedures and
    - .4 Maintenance guidelines.
  - .2 Reviewed shop drawings.
  - .3 As-built record drawings and Specifications.
- .2 Completed Installation/Start-up Checklist sheets used.
- .3 Performance Verifications checks and tests procedures and completed report sheets used.
- .4 Copy of any static and dynamic test and reports conducted.
- .5 TAB report and other reports as specified in various trade sections.

.2 Documentation to include detailed information and number of copies as specified for maintenance manuals of section 01 78 00.

.3 Provide information on all new equipment, on CSC CMMS forms.

END OF SECTION

Part 1 General

1.1 GENERAL

.1 This section covers items common to all sections of Divisions 21 & 23.

1.2 SCOPE OF WORK

.1 The work of this section includes all labour, materials, and equipment necessary for the installation complete of the mechanical systems shown on the drawings and described in these specifications.

.2 It is the requirement of this work to provide all systems complete, functioning in intended system operation, notwithstanding that every item necessarily required may not be specifically mentioned.

1.3 EQUIPMENT LIST

.1 Complete list of equipment and materials to be used on this project and forming part of tender documents including manufacturer's name, model number and details of materials, and submit for approval.

.2 Submit for approval within seven (7) days after award of contract.

1.4 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit Shop Drawings to Owner Representative for approval by the Consultant. Submit shop drawings stamped and signed by Professional Engineer registered or licensed in the Province of Prince Edward Island, Canada.

.3 Shop drawings to show:

- .1 Mounting arrangements.
- .2 Operating and maintenance clearances. eg. access door swing spaces.

.4 Shop drawings and product data accompanied by:

- .1 Detailed drawings of bases, supports, and anchor bolts.
- .2 Acoustical sound power data, where applicable.
- .3 Points of operation on performance curves.
- .4 Manufacturer to certify current model production.
- .5 Certification of compliance to applicable codes.

.5 In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures: use Mechanical Contractors Association of Canada "Shop Drawing Submittal Title Sheet". **Identify section and paragraph number**.

.6 Closeout Submittals:

- .1 Provide Operation and Maintenance Data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.
- .2 Operation and Maintenance Manual approved by and final copies deposited with, Consultant before final inspection.

.3 Operation data to include:

.1 Control schematics for systems including environmental controls.

.2 Description of systems and their controls.

.3 Operation instruction for systems and component.

.4 Description of actions to be taken in event of equipment failure.

.4 Maintenance data to include:

.1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.

.2 Data to include schedules of tasks, frequency, tools required and task time.

.5 Performance data to include:

.1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.

.2 Equipment performance verification test results.

.3 Special performance data as specified.

.6 Approvals:

.1 Submit two (2) hard copies and one (1) electronic PDF copy of draft Operation and Maintenance Manual to Owner Representative for approval. Submission of individual data will not be accepted unless directed by Owner Representative.

.2 Make changes as required and re-submit as directed by Owner Representative.

.7 Additional data:

.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.8 Site records:

.1 Contractor shall obtain one (1) set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.

.2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection.

.9 As-built drawings:

.1 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).

.2 Submit to Owner Representative for approval and make corrections as directed.

.3 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

1.5 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

.2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29 – Occupational Health and Safety (OH&S) Requirements.

1.6 EQUIPMENT INSTALLATION

.1 In accordance with Manufacturer's instructions unless otherwise indicated.

.2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.

1.7 CLEARANCES

.1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer.

.2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer or as indicated (whichever is greater) without interrupting operation of other system, equipment and components.

1.8 TRIAL USAGE

.1 Owner's Representative may use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

1.9 PROTECTION OF OPENINGS

.1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

1.10 ELECTRICAL

.1 The Electrical Contractor is responsible for all power wiring over 120V and over required for operation of mechanical equipment and plant systems.

.2 Division 25 EMCS is responsible for all wiring required for controls systems, including obtaining 120V sources from the electrical system.

1.11 PREPARATION FOR FIRESTOPPING

.1 All fire stopping is to be performed by a qualified subcontractor.

.2 Contractor to identify all locations where mechanical penetrations are required through fire rated separations including type and sizing.

.3 Provide all required clearances between outside surface of pipe and inside surface of sleeve, core drilled-hole or listed fire rated system.

1.12 EXISTING CONDITIONS

.1 Connect into existing systems at times coordinated with Owner.

.2 Request written approval ten (10) days minimum, prior to commencement of work.

.3 Be responsible for damage to existing plant by this work.

.4 Ensure daily clean-up of existing areas.

1.13 UNFORSEEN HAZARDS

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

.2 Perform work in accordance with Section 01 35 29 Health & Safety Requirements.

1.14 TESTS

.1 Give 48 hours written notice of date for all tests.

.2 Insulate or conceal work only after testing and approval by Owner Representative.

.3 Conduct tests in presence of Owner Representative.

.4 Bear costs including retesting and making good.

.5 Equipment: test as specified in relevant sections.

.6 Prior to tests, isolate all equipment or other parts which are not designed to withstand test pressures or test medium.

1.15 FIELD QUALITY CONTROL

.1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - SUBMITTALS.

.2 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 – SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

1.16 DEMONSTRATION, OPERATING AND MAINTENANCE INSTRUCTIONS

.1 Where specified elsewhere in Divisions 21and 23, Manufacturers to provide demonstrations and instructions.

.2 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.3 Use operation and maintenance manual, as-built drawings and audio visual aids as part of instruction materials.

.4 Instruction duration time requirements as specified in appropriate sections. Provide minimum 4 hour instruction.

.5 When deemed necessary, Owner Representative may record these demonstrations on video tape for future reference.

1.17 INTERPRETATION OF PLANS AND SPECIFICATIONS

.1 These specifications are to be considered as an integral part of the plans which accompany them and neither the plans not 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 by this Contractor.

.2 Misinterpretation of the plans or specifications shall not relieve this Contractor of responsibility; final interpretation of details and clauses remains with the Owner's Representative.

.3 Where uncertainty exists in the passing of pipes and location of equipment, the Consultant and or Owner Representative shall be consulted before work is started. Where such materials and equipment have been installed so as to cause interference with the inside treatment of the building, they shall be removed and relocated without additional cost to the Owner.

.4 The plans do not necessarily show all valves, duct offsets, access panels, connections, balancing fittings, bases, isolators, flexible connections, drains, etc., and this Contractor shall not avail himself of these obvious omissions, but shall install the work complete in essential details so that it will function properly, can be easily balanced and so that repairs and removal of equipment can easily be made.

.5 Building dimensions shall not be scaled from the plans but shall be obtained from on-site dimensions of the building. Any discrepancy between the drawings and the building shall be questioned before proceeding with any installation.

1.18 CO-OPERATION OF CONTRACTORS

.1 This Contractor shall become familiar with the work of other Contractors and in laying out and installing the work shall co-operate with the other Contractors, so as to facilitate the progress of the work as a whole and avoid interference or delays. Where interference exists, this Contractor shall notify the Owner Representative and the Consultant before installing the work. Any changes in the work or alterations of the Contractor's schedule of procedure required for such co-operation will not be considered as a claim for extra compensation.

.2 Due to the complexities of many sub-trades, and the restrictive space available in this project, it is required that all trades co-operate closely so as to install all systems in their allotted locations as indicated on the drawings, or coordination on site.

1.19 ERRORS AND OMISSIONS

.1 The drawings are not intended to show every item of accessory equipment, but the Contractor shall tender on and install all essential details to provide for efficiency of operation and ease of maintenance.

.2 Should this Contractor discover errors or discrepancies in the plans or specification, he shall refer the matter to the Consultant for change or clarification and shall not proceed with that portion of the work until advised by the Owner Representative to do so.

Part 2 Products

2.1 MATERIALS

.1 Materials and products in accordance with Division 01 – General Requirements.

.2 Do verification requirements in accordance with Division 01 – General Requirements.

2.2 VOC LIMITS

.1 The purpose of this section is to reduce emissions of volatile organic compounds (VOCs) and to eliminate emissions of chloroform, ethylene dichloride, methylene chloride, perchloroethylene, and trichloroethylene from the application of adhesives, adhesive bonding primers, adhesive primers, sealants, sealant primers, or any other primers.

.2 This section applies to all commercial and industrial sales and applications of adhesives, adhesive bonding primers, adhesive primers, sealants, sealant primers, or any other primers, unless otherwise specifically exempted by this rule.

.3 Requirements:

.1 Unless otherwise specified in paragraph .2 a person shall not apply any adhesives, adhesive bonding primers, adhesive primers, or any other primer, which have a VOC content in excess of 250 g/L less water and less exempt compounds.

2.3 ENUM RATED WIRES AND CABLES

.1 Cables and electrical wires used for transmission of sound or data and that are not located in totally enclosed non-combustible raceway shall be FT6 rated.

Part 3 Execution

3.1 PAINTING REPAIRS AND RESTORATION

.1 Prime and touch up marred finished paintwork to match original.

.2 Restore to new condition, finishes which have been damaged.

3.2 CLEANING

.1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

3.3 FIELD QUALITY CONTROL

.1 Site Tests: conduct following tests in accordance with Division 01 – General Requirements and submit report as described in PART 1 - SUBMITTALS.

.2 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 – SUBMITTALS AND AS SPECIFIED RESPECTIVE SECTIONS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.4 PROTECTION

.1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Refer to Division 01- General Requirements.

.2 Refer to Division 20 – Common Work Results for Mechanical.

1.2 SCOPE

.1 This Section includes for supply, installation, testing and certification of the following:

.1 Wet pipe sprinkler system as indicated.

1.3 REGULATIONS

.1 The installation of the fire suppression system shall be in accordance with the drawings prepared as part of Existing Design issued under this contract, these specifications and:

.1 The National Building Code of Canada, 2015 edition.

.2 The National Fire Code of Canada, 2015 edition.

.3 NFPA 13 (2013 Edition) Standard for the Installation of Sprinkler Systems.

.4 NFPA 20 (2013 Edition) Standard for the Installation of Statutory Pumps for Fire Protection.

.5 NFPA 25 (2013 Edition) Standard for the Inspection testing, and maintenance of water based fire protection system.

1.4 COMPONENTS

.1 All system components required to be “listed” as per NFPA shall have their listing through underwriters laboratories of Canada (ULC), Factory Mutual Engineering.

1.5 GOVERNMENTAL AUTHORITIES

.1 Contractor shall supply and install complete and working system to the satisfaction of the Governmental Authorities having jurisdiction.

