Public Works and Government Services Canada

Requisition No: EZ899-181884/B

DRAWINGS & SPECIFICATIONS
for
Generator(s) replacement at Little Gold Port of Entry

CBSA Little Gold Creek Generator Upgrade

APPROVED BY:

Regional Manager, ___ — Date: JAN 0 8 2018

Construction Safety Coordinator — Date: 17.11.28

TENDER:

Mike Gilbert
Project Manager — Date: Nov. 3, 2017

Real Property Services Branch, Professional and Technical Services, Pacific Region
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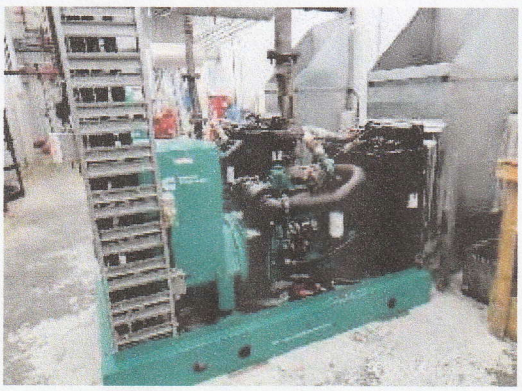
ELECTRICAL POWER GENERATORS REPLACEMENT SPECIFICATIONS



Prepared for: CBSA/Public Works and Government Services Canada - PWGSC
Canada Border Services Agency (CBSA) Offices, Little Gold Creek, YT
Date February 19, 2018
2017019

PROFESSIONAL ENGINEER
YUKON TERRITORY
KLAUS GEITHNER

FEB 22 2018

END OF SECTION

Part 1 General

1.1 SCOPE OF WORK COVERED BY CONTRACT DOCUMENTS

.1 This Project Specification, including all appendices, shall be deemed to cover the complete installation ready for operation. Consequently, minor details not necessarily shown or specified but necessary for the proper functioning of the installation, including equipment serviceability, shall be included in the Work, the same as if shown on the drawings or in the Project Specification. Work shall be in accordance with the specifications and their intent, complete with all necessary components, including those not normally shown or specified, and shall be ready for operation before acceptance.

.2 The Electrical Contractor shall be the Prime Contractor for the project and shall include all required subtrades, including general contract trades and any others as required to ensure a complete installation.

.3 The generator system supplied will be a custom manufactured product, standard packages with upgrades will need the supplier to verify conformance to the design spec and application.

.4 General Scope of Work and proposed Work sequence, not to be limited but shall include the following:

.1 Generator Supply and Installation

.1 Connect temporary generator (supplied by Owner) to temporary generator transfer switch (switch on the right) to provide power to building electrical panel during subsequent electrical work;

.2 Reconnect Generator #1 to temporary generator transfer switch (switch on the right);

.3 Connect electrical panel to new automatic transfer switch;

.4 Remove permanent generator transfer switch (on the left) and all associated wiring and conduits;

.5 Remove Generator #2 (75kW). The contractor shall be responsible for removal and disposal of all generators and generator related equipment, including the generator transfer switch and associated electrical, fuel, exhaust, and cooling equipment that are being removed as part of this project;

.6 Install new Generator #2 (40kW) complete with controller, including replacement of muffler, modifications to existing exhaust systems and radiator sheet metal, and performing all site testing and commissioning;

.7 Install new automatic transfer switch complete with controller;

.8 Connect Generator #2 to the new automatic transfer switch;

.9 Connect temporary generator to the new automatic transfer switch;

.10 Connect electrical panel to new automatic transfer switch;

.11 Remove temporary generator transfer switch;

.12 Remove Generator #1 (75kW) The contractor shall be responsible for removal and disposal of all generators and generator related equipment,

including the generator transfer switch and associated electrical, fuel, exhaust, and cooling equipment that are being removed as part of this project;

.13 Install new Generator #1 (40kW) complete with controller, including replacement of muffler, modifications to existing exhaust systems and radiator sheet metal, and performing all site testing and commissioning;

.14 Install manual transfer switch;

