



**ELECTRICAL SPECIFICATION**



**CORRECTIONAL SERVICE CANADA  
PORT-CARTIER INSTITUTION**

**CLIENT FILE N<sup>o</sup>: 550-2-368-1302**

**REPLACEMENT OF THE EMERGENCY SYSTEM ATS**

***FOR TENDER***

**DO NOT USE FOR  
CONSTRUCTION**

**May 2015**

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Port-Cartier Institution

Project N°: 550-2-368-1302

SEALS AND SIGNATURES

Replacement of the Emergency  
System ATS

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Discipline	Prepared by	Assisted by	Seal
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Electrical  
engineering

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Luc Gobeil, ing.

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**DESCRIPTION**

**ELECTRICAL**

**AAC (ATS)**

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550-2-368-1302-E02-AS-PLN	Services Correctionnels Correctional Service Remplacement de l'AAC de la génératrice Emergency generator ATS replacement Démolition et localisation AAC Vues en plan – RDC Demolition and ATS layout Plan views – Ground floor
550-2-368-1302-E03-AS-PLN	Services Correctionnels Correctional Service Remplacement de l'AAC de la génératrice Emergency generator ATS replacement Coupes - Détails Plan de localisation Cut section – Details Localisation plan
Drawing Reference (for information) E-33 E-40	Electrical/Generator Room Details Electrical Supply Diagram

**END OF SECTION**

## 1 GENERAL

### 1.1 References

- .1 National Building Code of Canada (NBC) current edition, including all amendments up to bid closing.
- .2 Québec Construction Code, Chapter V, Electricity, current edition herein referred to as the Québec Electrical Code.
- .3 Canadian Standards Association (CSA), Workplace electrical safety, CSA Z462, current edition.
- .4 Canadian Standards Association (CSA), Emergency electrical power supply for buildings, CSA C282, current edition.
- .5 And any other code and standard applicable to the supply and installation relevant to this project.
- .6 Specifications have precedence over the drawings.

### 1.2 Description of work

- .1 The project includes the following work, without limitation. Contractor to provide a complete and operational installation to best practices in compliance with applicable codes and standards.
- .2 All work is performed in a penal institution and shall comply with the CSC (Correctional Service Canada) standards.
- .3 Contractor to supply all equipment and materials required to perform the work. No material supplied by the Client.
- .4 Provide installation as indicated on the drawings.
- .5 Work on existing systems shall be performed to minimise periods of power interruption.
- .6 All work to proceed under power-down conditions (zero-energy).
  - .1 Should certain activities need to be carried out under powered up conditions, the Contractor shall obtain the Client's written authorisation before any such work is undertaken.
  - .2 Contractor to assess risks at all connection points and perform work to CSA Z462.
- .7 Supply and install all required equipment identification onto new and existing material, components and cables (cables, wires, conduits) included in Work.

- .8 Notify Client Representative of any irregularity of existing installation where included in Work.
- .9 Components to be relocated within a 3 m radius.
- .10 Execute short-circuit, coordination and arc-flash study according to specification sections.
- .11 ATS work (automatic transfer switch)
  - .1 Work includes the replacement of the existing ATS system dating back to 1988, with a new ATS to current codes and standards.
  - .2 The following work is realized by a specialized supplier of the existing ATS:
    - .1 Disconnect busbar from breakers in existing ATS.
    - .2 Preserve busbar going to breakers.
    - .3 Remove busbar joining two (2) neutral bars.
    - .4 Extend approximately 18 to 24 inches both (2) neutral bars from busway.
    - .5 Make connection field on busway at approximately 18 to 24 inches from the top of the box for the regular power, load and neutral bars.
    - .6 Make a connection bar on bottom of box for generator cables and a bar for the neutral.
    - .7 Seal openings on box doors.
    - .8 Provide and install hardware to be able to paddlelock the door.
  - .3 Remove both (2) breakers and control equipment in existing ATS box. At the end of work, the existing ATS will become a junction box.
  - .4 Provide Nema two-hole terminals for cable rating indicated on plans.
  - .5 Connect cables on new connection range.
  - .6 The modifications in existing ATS box must be approved by the CSA. The person responsible for the CSA approval must stay on site during modifications. The cost of CSA approval are at the expense of the electrical contractor.
  - .7 The cost for the specialized supplier are at the expense of the electrical contractor.
  - .8 Proceed to installation of a new ATS system.
  - .9 In this project, supply all subcontractors as required.
  - .10 Supply and install junction boxes complete with terminals to extend any existing cabling to the new ATS system. Each terminal to be adequately identified. Murette-type connectors are prohibited. Affix a lamicoïd plate onto the face of the junction box indicating purpose of junction box.
  - .11 Should the existing unit be replaced in the future, the new ATS system shall be operational with the existing generator and with any other brand of generators.

Provide any assistance from the manufacturers for the commissioning of the ATS system.

- .12 Contractor to provide ATS shop tests, the preoperational verification reports of all field tests and the successful commissioning report.
- .13 Perform all work required to ensure bonding continuity of the new ATS system to the existing grounding system.
- .14 Contractor to minimize downtime by reason of critical installation.
- .15 When generators are being used, the Contractor shall co-ordinate location with CSC officers on site.
- .16 Existing power supply to ATS system:
  - .1 Bus ducts, 1 600 A, 600/347 V, 3-phase, 4-wire from main service and distribution centre.
  - .2 Bus ducts, 1 600 A, 600/347 V, 3-phase, 4-wire from emergency distribution centre.
  - .3 Cabling 3 (4 x 400 kcmil), generator control cabinet.
- .17 Existing bus ducts:
  - .1 By Westinghouse, LoZ type, model M, drawing 6316C96.
- .18 Reuse bus duct connections to relevant equipment and reuse part of same to connect the conductors (above the equipment); install protection box to cover conductor-busbar connection points.
- .19 Proceed to connection of the generator's existing control panel to the new ATS system.
  - .1 Dismantle existing cables between the control panel and the existing ATS system.
  - .2 Re-cable the control panel and the ATS.
- .20 Make the connection between the existing control panel of the generator to the fire alarm junction box.
- .21 Make the connection between the ATS and the fire alarm junction box.
- .22 The control cabling between the generator's control panel and the ATS shall be validated on site including, without limitation:
  - .1 The generator start signal.
- .23 The control cabling between the generators control panel and the fire alarm system shall be validated on site including, without limitation :
  - .1 The generator supervisory signal – engine-out, engine running.
- .24 The control cabling between the ATS and the fire alarm system shall be validated on site including, without limitation :

- .1 Supervisory signal indicating the ATS transfer switch position (ATS in manual mode).
- .25 Saw the concrete floor and dig a trench for the installation of power and control conduits between the existing ATS and the new ATS.
- .26 Install conduits in trench.
- .27 Fill in trench and redo concrete floor implicated in work. Paint new concrete as existing.
- .28 Modify generator air intake.
- .29 Co-ordinate with the owner (CSC) the date and time of power outage.
- .30 Temporary power
  - .1 The supply, maintenance and gas of the temporary generators during work on the existing ATS are under responsibility of the owner.
  - .2 The generators are connected by the electrical contractor. The cables, connectors and hardware necessary are provided by the electrical contractor. The first generator is connected to the main switch (load side) of the pumping station. The second generator is connected to the main switch (power side) of the pumping station to power CDU.
  - .3 Close required breakers in order to work currentless.
  - .4 Maximum outage time for connecting both generators: 1 hour, from 03h00 AM
  - .5 Systems start-up: ATS, generator control panel, fire alarm.
  - .6 Remove temporary generators.
  - .7 Maximum outage time to remove both generator connections: 1 hour, from 03h00 AM.

### 1.3 Site inspection by bidders

- .1 N/A.

### 1.4 Security screening

- .1 All workers shall undergo security screening in order to be granted a security classification as required by Correctional Service Canada (CSC) and Public Works and Government Services Canada (PWGSC).
- .2 Section 01 35 13 provides a detailed description of the procedures involved in the security screening.
- .3 At the onset of work, a special job-site meeting will be held with CSC institution representatives to acknowledge the instructions governing security and site operations in a correctional environment.

## 1.5 Codes

- .1 This Specification requires that the work and materials comply with the National Building Code of Canada (NBC) and all other applicable provincial or local codes. The strictest requirements shall apply should contradictions or discrepancies arise.
- .2 Work of this contract to be performed in a manner that meets or exceeds the following requirements:
  - .1 Contract documents.
  - .2 Specified standards and codes as well as other referenced documents.

## 1.6 Required documents

- .1 A copy of the following documents shall be kept at the job site:
  - .1 Contract drawings.
  - .2 Specifications.
  - .3 Amendments.
  - .4 Amended shop drawings.
  - .5 Change orders.
  - .6 Other contract amendments.
  - .7 Field test reports.
  - .8 Approved work schedule.
  - .9 Manufacturers installation and start-up instructions.

## 1.7 Substitutes

- .1 When products, material, or equipment are specified by brand or trade name or the manufacturer's or supplier's name, the bid shall be based on the designated products, material, or equipment. During the tender period, a substitution can be considered if the contracting authority receives, in writing, complete technical data at least ten (10) days before the deadline specified in the tender documents. If a substitution is approved for tendering purposes, an addendum to the tender documents will be issued.
- .2 The Contractor shall be responsible for providing supporting data of equivalence. The substitution request must be presented clearly and include all the details required to analyze it properly.
- .3 The main criteria for accepting substitutions are: construction, performance, capacity, dimensions, arrangement of connections, availability of replacement parts, ease of maintenance, delivery times, the existence of similar equipment has in service for some time.

- .4 If a proposed substitution requires changes to installations shown on plans or in the specifications, the General Contractor shall be responsible for such changes and shall also assume responsibility for any ensuing modifications that may be required to the work of specialized subcontractors.

### **1.8 Cost breakdown**

- .1 With the bid, the Contractor shall present an itemized breakdown of the costs related to this contract, including the overall contract value, **on the bid request form**. Once approved, the cost breakdown will be used as a baseline for calculating progress payments.

### **1.9 Payment**

- .1 Payments shall be made monthly on a pro rata basis according to work progress. Before submitting an invoice, the Contractor shall submit an itemized request for payment, as per the bid summary, for approval with the percent of progress for each item. Ten percent of the total amount of the request for payment, before tax deductions, will be held back. The hold back is payable upon final acceptance of the work.

### **1.10 Measurement for payment purposes**

- .1 The Engineer must be informed sufficiently prior to the start of work so that he or she can make the measurements required for payment purposes.

### **1.11 Contractor's use of the site**

- .1 The institution must remain fully operational during construction. With this end in view, the CSC Project Manager or the institution's head of security may require the Contractor to halt work immediately on a temporary basis to prevent institution activities from being compromised.
- .2 Use of premises; limited access to the job site. Work conducted outside the job site proper shall be carried out crews accompanied by an escort provided by CSC (cf. section 01 35 13).
- .3 The Contractor shall perform the work so as to disturb the occupants as little as possible and, as much as possible ensure that normal use can be made of the facilities. The Contractor shall also cooperate with the CSC Project Manager to facilitate performance of the work.
- .4 Existing services in the buildings must be maintained during the project.
- .5 No vehicle or mobile construction equipment shall remain on institution premises outside of working hours. All construction vehicles must be parked in the lot in front of the postern (main entrance). Refer to section 01 35 13.

### **1.12 Noisy environment and cell-phone use**

- .1 No radios or "boom boxes" shall be tolerated at the job site.

- .2 Cell phones are prohibited within the perimeter of the penitentiary.

### **1.13 Parking at the site**

- .1 The Contractor shall restrict parking to those areas authorized by the Institutional Head.

### **1.14 Job-site meetings**

- .1 Job-site meetings shall be held at times and places subject to the approval of the CSC Project Manager.
- .2 All participants shall be informed of meetings being called.
- .3 The Engineer shall organize job-site meetings, set their date and time, and ensure that minutes are drafted and distributed.

### **1.15 Location of equipment and various elements**

- .1 The location of various devices and pieces of equipment as well as the electrical outlets indicated on the drawings and in the specifications must be considered approximate.
- .2 The Contractor shall install equipment and devices as well as distribution systems so as to limit hindrances and keep the largest amount of useful space possible while complying with manufacturer recommendations relating to safety, access, and maintenance.
- .3 The Contractor shall inform the Project Manager of the installation date and request approval for the designated location.
- .4 When so requested by the CSC Project Manager, the Contractor shall provide location plans indicating the relative positions of equipment and systems.

### **1.16 Concealed work**

- .1 Unless indicated otherwise, pipes, conduits, ducts, and wiring in floors, walls, and ceilings in finished areas shall be concealed.

### **1.17 Drilling and sealing**

- .1 The Engineer's approval shall be obtained before cutting or drilling in bearing members or inserting sleeves.
- .2 Drilling and sealing shall be performed to ensure that connections are exact and play-free.
- .3 Edges of holes and openings to be clean, straight, and smooth.
- .4 When the addition of new work requires modifications to an existing feature, all required drilling, sealing, and other repairs shall be carried out to restore the existing structure to its initial condition.

### **1.18 Existing systems**

- .1 When connections must be made to existing systems, the work shall be carried out at times determined by local authorities and performed to minimize disruption of pedestrian and vehicular traffic.
- .2 A work schedule shall be submitted to the CSC Project Manager for approval at least 48 hours prior to any existing services or system being interrupted. The approved schedule shall be followed; individuals affected shall be informed beforehand.
- .3 Should installations be discovered during the course of work, the Engineer shall be immediately informed and a written report containing the observations provided to him.
- .4 All conduits for disused services within a radius of 2 m from any work shall be removed. Conduits that have been cut shall be capped or otherwise plugged, as directed by the Engineer.
- .5 There shall be a record of the location of conduits that have been maintained in service, deviated, or abandoned.
- .6 Provide temporary utility services and ensure that emergency lighting (critical systems) and building lighting for occupants are maintained.