1.6 SUBMISSIONS

.1 Contractor As-Built Drawings:

.1 As-built drawings shall represent the installed system components.

.2 During system installations, the Contractor shall note any variances from the working drawings, and shall record these variances in red pencil on a “reviewed” working drawing. This drawing shall have no other markings and shall be available for review at all times on site.

.3 The Contractor shall submit up-to-date accurate As-Built drawings for the complete systems and any ancillary equipment.

.4 The Contractor shall provide drawings for the complete system, whiteprints (3 for binders) and AutoCAD files on CD.

.2 Operation and Maintenance Data:

.1 The Contractor shall provide three (3) copies of operation and maintenance information in a 3 ring binder and drawings. Information in each binder is to include:

.1 Copy of reviewed (stamped) product data.

.2 Pressure settings for all switches, pumps, compressors, etc.

.3 Copy of as-built drawings (folded prints) and electronic files on CD.

.4 Copy of hydraulic nameplates indicating system demand.

.5 Copy of this specification section.

1.7 SUBCONTRACTORS

.1 Only Subcontractors competent in the installation of sprinkler systems, and who have a thorough and demonstrated knowledge of requirements in NFPA 20 will be considered acceptable.

.2 The Contractor shall assign an on-the-job fulltime foreman with "Journey Person" classification. In addition, all persons involved with the fabrication or installation shall have a valid certificate of qualification or a valid letter of authenticity in the occupation. Subcontractors shall ensure all of their workers are certified in accordance with the Apprenticeship and Occupational Certification Act, Section 17(2).

1.8 CERTIFICATION

.1 Certification date shall be as posted on certificate unless otherwise directed by Engineer of Record.

1.9 SYSTEM PRESSURE LIMITATIONS

.1 The system shall be designed not to exceed 1,200 kPa (175 psi) working pressure.

1.10 WATER SUPPLY

.1 City Supply (Refer to Appendix A) and new fire pump, refer to drawings for size.

Part 2 Products

2.1 PIPING, FITTINGS AND VALVES

.1 Piping shall satisfy the following criteria:

.1 Steel pipe shall be of the type tested for sprinkler use as per NFPA 13. Piping to meet requirements of Section 6.3 of NFPA 13, and have zero corrosion.

.2 Black steel piping for all wet systems. Schedule 10 for pipe 65 mm and greater. Schedule 40 for pipe 50 mm and smaller.

.3 Only pipe manufactured in Canada or USA shall be accepted.

.4 All piping shall be supply of one manufacturer.

.2 Fittings shall satisfy the following criteria:

.1 All fittings to meet requirements as per NFPA 13 and are to be stored inside prior to installation and have zero corrosion.

.2 Fittings are to withstand 175 psi working pressure.

.3 All gaskets shall be flush seal.

.4 Flange, grooved.

.3 Valves:

.1 ULC listed for fire protection service.

.2 Gate valves: open by counter-clockwise rotation.

.3 Provide OS & Y valve beneath each alarm valve in each riser when more than one alarm valve is supplied from same water supply pipe.

.4 Check valves: flanged clear opening swing-check type with flanged inspection and access coverplate.

.5 Butterfly valves: coordinate supervised status (open or closed), ductile iron body with EPDM seat, gear operator complete with waterproof actuator housing, pressure rating: 300 psi. (21 bar).

.4 Flange bolts shall be square or hex head bolts with heavy hex nuts to ASTM A307-82a.

.5 Flange gaskets shall be 1/16" thick plain cloth or inserted red rubber to ASME/ANSI B16.20 and ASME/ANSI B16.21.

.6 All fittings shall be supply of one manufacturer.

.7 All roll grooved fittings to be ULC listed for fire protection service.

.8 All couplings to be designed with an angle bolt pad to provide a rigid joint.

2.2 SUPERVISORY SWITCHES

.1 General: to ANSI/NFPA 13 and ULC listed for fire service.

.2 Valves:

.1 Mechanically attached to valve body, with normally open and normally closed contacts and supervisory capability.

.3 Pressure or flow switch type:

.1 With normally open and normally closed contacts and supervisory capability.

.2 Provide switch with circuit opener or closer for automatic transmittal of alarm over facility fire alarm system.

.3 Connect into building fire alarm system.

.4 Pressure alarm switch:

.1 Not applicable.

2.3 IDENTIFICATION TAGS

.1 Required for all control valves, drain valves, inspector's test connections, trim valves, and switches. Red lamicoid with white letters.

.2 All tagging to be coordinated prior to installation.

2.4 SIGNS

.1 Signs, bilingual, fabricated from metal with chain suspension; white letters on red background.

2.5 BACKFLOW PREVENTERS

.1 Double Check Valve Assemblies – BFP-1:

.1 ULC listed, FM approved.
.2 Size: NPS 8.
.3 Housing & Sleeve: 304 (Schedule 40) Stainless Steel.
.4 Elastomers: EPDM, Silicone and Buna-N.
.5 Tri-link Checks: Noryl®, Stainless Steel.
.6 Check Discs: Reversible Silicone or EPDM.
.7 Test Cocks: Bronze Body Nickel Plated.
.8 Pins & Fasteners: 300 Series Stainless Steel.
.9 Springs: Stainless Steel.
.10 Temperature Range: 33°F - 140°F (0.5°C - 60°C).
.11 Maximum Working Pressure: 175psi (12.1 bar).
.12 Approved Material: Watts, Wilkins.

.2 Double Check Valve Assemblies – BFP-2:

.1 ULC listed, FM approved.
.2 Size: NPS 8.
.3 Housing & Sleeve: 304 (Schedule 40) Stainless Steel.
.4 Elastomers: EPDM, Silicone and Buna-N.
.5 Tri-link Checks: Noryl®, Stainless Steel.
.6 Check Discs: Reversible Silicone or EPDM.
.7 Test Cocks: Bronze Body Nickel Plated.
.8 Pins & Fasteners: 300 Series Stainless Steel.
.9 Springs: Stainless Steel.
.10 Temperature Range: 33°F - 140°F (0.5°C - 60°C).
.11 Maximum Working Pressure: 175psi (12.1 bar).
.12 Approved Material: Watts, Wilkins.

2.6 PRESSURE GAUGES

.1 ULC listed.

.2 Liquid filled.

.3 Minimum 100mm dial.

.4 Maximum limit of not less than twice normal working pressure where installed.

Part 3 Execution

3.1 APPROVALS

.1 Working (shop) drawings and hydraulic calculations shall be reviewed by the Engineer of Record, the City, and all applicable Governmental Authorities Having Jurisdiction prior to any fabrication, ordering of material or site work.

3.2 INSTALLATION

.1 All system components to be installed as per the shop drawings and the manufacturer's recommendations.

3.3 TESTING AND TRAINING

.1 The Contractor shall subject all system components to operational and hydrostatic tests as per NFPA 13, NFPA 20 and NFPA 25. Repair any leaks or defective piping that should occur during the tests.

.2 Provide four (4) hours of training to the building maintenance staff prior to functional testing.

.3 The Contractor shall conduct a full system functional test in the presence of the City. Provide foreman for a minimum of one (1) day for the duration of this testing. The purpose of the test will be to verify the operation of the equipment. Ten (10) days' notice shall be given before any functional testing. Coordinate testing with fire alarm Contractor. The testing shall include testing of the wet pipe systems.

3.4 CUTTING, CORE DRILLING AND PATCHING

.1 All cutting, welding, core drilling and patching shall be the responsibility of this Contractor. This Contractor shall mark and be responsible for all holes locations.

3.5 OBSERVATION REPORTS

.1 Observation reports as issued by the Engineer of Record are to be signed off (each item) by the Foreman when the deficiency is completed. Reports to be issued, with signature, to the Engineer of Record for their review.

3.6 FIELD QUALITY CONTROL

.1 Site Test, Inspection:

- .1 Perform test to determine compliance with specified requirements.
- .2 Test, inspect, and approve piping before covering or concealing.
- .3 Preliminary Tests:
  - .1 Hydrostatically test each system at 200 psig for a 2 hour period with no leakage or reduction in pressure.
  - .2 Flush piping with potable water in accordance with NFPA 13.
  - .3 Test alarms and other devices.
  - .4 Test water flow alarms by flowing water through inspector's test connection. When tests have been completed and corrections made, submit signed and dated certificate in accordance with NFPA 13.

.4 Formal Tests and Inspections:

.1 Do not submit request for formal test and inspection until preliminary test and corrections are completed and approved.

.2 Submit written request for formal inspection at least 15 days prior to inspection date.

.3 Repeat required tests as directed.

.4 Correct defects and make additional tests until systems comply with contract requirements.

.5 Furnish appliances, equipment, instruments, connecting devices, and personnel for tests.

.6 Authority of Jurisdiction, will witness formal tests and approve systems before they are accepted.

.2 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

.3 Site Tests:

.1 Testing to be witnessed by Engineer of Record, unless indicated otherwise.

3.7 CLEANING

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

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

END OF SECTION

Part 1 General

1.1 DESCRIPTION OF WORK

.1 Provide pumps for fire suppression.

1.2 REFERENCES

.1 American National Standards Institute/National Fire Protection Association (ANSI/NFPA):

.1 ANSI/NFPA 20 - 2013 Edition, Standard for the Installation of Stationary Pumps for Fire Protection.

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS):

.1 Material Safety Data Sheets (MSDS).

1.3 SECTION INCLUDES

.1 Section Includes:

.1 Materials and installation for fire pumps for use when water pressure serving facility is inadequate.

.2 Division 1 – General Requirements.

.3 Section 21 05 01 – Common Work Results for Mechanical.

1.4 QUALITY ASSURANCE

.1 All equipment or components of this specification section shall meet or exceed the requirements and quality of the items herein specified, or as denoted on the drawings.

.2 Installer: company or person specializing in fire pump installations with documented experience and approved by manufacturer. The manufacturer shall assume “Unit Responsibility” for the complete fire pump. Unit responsibility shall be defined as responsibility for interface and successful operation of all system components supplied by the pumping system manufacturer.

.3 System Designer: The system designer shall be identified on the system design documents. Acceptable minimum evidence of qualifications or certification shall be provided when requested by the authority having jurisdiction. Qualified personnel shall include, but not be limited to, one or more of the following:

.1 Personnel who are factory trained and certified for fire pump system design of the specific type and brand of system being designed.