.15 Install manual selector switch;

.16 Install load bank and load bank quick connect box on the exterior of the building and connection to the manual transfer switch;

.17 Install of portable generator quick connect box on the exterior of the building and connection to manual transfer switch;

.18 Connect Generator #1 to the new automatic transfer switch and connect new automatic transfer switch to new manual transfer switch;

.19 Install remote on/off switch to control “house” load upon detection of preset generator loading condition;

.20 Proper grounding of all new equipment;

.21 Provide testing and commissioning of all new equipment under all possible conditions;

.22 Disconnect temporary generator;

.23 Clean floor surfaces, patch and repair any floor surfaces or walls that have been modified during this work;

.24 Provide all documentation including Operating and Maintenance manuals, commissioning, arc flash and grounding study.

.25 Supply, install and commissioning for all local/remote control systems for the Gensets and transfer switches, including a microprocessor-based control with digital display, and all devices and software required for cloud-based monitoring and control.

.26 All work shall be completed no later than September 3, 2018.

.2 Existing Photos for reference

Existing Panelboard A

Existing 72kW Generators

Existing 72kW Generators

Existing Cummins Automatic Transfer Switch

Existing Thomson Technology Transfer Switch

Existing Fuel Storage Day Tanks

1.2 CONTRACT METHOD

.1 Construct Work under stipulated price contract.

.2 Relations and responsibilities between Contractor and subcontractors are as defined in Conditions of Contract. Assigned Subcontractors must, in addition:

.1 Furnish to Contractor, bonds covering faithful performance of subcontracted work and payment of obligations there under when Contractor is required to furnish such bonds.

.2 Purchase and maintain liability insurance to protect Contractor from claims for not less than limits of liability which Contractor is required.

1.3 WORK BY OTHERS

.1 Co-operate with other Contractors in carrying out their respective works and carry out instructions from Consultant.

.2 Co-ordinate work with other Contractors. If any part of work under this Contract depends on proper execution by or relies upon work of another Contractor, report immediately to the Consultant in writing, any situations which may interfere with proper execution of Work.

1.4 CONTRACTOR USE OF PREMISES

.1 Limit use of premises for Work, and for storage to allow:

.1 Owner occupancy during the construction period.

.2 Work by other contractors.

.2 Co-ordinate use of premises under direction of the building manager.

.3 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.

.4 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.

.5 Repair or replace portions of existing work which have been altered during construction to match existing or adjoining work.

.6 At completion the work: ensure premises condition for the work area to be equal or better than that which existed before the work started.

1.5 OWNER OCCUPANCY

.1 Owner will occupy premises during entire construction period for execution of normal operations.

.2 Co-operate with the building manager in scheduling operations to minimize conflict and to facilitate occupancy.

1.6 WORK IN EXISTING BUILDINGS

.1 All work on site shall be co-ordinated with the CBSA so as to minimize disruptions. Execute work with least possible interference or disturbance to building operations, occupants, and normal use of premises. Arrange with CBSA to facilitate execution of work.

.2 Obtain approval from the Owner's Representative prior to penetrating any structural surfaces including floor slabs. Obtain from the CBSA approval of locations of all penetrations prior to commencing work. Contractor shall replace/repair any building services that are damaged due to this construction (example: drilling through concrete floors) at no extra cost.

.3 Carefully route new conduits and other new services so that they do not interfere with existing installation. Arrange and pay for any necessary relocation of existing conduit, cable tray, bus duct or any other services required for the proper installation of new Work.

.4 Removed equipment and material shall become the property of the Contractor and shall be removed from site unless otherwise requested by the Owner's Representative.

.5 All Contractors shall exercise due care and diligence in working in the occupied areas. Keep the job reasonably clear of waste material and rubbish at all times during progress of the work. Clean up and restoration of the work area shall occur after each day's installation to ensure that no disruption to the work area takes place.

.6 Protect all existing services and make good any damage occasioned by the work in this contract.

.7 The Owner reserves the right to complete and/or repair any work that is not in operating condition, beyond scheduled shut downs, in order to maintain the Owner's operation.