### **1.19 Modifications, additions, or renovation of existing buildings**

- .1 The Contractor shall perform the work so as to disturb the occupants as little as possible and, to the degree possible, ensure that normal use can be made of the facilities. The Contractor shall also cooperate with the CSC Project Manager to facilitate performance of the work.
- .2 At no time shall the safety measures be relaxed because of the work to be carried out under this contract. The Contractor shall take the steps required to ensure the level of safety required.
- .3 The Contractor shall use only those elevators, if any, or freight elevators, conveyors, and escalators reserved for his or her use to move materials and personnel. Before the Contractor uses an elevator, the cabin walls shall be protected as directed by the Engineer. The Contractor accepts liability for any damage to such devices, for their safe and proper use, and for any overloading of the existing equipment.
- .4 When work is to be carried out in occupied spaces, the Contractor shall provide and install whatever is required to protect the furnishings, equipment, and finish work; install dust barriers, partitions, and temporary notices; and clean the area at the end of each work day.

### **1.20 Supplemental drawings**

- .1 The Engineer may provide supplemental drawings for clarification. Such supplemental drawings shall be considered to have the same meaning and scope as the contract documents.

### **1.21 Vestiges and antiques**

- .1 Protect vestiges, antiques, and other items of historical or scientific interest, such as cornerstones and their contents, commemorative plaques, and other objects bearing inscriptions discovered during the project.
- .2 The CSC Project Manager shall be informed immediately; authorization in writing is required before work may resume.
- .3 Vestiges, antiques, and other items of historical or scientific interest are the property of the Crown.

### **1.22 Restrictions related to tobacco use**

- .1 Restrictions regarding the use of tobacco inside Crown buildings shall be complied with.

### **1.23 Asbestos**

- .1 Removing sprayed or troweled-on asbestos can be a health risk. If, during the course of the work, the Contractor encounters materials that appear to be sprayed or troweled-on asbestos, he shall halt work and immediately inform the Engineer. Work shall not resume unless so authorized in writing by the Engineer.

### **1.24 Operating manual**

- .1 The Contractor shall submit, for approval, three (3) copies of an operating manual containing the following items:
  - .1 Table of contents.
  - .2 List of suppliers and their contact information.
  - .3 Warranties.
  - .4 Approved shop drawings.
  - .5 Operating and maintenance guides.
  - .6 As-built drawings.

### **1.25 Personnel training**

- .1 The Contractor shall provide one (1) period of training:
  - .1 For the personnel in charge of systems maintenance and new installations.

## **2 PRODUCTS**

- .1 Not used.

## **3 EXECUTION**

.1 Not used.

**END OF SECTION**

## **1 GENERAL**

### **1.1 Work includes**

- .1 Only the devices, equipment, material and materials supplied in the wake of electrical works are of concern in this Section 01 33 00

### **1.2 Administrative**

- .1 Submit to Engineer submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Do not proceed with Work affected by submittal until review is complete.
- .3 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable.
- .5 Review submittals prior to submission to Engineer. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .6 Notify Engineer, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work are co-ordinated.
- .8 Contractor's responsibility for errors and omissions in submission is not relieved by Engineer's review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Engineer's review.
- .10 Keep one reviewed copy of each submission on site.

### **1.3 Shop drawings and product data**

- .1 Refer to Owner's requirements specified in the general clauses.
- .2 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.

- .3 Submit shop drawings bearing stamp and signature of qualified professional engineer registered or licensed in the Province of Québec, Canada.
- .4 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .5 Allow seven (7) days for Engineer's review of each submission.
- .6 Adjustments made on shop drawings by Engineer are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Engineer prior to proceeding with Work.
- .7 Make changes in shop drawings as Engineer may require, consistent with Contract Documents. When resubmitting, notify Engineer in writing of revisions other than those requested.
- .8 Accompany submissions with transmittal letter containing:
  - .1 Date.
  - .2 Project title and number.
  - .3 Contractor's name and address.
  - .4 Identification and quantity of each shop drawing, product data and sample.
  - .5 Other pertinent data.
- .9 Submissions include:
  - .1 Date and revision dates.
  - .2 Project title and number.
  - .3 Name and address of:
    - .1 Subcontractor.
    - .2 Supplier.
    - .3 Manufacturer.
  - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
  - .5 Details of appropriate portions of Work as applicable:
    - .1 Fabrication materials and details.

- .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.
- .10 After Engineer's review, distribute copies of shop drawings and product data sheets.
- .11 Submit three (3) copies in print and one (1) electronic copy of shop drawings for each requirement requested in specification Sections and as Engineer may reasonably request.
- .12 Submit one (1) electronic copy or three (3) hard copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Engineer where shop drawings will not be prepared due to standardized manufacture of product.
- .13 Submit one (1) electronic copy or three (3) hard copies of test reports for requirements requested in specification Sections and as requested by Engineer.
  - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
  - .2 Testing must have been within three (3) years of date of contract award for project.
- .14 Submit one (1) electronic copy or three (3) hard copies of certificates for requirements requested in specification Sections and as requested by Engineer.
  - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
  - .2 Certificates must be dated after award of project contract complete with project name.
- .15 Submit one (1) electronic copy or three (3) hard copies of manufacturer's instructions for requirements requested in specification Sections and as requested by Engineer.

- .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .16 Submit one (1) electronic copy or three (3) hard copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Engineer.
  - .1 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .17 Submit one (1) electronic copy or three (3) hard copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Engineer.
- .18 Delete information not applicable to project.
- .19 Supplement standard information to provide details applicable to project.
- .20 If upon review by Engineer, no errors or omissions are discovered or if only minor corrections are made, print copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .21 The review of shop drawings by Public Works and Government Services Canada (PWGSC) is for sole purpose of ascertaining conformance with general concept.
  - .1 This review shall not mean that PWGSC approves detail design inherent in 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 requirements of construction and Contract Documents.
  - .2 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 sub-trades.

#### **1.4 Certificates and transcripts**

- .1 Immediately after award of Contract, submit relevant CSST workers' compensation board status.
- .2 Submit transcription of insurance immediately after award of Contract.

## **2 PRODUCTS**

- .1 Not Used.

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**3 EXECUTION**

.1 Not Used.

**END OF SECTION**

## 1 PURPOSE

- .1 Ensure that both the construction project and the institutional operations may proceed without undue disruption or hindrance and that the security of the Institution is maintained at all times.

## 2 DEFINITIONS

- .1 "Contraband" means:
  - .1 an intoxicant, including alcoholic beverages, drugs and narcotics ;
  - .2 a weapon or a component thereof, ammunition for a weapon, and anything that is designed to kill, injure or disable a person or that is altered so as to be capable of killing, injuring or disabling a person, when possessed without prior authorization ;
  - .3 an explosive or a bomb or a component thereof ;
  - .4 currency over any applicable prescribed limit \$25.00, and ;
  - .5 any item not described in paragraphs (1) to (4) that could jeopardize the security of a Penitentiary or the safety of persons, when that item is possessed without prior authorization.
- .2 "Unauthorized Smoking Items" means all smoking items including, but not limited to, cigarettes, cigars, tobacco, chewing or snuffing tobacco, cigarette making machines, matches and lighters.
- .3 "Commercial Vehicle" means any motor vehicle used for the shipment of material, equipment and tools required for the construction project.
- .4 "CSC" means Correctional Service Canada.
- .5 "Director" means Director or Warden of the Institution as applicable or their representative.
- .6 "Construction employees" means persons working for the general contractor, the sub-contractors, equipment operators, material suppliers, testing and inspection companies and regulatory agencies.
- .7 "Departmental Representative" means the Public Works and Government Services Canada (PWGSC) or the Correctional Service Canada (CSC) project manager depending on project.
- .8 "Perimeter" means the fenced or walled area of the institution that restrains the movement of the inmates.
- .9 "Construction zone" means the area as shown on the contract drawings where the contractor will be allowed to work. This area may or may not be isolated from the security area of the institution.

- .10 Construction zone to include mechanical sectors, rooms D201 and B232 as well as the walkway in Sector E.

### **3 PRELIMINARY PROCEEDINGS**

- .1 Prior to the commencement of work, the contractor shall meet with the Director to:
  - .1 Discuss the nature and extent of all activities involved in the Project.
  - .2 Establish mutually acceptable security procedures in accordance with this instruction and the institution's particular requirements.
- .2 The contractor will:
  - .1 Ensure that all construction employees are aware of the CSC security requirements.
  - .2 Ensure that a copy of the CSC security requirements is always prominently on display at the job site.
  - .3 Co-operate with institutional personnel in ensuring that security requirements are observed by all construction employees.

### **4 CONSTRUCTION EMPLOYEES**

- .1 Submit to the Director a list of the names with date of birth of all construction employees to be employed on the construction site and a security clearance form for each employee.
- .2 Allow two (2) weeks for processing of security clearances. Employees will not be admitted to the Institution without a valid security clearance in place and a recent picture identification such as a provincial driver's license. Security clearances obtained from other CSC institutions are not valid at the institution where the project is taking place.
- .3 The Director may require that facial photographs may be taken of construction employees and these photographs may be displayed at appropriate locations in the institution or in an electronic database for identification purposes. The Director may require that Photo ID cards be provided for all construction workers. ID cards will then be left at the designated entrance to be picked upon arrival at the institution and shall be displayed prominently on the construction employees clothing at all time while employees are at the institution.
- .4 Entry to Institutional Property will be refused to any person there may be reason to believe may be a security risk.
- .5 Any person employed on the construction site will be subject to immediate removal from Institutional Property if they:

- .1 appear to be under the influence of alcohol, drugs or narcotics ;
- .2 behave in an unusual or disorderly manner ;
- .3 are in possession of contraband.

## 5 VEHICLES

- .1 All unattended vehicles on CSC property shall have windows closed; doors and trunks shall be locked and keys removed. The keys shall be securely in the possession of the owner or an employee of the company that owns the vehicle.
- .2 The director may limit at any time the number and type of vehicles allowed within the Institution.
- .3 Drivers of delivery vehicles for material required by the project shall not require security clearances but must remain with their vehicle the entire time that the vehicle is in the Institution. The director may require that these vehicles be escorted by Institutional staff or Commissionaires while in the Institution.
- .4 If the Director permits trailers to be left inside the secure perimeter of the Institution, these trailer doors will be locked at all times. All windows will be securely locked when left unoccupied. All trailer windows shall be covered with expanded metal mesh. All storage trailers inside and outside the perimeter must be locked when not in use.

## 6 PARKING

- .1 The parking area(s) to be used by construction employees will be designated by the Director. Parking in other locations will be prohibited and vehicles may be subject to removal.

## 7 SHIPMENTS

- .1 All shipments of project material, equipment and tools shall be addressed in the Contractor's name to avoid confusion with the institution's own shipments. The contractor must have his own employees on site to receive any deliveries or shipments. CSC staff will **not** accept receipt of deliveries or shipments of any material equipment or tools for the contractor.

## 8 TELEPHONES

- .1 There will be no installation of telephones, facsimile machines and computers with Internet connections permitted within the perimeter of the institution unless prior approval of the Director is received.
- .2 The Director will ensure that approved telephones, facsimile machine and computers with Internet connections are located where they are not accessible to inmates. All computers will have an approved password protection that will stop an Internet connection to unauthorized personnel.

- .3 Wireless cellular and digital telephones, including but not limited to devices for telephone messaging, pagers, blackberries, telephone used as 2-way radios, are not permitted within the perimeter of the Institution unless approved by the Director. If wireless cellular telephones are permitted, the user will not permit their use by any inmate.
- .4 The Director may approve but limit the use of two way radios.

## **9 WORK HOURS**

- .1 Work hours within the Institution are: Monday to Friday from 7 h (7 h a.m.) to 16 h (4 h p.m.).
- .2 Work will not be permitted during weekends and statutory holidays without the permission of the Director. A minimum of seven days advance notice will be required to obtain the required permission. In case of emergencies or other special circumstances, this advance notice may be waived by the Director.

## **10 WORK BEYOND NORMAL WORKING HOURS**

- .1 No overtime work will be allowed without permission of the Director. Give a minimum forty-eight (48) hours advance notice when overtime work on the construction project is necessary and approved. If overtime work is required because of an emergency such the completion of a concrete pour or work to make the construction safe and secure, the contractor shall advise the Director as soon as this condition is known and follow the directions given by the Director. Costs to Canada for such events may be attributed to the contractor.
- .2 When overtime work, weekend statutory holiday work is required and approved by the Director, extra staff members may be posted by the Director or his designate, to maintain the security surveillance. The actual cost of this extra staff may be attributed to the Contractor.

## **11 TOOLS AND EQUIPMENT**

- .1 Maintain on site a complete list of all tools and equipment to be used during the construction project. Make this inventory available for inspection when required.
- .2 Throughout the construction project maintain an up-to-date list of tools and equipment specified above.
- .3 Keep all tools and equipment under constant supervision, particularly power-driven and cartridge-driven tools, cartridges, files, saw blades, rod saws, wire, rope, ladders and any sort of jacking device.
- .4 Store all tools and equipment in approved secure locations.
- .5 Lock all tool boxes when not in use. Keys to remain in the possession of the employees of the Contractor.
- .6 All missing or lost tools or equipment shall be reported immediately to the Director.

- .7 The Director will ensure that the security staff members carry out checks of the Contractor's tools and equipment against the list provided by the Contractor. These checks may be carried out at the following intervals:
- .1 At the beginning and conclusion of every construction project.
  - .2 Weekly, when the construction project extends longer than a one week period.
- .8 Certain tools/equipment such as cartridges and hacksaw blades are highly controlled items. The contractor will be given at the beginning of the day, a quantity that will permit one day's work. Used blades/cartridges will be returned to the Director's representative at the end of each day.

## 12 PRESCRIPTION DRUGS

- .1 Employees of the contractor who are required to take prescription drugs during the workday shall obtain approval of the Director to bring a one day supply only into the Institution.

## 13 SMOKING RESTRICTIONS

- .1 Contractors and construction employees are not permitted to smoke inside correctional facilities or outdoors within the perimeter of a correctional facility and must not possess unauthorized smoking items within the perimeter of a correctional facility.
- .2 Contractors and construction employees who are in violation of this policy will be requested to immediately cease smoking or dispose of any unauthorized smoking items and, if they persist, will be directed to leave the institution.
- .3 Smoking is only permitted outside the perimeter of a correctional facility in an area to be designated by the Director.