.2 Personnel who are certified by a nationally recognized fire protection certification organization acceptable to the authority having jurisdiction.

.3 Personnel who are registered, licensed, or certified by a state or local authority.

.4 Ensure pump pressure ratings are at least equal to system’s maximum operating pressure at point where installed, but not less than specified.

.5 Equipment provider shall be responsible for providing certified equipment start-up and, when noted, an in the field certified training session. This pump start-up shall be by the pump manufacturer or a certified factory-trained representative per NFPA 20.

.6 This start-up shall include verification of proper installation, system initiation, adjustment and fine tuning. Start-up shall not be considered complete until the sequence of operation, including all alarms, has been sufficiently demonstrated to the owner or owner's designated representative. This job site visit shall occur only after all hook-ups, tie-ins, and terminations have been completed and signed off on the manufacturer's start-up request form.

1.5 PRODUCT HANDLING

.1 Protection: Use all means necessary to protect equipment before, during, and after installation in accordance with manufacturer's storage, installation and maintenance instructions.

1.6 SUBMITTAL

.1 Submit each item in this article according to the Conditions of the Contract and Specifications Sections.

.2 Submit manufacturer's installation instructions under provisions of General Conditions.

.3 Product Data including certified performance curves and rated capacities of selected models, weights (shipping, installed, and operating), furnished specialties, and accessories. Indicate pump's operating point on curves.

.4 Hanging and support requirements should follow the recommendations in the Manufacturer's installation instructions.

1.7 OPERATION AND MAINTENANCE DATA

.1 All equipment or components of this specification section shall meet or exceed the requirements and quality of the items herein specified, or as denoted on the drawings.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials to the site in such a manner as to protect the materials from shipping and handling damage. Provide materials on factory provided shipping skids. Materials damaged by the elements should be packaged in such a manner that they could withstand short-term exposure to the elements during transportation.

.2 Store materials in clean, dry place and protect from weather and construction traffic. Handle carefully to avoid damage.

Part 2 Products

2.1 FIRE PUMPS – FP-1 AND FP-2 (IDENTICAL)

.1 Packaged, ULC listed and labeled motor driven vertical in-line fire pump and controller.

.2 Pump:

.1 Two Vertical in-line fire pumps complete with NPS 6 flanged inlet, NPS 4 flanged outlet, listed by ULC/FM having a rated capacity of 750 us gpm for a pressure boost of 80.0 psi. Chum pressure to be 97.0 psi.

.2 The pump shall have a bronze impeller, non-corrosive shaft sleeve, packed gland with external flush line to the lantern ring suitable for 125 PSIG suction pressure. Pumps are supplied with cast iron casings incorporating a double volute design.

.3 Electric Motor:

.1 The fire pump shall be driven by a 50 HP at 3550 rpm, 575 Volts, 3 Phase, 60 Hz standard vertical close coupled open drip proof motor with a 1.15 service factor. Minimum Fittings:

.4 Minimum Fittings:

.1 The pump shall be supplied with the following accessories:

.1 One (1) 3.5 inch dial type suction gauge.

.2 One (1) 3.5 inch dial type discharge gauge.

.3 One (1) circulation relief valve.

.5 Testing and Mounting:

.1 The fire pump shall be hydrostatically tested to twice the maximum pressure developed at shut-off but not less than 250 PSI. Tests will meet or exceed NFPA 20 standards.

.2 The fire pump shall be subjected to a performance test at rated speed.

.3 The pump shall furnish not less than 150% of rated capacity at a pressure not less than 65% of rated head. The shut-off total head of the pump shall not exceed 140% of rated total head. Certified curves shall be supplied to the purchaser showing the efficiency, brake-horsepower and total head developed at shut-off at rated capacity and at 150% of rated capacity.

.4 Following the tests, the fire pump shall be factory mounted and aligned with electric motor on a common structural base.

2.2 ELECTRIC MOTOR DRIVEN FIRE PUMP-CONTROLLER (ONE (1) PER FIRE PUMP)

.1 The fire pump manufacturer shall furnish a ULC/FM fire pump controller. The controller shall be listed. The controller shall be Soft Start/Stop. The main fire pump controller shall be housed in a STD - Standard Enclosure Rated Enclosure.

.2 Fire Pump Controller and Automatic Transfer Switch Controller Combination shall be approved by ULC/FM. The automatic transfer switch and the fire pump controller shall each be mounted in a separate enclosure, mechanically attached to form one unit and provide for protected interlock wiring. The automatic transfer switch shall be capable of automatic power transfer from normal to emergency power source in case of failure of normal supply and automatically re-transfer after restoration of normal power conditions.

2.3 FIRE PUMP REMOTE ALARM PANEL

.1 Fire pump remote alarm panel: to NFPA No. 20, sheet steel, wall mounting, finished red, hinged front access door. Audible and visual alarm equipment indicating pump power failure, pump operating, supervisory power failure, controller engine trouble. Coloured indicating lamps, pushbuttons, gong, control relays, terminals, completely factory installed and wired.

.2 Each abnormal pump condition to light appropriate lamp and to sound audible gong alarm. Gong is to be pushbutton silenced, light to remain on until abnormal condition removed, except that in event of supervisory power supply failure, gong cannot be silenced until supply restored.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION

.1 Install in accordance with ULC listing, ANSI/NFPA 20, manufacturer's instructions and approved reviewed shop drawings.

.2 Align pump and motor shafts to within manufacturer's recommended clearances prior to start-up.

.3 Wiring to perform in accordance with manufacturer's instructions and applicable codes.

3.3 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

.2 Site Tests:

.1 Field test each fire pump, driver and controllers in accordance with ANSI/NFPA 20. Testing shall include:

.1 Verification of proper installation, system initiation, adjustment and fine tuning.

.2 Verification of the sequence of operations and alarm systems.

.2 Testing to be witnessed by authority having jurisdiction.

.3 Develop, with Consultant assistance, detailed instructions for O & M of this installation.

3.4 CLEANING

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

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

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Division 01 – General Requirements.

.2 Division 21 – Common Work Results for Mechanical.

.3 Related Sections:

.1 Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

1.2 REFERENCES

.1 American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME):

.1 ANSI/ASME B31.1, Power Piping.

.2 ANSI/ASME B31.3 Process Piping Addenda A.

.3 ANSI/ASME B31.3 Process Piping Addenda B.

.4 ANSI/ASME Boiler and Pressure Vessel Code latest edition:

.1 Section I: Power Boilers.

.2 Section V: Non-destructive Examination.

.3 Section IX: Welding and Brazing Qualifications.

.2 American National Standards Institute/American Water Works Association (ANSI/AWWA):

.1 ANSI/AWWA C206 Field Welding of Steel Water Pipe.

.3 American Welding Society (AWS):

.1 AWS C1.1, Recommended Practices for Resistance Welding.

.2 AWS Z49.1, Safety Welding, Cutting and Allied Process.

.3 AWS W1, Welding Inspection Handbook..

.4 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-48.2, Spot Radiography of Welded Butt Joints in Ferrous Materials.

.5 Canadian Standards Association (CSA International):

.1 CSA W47.2, Certification of Companies for Fusion Welding of Aluminum.

.2 CSA W48 series-01, Filler Metals and Allied Materials for Metal Arc Welding.

.3 CSA B51, Boiler, Pressure Vessel and Pressure Piping Code.

.4 CSA-W117.2, Safety in Welding, Cutting and Allied Processes.

.5 CSA W178.1, Certification of Welding Inspection Organizations.

.6 CSA W178.2, Certification of Welding Inspectors.

1.3 QUALIFICATIONS

.1 Welders:

.1 Welding qualifications in accordance with CSA B51.

.2 Use qualified and licensed welders possessing certificate for each procedure performed from authority having jurisdiction.

.3 Furnish welder's qualifications.

.4 Each welder to possess identification symbol issued by authority having jurisdiction.

.5 Certification of companies for fusion welding of aluminum in accordance with CSA W47.2.

.2 Inspectors:

.1 Inspectors qualified to CSA W178.2.

1.4 QUALITY ASSURANCE

.1 Registration of welding procedures in accordance with CSA B51.

.2 Copy of welding procedures available for inspection.

.3 Safety in welding, cutting and allied processes in accordance with CSA-W117.2.

Part 2 Products

2.1 ELECTRODES

.1 Electrodes: in accordance with CSA W48 Series.

Part 3 Execution

3.1 WORKMANSHIP

.1 Welding: in accordance with ANSI/ASME B31.1, ANSI/ASME Boiler and Pressure Vessel Code, Sections I and IX and ANSI/AWWA C206, using procedures conforming to AWS B3.0, AWS C1.1.

3.2 INSTALLATION REQUIREMENTS

.1 Identify each weld with welder's identification symbol.

.2 Backing rings:

.1 Where used, fit to minimize gaps between ring and pipe bore.

.2 Do not install at orifice flanges.

.3 Fittings:

.1 NPS 2 and smaller: install welding type sockets.

.2 Branch connections: install welding tees or forged branch outlet fittings.

3.3 INSPECTION AND TESTS - GENERAL REQUIREMENTS

.1 Review weld quality requirements and defect limits of applicable codes and standards with Provincial Authority before work is started.

.2 Formulate "Inspection and Test Plan" in co-operation with Governmental Authorities.

.3 Do not conceal welds until they have been inspected, tested and approved by inspector.

.4 Provide for inspector to visually inspect welds during early stages of welding procedures in accordance with Welding Inspection Handbook. Repair or replace defects as required by codes and as specified.

3.4 SPECIALIST EXAMINATIONS AND TESTS

.1 General:

.1 Perform examinations and tests by specialist qualified in accordance with CSA W178.1 and CSA W178.2 and approved by Provincial Authority.

.2 To ANSI/ASME Boiler and Pressure Vessels Code, Section V, CSA B51 and requirements of authority having jurisdiction.

.3 Inspect and test 10% of welds in accordance with "Inspection and Test Plan" by non-destructive visual examination and magnetic particle (hereinafter referred to as "particle") tests.

.2 Visual examinations: include entire circumference of weld externally and wherever possible internally.

.3 Failure of visual examinations:

.1 Upon failure of welds by visual examination, perform additional testing as directed by Governmental Authorities of up to 10% of welds, selected at random.

3.5 DEFECTS CAUSING REJECTION

.1 As described in ANSI/ASME B31.1 and ANSI/ASME Boiler and Pressure Vessels Code.