1.7 CONTINUITY OF EXISTING SERVICES

.1 Keep existing building in operation at all times with minimum length of shutdown periods.

.2 Co-operate with the Owner and other contractors on the job and provide necessary services so that existing building can be kept in operation at all time.

.3 Notify CBSA of intended interruption of services and obtain required permission.

.4 Where unknown services are encountered, immediately advise Consultant and confirm findings in writing.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 GENERAL

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

1.2 USE OF SITE AND FACILITIES

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

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

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

.4 The building manager will assign sanitary facilities for use by Contractor’s personnel. Keep facilities clean.

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

1.3 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

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

1.4 EXISTING SERVICES

.1 Notify the building manager and Consultant of intended interruption of services and obtain required permission.

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

1.5 SPECIAL REQUIREMENTS

.1 Hours of Work shall be on Monday to Friday from 18:00 to 07:00 hours and on Saturdays, Sundays and statutory holidays for any work that is located in occupied spaces. There are no works hour’s restrictions are for mechanical and electrical rooms.

.2 Schedule applies all items of the Work defined in Section 01-11-00 Summary of Work

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

.4 Deliver materials outside of peak traffic hours 17:00 to 07:00, unless otherwise approved by the building operator.

1.6 BUILDING SMOKING ENVIRONMENT

.1 Comply with smoking restrictions. Smoking is not allowed in the building.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 78 00 – Closeout Submittals.

1.2 ADMINISTRATIVE

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

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

.3 Present shop drawings, 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 Consultant. 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 Consultant, 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 Consultant's review of submittals.

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

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

1.3 SHOP DRAWINGS AND PRODUCT DATA

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

.2 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.

.3 Allow 14 business days for Consultant's review of each submission.

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

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

.6 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.

.7 Submissions include:

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

.8 After Consultant's review, distribute copies.

.9 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as Consultant may reasonably request.

.10 Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Consultant where shop drawings will not be prepared due to standardized manufacture of product.

.11 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Consultant.

.1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.

.2 Testing must have been within 3 years of date of contract award for project.

.12 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Consultant.

.1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.

.2 Certificates must be dated after award of project contract complete with project name.

.13 Submit electronic copies of manufacturers instructions for requirements requested in specification Sections and as requested by Consultant.

.1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.

.14 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Consultant.

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

.16 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Consultant.

.17 Delete information not applicable to project.

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

.19 If upon review by Consultant, no errors or omissions are discovered or if only minor corrections are made, 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.

.20 The review of shop drawings is for sole purpose of ascertaining conformance with general concept.

.1 This review shall not mean that the Consultant 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.

.21 Each shop drawing shall be **checked** and **stamped** as being correct, by trade purchasing item, and by the Contractor, before drawing is submitted to Consultant for review. If above requirements are not complied with, shop drawings will be rejected and returned forthwith.

.22 Do not have equipment delivered to site until a shop drawing for the item has been reviewed, stamped as accepted or modified by Consultant and returned to Contractor.

1.4 EQUIVALENCY

.1 Manufacturer products listed in these specifications are provided as materials or equipment already reviewed and accepted for inclusion in the Work. These listed materials or equipment demonstrate the minimum quality and performance of materials and equipment that manufacturers offerings and requests for equivalency must demonstrate in order to be considered for inclusion in the project.

.2 Unless stated ‘no equivalent’, manufacturers, their agents or representatives may and are invited to submit materials or equipment for consideration as equivalent to listed materials or equipment by submitting written request to the Consultant and providing information for submittals as detailed within these specifications.

.3 All requests for equivalency must be submitted no later than three days prior to the close of tender or request for pricing.

1.5 DETAIL DRAWINGS AND INSTRUCTIONS

.1 Submit notification of locations where installation of luminaires, fittings and equipment would interfere with interior treatment and use of building. Detail drawings or instructions exactly locating these items will then be issued.

.2 Submit all the drawings respecting the work to the Consultant, upon request, for acceptance before using them. Contractor is responsible for performing the work properly notwithstanding such acceptance.