## 14 CONTRABAND

- .1 Weapons, ammunition, explosives, alcoholic beverages, drugs and narcotics are prohibited on institutional property.
- .2 The discovery of contraband on the construction site and the identification of the person(s) responsible for the contraband shall be reported immediately to the Director.
- .3 Contractors should be vigilant with both their staff and the staff of their sub-contractors and suppliers that the discovery of contraband may result in cancellation of the security clearance of the affected employee. Serious infractions may result in the removal of the company from the Institution for the duration of the construction.
- .4 Presence of arms and ammunition in vehicles of contractors, sub-contractors and suppliers or employees of these will result in the immediate cancellation of security clearances for the driver of the vehicle.

## 15 SEARCHES

- .1 All vehicles and persons entering institutional property may be subject to search.
- .2 When the Director suspects, on reasonable grounds, that an employee of the Contractor is in possession of contraband or unauthorized items, he may order that person to be searched.
- .3 All employees entering the Institution may be subject to screening of personal effects for traces of contraband drug residue.

## 16 ACCESS TO INSTITUTIONAL PROPERTY

- .1 Construction personnel and commercial vehicles will not be admitted to the institution after normal working hours, unless approved by the Director.

## 17 MOVEMENT OF VEHICLES

- .1 Escorted commercial vehicles will be allowed to enter or leave the institution through the vehicle access gate during the following hours:
  - .1 from 07 h 45 to 11 h AM
  - .2 from 13 h to 15 h 30 PM.Construction vehicles shall not leave the Institution until an inmate count is completed.
- .2 The Contractor shall notify the Director twenty four (24) hours in advance to the arrival on the site of heavy equipment such as concrete trucks, cranes, etc.
- .3 Vehicles being loaded with soil or other debris, or any vehicle considered impossible to search, must be under continuous supervision by CSC staff or Commissionaires working under the authority of the Director.
- .4 Commercial vehicles will only be allowed access to institutional property when their contents are certified by the Contractor or his representative as being strictly necessary to the execution of the construction project.
- .5 Vehicles shall be refused access to institutional property if, in the opinion of the Director, they contain any article which may jeopardize the security of the institution.
- .6 Private vehicles of construction employees will not be allowed within the security perimeter of medium or maximum security institutions without the authorization of the Director.
- .7 With prior approval of the Director, a vehicle may be used in the morning and evening to transport a group of employees to the work site. This vehicle will not remain within the Institution the remainder of the day.

- .8 With the approval of the Director, certain equipment may be permitted to remain on the construction site overnight or over the weekend. This equipment must be securely locked, with the battery removed. The Director may require that the equipment be secured with a chain and padlock to another fixed object.

## **18 MOVEMENT OF CONSTRUCTION EMPLOYEES ON INSTITUTIONAL PROPERTY**

- .1 Subject to the requirements of good security, the Director will permit the Contractor and his employees as much freedom of action and movement as is possible.
- .2 However, notwithstanding the above paragraph, the Director may:
  - .1 Prohibit or restrict access to any part of the institution.
  - .2 Require that in certain areas of the institution, either during the entire construction project or at certain intervals, construction employees only be allowed access when escorted by a member of the CSC security staff or a commissioner.
- .3 During the lunch and coffee/health breaks, all construction employees will remain within the construction site. Construction employees are not permitted to eat in the officer's lounge or the dining room of the institution.

## **19 SURVEILLANCE AND INSPECTION**

- .1 Construction activities and all related movement of personnel and vehicles will be subject to surveillance and inspection by CSC security staff members to ensure that established security requirements are met.
- .2 CSC staff members will ensure that an understanding of the need to carry out surveillance and inspections, as specified above, is established among construction employees and maintained throughout the construction project.

## **20 STOPPAGE OF WORK**

- .1 The director may order at any time that the contractor, his employees, sub-contractors and their employees to not enter or to leave the work site immediately due to a security situation occurring within the Institution. The contractor's site supervisor shall note the name of the CSC staff member giving this instruction, the time of the request and obey the order as quickly as possible.
- .2 The contractor shall advise the Departmental Representative of this interruption of the work within 24 hours.

## **21 CONTACT WITH INMATES**

- .1 Unless specifically authorized, it is forbidden to come into contact with inmates, to talk with them, to receive objects from them or to give them objects. Any construction employee doing any of the above will be removed from the site and his security clearance revoked.
- .2 It is to be noted that cameras are not allowed on CSC property.

- .3 Notwithstanding the above paragraph, if the director approves of the usage of cameras, it is strictly forbidden to take pictures of inmates, of CSC staff members or of any part of the Institution other than those required as part of this contract.

## **22 COMPLETION OF CONSTRUCTION PROJECT**

- .1 Upon completion of the construction project or, when applicable, the takeover of a facility, the Contractor shall remove all remaining construction material, tools and equipment that are not specified to remain in the Institution as part of the construction contract.

**END OF SECTION**

## **1 GENERAL**

### **1.1 Content**

- .1 The Contractor must ensure that during construction activities, the public and his employees' health and safety and the protection of the environment will always prevail on cost or schedule issues.

### **1.2 References**

- .1 Canada Labour Code, part II, Canada Occupational Safety and Health Regulations.
- .2 Canadian Standards Association (CSA).
- .3 Workplace Hazardous Materials Information System (SIMDUT) /Health Canada.
  - .1 MSDS data sheets.
- .4 An Act respecting Occupational Health and Safety, L.R.Q. Chapter S-2.1.
- .5 Safety Code for the Construction Industry, S-2.1, r.6.

### **1.3 Submittals**

- .1 Submit all documents and samples in accordance with Section 01 33 00 – Submittal procedures.
- .2 At least ten (10) days before construction is undertaken, provide the CSC representative and CSST with the site-specific health and safety program as described in paragraph 1.8. If necessary, the general contractor will update his prevention program to reflect any changes to initial assessment. Following reception of the prevention program and at any time during work, the Departmental Representative may require modifications to better reflect conditions on the work site. The general contractor shall proceed with the required modifications before work is undertaken.
- .3 Provide Departmental Representative with copy of any federal or provincial inspector report, notice of corrections or recommendations within 24 hours of reception.
- .4 Provide Departmental Representative with copy of investigation report concerning any accident with injury or pointing at any potential health and safety hazard within 24 hours of reception.
- .5 Provide Departmental Representative with data sheets of all controlled products at least three (3) days before they are used on site.
- .6 Provide Departmental Representative with copy of training certificates that are required for the application of the prevention program including:
  - .1 General health and safety on construction work sites;

- .2 Security officer certificate;
- .3 Work site first-aid and CPR;
- .4 Work that may emit Asbestos dust;
- .5 Locking/securing procedures;
- .6 Wearing and use of individual protective equipment and clothing;
- .7 And any other training required either in regulations or the prevention program.
- .7 Medical examinations: where required by law, regulation, directive, specification or by a prevention program, the general contractor must :
  - .1 Before mobilisation, provide Departmental Representative with the medical examination certificate of all surveillance employees and all other employees attending the first site meeting concerned by the first paragraph of this article.
  - .2 Afterwards, provide from time to time and without delay the medical examination certificates of any new incoming worker concerned by the first paragraph of this article.
- .8 Emergency plan: the emergency plan described in the article 1.8.3 must be forwarded to the CSC Representative with the prevention program.
- .9 Notice of start of construction: the notice must be provided to CSST (Commission de la santé et de la sécurité du travail) before work is undertaken and copied to the CSC Representative. Copy of this notice must be posted at all time in a conspicuous location on site. At demobilisation, the notice of closing of the work site shall be provided CSST with a copy to the CSC Representative.
- .10 Engineering plans and certificates of compliance: the general Contractor shall provide CSST and the CSC Representative with all plans and compliance certificates signed and sealed by an engineer as required under the Safety Code for the Construction Industry (S-2.1, r. 6), by any other regulations, rules or any provision in the specifications or the contract. Copy of such documents to be available at all times on the work site.
- .11 Certificate of conformity issued by CSST: the certificate of conformity is a document issued by CSST to confirm that the general Contractor is in good standing with CSST, that is, he has paid all amounts due relative to any given contract. This document shall be provided to the CSC Representative at work completion.

#### **1.4 Risk assessment**

- .1 The general Contractor must identify all risks pertaining to the various activities on site.
- .2 The general Contractor shall plan and organize his work in order to eliminate dangers at the source or the collective protection and to minimize the use of individual protective equipment. When the use of individual protective equipment is required against falls, the workers must use a safety harness to CAN/CSA-Z-259.10-M90. Safety belts shall not be used as protection against falls.

- .3 Any equipment, tool or means of protection that cannot be installed or used without compromising the health and safety of workers is considered inadequate for the work at hand.
- .4 All mechanical equipment shall be inspected before delivery on site. Before using mechanical equipment, the general Contractor shall provide the CSC Representative with a certificate of conformity signed by a qualified mechanic. At any time, should the CSC Representative suspect a defect or any risk of accident, he can order the immediate shutdown of the machine and require a second inspection performed by a specialist of his choice.

### **1.5 Meetings**

- .1 A representative of the general Contractor with decisional power shall attend all meetings where job site health and safety issues are discussed.

### **1.6 Regulatory requirements**

- .1 Comply with all rules, regulations and standards applicable to the Work at hand.
- .2 Observe all prescribed standards and rules in order to ensure normal course of events at locations contaminated by hazardous or toxic substances.
- .3 Despite the publication date of standards referred to in the Safety Code for the Construction industry, always use its most recent and applicable version during work.

### **1.7 Local site/implementation conditions**

- .1 Not used.

### **1.8 Health and safety management**

- .1 Accept and assume all duties and obligations normally assigned to the principal Contractor under L.R.Q., Chapter S-2.1 (Loi sur la santé et la sécurité du travail) and the Safety Code for the Construction Industry (S-2.1, r.6).
- .2 Develop a site-specific prevention program based on identification of risks and implement this program from work start up to the final stages of demobilization. It must be forwarded to all persons involved as required in article 1.2. At minimum, the prevention program shall include:
  - .1 The company policy regarding health and safety;
  - .2 The description of the work, the total cost of the work, the schedule and planned staffing level;
  - .3 A flowchart of health and safety responsibilities;
  - .4 The physical and material organization of job site;
  - .5 The first-aid standards;

- .6 Identified of site-specific risks;
  - .7 The identification of risks related to the work at hand, including the prevention measures and the application procedures;
  - .8 The required training;
  - .9 The procedures in case of accident/injury;
  - .10 A written commitment from all stakeholders to comply with this prevention program;
  - .11 A job site inspection schedule based on the prevention measures.
- .3 The general Contractor must develop a site-specific, efficient emergency plan designed for the conditions at hand. The emergency plan must be forwarded to all persons concerned as required in article 1.2. The emergency plan shall include:
- .1 Evacuation procedures;
  - .2 Identification of resources (police, firefighter, ambulance, etc.);
  - .3 Identification of the persons in charge at the job site;
  - .4 Identification of the first-aid attendants;
  - .5 The training required of the persons in charge of its application;
  - .6 And any other information necessary in view of the job site characteristics.

## 1.9 Responsibilities

- .1 No matter the size of the job site or the number of workers on site, designate a competent supervisor responsible for health and safety. Take all necessary measures to ensure the health and safety of persons and property in and around the work site that could be affected by the performance of the work.
- .2 Take all necessary measures to ensure the application of and compliance with all health and safety requirements indicated in the contract documents, in federal and provincial regulations, in applicable codes and standards and in the site-specific safety program; comply immediately with any order or notice of correction issued by CSST.
- .3 Take all necessary measures to maintain job site clean and in good upkeep during construction.

### 1.10 Communication and signage

- .1 Take all necessary measures to ensure efficient transmission of the health and safety information on the job site. Upon arrival on the job site, all workers must be informed of the features of the prevention program, of their obligations and rights. The general Contractor must insist on the worker's right to refuse to execute work they believe could imperil their health, safety, their own physical integrity or that of other persons on the premises. The Contractor must keep on the work site an updated record containing the information conveyed and the signature of all the workers who received this information.
- .2 The following information and documents shall be displayed in a location easily accessible to the workers :
  - .1 Notice of work site opening;
  - .2 Identification of the principal Contractor;
  - .3 Company occupational health and safety policy;
  - .4 The site-specific prevention program;
  - .5 The emergency plan;
  - .6 MSDS of all controlled products used on the job site;
  - .7 Minutes of the construction site committee meetings;
  - .8 Name of the first-aid attendants;
  - .9 Intervention reports and correction notices issued by CSST.

### 1.11 Contingencies

- .1 When a source of danger not mentioned in the specifications and not identifiable during the preliminary inspection of the site occurs in the course of construction, the general Contractor shall immediately stop the work, implement temporary protection measures for the workers and the public and notify the CSC Representative verbally and in writing. The general Contractor shall thereafter proceed any required modifications to the prevention program before work may resume safely.

**IMPORTANT:** Any work stoppage does not relieve the Contractor of his responsibility as the Principal Contractor under the contract or by way of the specifications.

### 1.12 Caulking guns and other cartridge devices

- .1 Caulking guns or any other cartridge devices are forbidden on the CSC property. Refer to Section 01 35 13.

**END OF SECTION**

## **1 GENERAL**

### **1.1 Project cleanliness**

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris.
- .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed.
- .3 Clear waste and debris from access to building.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5 Provide on-site containers for collection of waste materials and debris, as the case may be.
- .6 Dispose of waste materials and debris off site.
- .7 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
- .8 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .9 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

### **1.2 Final cleaning**

- .1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .3 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste materials from site at regularly scheduled times or dispose of as directed by Consultant.
- .5 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .6 Repair any damage caused during construction.
- .7 Vacuum clean and dust building interiors, as the case may be.

**2 PRODUCTS**

.1 Not Used.

**3 EXECUTION**

.1 Not Used.

**END OF SECTION**

## **1 GENERAL**

### **1.1 Work included**

- .1 Only the devices, equipment, materials and materiel supplied under this contract for electrical works are concerned by this Section (01 78 00).

### **1.2 Submittals**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .3 Copy will be returned after final inspection with Engineer's comments.
- .4 Revise content of documents as required prior to final submittal.
- .5 Two] (2) weeks prior to Substantial Performance of the Work, submit to Engineer four (4) final copies of operating and maintenance manuals in English and French.
- .6 Ensure spare parts, maintenance materials and special tools provided are new, undamaged and of same quality and manufacture as products provided in Work.
- .7 Furnish evidence for type, source and quality of products provided.
- .8 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- .9 Pay costs of transportation.