3.6 REPAIR OF WELDS WHICH FAILED TESTS

.1 Re-inspect and re-test repaired or re-worked welds.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

.1 The Contractor shall be responsible to carry out all the Work set out or referred to in this Section.

1.2 SUMMARY

.1 Section Includes:

.1 Materials and requirements for the identification of piping systems, duct work, valves and controllers, including the installation and location of identification systems.

.2 Sustainable requirements for construction and verification.

1.3 REFERENCES

.1 Canadian Gas Association (CGA):

.1 CSA/CGA B149.1, Natural Gas and Propane Installation Code.

.2 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-1.60, Interior Alkyd Gloss Enamel.

.2 CAN/CGSB-24.3, Identification of Piping Systems.

.3 National Fire Protection Association (NFPA):

.1 NFPA 13, Standard for the Installation of Sprinkler Systems.

1.4 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures

.2 Product data to include paint colour chips, other products specified in this section.

.3 Samples:

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

.2 Samples to include nameplates, labels, tags, lists of proposed legends.

1.5 QUALITY ASSURANCE

.1 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

.2 Health and Safety:

.1 Construction occupational health and safety in accordance with Section 01 35 29 06 - Health and Safety Requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

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

.2 Dispose of unused paint, coating material at official hazardous material collections site approved by Consultant.

.3 Do not dispose of unused paint, coating material into sewer system, into streams, lakes, onto ground or in locations where it will pose health or environmental hazard.

Part 2 Products

2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

.1 Plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer. Metal plates shall be provided for all for equipment operating over 140°F.

.2 Lettering and numbers raised or recessed.

.3 Information to include, as appropriate:

.1 Equipment: manufacturer's name, model, size, serial number, capacity.

.2 Motor: voltage, Hz, phase, power factor, duty, frame size.

2.2 SYSTEM NAMEPLATES

.1 Colours:

.1 Hazardous: red letters, white background.

.2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).

.2 Construction:

.1 3 mm thick laminated plastic, matte finish, with square corners, letters accurately aligned and machine engraved into core.

.3 Sizes:

.1 Conform to following table:

Size	Sizes (mm)	No. of Lines	Height of Letters (mm)
1	10 x 50	1	3
2	13 x 75	1	5
3	13 x 75	2	3
4	20 x 100	1	8
5	20 x 100	2	5
6	20 x 200	1	8
7	25 x 125	1	12
8	25 x 125	2	8
9	35 x 200	1	20

.2 Use maximum of 25 letters/numbers per line.

.4 Locations:

.1 Terminal cabinets, control panels: use size #5.

.2 Equipment in Mechanical Rooms: use size #9.

2.3 EXISTING IDENTIFICATION SYSTEMS

.1 Apply existing identification system to new Work.

.2 Where existing identification system does not cover for new work, use identification system specified this Section.

.3 Before starting work, obtain written approval of identification system from Consultant.

2.4 PIPING SYSTEMS GOVERNED BY CODES

.1 Identification:

.1 Sprinklers: in accordance with NFPA 13.

2.5 IDENTIFICATION OF PIPING SYSTEMS

.1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.

.2 Pictograms:

.1 Where required: Workplace Hazardous Materials Information System (WHMIS) regulations.

.3 Legend:

.1 Block capitals to sizes and colours listed in CAN/CGSB 24.3.

.4 Arrows showing direction of flow:

.1 Outside diameter of pipe or insulation less than 75 mm: 100 mm long x 50 mm high.

.2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.

.3 Use double-headed arrows where flow is reversible.

.5 Extent of background colour marking:

.1 To full circumference of pipe or insulation.

.2 Length to accommodate pictogram, full length of legend and arrows.

.6 Materials for background colour marking, legend, arrows:

.1 Pipes and tubing 20 mm and smaller: waterproof and heat-resistant pressure sensitive plastic marker tags.

.2 Other pipes: pressure sensitive vinyl with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous operating temperature of 150°C and intermittent temperature of 200°C.

.7 Colours and Legends:

.1 Where not listed, obtain direction from Consultant.

.2 Colours for legends, arrows: to following table:

Background colour:	Legend, arrows:
Yellow	BLACK
Green	WHITE
Red	WHITE

.3 Background colour marking and legends for piping systems:

Contents	Background colour marking	Legend
Fire protection water	Red	FIRE PROT. WTR

2.6 VALVES, CONTROLLERS

.1 Brass tags with 12 mm stamped identification data filled with black paint.

.2 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, location of tagged item.

2.7 CONTROLS COMPONENTS IDENTIFICATION

.1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.

.2 Inscriptions to include function and (where appropriate) fail-safe position.

2.8 LANGUAGE

.1 Identification in English and French.

.2 Use one nameplate and label for each language.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION

.1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.

.2 Provide ULC and/or CSA registration plates as required by respective agency.

.3 Identify systems, equipment to conform to Correction Services Canada Technical Standards.

3.3 NAMEPLATES

.1 Locations:

.1 In conspicuous location to facilitate easy reading and identification from operating floor.

.2 Standoffs:

.1 Provide for nameplates on hot and/or insulated surfaces.

.3 Protection:

.1 Do not paint, insulate or cover.

3.4 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

.1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: at not more than 17 m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.

.2 Adjacent to each change in direction.

.3 At least once in each small room through which piping or ductwork passes.

.4 On both sides of visual obstruction or where run is difficult to follow.

.5 On both sides of separations such as walls, floors, partitions.

.6 Where system is installed in pipe chases, ceiling spaces, galleries, confined spaces, at entry and exit points, and at access openings.

.7 At beginning and end points of each run and at each piece of equipment in run.

.8 At point immediately upstream of major manually operated or automatically controlled valves, and dampers. Where this is not possible, place identification as close as possible, preferably on upstream side.

.9 Identification easily and accurately readable from usual operating areas and from access points:

.1 Position of identification approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

3.5 VALVES, CONTROLLERS

.1 Valves and operating controllers: Secure tags with non-ferrous chains or closed "S" hooks.

3.6 CLEANING

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

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

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

.1 The Contractor shall be responsible to carry out all the Work set out or referred to in this Section.

1.2 SUMMARY

.1 Section Includes:

.1 Thermal insulation for piping and piping accessories in commercial type applications.

1.3 REFERENCES

.1 American Society of Heating, Refrigeration and Air Conditioning Engineer (ASHRAE):

.1 ASHRAE Standard 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings (IESNA co-sponsored; ANSI approved; Continuous Maintenance Standard).

.2 American Society for Testing and Materials International (ASTM):

.1 ASTM B209M, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate Metric.

.2 ASTM C335, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.

.3 ASTM C411, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

.4 ASTM C449/C449M, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.

.5 ASTM C533, Calcium Silicate Block and Pipe Thermal Insulation.

.6 ASTM C547, Mineral Fiber Pipe Insulation.

.7 ASTM C795, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

.8 ASTM C921-03a, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

.3 Canadian General Standards Board (CGSB):

.1 CGSB 51-GP-52Ma, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

.2 CAN/CGSB-51.53, Poly (Vinyl Chloride) Jacketing Sheet, for Insulated Pipes, Vessels and Round Ducts

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS):

.1 Material Safety Data Sheets (MSDS).

.5 Manufacturer's Trade Associations:

.1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (latest edition).

.6 Underwriters' Laboratories of Canada (ULC):

.1 CAN/ULC-S102, Surface Burning Characteristics of Building Materials and Assemblies.

.2 CAN/ULC-S701, Thermal Insulation, Polystyrene, Boards and Pipe Covering.

.3 CAN/ULC-S702, Thermal Insulation, Mineral Fibre, for Buildings

.4 CAN/ULC-S702.2, Thermal Insulation, Mineral Fibre, for Buildings, Part 2: Application Guidelines.

1.4 DEFINITIONS

.1 For purposes of this Section:

.1 "concealed" - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.

.2 "exposed" - will mean "not concealed" as specified.

.2 TIAC ss:

.1 CRF: Code Rectangular Finish.

.2 CPF: Code Piping Finish.

1.5 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.

.3 Shop Drawings:

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.4 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.6 QUALITY ASSURANCE

.1 Subcontractor responsible for installation shall be a specialist in performing work of this Section, have at least 3 years successful experience in this size and type of project, and be a member of TIAC.

.2 Health and Safety:

.1 Construction occupational health and safety in accordance with Section 01 35 29 06 - Health and Safety Requirements.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:

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

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.3 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.2 Storage and protection:

.1 Protect from weather, construction traffic.

.2 Protect against damage.

.3 Store at temperatures and conditions required by manufacturer.

.3 Waste management and disposal:

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

.2 Place excess or unused insulation and insulation accessory materials in designated containers.

.3 Divert unused metal materials from landfill to approved metal recycling facility.

.4 Dispose of unused adhesive material at official approved hazardous material collections site.

Part 2 Products

2.1 SUSTAINABLE REQUIREMENTS

.1 Materials and products in accordance with Section here within on Sustainable Requirements: Construction.

2.2 FIRE AND SMOKE RATING

.1 In accordance with CAN/ULC-S102:

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.3 INSULATION

.1 Mineral fibre specified includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24 degrees C mean temperature when tested in accordance with ASTM C335.

.3 TIAC Code A-2: Rigid moulded calcium silicate in sections and blocks, and with special shapes to suit project requirements.

.1 Insulation: to ASTM C533.

.2 Maximum "k" factor: to 0.075 W/m ^{o}C @ 500^{o}C.

.3 Design to permit periodic removal and re-installation.

.4 TIAC Code A-3: rigid moulded mineral fibre with factory applied vapour retarder jacket:

.1 Mineral fibre: to CAN/ULC-S702.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Maximum "k" factor: to CAN/ULC-S702.

2.4 INSULATION SECUREMENT

.1 Tape: self-adhesive, aluminum, reinforced, 50 mm wide minimum.

.2 Contact adhesive: quick setting.

.3 Canvas adhesive: washable.

.4 Tie wire: 1.5 mm diameter stainless steel.

.5 Bands: stainless steel, 19 mm wide, 0.5 mm thick.

2.5 CEMENT

.1 Thermal insulating and finishing cement:

.1 Hydraulic setting on mineral wool, to ASTM C449/C449M.

2.6 VAPOUR RETARDER LAP ADHESIVE

.1 Water based, fire retardant type, compatible with insulation.