.3 Perform the work in accordance with drawings and instructions supplied by the Consultant but do not use such drawings for construction, manufacture or installation unless the Consultant has released them for such use.

.4 Inform the Consultant of any instructions given by any parties that would affect the equipment, quantities, locations, price, or any modification to the work as outlined in this Contract. Failure to comply may result in the rejection of the work or any associated costs.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

PWGSC Update on Asbestos Use

Effective April 1, 2016, all Public Works and Government Services Canada (PWGSC) contracts for new construction and major rehabilitation will prohibit the use of asbestos-containing materials. Further information can be found at http://www.tpsgc-PSPC.gc.ca/comm/vedette-features/2016-04-19-00-eng.html

1. References

.1 Government of Canada.
- .1 Canada Labour Code - Part II
- .2 Canada Occupational Health and Safety Regulations.

.2 National Building Code of Canada (NBC):
- .1 Part 8, Safety Measures at Construction and Demolition Sites.

.3 The Canadian Electric Code (as amended)

.4 Canadian Standards Association (CSA) as amended:
.1 CSA Z797-2009 Code of Practice for Access Scaffold
.2 CSA S269.1-1975 (R2003) Falsework for Construction Purposes
.3 CSA S350-M1980 (R2003) Code of Practice for Safety in Demolition of Structures
.4 CSA Z1006-10 Management of Work in Confined Spaces.
.5 CSA Z462- Workplace Electrical Safety Standard

.5 National Fire Code of Canada 2010 (as amended)
.1 Part 5 – Hazardous Processes and Operations and Division B as applicable and required.

.6 American National Standards Institute (ANSI):
- .1 ANSI A10.3, Operations – Safety Requirements for Powder-Actuated Fastening Systems.

.7 Yukon Territories:
- .1 Workers Compensation Act.
- .2 Occupational Health and Safety Act

2. Related Sections

.1 Refer to the following current NMS sections as required:
- .1 Submittals procedures: Section [013300]

3. Workers' Compensation Board Coverage

.1 Comply fully with the Workers' Compensation Act, regulations and orders made pursuant thereto, and any amendments up to the completion of the work.

.2 Maintain Workers' Compensation Board coverage during the term of the Contract, until and including the date that the Certificate of Final Completion is issued.

4. Compliance with Regulations

.1 PWGSC may terminate the Contract without liability to PWGSC where the Contractor, in the opinion of PWGSC, refuses to comply with a requirement of the Workers' Compensation Act or the Occupational Health and Safety Act.

.2 It is the Contractor's responsibility to ensure that all workers are qualified, competent and certified to perform the work as required by the Workers' Compensation Act or the Occupational Health and Safety Act.

5. Submittals

.1 Submit to Departmental Representative submittals listed for review. [in accordance with Section 013300]

.2 Work effected by submittal shall not proceed until review is complete.

.3 Submit the following:
- .1 Site Specific Health and Safety Plan.
- .2 Copies of reports or directions issued by Federal and Provincial health and safety inspectors.
- .3 Copies of incident and accident reports.
- .4 Complete set of current Material Safety Data Sheets (MSDS), and all other documentation required by Workplace Hazardous Materials Information System (WHMIS) requirements.
- .5 Emergency Procedures.

.4 The Departmental Representative will review the Contractor's Site Specific Health and Safety Plan and emergency procedures and provide comments to the Contractor within [5]

days after receipt of the plan. Revise the plan as appropriate and re-submit to Departmental Representative.

.5 Submission of the Site Specific Health and Safety Plan, and any revised version, to the Departmental Representative is for information and reference purposes only. It shall not:
- .1 Be construed to imply approval by the Departmental Representative.
- .2 Be interpreted as a warranty of being complete, accurate, and legislatively compliant.
- .3 Relieve the Contractor of his legal obligations for the provision of health and safety on the project.

6. Responsibility

.1 Assume responsibility as the Constructor for work under this contract.

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

.3 Comply with and enforce compliance by employees with safety requirements of Contract documents, applicable Federal, Provincial, Territorial and local statutes, regulations, and ordinances, and with Site Specific Health and Safety Plan.