### **1.3 Format**

- .1 Organize data in the form of an instructional manual.
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
- .3 When multiple binders are used correlate data into related consistent groupings. Identify contents of each binder on spine.
- .4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content by systems under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

- .7 Text: manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

#### **1.4 Contents - Each volume**

- .1 Table of Contents: provide title of project:
  - .1 Date of submission.
  - .2 Names, addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.
  - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
  - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
  - .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
  - .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

#### **1.5 Project record documents**

- .1 Maintain, in addition to requirements in General Conditions at site for Engineer one record copy or set of:
  - .1 Contract Drawings.
  - .2 Specifications.
  - .3 Addenda.
  - .4 Change Orders and other modifications to Contract.
  - .5 Reviewed shop drawings and product data.
  - .6 Field test records.
  - .7 Inspection certificates.
  - .8 Manufacturer's certificates.
- .2 Store project record documents in field office apart from documents used for construction. Provide files, racks, and secure storage.

- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.
- .5 Keep record documents available for inspection by Engineer.

#### **1.6 Recording actual site conditions**

- .1 Record information on set of opaque drawings provided by Engineer.
- .2 Provide felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
  - .1 Field changes of dimension and detail.
  - .2 Changes made by change orders.
  - .3 Details not on original Contract Drawings.
  - .4 References to related shop drawings and modifications.
- .5 Specifications: mark each item to record actual construction, including:
  - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
  - .2 Changes made by Addenda and change orders.
- .6 Other Documents: maintain manufacturer's certificates, inspection certificates and field test records required by individual specifications sections.

#### **1.7 Equipment and systems**

- .1 Each Item of Equipment and Each System: provide description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.

- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Provide servicing schedule.
- .7 Include manufacturer's printed operation and maintenance instructions.
- .8 Include sequence of operation by controls/regulation manufacturers.
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by controls/regulation manufacturers.
- .11 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .12 Include test reports.
- .13 Additional requirements: as specified in individual specification sections.

#### **1.8 Spare parts**

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

#### **1.9 Special tools**

- .1 Provide special tools, in quantities specified in individual specification section.
- .2 Provide items with tags identifying their associated function and equipment.
- .3 Deliver special tools to site; place and store.
- .4 Receive special tools and catalogue items. Submit inventory listing to Owner. Include approved listings in Maintenance Manual.

### **1.10 Storage, handling and protection**

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .3 Store components subject to damage from weather in weatherproof enclosures.
- .4 Remove and replace damaged products at own expense and to satisfaction of Engineer.

### **1.11 Warranties and bonds**

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit warranty management plan to Owner for approval, 30 days before planned pre-warranty conference.
- .3 Warranty management plan to include required actions and documents to assure that Owner receives warranties to which it is entitled.
- .4 Provide plan in narrative form and include sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .5 Assemble all information in binder and submit upon acceptance of work. Organize binder as follows:
  - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
  - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
  - .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten (10) days after completion of applicable item of work.
  - .4 Verify that documents are in proper form, contain full information, and are notarized.
  - .5 Co-execute submittals when required.
  - .6 Retain warranties and bonds until time specified for submittal.
- .6 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .7 Include information contained in warranty management plan as follows:
  - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.

- .2 Listing and status of delivery of Certificates of Warranty for extended warranty items.
- .3 Provide list for each warranted equipment, item, feature of construction or system indicating:
  - .1 Name of item, material, system or job.
  - .2 Model and serial numbers.
  - .3 Location where installed.
  - .4 Name and phone numbers of manufacturers or suppliers.
  - .5 Names, addresses and telephone numbers of sources of spare parts.
  - .6 Warranties and terms of warranty: include one-year (1) overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
  - .7 Cross-reference to warranty certificates as applicable.
  - .8 Starting point and duration of warranty period.
  - .9 Summary of maintenance procedures required to continue warranty in force.
  - .10 Cross-Reference to specific Operation and Maintenance manuals.
  - .11 Organization, names and phone numbers of persons to call for warranty service.
  - .12 Typical response time and repair/troubleshooting time expected for various warranted equipment.
- .4 Procedure and status of tagging of equipment covered by extended warranties.
- .5 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- .8 Respond in a timely manner to oral or written notification of required construction warranty repair work.
- .9 Written verification will follow oral instructions. Failure to respond will be cause for the Owner to proceed with action against Contractor.

## **2 PRODUCTS**

- .1 Not Used.

## **3 EXECUTION**

- .1 Not Used.

**END OF SECTION**

## 1 GENERAL

### 1.1 Related sections

- .1 This section includes prescriptions that are common to the different sections of Division 26 and are added to the general instructions stated in Division 00.
- .2 The requirements prescribed in this section are a complement to the special work requirements described on the drawings and in the specification and in Section 01 00 50 –General Instructions.

### 1.2 References

- .1 Canadian Standards Association (CSA International).
  - .1 CSA C22.1, Canadian Electrical Code, Part 1 (current edition), Safety Standard for Electrical Installations.
  - .2 CAN/CSA-C22.3 No. 1 (current edition), Overhead Systems.
  - .3 CAN3-C235 (current edition), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
  - .4 CSA C22.10 (current edition), Québec Construction Code, Chapter V, Electricity, referred to as the Québec Electrical Code in the specifications.
  - .5 CSA Z462 (current edition), Workplace electrical safety.
- .2 Electrical and Electronic Manufacturer's Association of Canada (EEMAC).
  - .1 EEMAC 2Y-1 1958, Light Gray Colour for Indoor Switch Gear.
- .3 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC).
  - .1 IEEE SP1122 (current edition), The Authoritative Dictionary of IEEE Standards Terms.

### 1.3 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.

### 1.4 Design requirements

- .1 Operating voltages: to CAN3-C235.
- .2 Lighting fixtures to operate satisfactorily at 60 Hz within normal operating limits established by above standard.

- .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.
- .3 Language operating requirements and identification: provide and post identification nameplates and labels for control items in French.

## 1.5 Submittals

- .1 Submittals: as required in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit for review single line electrical diagrams under plexiglass and locate as indicated.
  - .1 Electrical distribution system in main electrical room.
- .3 Shop drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Québec, Canada.
  - .2 Submit wiring diagrams and installation details of equipment indicating location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.
  - .3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
  - .4 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.
  - .5 Submit one (1) PDF copy of 600 x 600 mm minimum size drawings and product data to authority having jurisdiction.
  - .6 If changes are required, notify Engineer of these changes before they are made.
- .4 Quality Control
  - .1 Provide CSA certified equipment and material.
  - .2 Where CSA certified equipment and material is not available, submit such equipment and material to authority having jurisdiction for approval before delivery to site.
  - .3 Submit test results of installed electrical systems and instrumentation.
  - .4 Permits and fees: in accordance with General Conditions of contract.
  - .5 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Engineer.
- .5 Manufacturer's Field Reports: submit to Engineer manufacturer's written report, within three (3) days of review, verifying compliance of Work and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.

## 1.6 Quality assurance

- .1 Qualifications: electrical Work to be carried out by qualified, licensed electricians, by a master electrician, or company with valid Master Electrical Contractor license in the Province where work is performed in accordance with authorities having jurisdiction as per the conditions of Provincial Act respecting manpower vocational training and qualification.
  - .1 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.
  - .2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.

## 1.7 Delivery, storage and handling

- .1 Material Delivery Schedule: provide Engineer with schedule within two (2) weeks after award of Contract.

## 1.8 System startup

- .1 Instruct Engineer and operating personnel in operation, care and maintenance of systems, system equipment and components.
- .2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.
- .3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant will aspects of its care and operation.

## 1.9 Operating instructions

- .1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
- .2 Operating instructions to include following:
  - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
  - .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
  - .3 Safety precautions.
  - .4 Procedures to be followed in event of equipment failure.
  - .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.

- .3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.
- .4 Post instructions where directed.
- .5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.
- .6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

### **1.10 Arc flash hazards**

- .1 The Contractor shall take required measures to ensure system is turned to the OFF (Zero Energy) position before any work is performed. Otherwise, comply with the following when working on energized equipment.
- .2 Work on energized systems:
  - .1 Any work performed on energized equipment to comply with requirements set forth in CSA Z-462 — Workplace Electrical Safety. Refer to tables 1 and 4 of this reference standard.
  - .2 Before any work on energized equipment is undertaken, Contractor to obtain acceptance from the work site supervisor.
- .3 Electrical ARC FLASH LABELS
  - .1 Produce and install a warning label or danger label for each piece of equipment following arc-flash study sections 26 36 25 and 26 36 26.

## **2 PRODUCTS**

### **2.1 Materials and equipment**

- .1 Products, material, equipment, devices and parts used in the work of this project shall be new, in working condition and of best quality for intended service. Where required, submit evidence of nature, origin and quality of products supplied.
- .2 Factory assemble control panels and component assemblies.

### **2.2 Warning signs**

- .1 Porcelain enamel decal signs, minimum size 175 x 250 mm.

### **2.3 Wiring terminations**

- .1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

## 2.4 Equipment identification

- .1 Identify electrical equipment as designated on the drawings. Submit shop drawings of lamicoïd plates to Engineer's approval before their production.
- .2 Use electrical equipment identification plates to following requirements:
  - .1 Nameplates: lamicoïd 3 mm thick plastic engraving sheet, matt white finish face, black core, lettering accurately aligned and engraved into core.
  - .2 Affix nameplates with heat-resistant self-adhesive pressure sheet and/or mechanically with self-tapping screws.
  - .3 Sizes as follows:

### .1 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: 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 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .7 Terminal cabinets and pull boxes: indicate system and voltage.

## 2.5 Wiring identification

- .1 Identify wiring with permanent indelible identifying markings, 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.
- .4 Use colour coded wires in communication cables, matched throughout system.

## 2.6 Conduit and cable identification

- .1 Colour code conduits, boxes and metallic sheathed cables.

- .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.
- .3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

	Prime	Auxiliary
Up to 250 V	Yellow	
Up to 600 V	Yellow	Green
Up to 5 kV	Yellow	Blue
Up to 15 kV	Yellow	Red
Telephone	Green	
Other communication systems	Green	Blue
Fire alarm	Red	
Emergency voice	Red	Blue
Other security systems	Red	Yellow

## 2.7 Finishes

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

## 3 EXECUTION

### 3.1 Installation

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

### 3.2 Nameplates and labels

- .1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

### 3.3 Conduit and cable installation

- .1 Where plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- .2 Seal firewall troughs with fire resistant putty.

### 3.4 Mounting heights

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

### **3.5 Coordination of protective devices**

- .1 Ensure circuit protective devices such as overcurrent trips, are installed to required values and settings.

### **3.6 Field quality control**

- .1 Conduct following tests.
  - .1 Distribution system including phasing, voltage and grounding.
  - .2 Circuits originating from branch distribution panels.
  - .3 Lighting and its control.
  - .4 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.
- .2 Carry out tests in presence of Engineer.
- .3 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .4 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.

### **3.7 Cleaning**

- .1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

### **3.8 Dismantling**

- .1 Contractor to visit site in order to assess scope of demolition work.
- .2 Remove entirely all electrical distribution rendered useless, including conductors, surface conduits, etc.

- .3 All dismantled materials shall not be reused.
- .4 All dismantled materials shall be disposed of by Contractor off site (cables, conduits, conductors, etc.).
- .5 Dismantled equipment shall be handed to the Owner and placed in designated area and/or disposed of as indicated.
- .6 Where required, disconnect and relocate electrical equipment to allow performance of work by other trades; reconnect.
- .7 Re-establish bonding of preserved electrical outlets and re-energize preserved circuits from existing distribution panels by adding required breakers.
- .8 Re-wire circuits that were severed during demolition or drilling of existing surfaces.
- .9 Contractor to remove entirely the wires and conduits to the last preserved outlet if any, or to the distribution panel.
- .10 Relocate existing power sources likely to interfere with construction activities. Where necessary refit power sources using conduits and conductors displaying same characteristics.
- .11 Contractor to proceed to field verification to scope work accurately before submitting his bid.

**END OF SECTION**

## 1 GENERAL

### 1.1 Section includes

- .1 Materials and installation for wire and box connectors.

### 1.2 References

- .1 Canadian Standards Association (CSA International).
  - .1 CAN/CSA-C22.2 No.18, current edition, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.
  - .2 CSA C22.2 No.65, current edition, Wire Connectors.
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC).
  - .1 EEMAC 1Y-2, 1961 Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Rating).
- .3 National Electrical Manufacturers Association (NEMA).

## 2 PRODUCTS

### 2.1 Materials

- .1 Pressure type wire connectors to: CSA C22.2 No.65, with current carrying parts in compatible materials sized to fit copper or aluminum conductors as required.
- .2 Fixture type splicing connectors to: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.
- .3 Bushing stud connectors: to relevant EEMAC 1Y-2 and NEMA to consist of:
  - .1 Connector body and stud clamp for copper conductors.
  - .2 Clamp for copper conductors.
  - .3 Flange bolts.
  - .4 Bolts for copper conductors.
  - .5 Sized for conductors as indicated.
- .4 Clamps or connectors for armoured cable, as required to: CAN/CSA-C22.2 No.18.
- .5 Compatible clamps or connectors with required protection against infiltration and explosion risks provided by box in which cable or conduit penetrates.

### **3 EXECUTION**

#### **3.1 Installation**

- .1 Remove insulation carefully from ends of conductors and:
  - .1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.
  - .2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No.65.
  - .3 Install fixture type connectors and tighten. Replace insulating cap.
  - .4 Install bushing stud connectors in accordance with relevant EEMAC 1Y-2 and NEMA standards.

**END OF SECTION**

## **1 GENERAL**

### **1.1 Related section**

- .1 Section 26 05 20 – Wire and box connectors, 0 - 1000 V.

### **1.2 References**

- .1 CSA C22.2 n° 0.3 (current edition), Test Methods for electrical wires and cables.
- .2 CAN/CSA-C22.2 n° 131-M89 (current edition), Type TECK 90 cables.

### **1.3 Product data**

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

## **2 PRODUCTS**

### **2.1 Building wires**

- .1 Conductors: stranded if for 10 AWG and larger. Minimum size: 12 AWG.
- .2 Copper conductors: size as indicated, with insulation of cross-linked thermosetting polyethylene material rated 600 or 1000 V, type RW90 or RWU90 for underground use.