2.7 INDOOR VAPOUR RETARDER FINISH

.1 Vinyl emulsion type acrylic, compatible with insulation.

2.8 JACKETS

.1 Polyvinyl Chloride (PVC):

.1 One-piece moulded type and sheet to CAN/CGSB-51.53 with pre-formed shapes as required.

.2 Colours: White.

.3 Minimum service temperatures: -20°C.

.4 Maximum service temperature: 65° C.

.5 Moisture vapour transmission: 0.02 perm.

.6 Fastenings:

.1 Use solvent weld adhesive compatible with insulation to seal laps and joints.

.2 Tacks.

.3 Pressure sensitive vinyl tape of matching colour.

.7 Special requirements:

.1 Outdoor: UV rated material at least 0.5 mm thick.

.2 Metal jacket banding and mechanical seals: stainless steel, 19 mm wide, 0.5 mm thick at 300 mm spacing.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 PRE-INSTALLATION REQUIREMENT

.1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified.

.2 Surfaces clean, dry, free from foreign material.

3.3 INSTALLATION

.1 Install in accordance with TIAC National Standards.

.2 Apply materials in accordance with manufacturers' instructions and this specification.

.3 Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm.

.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes:

.1 Install hangers, supports outside vapour retarder jacket.

.5 Supports, Hangers:

.1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.

3.4 PIPING INSULATION SCHEDULES

.1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.

.2 TIAC Code: A-1:

.1 Securements: SS bands 19mm at 300 mm on centre.

.2 Seals: lap seal adhesive, lagging adhesive.

.3 Installation: TIAC Code 1501-H.

.3 TIAC Code: A-2.

.1 Insulation securements: 18 ga SS wire or 12 mm x 0.51 mm SS bands at 300 mm oc.

.2 Seals: lap seal adhesive, lagging adhesive.

.3 Installation: TIAC Code: 1501-H.

.4 TIAC Code: A-3:

.1 Securements: SS wire at 300 mm on centre.

.2 Seals: VR lap seal adhesive, VR lagging adhesive.

.3 Installation: TIAC Code: 1501-C.

.5 TIAC Code: C-2 with vapour retarder jacket:

.1 Insulation securements: ss. wire, 300 mm on centre

.2 Seals: lap seal adhesive, lagging adhesive.

.3 Installation: TIAC Code: 1501-C.

.6 Thickness of insulation as listed in following table:

.1 Run-outs to individual units and equipment not exceeding 4000 mm long.

.2 Do not insulate exposed run outs to plumbing fixtures, chrome plated piping, valves and fittings.

Application	**Temp ° C**	**TIAC code**	**Pipe sizes (NPS) and insulation thickness (mm)**					
			Run out	**to 1**	**1 1/4 to 2**	**2 1/2 to 4**	**5 to 6**	**8 & over**
Diesel Engine Exhaust		A-2	38	65	65	75	90	90
Sprinkler Piping		A-3	25	25	25	25	25	25

.7 Finishes:

.1 Exposed indoors: PVC.

.2 Exposed in mechanical rooms: PVC.

.3 Concealed, indoors: canvas on valves, fittings. No further finish.

.4 Use vapour retarder jacket on TIAC code A-3 insulation compatible with insulation.

.5 Finish attachments: SS bands at 150 mm on centre.

.6 Installation: to appropriate TIAC code CRF/1 through CPF/5.

3.5 CLEANING

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

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

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 General requirements that are common to Sections of Division 26 – Electrical.

1.2 RELATED SECTIONS

.1 Division 01 – General Requirements.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International):

.1 CSA C22.1-18, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.

.2 CSA C22.2 No. 0-M91 (R2006), General Requirements.

.3 CAN3-C235-83 (R2006) Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

.4 CAN/CSA-C22.3 No. 1-01 (Update March 2005), Overhead Systems.

.5 CAN/CSA-C22.3 No. 3.Underground Electrical Services:

.6 CAN/CSA-ULC-536 Standard for Inspection and Testing of Fire Alarm Systems

.7 CAN/CSA-ULC-537 Standard for Verification of Fire Alarm Systems

.8 CAN/CSA-B651 Barrier-Free access:

.2 National Building Code of Canada, (2015).

.3 National Fire Code of Canada, (2015).

.4 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.

1.4 DEFINITIONS

.1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.

1.5 SCOPE OF WORK

.1 The work shall include all labour, materials and equipment necessary for the complete installation of the electrical, communications and electronic safety and systems shown on the drawings and described in these specifications.

.2 It is the requirement of this work to provide all systems completely functioning in intended system operation, notwithstanding that every item necessarily required may not be specifically mentioned.

.3 The specification complements the drawings in describing the supply and installation of a complete electrical system. This system shall include but not necessarily be limited to the following:

.1 Disconnections and reconnection of the existing power and fire alarm services related to the existing fire pumps and controllers,

.2 Supply and install of the power distribution system to connect the new fire pump controller to generator power.

.3 Supply and install of the fire alarm devices to connect the new fire pump controller to existing fire alarm system.

.4 Supply and install the control wiring to initiate generator control from the new fire pump controller.

.5 Fire Alarm System;

.6 Transfer Switch.

.7 Oversee the commissioning of the fire pump, controller and fire alarm system as lead by the manufacturer's representative.

1.6 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.

.3 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

.4 Overhead and Underground Electrical Services: CSA C22.3 No. 1 and CAN/CSA-C22.3 No. 3.

.5 Barrier-Free access: design equipment and components in accordance with CAN/CSA-B651.

1.7 SUBMITTALS

.1 Submittals: in accordance with Division 01 – General Requirements.

.2 Product Data: submit WHMIS MSDS in accordance with Division 01 – General Requirements.

.3 Shop drawings:

.1 Refer to individual specification sections for shop drawing requirements.

.2 Submit shop drawings in accordance with Division 01 – General Requirements.

.3 Identify applicable specification section and paragraph number on each shop drawing.

.4 Submit installation details of proposed location, layout and arrangement of conduit and boxes, and other items that must be shown to ensure co-ordinated installation.

.5 Faxes are not acceptable for shop drawings. If sent by fax, they will not be reviewed.

.6 Do not begin fabrication until shop drawings have been reviewed by Departmental Representative. Allow ten (10) working days for Departmental Representative's review.

.7 Review of shop drawings does not relieve the contractor of the responsibility for co-ordination of field measurements required to complete the work.

.8 Contractor shall approve all shop drawings by signing and dating them prior to submitting to Departmental Representative.

.4 Quality Control: in accordance with Division 01 – General Requirements.

.1 Provide CSA or other certification agency certified material, recognized by the Authority Having Jurisdiction.

.2 Where certified material is not available, submit such equipment and material to authority having jurisdiction for approval before delivery to site.

.3 Perform pill testing of the following conduit systems:

.1 Underground.

.2 Concrete encased.

.3 41mm and larger.

.4 Submit, upon completion of Work, load balance report as described in PART 3 – FIELD QUALITY CONTROL.

.5 Submit test results for installed electrical systems.

.6 Manufacturer's Field Reports: submit to Engineer written report, within 3 days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

.7 Submit for review single line electrical diagrams under plexi-glass and locate adjacent main switchboard.

.1 Electrical distribution system in main electrical room.

1.8 AS-BUILT DRAWINGS:

.1 On a set of opaque drawings, record all changes as work progresses. Incorporate all information issued in Addenda, Site Instructions and Change Orders and all changes in actual installation as a result of site conditions and coordination. All changes shall be recorded neatly and legibility in red ink.

.2 Identify each drawing in lower right hand corner in letters at least 13 mm high as follows: AS-BUILT DRAWING (This drawing has been revised to show electrical systems as installed), (Name of Contractor), (Signature of Contractor) and (Date).

.3 Submit to the General Contractor for approval and make all corrections as directed.

1.9 ALTERNATE PRODUCTS

.1 Requests for alternate product approval shall be in accordance with Division 01 – General Requirements.

.2 It is the intent of these specifications to establish the required quality of materials. Where manufacturer’s name and catalogue number are used, it is done in order to establish the required quality, style, size or function. The decision as to suitability shall rest with the Engineer.

.3 All materials not meeting the standards as set down by these specifications shall not be allowed on the job site.

.4 Substitutions affecting the design will not be permitted.

.5 Additional costs to any other trade as a result of a change or substitution by this Contractor shall be borne by this Contractor.

.6 The listing of a manufacturer as acceptable does not imply acceptance of all products of that manufacturer and only products of that manufacturer meeting the standards as set out in the specifications will be accepted.

.7 All requests for alternates must be submitted no later than five (5) working days prior to tender close.

.8 Faxes are not acceptable for request for alternates. If sent by fax, they will not be reviewed.

1.10 SAMPLES

.1 Submit samples in accordance with Division 01 – General Requirements.

.2 After review and acceptance, samples will be returned for incorporation into work.

1.11 TEST REPORTS

.1 Submit certified test reports and certificates to Engineer from approved independent testing laboratories.

.2 Indicate compliance with specifications for specified performance characteristics and physical properties.

.3 Manufacturer's Field Services: submit copies of manufacturer's field inspection reports.

1.12 OPERATION AND MAINTENANCE DATA

.1 Provide operation and maintenance data for incorporation into operation and maintenance manual as per Division 01 – General Requirements.

.2 Include in Operation and Maintenance Data:

.1 Table of Contents.

.2 Name and address of Electrical Contractor.

.3 Names, addresses and telephone numbers of local suppliers for items included in Operation and Maintenance Manuals.

.4 Letter of Warranty.

.5 Product related warranties.

.6 Copy of reviewed Shop Drawings.

.7 Copy of all test certificates.

.8 Copy of all final panelboard schedules.

.9 Copy of signed transmittal verifying all maintenance materials turned over to the owner/user.

.10 One (1) paper copy of As Built drawings and specifications including all addenda and change orders.

.11 Include details of design elements, component function and maintenance requirements to effectively operate, maintain or repair.

.12 Include technical data, product data, component illustrations, technical descriptions and parts list, wiring and schematic diagrams not considered proprietary, test and verification reports. Advertising or sales literature is not acceptable.

1.13 MAINTENANCE MATERIALS

.1 Provide maintenance materials in accordance with Division 01 – General Requirements and as indicated in respective specification sections.

1.14 EXISTING CONDITIONS

.1 Tie into existing systems at times coordinated with Departmental Representative.

.2 Submit written request for approval 10 days minimum, prior to commencement of work.