## **3 EXECUTION**

### **3.1 Installation of building wires**

- .1 Install wiring as follows:
  - .1 In conduit, as indicated on the drawings, as per section 26 05 34 – Conduits, conduit fastenings and conduit fittings.
  - .2 In surface raceways as indicated on the drawings.

**END OF SECTION**

## 1 GENERAL

### 1.1 Section includes

- .1 This section governs the use of U-shaped supports for surface mounting, suspended or set in poured concrete walls or ceilings.

## 2 PRODUCTS

### 2.1 Support channels

- .1 U-shaped, size 41 x 41 mm, 2.5 mm thick, surface mounted, suspended or set in poured concrete walls and ceilings.

## 3 EXECUTION

### 3.1 Installation

- .1 Secure equipment to hollow or solid masonry, tile and plaster surfaces with lead anchors or nylon shields.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 Secure surface mounted equipment to building construction.
- .4 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .5 Fasten exposed conduit or cables to building construction or support system using straps.
  - .1 One-hole steel straps to secure surface conduits and cables 50 mm and smaller.
  - .2 Two-hole steel straps for conduits and cables larger than 50 mm.
  - .3 Beam clamps to secure conduit to exposed steel work.
- .6 Suspended support systems.
  - .1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
  - .2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.
- .7 For surface mounting of two or more conduits use channels at 1.5 m on centre spacing.
- .8 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

- .9 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .10 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .11 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Engineer.
- .12 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

**END OF SECTION**

## 1 GENERAL

### 1.1 References

- .1 Canadian Standards Association (CSA International).
  - .1 CAN/CSA C22.2 No. 18, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
  - .2 CSA C22.2 No. 45, Rigid Metal Conduit.
  - .3 CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
  - .4 CSA C22.2 No. 83, Electrical Metallic Tubing.
  - .5 CSA C22.2 No. 211.2, Rigid PVC (Unplasticized) Conduit.
  - .6 CAN/CSA C22.2 No. 227.3, Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada.

### 1.2 Submittals

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product data: submit manufacturer's printed product literature, specifications and datasheets pertaining to products supplied.
  - .1 Submit cable manufacturing data.
- .3 Quality assurance submittals:
  - .1 Test reports: submit certified test reports issued by recognized independent testing laboratory.
  - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  - .3 Instructions: submit manufacturer's installation instructions.

## 2 PRODUCTS

### 2.1 Conduits

- .1 PVC conduit: to CSA C22.2 No. 45, galvanized steel and/or aluminum, threaded.
- .2 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.

### 2.2 Conduit fastenings

- .1 One hole steel straps to secure surface conduits 50 mm and smaller.

- .2 Two hole steel straps for conduits larger than 50 mm.
- .3 Beam clamps to secure conduits to exposed steel work.
- .4 Channel type supports U-shaped for two or more conduits at 1.5 m on centre.
- .5 Threaded rods, 6 mm diameter, to support suspended channels.

### **2.3 Conduit fittings**

- .1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit.
- .2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.
- .3 Watertight connectors and couplings for EMT.
  - .1 Set-screws are not acceptable.

### **2.4 Fish cord**

- .1 Polypropylene.

## **3 EXECUTION**

### **3.1 Manufacturer's instructions**

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

### **3.2 Installation**

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 For electrical distribution, use PVC conduit for underground installations.
- .3 Use electrical metallic tubing (EMT) above 2.4 m and not subject to mechanical damage.
- .4 Minimum conduit size for lighting and power circuits: 19 mm.
- .5 Bend conduit cold:
  - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .6 Mechanically bend steel conduit over 19 mm diameter.
- .7 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .8 Install fish cord in empty conduits.

- .9 Remove and replace blocked conduit sections.
- .1 Do not use liquids to clean out conduits.
- .10 Dry conduits out before installing wire.

### **3.3 Surface conduits**

- .1 Run parallel or perpendicular to building lines.
- .2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.
- .3 Run conduits in flanged portion of structural steel.
- .4 Group conduits wherever possible on suspended or surface U channels.
- .5 Do not pass conduits through structural members except as indicated.
- .6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

### **3.4 Cleaning**

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

## 1 GENERAL

### 1.1 General

- .1 The requirements of this section are in addition to the project special requirements described and shown on the plans and in the specifications, and to Section 26 05 00 – Common work results for electrical.

### 1.2 Seismic Data

- .1 Port-Cartier seismic data is as follows:

Sa (0.2)	=	0.46
Sa (0.5)	=	0.26
Sa (1.0)	=	0.11
Sa (2.0)	=	0.038
PGA	=	0.29

### 1.3 Scope of work

- .1 Design, supply and install a complete seismic restraint system (SRS) for the new ATS, existing ATS and existing generator control panel.
- .2 Provide a complete and operational system of seismic restraints designed by a professional engineer registered in a Canadian province and specializing in the design of seismic restraint systems.
- .3 SRS to be fully integrated into, and compatible with noise and vibration controls on mechanical systems and related equipment specified on the drawings of this project and elsewhere..
- .4 The SRS shall be compatible with the electrical installation and the building structural design.
- .5 Systems, equipment not required to be operational during and after seismic event. During seismic event, SRS to prevent systems and equipment from causing personal injury and from moving from normal position.
- .6 Any installed equipment weighing more than 10 kg whether hanged or set on a surface shall be fitted and firmly fastened in accordance with requirements herein prescribed.

### 1.4 Construction drawings, specifications and data

- .1 At completion of construction activities, the Contractor shall deliver to Engineer the complete body of original construction documents, reviewed to reflect as-built systems.
- .2 Before work is undertaken, submit to Engineer's approval two (2) sets of technical production drawings.

- .3 Details on drawings and plans to include the following:
  - .1 Location of each seismic restraint device.
  - .2 Identification of type of seismic restraint device.
  - .3 Details on restraint equipment fastened to building structure.
- .4 Calculations pertaining to seismic restraint devices indicating seismic loads in accordance to the current version of the National Building Code of Canada and supplement, shall be provided complete with worksheets and detailed tables. Conservative simplified hypotheses are acceptable.
- .5 Submit documentation describing in full detail the installation method of all seismic restraint systems.
- .6 All documents to be signed and sealed by a recognized engineer.

## 1.5 Reference standards

- .1 Anti-seismic protection measures to meet the requirements in the current edition of the National Building Code of Canada and supplement.

## 1.6 Shop drawings

- .1 Submit shop drawings as prescribed.
- .2 Provide shop drawings and product data separately for each seismic restraint system and device intended for the electrical material and equipment.

## 2 PRODUCTS

### 2.1 General

- .1 The anti-seismic protection systems to restrain seismic forces in all directions.
- .2 Attachment points and fasteners to withstand same maximum load that seismic restraint is to resist.
- .3 Seismic restraints installed onto piping shall be compatible with requirements applicable to anchors and guiding of piping systems.
- .4 Use high strength mechanical expansion anchors to fasten seismic restraint devices to concrete structures. Further, mechanical expansion anchors to be inserted in new holes drilled specifically for that purpose. Do not use existing holes. Drilled or power driven anchors not permitted.
  - .1 Acceptable materials: Type HSL by Hilti.
- .5 The use of supports in pig iron or made of threaded piping or other breakable or brittle materials is prohibited.

- .6 Seismic restraints installed onto piping and other related accessories shall be compatible with vibration isolators and seismic restraint devices intended for those elements.
- .7 Seismic restraint devices shall not interfere with the operation of fire-stop devices or jeopardize their integrity.

## **2.2 Seismic restraint for static equipment (not requiring vibration isolation)**

- .1 Anchor equipment to equipment supports.
  - .1 Anchor equipment supports to structure. Use size of bolts scheduled in approved shop drawings.
- .2 Suspended equipment, systems and accessories.
  - .1 Use one or combination of following methods according to local conditions.
    - .1 Install tight to structure.
    - .2 Cross-brace in all directions.
    - .3 Brace back fastening points to structure.
    - .4 Slack cable restraint system.
  - .2 Slack cable system (SCS) to prevent sway of conduits in horizontal plane, "rocking" in vertical plane, sliding and buckling in axial direction.
  - .3 Take necessary precautions to ensure that hanger rods able to withstand compressive loading and buckling.
  - .4 Anti-seismic protection system to provide smooth and even dampening effect using an elastomeric material or by other means in order to prevent severe impact loads.
  - .5 SCS acceptable trade names: Grinnell, Korfund-Sampson, Tecoustics, Vibra-Sonic Control, Vibron.

## **2.3 SRS for vibration isolated equipment**

- .1 Floor mounted equipment, systems.
  - .1 Use one or combination of following methods according to local conditions.
    - .1 Use vibration isolators with built-in snubbers.
    - .2 Use separate snubbers in addition to anti-vibration devices.
    - .3 Use manufactured vibration isolation system consisting of structural elements and elastomeric layer approved by an engineer.
  - .2 SRS not to jeopardize noise and vibration isolation systems. Provide 4-8 mm clearance between seismic restraint snubbers and equipment during normal operation of equipment and systems.

- .3 Incorporate seismic devices to vibration isolation system to resist complete unloading of the latter.
- .4 Cushioning action to be gentle and steady by utilizing elastomeric material or other means in order to avoid high impact loads.
- .5 Acceptable trade names are: Korfund-Sampson, Tecoustics, Vibra-Sonic Control, Vibron.
- .2 Suspended equipment, systems, including conduit and other similar systems and accessories.
  - .1 Use one or combination of following methods according to local conditions.
    - .1 Slack cable restraint system.
    - .2 Brace back to structure via vibration isolators and snubbers or with additional separate snubbers.
  - .2 Restraint of conduits using SCS prevents sway in horizontal plane, "rocking" in vertical plane, sliding and buckling in axial direction.
  - .3 Take preventive measures to ensure that hanger rods withstand compressive loading and buckling.
  - .4 Seismic protection system to avoid high impact loads and provide gentle and steady cushioning action.
  - .5 Acceptable trade names for slack cable restraint system: Grinnell, Korfund-Sampson, Tecoustics, Vibra-Sonic Control, Vibron.

### **3 EXECUTION**

#### **3.1 Installation**

- .1 All attachment points and fasteners to withstand same maximum load that seismic restraint is to resist in compliance with current edition of National Building Code of Canada and supplement.
- .2 Connect slack cable restraint system to suspended equipment so that axial projection of wire passes through centre of gravity of equipment.
- .3 Orient restraint wires on ceiling hung equipment at approximately 90° to each other (in plan), tie back to structure at maximum of 45° to structure.
- .4 Install seismic protection system at least 25 mm from all other equipment, systems, services.
- .5 Adjust restraint cables so that they are not visibly slack but permit vibration isolation system to function normally.
- .6 Bolt to structure any miscellaneous items not vibration-isolated.

- .7 SRS to be inspected by professional engineer. Provide written report with certificate of compliance with recommendations. Inspection certificate to validate compliance with applicable NBC requirements for geographical location.

**END OF SECTION**

## 1 GENERAL

### 1.1 Section includes

- .1 This section specifies the acquisition of an automatic transfer switch.

### 1.2 Related Sections

- .1 Section 01 33 00 - Submittal procedures.
- .2 Section 01 78 00 - Closeout submittals.
- .3 Section 26 05 00 – Common work results for electrical.

### 1.3 References

- .1 Canadian Standards Association (CSA)/CSA International.
  - .1 CAN3-C13-FM83, Instrument transformers.
  - .2 CSA C22.2 No.5-02, Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the second edition of NMX-J-266-ANCE).
  - .3 CSA C22.2 No 178, Automatic transfer switches.
- .2 American National Standards Institute (ANSI)/National Electrical Manufacturers Association (NEMA).
  - .1 ANSI/NEMA ICS 2, Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.
- .3 Switch to meet or exceed relevant UL, IEEE, NFPA and IEC applicable standards.

### 1.4 System description

- .1 Automatic transfer switch designed to:
  - .1 Control all phases of normal source voltage.
  - .2 Cause generator to start in case of power failure or abnormal voltage lower than the pre-established adjustable limits, in any phase, over an adjustable period.
  - .3 Transfer load circuit to emergency source when generator reaches pre-established adjustable limits of nominal voltage and frequency.
  - .4 Retransfer load circuit when restoration is confirmed by the sensing, in all phases, of voltage higher than pre-established adjustable limit over an adjustable period.

- .5 Cause generator to stop after cool down no-load operation over a period determined by an adjustable time relay.

### **1.5 Shop drawings**

- .1 Submit required shop drawings in accordance with section 01 33 00 - Submittal Procedures.
- .2 Shop drawings must comprise and indicate:
  - .1 Brand, model, and transfer type.
  - .2 Single-line connection diagram of controls and relays.
  - .3 Description of equipment operation covering the following:
    - .1 Automatic starting of generator, automatic transfer from load circuit to emergency source, and transfer back to normal load circuit.
    - .2 Test control.
    - .3 Manual control.
    - .4 Automatic stop.

### **1.6 Closeout submittals**

- .1 Provide necessary maintenance and operating instructions of automatic transfer switch and include in user manual specified in section 01 78 00 - Closeout Submittals.
- .2 Provide necessary maintenance, repair and operating instructions of switch.
- .3 Provide following technical data:
  - .1 Schematic layout of elements, relays, and controls.
  - .2 Provide illustrated list of parts with corresponding catalogue numbers.
  - .3 Certified copy of shop tests results.

## **2 PRODUCTS**

### **2.1 Materials/Equipment**

- .1 Instrument transformers: to CAN3-C13.
- .2 Contactors: to ANSI/NEMA ICS-2.
- .3 Recognized manufacturers: Eaton, Asco, GE.

### **2.2 Contactor switching device**

- .1 Contactor switching device: to CSA C22.2, n° 178.

- .2 Two direction contactor-type automatic transfer switch activated by a single-coil mechanism, inherently and mechanically held in both positions. Direct-type coupling to ensure transfer within six (6) cycles or less.
- .3 Unit to be assembled in a Nema 1-type enclosure.
- .4 Switch to have connecting sockets for Al-Cu cables in sufficient number and capacity.
- .5 Nominal voltage: 347/600 V, 60 Hz, 1600 A, 3-phase, 3-pole, 4 wires, continuous neutral without decommissioning for 100% use with inductive loads for both main contactor and by-pass. Interrupt capacity 100 kA.
- .6 Neutral is not transferred.
- .7 Main contacts with silver finish protected with arc extinguishing means.
- .8 Selector and relay contacts, coils, springs, and control elements accessible from front of enclosure for maintenance and inspection purposes without removing the switching panel, disconnecting the drive shaft, or disconnecting the supply conductors.
- .9 Auxiliary contacts designed to initiate generator start in case of normal power supply failure.
- .10 Rated resistance capacity to 100 kA RMS symmetrical fault currents for a period of 50 milliseconds under 600 Vac.
- .11 Lever to allow manual activation of contactors when the latter are isolated.
- .12 Solid-type isolated neutral bar.
- .13 All interconnections with other equipment to converge to a terminal block located inside main panel and clearly identified

### **2.3 Automatic transfer switch (ATS)**

- .1 Auxiliary contacts (2): Closed when switch in emergency position.
- .2 Auxiliary contacts (2): Closed when switch in normal position.
- .3 All external control connections to be made on a customer terminal block.
- .4 Connections between the switch and the control panel to be detachable.
- .5 Automatic transfer switch with manual transfer switch and isolated uninterruptible power supply under load during by-pass. This system allows to manually by-pass the automatic transfer switch. The automatic switch is detachable and installed on a removable frame to allow maintenance and tests without causing loss of power source to the load.
- .6 The switch is a single source by-pass device. Install by-pass on the standby power side.
- .7 The automatic unit to have a three-position lever:

- .1 Automatic: the automatic switch is connected to the two sources and to the load; the by-pass unit is in the open position.
- .2 Test: the by-pass unit is closed and supplies the load; the automatic switch can be tested with the test button available on the door.
- .3 Isolated: the automatic switch is disconnected from the two sources and from the load; load is supplied by the by-pass unit.
- .8 The by-pass unit to have a three-position lever:
  - .1 Automatic: by-pass unit is disconnected from the two sources.
  - .2 By-pass in normal position: by-pass unit is connected to the normal source.
  - .3 By-pass in emergency position: by-pass unit is connected to the emergency source.
- .9 The automatic and by-pass unit shall be designed as to make it impossible to connect the two sources at any moment in parallel at the load point, even by mistake.
- .10 Start signal to be automatically conveyed to the generator should a power failure occur at the normal source during maintenance of the automatic unit.
- .11 External exerciser with timer to start the generator with programming over 365 days and the possibility to test the generator with or without load.
- .12 Synchronising monitors to operate the transfer when two (2) sources are in similar phase angle. Transition in neutral position is not accepted.
- .13 Generator starting contact.
- .14 Signal lamp for:
  - .1 Normal source available.
  - .2 Emergency source available.
  - .3 By-pass unit in normal position.
  - .4 By-pass unit in emergency position.
  - .5 Automatic unit in test position.
  - .6 Automatic unit in isolated position.
  - .7 Automatic unit in locked position.
  - .8 Automatic unit in normal position.
  - .9 Automatic unit in emergency position.
- .15 Provide reset button/warning lamp test.

- .16 Time delay relay for start of generator set, adjustable from 0 to 4 seconds.
- .17 Time delay relay transfer from normal source to emergency source after verification of the latter source; adjustable from 0 to 15 seconds.
- .18 Time delay relay from emergency source to normal source to provide the latter with stabilisation time; adjustable from 0 to 30 minutes.
- .19 Time delay relay to allow cooling down of engine and keeping generator running on no-load after switching to normal source; adjustable from 0 to 5 minutes.
- .20 Voltage detection on the normal side over the three (3) phases; adjustable in control panel.
- .21 Voltage detection on the emergency side over one phase; adjustable in control panel.
- .22 Digital control panel, directly accessible from front side of switch unit. Automatic controller helps to visualize the different parameters and relevant information concerning both sources. Programming is done with this controller. Programmer allows to review the last events.
- .23 Display to be designed for adequate legibility even in total darkness and under intense lighting conditions. It shall be designed to be legible at a perpendicular angle up to 120 °.
- .24 Status mode of system to allow real time display of switch status and ongoing processing; voltage measurements, frequency, phase sequence, and imbalance of normal and emergency sources.
- .25 The following functions shall be available and parameters shall be adjustable:
  - .1 Undervoltage measurement, normal and emergency sources.
  - .2 Overvoltage measurement, emergency source.
  - .3 Under-frequency measurement, normal and emergency sources.
  - .4 Over-frequency measurement, normal and emergency sources.
- .26 Operating temperature range: -40 °C to 65 °C.
- .27 Allows fault simulation on normal source.
- .28 Generator side position contact for elevator.
- .29 Elevator pre-transfer contact.
- .30 The automatic inverter allows for full configuration using digital control on the display screen; it may also be programmed using a compatible PC with appropriate utility software via a serial port. This PC, and the appropriate software should allow programming of all the automatic inverter parameters and to activate or turn off the inverter's various options.

## 2.4 Factory quality control

- .1 All of equipment, including switching mechanism, controls, relays, and accessories, shall be assembled and tested at the factory.
- .2 Tests
  - .1 Operate the equipment and ascertain that there are no electrical or mechanical defects.
  - .2 Check selector in all operating modes and record results.
  - .3 Check settings of voltage-sensitive relays and time delay relays.
- .3 Submit test reports to Engineer.

## 3 EXECUTION

### 3.1 Installation

- .1 Determine location and install ATS as indicated.
- .2 Connect the normal source terminals to the normal power circuit as indicated.
- .3 Connect the emergency source terminals to the generator terminals as indicated.
- .4 Connect the load terminals to the load.
- .5 Connect the switch contacts used to start the generator as indicated.
- .6 Check the relays and adjust as needed.
- .7 Connect contacts for supervision of switch position.

### 3.2 Tests

- .1 Energize ATS with normal power source.
- .2 Press and maintain the push-button which allows to simulate a power failure. Check that the generator start and transfer sequence operates as planned. Release the push-button and ascertain that the generator stops within the predetermined parameters.
- .3 Open the normal source isolating switch. The generator shall then start automatically and reach nominal voltage and frequencies. The load should be switched to the emergency source by the generator. Let the generator run for ten (10) minutes, and then close the normal source isolating switch. The load should then be switched back to the normal source and the generator should stop after the pre-set cooling time.

### **3.3 Commissioning**

- .1 The subcontractor shall coordinate, with the ATS manufacturer, the commissioning and field testing of the equipment. After testing, the ATS manufacturer shall issue a performance certificate.

### **3.4 Equipment identification**

- .1 Provide and install nameplates in accordance with section 26 05 00 - Common Work Results for Electrical.
- .2 Nameplates shall be in French.

### **3.5 Training**

- .1 Prepare and provide a two-hour training session for two technicians with all the necessary material.

### **3.6 Warranty**

- .1 A 5-year/1500 hours warranty, parts and labour without deductible, and no additional purchaser obligation shall be included with the supply of the equipment.

### **3.7 After-sale service and technical support**

- .1 Manufacturer shall keep a complete inventory of spare parts at his main warehouse. The inverter manufacturer shall have a regional office able to provide service on the above mentioned equipment, 24 hours a day, and 365 days a year. He shall also locally maintain an inventory of critical parts to provide emergency service of the equipment. The inverter manufacturer shall commit to maintain a record from which the owner may, based on the serial number, obtain all the information pertaining to the device such as date of commissioning, service history, product specifications and options when shipped from the factory.

**END OF SECTION**

## 1 GENERAL

### 1.1 Scope

- .1 The contractor shall furnish short-circuit and protective device coordination studies which shall be prepared by the equipment manufacturer.

### 1.2 Related Sections

- .1 Section 26 36 26 – Arc Flash Hazard Analysis Study.

### 1.3 References

- .1 Institute of Electrical and Electronics Engineers, Inc. (IEEE).
  - .1 IEEE 141 – Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems.
  - .2 IEEE 242 – Recommended Practice for Protection and coordination of Industrial and Commercial Power Systems.
  - .3 IEEE 399 – Recommended Practice for Industrial and Commercial Power System Analysis.
  - .4 IEEE 241 – Recommended Practice for Electric Power Systems in Commercial Buildings.
  - .5 IEEE 1015 – Recommended Practice for Applying Low Voltage Circuit Breakers Used in Industrial and Commercial Power Systems.
- .2 American National Standards Institute (ANSI).
  - .1 ANSI C57.12.00 – Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers.
  - .2 ANSI C37.13 – Standard for Low Voltage ac Power Circuit Breakers Used in Enclosures.
  - .3 ANSI C37.010 – Standard Application Guide for ac High Voltage Circuit Breakers Rated on a Symmetrical Current Basis.
  - .4 ANSI C37.41 – Standard Design Tests for High Voltage Fuses, Distribution Enclosed single-Pole Air Switches, Fuse Disconnecting Switches and Accessories.
  - .5 ANSI C37.5 – Methods for Determining the RMS Value of a Sinusoidal Current Wave and Normal-Frequency Recovery Voltage, and for Simplified Calculation of Fault Currents.
- .3 The National Fire Protection Association 70, National Electrical Code, latest edition.

#### 1.4 Submittals for review/Approval

- .1 The short-circuit and protective device coordination studies shall be submitted to the design engineer prior to receiving final approval of the distribution equipment shop drawings and/or prior to release of equipment drawings for manufacturing. If normal completion of the studies may cause delay in equipment manufacturing, approval from the engineer may be obtained for preliminary submittal of sufficient study data to ensure that the selection of device ans caractéristiques will be satisfactory.

#### 1.5 Submittals for construction

- .1 The results of the short-circuit and coordination studies shall be summarized in a final report. Submit five (3) bound copies of the final report. Additional copies, where required, shall be provided on CD in PDF format.
- .2 The report shall include the following sections :
  - .1 One-line diagram showing protective device ampere ratings and associated designations, cable size & lengths, transformer kVA & voltage ratings, motor & generator kVA ratings, and switchgear/switchboard/panelboard designations.
  - .2 Descriptions, purpose, basis and scope of the study.
  - .3 Tabulations of the worst-case calculated short circuit duties as a percentage of the applied device rating (automatic transfer switches, circuit breakers, fuses, etc.); the short circuit duties shall be upward-adjusted for X/R ratios that are above the device design ratings.
  - .4 Protective device time versus current coordination curves with associated one line diagram identifying the plotted devices, tabulations of ANSI protective relay functions and adjustable circuit breaker trip unit settings.
  - .5 Fault study input data, case descriptions, and current calculations including a definition of terms and guide for interpretation of the computer printout.
  - .6 Comments and recommendations for system improvements, where needed.
  - .7 Executive summary.

#### 1.6 Qualifications

- .1 The short-circuit and coordination studies shall be conducted under the supervision and approval of a Registered Professionnal Electrical Engineer skilled in performing and interpreting power system studies. The Registered Professionnal Electrical Engineer shall be a full-time employee of the Engineering Services Organization.

## 2 PRODUCTS

### 2.1 Studies

- .1 Contractor to furnish short-circuit and protective device coordination studies as prepared by equipment manufacturer.

## 2.2 Data collection

- .1 Contractor shall furnish all field data as required by the power system studies. The Engineer performing the short-circuit and coordination studies shall furnish the Contractor with a listing of required data. The Contractor shall expedite collection of the data to eliminate unnecessary delays and ensure completion of the studies as required for final approval of the distribution equipment shop drawings and/or prior to the release of the equipment for manufacturing.
- .2 Source contribution may include present and future utility supply, motors, and generators.
- .3 Load data utilized may include existing and proposed loads obtained from Contract Documents provided by owner or Contractor.
- .4 Include fault contribution of existing motors in the study, with motors < 50 hp grouped together. The Contractor shall obtain required existing equipment data, if necessary, to satisfy the study requirements.

## 2.3 Short-circuit and protective device evaluation study

- .1 Use typical conductor impedances based on IEEE Standard 141, latest edition.
- .2 Transformer design impedances and standard X/R ratios shall be used when test values are not available.
- .3 Provide the following :
  - .1 Calculation methods and assumptions.
  - .2 Selected base per unit quantities.
  - .3 One-line diagram of the system being evaluated.
  - .4 Source impedance data, including electric utility system and motor fault contribution characteristics.
  - .5 Typical calculations.
  - .6 Tabulations of calculated quantities.
  - .7 Results, conclusions and recommendations.
- .4 Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault at each.
  - .1 Electric utility's supply termination point.
  - .2 Incoming switchgear.
  - .3 Unit substation primary and secondary terminals.
  - .4 Low voltage switchgear.

- .5 Motor control centers.
- .6 Standby generators and automatic transfer switches.
- .7 Branch circuit panelboards.
- .8 Other significant locations throughout the system.
- .5 For grounded systems, produce a bolted line-to-ground fault current study for areas as defined for the three-phase bolted fault short-circuit study.
- .6 Protective device evaluation.
  - .1 Évalue equipment and protective devices and compare to short circuit ratings.
  - .2 Adequacy of switchgear, motor control centers, and panelboard bus bars to withstand short-circuit stresses.
  - .3 Adequacy of transformer windings to withstand short-circuit stresses.
  - .4 Cable and busbar sizes for ability to withstand short-circuit heating.
  - .5 Notify Owner in writing of existing circuit protective devices improperly rated for the calculated available fault current.

#### **2.4 Protective device coordination study**

- .1 Proposed protective device coordination time-current curves shall be graphically displayed on log-log scale paper.
- .2 Include on each curve sheet a complete title and one-line diagram with legend identifying the specific portion of the system covered.
- .3 Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which device is exposed.
- .4 Identify device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay and instantaneous settings recommended.
- .5 Plot the following characteristics on the curve sheets, where applicable.
  - .1 Electric utility's protective device.
  - .2 Medium voltage equipment relays.
  - .3 Medium and low voltage fuses including manufacturer's minimum melt, total clearing, tolerance and damage bands.
  - .4 Low voltage equipment circuit breaker trip devices, including manufacturer's tolerance bands.
  - .5 Transformer full-load current, magnetizing inrush current, and ANSI transformer withstand parameters.

- .6 Conductor damage curves.
  - .7 Ground fault protective devices, as applicable.
  - .8 Pertinent motor starting characteristics and motor damage points.
  - .9 Pertinent generator short-circuit derement curve and generator damage point.
  - .10 Other system load protective devices for the largest branch circuit and the largest feeder circuit breaker in each motor control center.
- .6 Provide adequate time margins between device characteristics such that selective operation is provided, shile providing proper protection.