.3 Be responsible for damage to existing construction by this work.

.4 Ensure daily clean-up of existing areas.

1.15 UNFORSEEN HAZARDS

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

.2 Perform work in accordance with Section 01 35 29 Health & Safety Requirements.

1.16 FIRESTOPPING

.1 All firestopping work is to be performed by the General Contractor.

.2 All firestopping work performed by the Electrical Contractor shall be performed in accordance with Division 01.

.3 Electrical contractor shall coordinate all fire rated assembly penetrations with General Contractor.

.4 Electrical Contractor shall provide required clearances between outside surface of conduits and inside surface of sleeves, core drilled holes or listed fire rated systems.

1.17 ACCESS DOORS

.1 All access doors related to Electrical work shall be provided by Electrical Contractor, where required, and turned over to General Contractor for installation.

1.18 INTERPRETATION OF PLANS AND SPECIFICATIONS

.1 These specifications are to be considered as an integral part of the plans which accompany them and neither the plans 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 by this Contractor.

.2 Drawings are diagrammatic. Building dimensions shall not be scaled from the Electrical plans.

.3 Any discrepancy between the drawings and the building shall be questioned before proceeding with any installation.

1.19 CO-OPERATION OF CONTRACTORS

.1 This Contractor shall become familiar with the work of other contractors and in laying out and installing the work shall co-operate with the other Contractors, so as to facilitate the progress of the work as a whole and avoid interference or delays. Where interference exists, this Contractor shall notify the Departmental Representative and the Engineer before installing the work. Any changes in the work or alterations of the Electrical Contractor's schedule required for such co-operation will not be considered as a claim for extra compensation.

1.20 ERRORS AND OMISSIONS

.1 The drawings are not intended to show every item of accessory equipment, but the Contractor shall tender on and install all essential details to provide for efficiency of operation and ease of maintenance.

.2 Should this Contractor discover errors or discrepancies in the plans or specification, he shall refer the matter to the Departmental Representative for change or clarification and shall not proceed with that portion of the work until advised by the Departmental Representative to do so.

1.21 DELIVERY, STORAGE, AND HANDLING

.1 Material Delivery Schedule: Provide Engineer with schedule within 14 days after award of contract.

.2 Construction/Demolition Waste Management and Disposal: in accordance with Division 01 – General Requirements.

.3 Store and handle materials in accordance with Division 01 – General Requirements and manufacturer’s written instructions.

1.22 SYSTEM STARTUP

.1 Instruct operating personnel in operation, care and maintenance of systems, system equipment and components.

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

1.23 PERMITS, FEES AND INSPECTION

.1 Submit to Electrical Inspection Department necessary number of drawings and specifications for examination and approval prior to commencement of work.

.2 Obtain an electrical work permit and pay associated fees.

.3 Notify Engineer of changes required by the Electrical Inspection Department.

1.24 WARRANTY

.1 Warranty duration: 12 calendar months following Substantial Completion.

.2 Coverage: warrant against failure to perform to characteristics as specified.

.3 Manufacturer's warranty: submit manufacturer's warranty, for Engineer's acceptance.

Part 2 Products

2.1 MATERIALS AND EQUIPMENT

.1 Provide material and equipment in accordance with Division 01– General Requirements.

.2 Material and equipment to be CSA or ULC certified. Where CSA or ULC certified material and equipment are not available, obtain special approval from authority having jurisdiction, before delivery to site.

.3 Ensure labels are visible and readable after equipment is installed.

.4 Factory assemble electrical panels and component assemblies.

2.2 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

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

.2 Division 26 responsibility is as follows:

.1 Supply and installation of breakers and/or switches.

.2 Supply and installation of power feeder (conduit and wire) from panel to starter, from starter to disconnect switch and from disconnect switch to motor.

.3 Supply and installation of starters complete with motor protection unless noted otherwise.

.4 Supply and installation of disconnect switches at motors unless noted otherwise.

.5 Supply and installation of 120V branch wiring to mechanical equipment as indicated on drawings.

.3 Control wiring and conduit is by Division 25 unless noted otherwise on electrical drawings.

2.3 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of authority having jurisdiction, inspection authorities and Engineer.

.2 Signs, minimum size 178 x 254 mm.

2.4 WIRING TERMINATIONS

.1 Ensure lugs, terminals and screws used for termination of wiring are suitable for copper conductors.

2.5 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two (2) coats of finish enamel:

.1 Paint outdoor electrical equipment "equipment" green finish to EEMAC Y1-1.

.2 Paint indoor switchgear and distribution enclosures light grey to EEMAC 2Y-1.

.2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.3 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

2.6 EQUIPMENT IDENTIFICATION

.1 Contractor to identify the project electrical components with the Owner supplied identification numbering system which coincides with the Clients maintenance management program.

.2 Identify electrical equipment with nameplates and labels as follows:

.1 Nameplates: 3 mm thick plastic engraving sheet, matt white finish face, black core, lettering accurately aligned and engraved into core, self-adhesive type.

.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

.3 Labels:

.1 Embossed plastic labels with 6 mm high letters unless specified otherwise.

.4 Wording on nameplates to be approved by Engineer prior to manufacture.

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

.6 Identification to be in English.

.7 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics. Label both box and cover.

.8 Disconnects, starters and contactors: indicate equipment being controlled and voltage. Terminal cabinets and pull boxes: indicate system and voltage.

.9 Panelboards and switchboards: name and electrical characteristics (voltage, phase, wire, bus capacity, interrupting capacity, circuit number and designation).

Example:

Panel A – 225 A 120/208 V – 3 PH – 4 W Fed from panel DA Circuit #2, 4, 6	Minimum interrupting capacity of breakers installed in this panel is to be not less than 10 KAIC

.10 Switch board and panels: indicate panel designation, amperage, voltage and interrupting rating.

.11 Transformers: indicate transformer designation, capacity, primary and secondary voltages.

.12 Each circuit shown on plans (new and existing) shall have the circuit number and supplying panelboard permanently identified at the cover. This identification shall be a lamicoid nameplate, mechanically attached and shall be visible when the cover is in place.

.13 All power receptacles, switches, data and telephone outlets shall have a transparent identification permanently installed on coverplate.

2.7 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour coding: to CSA C22.1–18.

.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 Contractor to allow for the following colour coding but is to confirm with Engineer prior to installation. Colours: 25 mm wide primary colour and *20 mm* wide auxiliary colour.

	Prime	**Auxiliary**
600 V essential	Yellow	Red
208/120 V essential	Black	Red
600 V Normal	Yellow	
208/120 V Normal	Black	
Fire Alarm	Red	
Low Voltage	White	

.4 Provide identification of equipment, components, and assemblies specified, using materials suitable to withstand anticipated operating environment.

2.9 HOUSE KEEPING PADS

.1 Co-ordinate with the General Contractor for the provision of Housekeeping Pads under floor mounted equipment.

.2 Provide concrete housekeeping pads for all switchboards, transformers and all other free-standing electrical equipment. Pads to be a minimum of 153 mm larger than the outside dimensions of the equipment they support, and not less than 102 mm thick.

Part 3 Execution

3.1 FIELD QUALITY CONTROL

.1 Confirm other related work is complete to receive work of this and related electrical sections.

.2 Commission electrical systems.

.3 Qualifications:

.1 Electricians: qualified, licensed electricians or apprentices in accordance with Provincial Act respecting manpower vocational training and qualifications.

.2 Apprentices: employees registered in provincial apprentices program permitted, under direct supervision of qualified licensed electrician, to perform specific tasks. Permitted activities determined based on level of training attained and demonstration of ability to perform specific duties.

.4 Contractor holding valid Master Electrical contractor licensed as issued by Province that work is being constructed.

3.2 INSTALLATION

.1 Comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, MSDS, and product datasheets.

.2 Protect electrical equipment from dust and dirt. Plug or cap openings in conduit, fixtures and equipment during construction with Consultant approved materials.

.3 Conceal conduit in finished areas, unless otherwise authorized. Run exposed conduit parallel to building lines, and maintain maximum headroom.

.4 Install outlets, plates and other visible items parallel to building lines. Line up exposed raceways, parallel and at right angles to building walls, partitions, and ceilings.

.5 Set equipment and components plumb and level, accurate to position intended, and position hanger rods plumb.

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 51 mm.

.2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

.3 Install cables, conduits and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.

3.5 LOCATION OF OUTLETS

.1 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.

.2 Change location of outlets at no extra cost or credit, providing distance does not exceed 3m, 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 Toggle switches: 1200 mm.

.2 Wall receptacles:

.1 General: 400 mm.

.2 Above top of counters or counter splash backs: 150 mm.

.3 In mechanical rooms: 1200 mm.

.3 Panel boards: as required by Code.

3.7 FIELD QUALITY CONTROL

.1 Conduct and pay for following tests in accordance with Division 01 – General Requirements:

.1 Circuits originating from branch and distribution panels.

.2 Systems: fire alarm system.

.3 Insulation resistance testing:

.1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.

.2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.

.3 Check resistance to ground before energizing.

.4 Replace conductors as required.

.2 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.3 Manufacturer's Field Services:

.1 Obtain written certificates from manufacturers verifying compliance of Work, in handling, installing, applying, protecting and cleaning of products for inclusion in operation and maintenance manuals.

.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 as indicated in respective specification sections.

3.8 VERIFICATION

.1 Measure phase current to panelboards with normal loads operating at time of acceptance. Adjust branch circuit connections as required to obtain best balance of current between phases and record changes.

.2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.

.3 Submit report, at completion of measurements, listing phase and neutral currents on panelboards, dry-type transformers and motor control centres, operating under normal load. Include hour and date on which load was measured, and voltage at time of test.

3.9 FIELD TESTS

.1 Provide advance notice Departmental Representative of proposed testing schedule.

.2 Perform tests at time of acceptance of work.

.3 Conduct and pay for field tests:

.1 Power distribution, including phase voltage, grounding and load balancing.

.2 Circuits originating from branch distribution panels.

.3 Motors, including sequenced operation.

.4 Lighting and lighting control.

.4 Perform tests in presence of Departmental Representative:

.1 Provide instruments, meters, equipment and personnel required to conduct required tests.

.2 Test systems to verify operation as specified.

.5 Conduct di-electric tests, hi-pot tests, insulation resistance tests and ground continuity tests as required by nature of various systems and equipment.

.6 Perform following tests on completed power systems:

.1 Control and switching: test circuits for correct operation of devices, switches and controls.