## 2.5 Report sections

- .1 Input Date.
  - .1 Utility three-phase and line-to-ground available contribution with associated X/R ratios.
  - .2 Short-circuit reactance of rotating machines with associated X/R ratios.
  - .3 Cable type, construction, size, # per phase, length, impedance and conduit type.
  - .4 Bus duct type, size, length and impedance.
  - .5 Transformer primary & secondary voltages, winding configurations, kVA rating, impedance and X/R ratio.
  - .6 Reactor inductance and continuous ampere rating.
  - .7 Aerial line type, construction, conductor spacing, size, 1 per phase, and length.
- .2 Short-circuit Data.
  - .1 Source fault impedance and generator contributions.
  - .2 X to R ratios.
  - .3 Asymmetry factors.
  - .4 Motor contributions.
  - .5 Short circuit kVA.
  - .6 Symmetrical and asymmetrical fault currents.
- .3 Recommended Protective Device Settings.
  - .1 Phase and Ground Relays.
    - .1 Current transformer ratio.

- .2 Current setting.
- .3 Time setting.
- .4 Instantaneous setting.
- .5 Specialty non-overcurrent device settings.
- .6 Recommendations on improved relaying systems, if applicable.
- .2 Circuit Breakers.
  - .1 Adjustable pickups and time delays (long time, short time, ground).
  - .2 Adjustable time-current characteristic.
  - .3 Adjustable instantaneous pickup.
  - .4 Recommendations on improved trip systems, if applicable.

### **3 EXECUTION**

#### **3.1 Field adjustment**

- .1 Adjust relay and protective device settings according to the recommended settings table provided by the coordination study. Field adjustments to be completed by the engineering service division of the equipment manufacturer under the Startup and Acceptance Testing contrat portion.
- .2 Make minor modifications to equipment as required to accomplish conformance with short-circuit and protective device coordination studies.

**END OF SECTION**

## 1 GENERAL

### 1.1 Scope

- .1 The contractor shall furnish short-circuit and protective device coordination studies which shall be prepared by the equipment manufacturer.
- .2 The contractor shall furnish an Arc-Flash Hazard Analysis Study per NFPA 70E – Standard for Electrical Safety in the Workplace, reference Article 130.5 and Informative Annex D.
- .3 Related sections.
  - .1 Section 26 36 25 – Short-circuit / Coordination study.

### 1.2 References

- .1 Institute of Electrical and Electronics Engineers, Inc. (IEEE).
  - .1 IEEE 141 – Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems.
  - .2 IEEE 242 – Recommended Practice for Protection and coordination of Industrial and Commercial Power Systems.
  - .3 IEEE 399 – Recommended Practice for Industrial and Commercial Power System Analysis.
  - .4 IEEE 241 – Recommended Practice for Electric Power Systems in Commercial Buildings.
  - .5 IEEE 1015 – Recommended Practice for Applying Low Voltage Circuit Breakers Used in Industrial and Commercial Power Systems.
  - .6 IEE 1584 – Guide for Performing Arc-Flash Hazard Calculations.
- .2 American National Standards Institute (ANSI).
  - .1 ANSI C57.12.00 – Standard General Requirements for Liquid-Immersed Distribution, Power, and Régulating Transmormers.
  - .2 ANSI C37.13 – Standard for Low Voltage ac Power Circuit Breakers Used in Enclosures.
  - .3 ANSI C37.010 – Standard Application Guide for ac High Voltage Circuit Breakers Rated on a Summetrical Current Basis.
  - .4 ANSI C37.41 – Standard Design Tests for High Voltage Fuses, Distribution Enclosed single-Pole Air Switches, Fuse Disconnecting Switches and Accessories.

- .5 ANSI C37.5 – Methods for Determining the RMS Value of a Sinusoidal Current Wave and Normal-Frequency Recovery Voltage, and for Simplified Calculation of Fault Currents.
- .3 The National Fire Protection Association (NFPA)
  - .1 NFPA 70, National Electrical Code, latest edition.

### 1.3 Submittals for review/Approval

- .1 The short-circuit and protective device coordination studies shall be submitted to the design engineer prior to receiving final approval of the distribution equipment shop drawings and/or prior to release of equipment drawings for manufacturing. If formal completion of the studies may cause delay in equipment manufacturing, approval from the engineer may be obtained for preliminary submittal of sufficient study data to ensure that the selection of device ans caractéristiques will be satisfactory.

### 1.4 Submittals for construction

- .1 The results of the short-circuit, protective device coordination and arc-flash hazard analysis studies shall be summarized in a final report. No more than five (5) bound copies of the complete final report shall be submitted. For large system studies, submittals, requiring more than five (5) copies of the report will be provided without the section containing the computer printout of the short-circuit input aind output date. Additional copies, where required, shall be provided on CD in PDF format.
- .2 The report shall include the following sections :
  - .1 One-line diagram showing protective device ampere ratings and associated designations, cable size & lengths, transformer kVA & voltage ratings, motor & generator kVA ratings, and switchgear/switchboard/panelboard designations.
  - .2 Descriptions, purpose, basis end scope of the study.
  - .3 Tabulations of the worst-case calculated short circuit futies as a percentage of the applied device rating (automatic transfet seitches, circuit breakers, fuses, etc.); the short circuit duties shall be upward-adjusted for X/R ratios that are above the device design ratings.
  - .4 Protective device time versus current coordination curves with associated one line diagram identifying th eplotted devices, tabulations of ANSO protective relay functions and adjustable circuit breaker trip unit settings.
  - .5 Mlti-function relay setting file printouts including all ANSI protective relay functions and associated logic and control. Metering, communication, and control logic settings not associated with ANSI protective functions are not required.
  - .6 Fault stydy input date, case descriptions, and current calculations including a definition of terms and guide for interpretation of the computer printout.
  - .7 Incident energy and flash protection boundary calculations.

- .8 Comments and recommendations for system improvements, where needed.
- .9 Executive Summary including source of information and assumptions made.

## 1.5 Qualifications

- .1 The short-circuit and coordination studies shall be conducted under the supervision and approval of a Registered Professional Electrical Engineer skilled in performing and interpreting power system studies. The Registered Professional Electrical Engineer shall be a full-time employee of the Engineering Services Organization.

## 2 PRODUCTS

### 2.1 Studies

- .1 Contractor to furnish short-circuit and protective device coordination studies as prepared by equipment manufacturer. By using the equipment manufacturer the study allows coordination of proper breakers, fuses, and current transformers. The coordination study shall begin with the utility company's feeder protective device and include all of the electrical protective devices down to and include the largest feeder circuit breaker and motor starter in the 480 volt motor control centers and power distribution panelboards. The study shall also include variable frequency drives, harmonic filters, power factor correction equipment, transformers and protective devices associated with variable frequency drives, emergency and standby generators associated paralleling equipment and distribution switchgear.
- .2 The contractor shall furnish an Arc-Flash Hazard Analysis Study per NFPA 70E – Standard for Electrical Safety in the Workplace, reference article 130.5 and informative Annex D.

### 2.2 Data collection

- .1 Contractor shall furnish all field data as required by the power system studies. The Engineer performing the short-circuit and coordination studies shall furnish the Contractor with a listing of required data. The Contractor shall expedite collection of the data to eliminate unnecessary delays and ensure completion of the studies as required for final approval of the distribution equipment shop drawings and/or prior to the release of the equipment for manufacturing.
- .2 Source combination may include present and future utility supply, motors, and generators.
- .3 Load data utilized may include existing and proposed loads obtained from Contract Documents provided by owner or Contractor.
- .4 Include fault contribution of existing motors in the study, with motors < 50 hp grouped together. The Contractor shall obtain required existing equipment data, if necessary, to satisfy the study requirements.

### 2.3 Short-circuit and protective device évaluation study

- .1 Use actual conductor impedances if known. If unknown, use typical conductor impedances based on IEE Standards 141, latest edition..
- .2 Transformer design impedances and standard X/R ratios shall be used when test values are not available.
- .3 Provide the following :
  - .1 Calculation methods and assumptions.
  - .2 Selected base per unit quantities.
  - .3 One-line diagram of the system being evaluated with available fault at each bus, and interrupting rating of devices noted.
  - .4 Source impedance data, including electric utility system and motor fault contribution characteristics.
  - .5 Typical calculations.
  - .6 Tabulations of calculated quantities.
  - .7 Results, conclusions and recommendations.
- .4 Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault at each.
  - .1 Electric utility's supply termination point.
  - .2 Incoming switchgear.
  - .3 Unit substation primary and secondary terminals.
  - .4 Low voltage switchgear.
  - .5 Motor control centers.
  - .6 Standby generators and automatic transfer switches.
  - .7 Branch circuit panelboards.
  - .8 Other significant locations throughout the system.
- .5 For grounded systems, produce a bolted line-to-ground fault current study for areas as defined for the three-phase bolted fault short-circuit study.
- .6 Protective device évaluation.
  - .1 Évalue equipment and protective devices and compare to short circuit ratings.

- .2 Adequacy of switchgear, motor control centers, and panelboard bus bars to withstand short-circuit stresses.
- .3 Adequacy of transformer windings to withstand short-circuit stresses.
- .4 Cable and busbar sizes for ability to withstand short-circuit heating.
- .5 Notify Owner in writing of existing circuit protective devices improperly rated for the calculated available fault current.

## 2.4 Protective device coordination study

- .1 Proposed protective device coordination time-current curves shall be graphically displayed on log-log scale paper.
- .2 Include on each curve sheet a complete title and one-line diagram with legend identifying the specific portion of the system covered.
- .3 Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which device is exposed.
- .4 Identify device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay and instantaneous settings recommended.
- .5 Plot the following characteristics on the curve sheets, where applicable.
  - .1 Electric utility's protective device.
  - .2 Medium voltage equipment relays.
  - .3 Medium and low voltage fuses including manufacturer's minimum melt, total clearing, tolerance and damage bands.
  - .4 Low voltage equipment circuit breaker trip devices, including manufacturer's tolerance bands.
  - .5 Transformer full-load current, magnetizing inrush current, and ANSI transformer withstand parameters.
  - .6 Conductor damage curves.
  - .7 Ground fault protective devices, as applicable.
  - .8 Pertinent motor starting characteristics and motor damage points.
  - .9 Pertinent generator short-circuit derating curve and generator damage point.
  - .10 Other system load protective devices for the largest branch circuit and the largest feeder circuit breaker in each motor control center.
- .6 Provide adequate time margins between device characteristics such that selective operation is provided, while providing proper protection.

- .7 Select each primary protective device required for a delta-wye connected transformer so that the characteristics or operating band is within the transformer parameters which includes a parameter equivalent to 58 % of the ANSI withstand point to afford protection for secondary line-to-ground faults.
- .8 Separate low voltage power circuit breakers from each other and the associated primary protective device by a 16 % current margin for coordination and protection in the event of secondary line-to-line faults.
- .9 Engineer shall provide settings file printouts for all multifunction relays supplied under this contract including all ANSI protective relay functions and associated logic and control. Metering, communication, and control logic settings not associated with ANSI protective functions are not required.

## 2.5 Arc-Flash Hazard Analysis

- .1 The arc-flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA 70E-2012, Informative Annex D.
- .2 When appropriate, the short circuit calculations and the clearing times of the phase over-current devices will be retrieved from the short-circuit and coordination study model. Alternative methods shall be presented in the proposal.
- .3 The flash protection boundary and the incident energy shall be calculated at all significant locations in the electrical distribution system (switchboards, switchgear, motor-control centers, panelboards, busway and splitters) where work could be performed on energized parts.
- .4 The arc-flash hazard analysis shall include all MV, 575v and 480v locations and significant locations in 240 volt and 208 volt systems fed from transformers equal to or greater than 125 kVA.
- .5 Safety working distances shall be specified for calculated fault locations based upon the calculated arc-flash boundary considering an incident energy of 1.2 cal/cm<sup>2</sup>.

The arc-flash hazard analysis shall include calculations for maximum and minimum contributions of fault current magnitude. The minimum calculation shall assume that the utility contribution is at a minimum and shall assume a minimum motor load. Conversely, the maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.

## 2.6 Report sections

- .1 Input Data.
  - .1 Utility three-phase and line-to-ground available contribution with associated X/R ratios.
  - .2 Short-circuit reactance of rotating machines with associated X/R ratios.
  - .3 Cable type, construction, size, # per phase, length, impedance and conduit type.

- .4 Bus duct type, size, length and impedance.
- .5 Transformer primary & secondary voltages, winding configurations, kVA rating, impedance and X/R ratio.
- .6 Reactor inductance and continuous ampere rating.
- .7 Aerial line type, construction, conductor spacing, size, 1 per phase, and length.
- .2 Short-circuit Data.
  - .1 Source fault impedance and generator contributions.
  - .2 X to R ratios.
  - .3 Asymmetry factors.
  - .4 Motor contributions.
  - .5 Short circuit kVA.
  - .6 Symmetrical and asymmetrical fault currents.
- .3 Recommended Protective Device Settings.
  - .1 Phase and Ground Relays.
    - .1 Current transformer ratio.
    - .2 Current setting.
    - .3 Time setting.
    - .4 Instantaneous setting.
    - .5 Specialty non-overcurrent device settings.
    - .6 Recommendations on improved relaying systems, if applicable.
  - .2 Circuit Breakers.
    - .1 Adjustable pickups and time delays (long time, short time, ground).
    - .2 Adjustable time-current characteristic.
    - .3 Adjustable instantaneous pickup.
    - .4 Recommendations on improved trip systems, if applicable.
- .4 Incident energy and arc-flash boundary calculations.
  - .1 Arcing fault magnitude.
  - .2 Device clearing time.
  - .3 Duration of arc.
  - .4 Arc-flash boundary.

- .5 Working distance.
- .6 Incident energy.
- .7 Recommendations for arc-flash energy reduction.

### **3 EXECUTION**

#### **3.1 Field adjustment**

- .1 Adjust relay and protective device settings according to the recommended settings table provided by the coordination study. Field adjustments to be completed by the engineering service division of the equipment manufacturer under the Startup and Acceptance Testing contract portion.
- .2 Make minor modifications to equipment as required to accomplish conformance with short-circuit and protective device coordination studies.