.2 Polarity tests: test circuits for correct operation of devices, switches and controls.

.3 Voltage tests: test voltage at last outlet of each circuit; maximum potential drop 2% on 120 V, and 208 V branch circuits, 2% on feeder circuits. Correct deficiencies.

.4 Phase balance: measure load on each phase at switchboards, splitter, distribution panel board and lighting and power panel board.

.1 Submit results to Departmental Representative in writing.

.2 Re-arrange phase connections as necessary to balance load on each phase as instructed by Departmental Representative.

.3 After marking such changes, submit revised drawings showing modified connections to Departmental Representative.

.5 Supply voltage: measure line voltage of each phase at load terminals of main breakers and report results in writing to Departmental Representative. Perform test with majority of electrical equipment in use.

.6 Motor loading: measure line current of each phase of motors with motor operating under load, and report results in writing to Departmental Representative.

.1 Upon indications of imbalances or overloads, thoroughly examine electrical connections and rectify defective parts or wiring.

.2 If electrical connections are correct, report overloads due to defects in driven machines in writing to Departmental Representative.

.7 Insulation resistance tests:

.1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument. Minimum insulation resistance shall be 0.5mΩ.

.2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument. Minimum insulation resistance shall be 1.0mΩ.

.3 Check resistance to ground before energizing.

.8 Co-ordinate and carry out motor testing at same time as driven equipment is being tested. In addition to motor loading tests, provide labour and instruments to read and record motor load readings required to supplement tests on driven equipment through various load sequences, as required by driven equipment tests.

.7 General operations: energize and operate electrical circuit and item. Repair, alter, replace, test and adjust as necessary for a complete and operating electrical system.

.8 Provide labour, instruments, apparatus and pay expenses required for testing. Departmental Representative reserves right to demand proof of accuracy of instruments used.

.9 Immediately prior to occupancy, test entire electrical system by performing loss and return of utility power test. Demonstrate operation of:

.1 Low voltage service equipment and metering

.2 Automatic Transfer Switches

.3 Fire alarm

.4 User equipment shut-down and auto-restart.

3.10 TEST RESULTS

.1 Submit test results to Departmental Representative for review.

.2 Testing methods and test results: to CSA, CEC and authorities having jurisdiction.

.3 Remove and replace conductors found damaged, with new materials.

.4 Provide required labour and tools, if during testing Departmental Representative requests equipment be opened and removed from their housings to examine equipment, terminations and connections.

3.11 TRAINING

.1 Train operating personnel in operation, care and maintenance of electrical equipment.

.2 Arrange and pay for manufacturer's factory service engineer to provide training. Ensure operating personnel are conversant with its care and operation.

.3 Obtain and submit written confirmation from operating personnel that satisfactory training has been received.

3.12 CLEANING

.1 Perform final cleaning of electrical equipment, systems and components.

3.13 DEMONSTRATION

.1 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.2 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

.3 Departmental Representative may record these demonstrations on video tape for future reference.

3.14 PROTECTION

.1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

3.15 CONTROL OF HAZARDOUS ENERGY

.1 Lock out and tag out all electrical and other equipment before performing work as per CAN/CSA-Z460-05.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for wire and box connectors.

1.2 RELATED SECTIONS

.1 Division 01 – General Requirements.

.2 Section 26 05 00 – Common Work Results – Electrical.

.3 Section 26 05 21 – Wires and Cables 0-1000V.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International) Latest Edition of the following:

.1 CAN/CSA-C22.2, No.18 (R2009), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.

.2 CSA C22.2 No.65 (R2008) Wire Connectors.

.2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC) Latest Edition of the following:

.1 EEMAC 1Y-2, 1961 Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

Part 2 Products

2.1 MATERIALS

.1 Pressure type wire connectors to: CSA C22.2 No. 65-03, with current carrying parts of copper sized to fit copper conductors as required.

.2 Fixture type splicing connectors to: CSA C22.2 No. 65-03, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.

.3 Bushing stud connectors to: EEMAC 1Y-2 to consist of:

.1 Connector body and stud clamp for stranded, copper conductors.

.2 Clamp for stranded copper conductors.

.3 Stud clamp bolts.

.4 Bolts for copper conductors.

.5 Sized for conductors as indicated.

.4 Clamps or connectors for armoured cable, flexible conduit, as required to: CAN/CSA-22.2 No. 18.1.

.5 Joints required in connecting all wiring up to and including # 8 are to be made using twist-on connectors.

.6 Joints for all other wiring shall be made using colour-keyed compression type connectors followed by a layer of CSA approved vinyl plastic tape.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION

.1 Remove insulation carefully from ends of conductors and:

.1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No.65.

.2 Install fixture type connectors and tighten. Replace insulating cap.

.3 Install bushing stud connectors in accordance with EEMAC 1Y-2.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Division 01 – General Requirements.

.2 Section 26 05 00 – Common Work Results – Electrical.

.3 Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.

.4 Section 26 05 34 Conduits, Conduit Fastenings and Conduit Fittings.

1.2 REFERENCES

.1 CSA C22.2 No .0.3-015 (R2005), Test Methods for Electrical Wires and Cables Latest Edition.

.2 CAN/CSA-C22.2 No.124 – Type MI cable

.3 CAN/CSA-C22.2 No. 131 - M89 (R2004), Type TECK 90 Cable Latest Edition.

Part 2 Products

2.1 BUILDING WIRES

.1 Conductors: solid for #10 AWG and smaller; stranded for #8 AWG and larger. Minimum size: #12 AWG.

.2 Conductors: size as indicated, with 600V insulation of chemically cross-linked thermosetting polyethylene material rated RW90, RWU90 for wiring installed underground in conduit.

.3 Conductors: all wiring shall be copper.

.4 Neutral conductor insulated for 600V shall be continuous with no fuses, switches, or breaks of any kind.

.5 Wiring requirements for specialized systems such as fire alarm, public address, etc. are indicated in the respective specification sections or on drawings.

.6 The voltage drop shall in no case exceed 3% of the line volts for branch circuits.

.7 Voltage drop shall be calculated based on 80% of the circuit breaker current rating for all branch circuits unless noted otherwise.

.8 Voltage drop for motor branch circuits shall be calculated based on current equal to 80% of the ampacity of the branch circuit conductors.

.9 Branch circuit conductor sizes specified on drawings are the minimum required. Upsize branch circuit conductor sizes as required so that the voltage drop is less than the maximum value permitted.

2.2 TECK CABLE

.1 Cable: to CAN/CSA-C22.2 No. 131.

.2 Conductors:

.1 Grounding conductor: copper.

.2 Circuit conductors: copper, size as indicated.

.3 Insulation:

.1 Type: ethylene propylene rubber.

.2 Chemically cross-linked thermosetting polyethylene rated type RW90, 600V.

.4 Inner jacket: polyvinyl chloride material.

.5 Armour: interlocking.

.6 Overall covering: thermoplastic polyvinyl chloride material.

.7 Fastenings:

.1 Channel type supports for two or more cables at 1.5 m centers.

.2 Threaded rods: 13 mm dia. to support suspended channels.

.8 Connectors:

.1 Watertight, approved for TECK cable.

2.3 CONTROL CABLES

.1 Low energy 300 V control cable: stranded annealed copper conductors sized as indicated, with PVC insulation type, TW wire braid over each group and overall covering of PVC jackets.

2.4 MINERAL INSULATED CABLES

.1 The materials used in construction are to be inorganic and can be utilized at 250°C continuously

.2 Cable to have Zero smoke produced, and Zero flame spread.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION OF BUILDING WIRES

.1 Fire rated cables shall be used for all 600 V, and 208 V essential power feeder as well as fire alarm system wiring as required by NBCC (latest edition).

.2 Install wiring as follows:

.1 In conduit systems in accordance with Section 26 05 34.

.2 Use vibration proof expanding spring wire connectors for No. 10 and smaller.

3.3 INSTALLATION OF TECK CABLE 0-1000 V

.1 Group cables wherever possible on channels.

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

.3 Use only for portions of feeders located outdoors, unless indicated otherwise.

3.4 INSTALLATION OF CONTROL CABLES

.1 Install control cables in conduit or underground ducts as directed.

.2 Ground control cable shield.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 32 – Outlet Boxes, Conduit Boxes and Fittings.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International):

.1 CSA C22.2 No.41-07, Grounding and Bonding Equipment.

Part 2 Products

2.1 CONNECTORS AND TERMINATIONS

.1 Copper compression connectors to CSA C22.2 as required sized for conductors.

Part 3 Execution

3.1 INSTALLATION

.1 Install, terminations, and splices in accordance with manufacturer's instructions.

.2 Bond and ground as required to CSA C22.2 No.41.

.3 Do not install more than three (3) connections per junction box unless specifically permitted by Departmental Representative (in writing).

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Division 01 – General Requirements.

.2 Section 26 05 00 – Common Work Results – Electrical.

1.2 REFERENCES

.1 Canadian Standards Association, CSA C22.1–12, Canadian Electrical Code, Part 1.

Part 2 Products

2.1 EQUIPMENT

.1 Clamps for grounding of conductor: size as required to electrically conductive underground water pipe.

.2 Copper conductor: minimum 6 m long for each concrete encased electrode, bare, stranded, tinned, soft annealed, size as indicated.

.3 Rod electrodes: copper clad steel 19 mm dia. by 3 m long.

.4 Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.

.5 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:

- .1 Grounding and bonding bushings.
- .2 Protective type clamps.
- .3 Bolted type conductor connectors.
- .4 Thermit welded type conductor connectors.
- .5 Bonding jumpers, straps.
- .6 Pressure wire connectors.

2.2 MANUFACTURERS

.1 Acceptable manufacturers:

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION GENERAL

.1 Install complete permanent, continuous grounding system including electrodes, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.

.2 Install connectors in accordance with manufacturer's instructions.

.3 Protect exposed grounding conductors from mechanical injury.

.4 Make buried connections, and connections to conductive water main and grounding electrodes using copper welding by Thermit process.

.5 Use mechanical connectors for grounding connections to equipment provided with lugs.

.6 Soldered joints not permitted.

.7 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

.8 Install separate ground conductor to outdoor lighting standards.

.9 Connect building structural steel and metal siding to ground by welding copper to steel.

.10 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.

.11 Bond single conductor metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end.

.12 Install grounding conductors in conduit except where run in cable tray. Bond to EMT conduit.

.13 Ground secondary enclosures.

3.3 ELECTRODES

.1 Make ground connections to continuously conductive underground water pipe on street side of water meter.

.2 Install water meter shunt.

.3 Install rod electrodes and make grounding connections.

.4 Bond separate, multiple electrodes together.

.5 Use size 2/0 AWG copper conductors for connections to electrodes.

.6 Make special provision for installing electrodes that will give acceptable resistance to ground value where rock or sand terrain prevails. Ground as indicated.

3.4 EQUIPMENT GROUNDING

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list: Service equipment, transformers, duct systems, frames of motors, starters, control panels, building steel work, elevators, distribution panels, outdoor lighting.

.2 Where feeders over 100 A capacity pass through junction or pull boxes the ground continuity through the box shall be ensured by the use of grounding bushings and conductors sized in accordance with table 18 of CSA 22.1.

.3 Run continuous bond wire the entire length of cable tray. Bond to cable tray at each section.

3.5 GROUNDING BUS

.1 Not Applicable

3.6 FIELD QUALITY CONTROL

.1 Verifications requirements in accordance with Division 01 – General Requirements.

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

3.7 COMMUNICATION SYSTEMS

.1 Install grounding connections for telephone, sound, fire alarm, intercommunication systems as follows:

.1 Telephones: make telephone grounding system in accordance with telephone company's requirements.

.2 Sound, fire alarm, intercommunication systems as indicated.

3.8 FIELD QUALITY CONTROL

.1 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Engineer and local authority having jurisdiction over installation.

.2 Perform tests before energizing electrical system.

.3 Disconnect ground fault indicator during tests.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Division 01 – General Requirements.

.2 Section 26 05 00 – Common Work Results – Electrical.

Part 2 Products

2.1 SUPPORT CHANNELS

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

2.2 CABLE SUPPORTS

.1 J-Hook secured to wall or structural member for support of communications cabling. See plans for more information.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION

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

.2 Secure equipment to poured concrete with expandable inserts.

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

.4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.

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

.6 Fasten exposed conduit or cables to building construction or support system using straps:

- .1 One-hole steel straps to secure surface conduits and cables 51mm and smaller.
- .2 Two-hole steel straps for conduits and cables larger than 51mm.
- .3 Beam clamps to secure conduit to exposed steel work.

.7 Suspended support systems:

- .1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.

.2 Support 2 or more cables or conduits on channels supported by 10 mm dia threaded rod hangers where direct fastening to building construction is impractical.

.8 For surface mounting of two or more conduits use channels at 1.5 m on centre spacing.

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

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

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

.12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Engineer.

.13 Install fastenings and supports as required for each type of equipment, cable and conduit, and in accordance with manufacturer's installation recommendations.

.14 Do not support conduit from other conduit.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Division 01- General Requirements.

.2 Section 26 05 00 – Common Work Results – Electrical.

1.2 REFERENCES

.1 CSA C22.1-18, Canadian Electrical Code, Part 1.

.2 CAN/CSA-C22.2 No. 18-98 (R2003) Outlet Boxes, Fittings and Associated Hardware.

Part 2 Products

2.1 JUNCTION AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with CSA C22.1.

.2 102 mm square or larger outlet boxes as required for special devices.

.3 Gang boxes where wiring devices are grouped.

.4 Blank cover plates for boxes without wiring devices.

2.2 SHEET STEEL OUTLET BOXES

.1 Electro-galvanized steel single and multi gang flush device boxes for flush installation, minimum size 76 x 51 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.

.2 Electro-galvanized steel utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.

.3 102 mm square or octagonal outlet boxes for lighting fixture outlets.

.4 102 mm square outlet boxes with extension and plaster rings for voice and data outlets.

2.3 MASONRY BOXES

.1 Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls.

2.4 CONCRETE BOXES

.1 Electro-galvanized sheet steel concrete type boxes for flush mounted devices in concrete with matching extension and plaster rings as required.

2.5 CONDUIT BOXES

.1 Cast FS boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacles.

2.6 FITTINGS - GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to 32 mm and pull boxes for larger conduits.

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

.5 EMT fittings to be steel set screw type.

2.7 IDENTIFICATION

.1 All boxes installed above finished ceilings and in interstitial levels shall have their covers color coded, as described in these specifications, and shall be labelled as to room number they serve.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION

.1 Support boxes independently of connecting conduits.

.2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

.3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.

.4 Provide correct size of openings in boxes for conduit, and armored cable connections. Reducing washers are not allowed.

.5 All boxes shall be installed recessed/flush unless indicated otherwise.

.6 Install all outlet boxes in exterior walls with flexible vapour barrier and seal with caulking.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Division 01 – General Requirements.

.2 Section 26 05 00 – Common Work Results – Electrical.

1.2 REFERENCES

.1 Canadian Standards Association (CSA) Latest Edition of the following:

- .1 CAN/CSA C22.2 No. 18.1-04 (R2009), Metallic Outlet Boxes.
- .2 CAN/CSA C22.2 No. 18.3-04 (R2009), Hardware for the Support of Conduit, Tubing and Cable Fittings.
- .3 CAN/CSA C22.2 No. 18.5-02 (R2007), Positioning Devices.
- .4 CSA C22.2 No. 45.1-07, Electrical Rigid Metal Conduit – Steel.
- .5 CSA C22.2 No. 45.2-07, Electrical Rigid Metal Conduit – Aluminum, Red Brass and Stainless Steel.
- .6 CSA C22.2 No. 56-04, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
- .7 CSA C22. 2 No. 83.1-07, Electrical Metallic Tubing – Steel.
- .8 CSA C22.2 No. 211.2-06, Rigid PVC (Un-plasticized) Conduit.
- .9 CAN/CSA C22.2 No.227.3-05, Non-Metallic Mechanical Protection Tubing (NMPT), National Standard of Canada (February 2006).

Part 2 Products

2.1 CONDUITS

.1 Rigid metal conduit: to CSA C22.2 No.5, Hot Dipped Galvanized Steel Threated.

.2 Electrical metallic tubing (EMT): to CSA C22.2 No. 83 – M 1985 (R003), with couplings.

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

.4 Flexible metal conduit and liquid-tight flexible conduit, complete with anti-short bushings: to CSA C22.2 No. 56-04, steel and liquid-tight flexible metal.

.5 Flexible PVC conduit: to CAN/CSA-C22.2 No.227.3.

2.2 CONDUIT FASTENINGS

.1 One-hole steel straps to secure surface conduits 51 mm and smaller. Two hole steel straps for conduits larger than 51 mm.

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

.3 Channel type supports for two or more conduits at 1.5 m oc.

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

2.3 CONDUIT FITTINGS

.1 Rain tight EMT connectors shall be used on "vertical" sections of conduit runs where terminating into tops of electrical equipment incorporating drip shields or hoods.

.2 Fittings: Use set screw connectors and fittings for EMT. Coating: same as conduit.

.3 Factory "ells" where 90 degree bends are required for 25 mm and larger conduits.

.4 Connectors for flexible conduit shall be set screw galvanized steel.

.5 Connectors for liquid tight flexible conduit shall be water tight, compression type galvanized steel.

.6 Threaded plastic or metal bushings to be installed on all EMT connectors sizes 35 mm and larger.

.7 Fittings: manufactured for use with conduit specified. Coating: same as conduit. To CAN/CSA C22.2 No. 18, Manufactured for use with conduit specified.

2.4 EXPANSION FITTINGS FOR RIGID CONDUIT

.1 Weatherproof expansion fittings with internal bonding assembly suitable for 53mm linear expansion.

.2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19mm deflection.

.3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.5 FISH CORD

.1 Polypropylene.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass, except on levels P1 and P2 where all conduits shall be embedded concealed in walls and ceiling.

.2 Conceal conduits except in mechanical and electrical service rooms and in unfinished areas.

.3 EMT shall be installed as a complete system.

.4 Support of electrical systems raceway shall be independent of any type of suspended ceiling support rods, wires, etc. and mechanical piping or duct systems.

.5 Use electrical metallic tubing (EMT) for all work, unless otherwise indicated, for panelboard feeders, branch circuit wiring, fire alarm and communications, etc., where not installed underground unless specifically indicated otherwise. Provide a separate green ground for all conduit systems, including E.M.T.

.6 Use rigid PVC conduit underground (direct buried) or embedded in concrete walls or ceiling slabs for panels and equipment.

.7 Flexible Metal Conduit:

.1 Use flexible metal conduit for connection to surface or recessed fluorescent fixtures.

.2 Flexible metal conduit permitted above T-bar ceilings, for drops to various fire alarm devices mounted on flush outlet boxes in finished ceiling. Minimum size of flexible conduit: 22 mm, Maximum length of drop: 1.5 m.

.8 Use flexible PVC conduit embedded in concrete walls or ceiling for light/power branch circuit wiring and switch legs.

.9 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment, furniture and transformers. Include a separate ground wire.

.10 Install conduit sealing fittings in hazardous areas. Fill with compound.

.11 Minimum conduit size for lighting and power circuits: 16 mm.

.12 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.13 Mechanically bend steel conduit over 22 mm dia.

.14 Install rigid galvanized steel threaded conduit for service cables for electrical vault to service entrance boards.

.15 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.16 Install fish cord in empty conduits.

.17 Run 2 – 25 mm spare conduits up to accessible ceiling (or interstitial space where existing) space for each flush panel. Terminate these conduits in 153 x 153 x 102 mm junction boxes in ceiling space / interstitial space.

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

.19 Dry conduits out before installing wire.

.20 Securely fasten in place within 83 mm of each outlet box, junction box, cabinet, coupling or fitting, maximum spacing between supports as follows:

.1 1.5 m for 21 mm trade size conduit and smaller.

.2 2 m for 27 mm to 35 mm trade size conduit.

.3 3 m for 41 mm trade size and larger.

.21 Ground Wires:

.1 Provide a separate green ground wire in all conduit, including EMT.

3.3 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Run conduits in flanged portion of structural steel.

.3 Group conduits wherever possible on suspended or surface channels.

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

.5 Do not locate conduits less than 76 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

.6 Unless approved in writing by Engineer, surface conduits are acceptable only in electrical, communications and mechanical rooms.

3.4 CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Do not install horizontal runs in masonry walls.

.3 Do not run conduits horizontally in walls and do not run conduit on inside of metal studs.

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

END OF SECTION