#### **3.2 Arc-flash warning labels**

- .1 The vendor shall provide a 4 in. x 4 in. thermal transfer type label of high adhesion polyester for each work location analyzed.
- .2 The label shall have an orange header with the wording, "WARNING, SHOCK U ARC-FLASH HAZARD", and shall include the following information.
  - .1 Location designation.
  - .2 Nominal voltage.
  - .3 Arc-flash boundary.
  - .4 Incident energy.
  - .5 Working distance.
  - .6 Shock boundaries.
  - .7 Engineering report number, revision number and issue date.
- .3 Labels shall be machine printed, with no field markings.
- .4 Arc-flash labels shall be provided in the following manner and all labels shall be based on recommended overcurrent device settings.
  - .1 For each 600, 480 and applicable 208 volt panelboards and disconnects, one arc-flash label shall be provided.
  - .2 For each motor control center, one arc-flash label shall be provided.
  - .3 For each low voltage switchboard, one arc-flash label shall be provided.
  - .4 For each switchgear, one flash label shall be provided.

- .5 For medium voltage switchches one arc-flash label shall be provided.
- .5 Labels shall be field installed by the engineering service division of the equipment manufacturer under the Startup and Acceptance Testing contract proton.

### **3.3 Arc-flash training**

- .1 The equipment vendor shall train personnel of the potential arc-flach hazards associated with working on energized equipment (minimum of 4 hours). Maintenance procedures in accordance with the requirements of NFPA 70E, Standard for Electrical Safety Requirements for employee workplaces, shall be provided in the equipment manuels. The training shall be certified for continuing education units (CEIs) by the International Association for Continuing Education Training (IACET).

**END OF SECTION**

## **1 GENERAL**

### **1.1 Related Sections**

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

### **1.2 References**

- .1 Government of Canada.
  - .1 NBC-[1995], National Building Code of Canada.
- .2 Underwriter's Laboratories of Canada (ULC)
  - .1 CAN/ULC-S524-[1991], Installation of Fire Alarm Systems.
  - .2 ULC-S525-[1978], Audible Signal Appliances for Fire Alarm.
  - .3 CAN/ULC-S526-[1987(R1995)], Visual Signal Appliances, Fire Alarm.
  - .4 CAN/ULC-S527-[1987(R1995)], Control Units.
  - .5 CAN/ULC-S528-[1991], Manual Pull Stations.
  - .6 CAN/ULC-S529-[1987(R1995)], Smoke Detectors.
  - .7 CAN/ULC-S530-[1991], Heat Actuated Fire Detectors.
  - .8 CAN/ULC-S531-[1987(R1995)], Smoke Alarms.
  - .9 CAN/ULC-S536-[1997], Inspection and Testing of Fire Alarm Systems.
  - .10 CAN/ULC-S537-[1997], Verification of Fire Alarm Systems.

### **1.3 General Requirements**

- .1 The goal of the present specification is to describe the addition of components to an existing integrated addressable intelligent type system of fire detection, brand Edwards EST3, with analog detection, low voltage and modular, using multiplex communication techniques, fully compliant to the applicable codes and standards. The described characteristics in the present specification are mandatory for the project and must be provided by the chosen contractor.

### **1.4 System Description**

- .1 The fire alarm system must include the following:
  - .1 Addressable modules
  - .2 Wiring

## 1.5 System Description

- .1 Constituent elements of the fire alarm system: authorized by the Underwriters Laboratories of Canada (ULC) and complies with the relevant stipulations of the National Building Code and requirements of the local competent organization.

## 1.6 Shop Drawings

- .1 Submit shop drawings in accordance with Section [01 33 00 - Submittal Procedures].
- .2 Include:
  - .1 Details for devices.
  - .2 Step-by-step operating sequence, cross referenced to logic flow diagram.

## 1.7 Closeout Submittals

- .1 Provide operation and maintenance data for fire alarm system for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
- .2 Include:
  - .1 Instructions for complete fire alarm system to permit effective operation and maintenance.
  - .2 Technical data - illustrated parts lists with parts catalogue numbers.
  - .3 Copy of approved shop drawings with corrections completed and marks removed except review stamps.
  - .4 List of recommended spare parts for system.

## 2 PRODUCTS

### 2.1 Materials

- .1 Equipment and devices: ULC listed and labelled and supplied by single manufacturer.
- .2 Power supply: to CAN/ULC-S524.
- .3 Auxiliary devices: to CAN/ULC-S527.

### 2.2 Wiring

- .1 Twisted copper conductors: rated 300V.
- .2 To initiating circuits: 18 AWG minimum, and in accordance with manufacturer's requirements.
- .3 To signal circuits: 16 AWG minimum, and in accordance with manufacturer's requirements.

- .4 To control circuits: 14 AWG minimum, and in accordance with manufacturer's requirements.

### 2.3 Supervision Module

- .1 Supervision modules for supervising the state of the generator.
- .2 The supervision modules are Edwards brand compatible with the EST3 panel.

### 2.4 Vertical diagram of system

- .1 Vertical diagram of fire alarm system: place behind a framed window; white inscriptions on black background; the diagram must measure at least 600 x 600mm.

## 3 EXECUTION

### 3.1 Installation

- .1 Install systems in accordance with CAN/ULC-S524.
- .2 Connect alarm circuits to main control panel.
- .3 Install remote relay units to detect a breakdown from the generator.
- .4 Splices are not permitted.
- .5 Provide necessary raceways, cable and wiring to make interconnections to terminal boxes, annunciator equipment and CCU, as required by equipment manufacturer.
- .6 Ensure that wiring is free of opens, shorts or grounds, before system testing and handing over.
- .7 Identify circuits and other related wiring at central control unit, annunciators, and terminal boxes.

### 3.2 Field Quality Control

- .1 Perform tests in accordance with Section [26 05 00 - Common Work Results - Electrical] and CAN/ULC-S537.
- .2 Fire alarm system:
  - .1 Test the new devices to make sure they transmit an alarm signal to the main control board and trigger an alarm or an event.
  - .2 Check annunciator panels to ensure zones are shown correctly.
  - .3 Simulate grounds and breaks on alarm and signalling circuits to ensure proper operation of systems.
    - .1 Addressable circuits system style DCLB:

- .1 Test each conductor on all DCLB addressable links for capability of providing 3 or more subsequent alarm signals on line side of single open-circuit fault condition imposed near electrically most remote device on each link. Operate Acknowledge/Silence switch after reception of each of the 3 signals. Correct imposed fault after completion of each series of tests.
- .2 Test each conductor on all DCLB addressable links for capability of providing 3 or more subsequent alarm signals during ground-fault condition imposed near electrically most remote device on each link. Operate Acknowledge/Silence switch after reception of each of the 3 signals. Correct imposed fault after completion of each series of tests.
- .3 Provide final PROM program re-burn for system incorporating program changes made during construction.
- .4 Provide a verification report.
- .5 Provide a compliance certificate.

### **3.3 Demonstration and Training**

- .1 Provide on-site lectures and demonstration by fire alarm equipment manufacturer to train operational personnel in use and maintenance of fire alarm system.

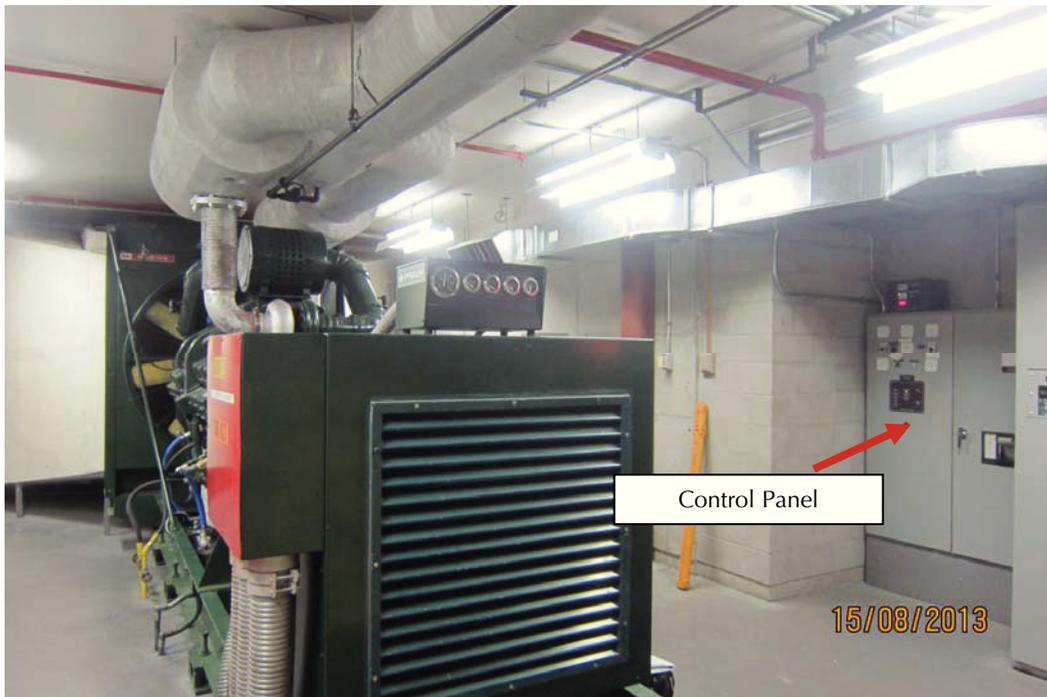
**END OF SECTION**

***ANNEX 1***  
***PHOTOGRAPHS***

ANNEX 1 - PHOTOGRAPHS



1 – New ATS location (equipment to relocate)



2 – Generator and control panel

ANNEX 1 - PHOTOGRAPHS



3 – Generator control panel, existing ATS and air intake

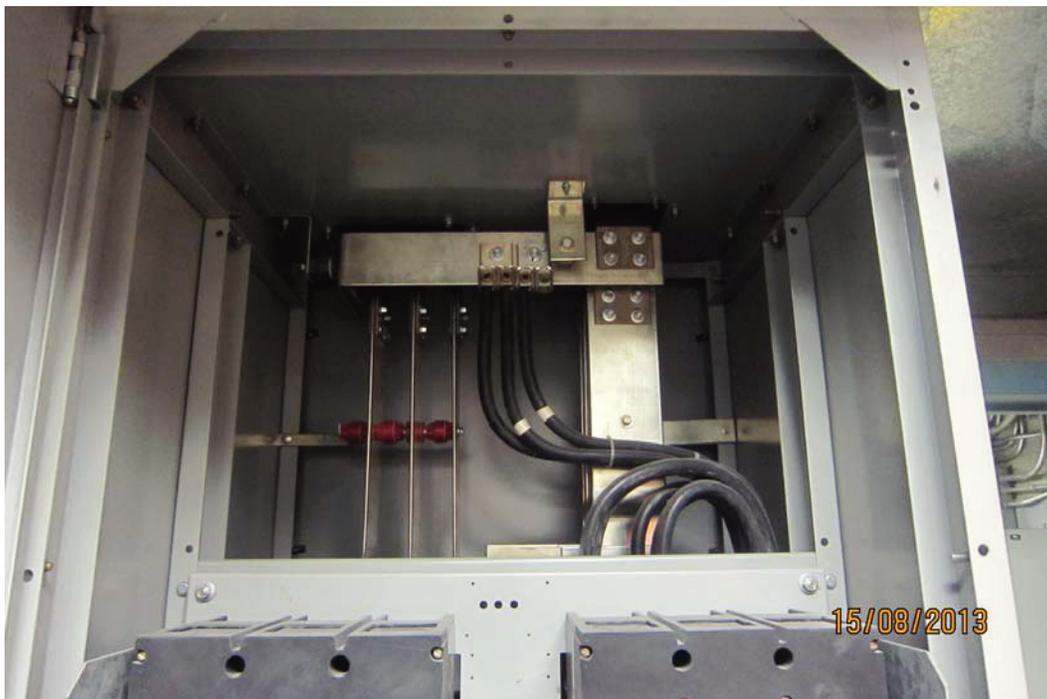


4 – Air intake to modify

ANNEX 1 - PHOTOGRAPHS



5 – Air intake to modify



6 – Interior upper part of existing ATS

ANNEX 1 - PHOTOGRAPHS



7 – Interior lower part of existing ATS

***ANNEX 2***  
***BID REQUEST FORM***

**PORT-CARTIER INSTITUTION**  
**REPLACEMENT OF THE EMERGENCY SYSTEM ATS**  
**BREAKDOWN OF LUMP SUM**

Code	Description	Unit	Qty	Material & equip.	Workforce	Total
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GENERAL CLAUSE						
	• Administration, licence (permit) and mobilization	Lot	1	\$	\$	\$
	• Demolition protection	Lot	1	\$	\$	\$
	• Miscellaneous	Lot	1	\$	\$	\$
<b>Partial Sum</b>						<b>\$</b>

STRUCTURAL						
	• Slab demolition	Lot	1	\$	\$	\$
	• Excavation and backfill	Lot	1	\$	\$	\$
	• New slab	Lot	1	\$	\$	\$
<b>Partial Sum</b>						<b>\$</b>

MECHANICAL						
	• Air intake modifications	Lot	1	\$	\$	\$
<b>Partial Sum</b>						<b>\$</b>

Code	Description	Unit	Qty	Material & equip.	Workforce	Total
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ELECTRICAL						
	• Demolition	Lot	1	\$	\$	\$
	• Specialized supplier work	Lot	1	\$	\$	\$
	• ATS implementation	Lot	1	\$	\$	\$
	• Putting ATS in service	Lot	1	\$	\$	\$
	• Electrical distribution	Lot	1	\$	\$	\$
	• CSA certification	Lot	1	\$	\$	\$
	• Relocation of existing electrical systems	Lot	1	\$	\$	\$
	• Fire alarm	Lot	1	\$	\$	\$
	• Ground	Lot	1	\$	\$	\$
	• Seismic restraint	Lot	1	\$	\$	\$
	• Short-circuit/coordination study	Lot	1	\$	\$	\$
	• Arc-Flash Hazard Analysis	Lot	1	\$	\$	\$
	• Temporary generator connection	Lot	1	\$	\$	\$
	• Miscellaneous	Lot	1	\$	\$	\$
<b>Partial Sum</b>						\$

<b>Lump Sum</b>	\$
<b>Federal Tax</b>	\$
<b>Provincial Tax</b>	\$
<b>Total</b>	\$
<b>GRAND TOTAL</b>	\$