7. Health and Safety Coordinator

.1 The Health and Safety Coordinator:
- .1 Be responsible for completing all health and safety training and ensuring that personnel that do not successfully complete the required training are not permitted to enter the site to perform work.
- .2 Be responsible for implementing, revising, daily enforcing, and monitoring the Site Specific Health and Safety Plan.
- .3 Be on site during execution of work.

8. General Conditions

.1 Provide safety barricades and lights around work site as required to provide a safe working environment for workers and protection for pedestrian and vehicular traffic.

.2 Ensure that non-authorized persons are not allowed to circulate in designated construction areas of the work site.

.1 Provide appropriate means by use of barricades, fences, warning signs, traffic control personnel, and temporary lighting as required.

.2 Secure site at night time [or provide security guard] as deemed necessary to protect site against entry.

9. Project/Site Conditions

.1 Work at site will involve contact with:

.1 Multi-employer work site.

.2 Federal employees and general public.

.3 Site specific hazards listed on the "Preconstruction Assessment Form" (PAF) (Appendix to this specification).

10. Utility Clearances

.1 The Contractor is solely responsible for all utility detection and clearances prior to starting the work

.2 The Contractor will not rely solely upon the Reference Drawings or other information provided for utility locations.

11. Regulatory Requirements

.1 Comply with specified codes, acts, bylaws, standards and regulations to ensure safe operations at site.

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

11. Work Permits

.1 Obtain speciality permit[s] related to project before start of work.

12. Filing of Notice

.1 The General Contractor is to complete and submit a Notice of Project as required by the Territorial authorities.

.2 Provide copies of all notices to the Departmental Representative.

13. Health and Safety Plan

.1 Conduct a site-specific hazard assessment based on review of Contract documents, required work, and project site. Identify any known and potential health risks and safety hazards.

.2 Prepare and comply with a site-specific project Health and Safety Plan based on hazard assessment, including, but not limited to, the following:

.1 Primary requirements:

.1 Contractor's safety policy.
.2 Identification of applicable compliance obligations.
.3 Definition of responsibilities for project safety/organization chart for project.
.4 General safety rules for project.
.5 Job-specific safe work procedures.
.6 Inspection policy and procedures.
.7 Incident reporting and investigation policy and procedures.
.8 Occupational Health and Safety Committee/Representative procedures.
.9 Occupational Health and Safety meetings.
.10 Occupational Health and Safety communications and record keeping procedures.

.2 Summary of health risks and safety hazards resulting from analysis of hazard assessment, with respect to site tasks and operations which must be performed as part of the work.

.3 List hazardous materials to be brought on site as required by work.

.4 Indicate Engineering and administrative control measures to be implemented at the site for managing identified risks and hazards.

.5 Identify personal protective equipment (PPE) to be used by workers.

.6 Identify personnel and alternates responsible for site

safety and health.

.7 Identify personnel training requirements and training plan, including site orientation for new workers.

.3 Develop the plan in collaboration with all subcontractors. Ensure that work/activities of subcontractors are included in the hazard assessment and are reflected in the plan.

.4 Revise and update Health and Safety Plan as required, and re-submit to the Departmental Representative.

.5 Departmental Representative's review: the review of Site Specific Health and Safety Plan by Public Service and Procurement Canada (PWGSC) shall not relieve the Contractor of responsibility for errors or omissions in final Site Specific Health and Safety Plan or of responsibility for meeting all requirements of construction and Contract documents.

14. Emergency Procedures

.1 List standard operating procedures and measures to be taken in emergency situations. Include an evacuation plan and emergency contacts (i.e. names/telephone numbers) of:

.1 Designated personnel from own company.
.2 Regulatory agencies applicable to work and as per legislated regulations.
.3 Local emergency resources.
.4 Departmental Representative [site staff].

.2 Include the following provisions in the emergency procedures:

.1 Notify workers and the first-aid attendant, of the nature and location of the emergency.
.2 Evacuate all workers safely.
.3 Check and confirm the safe evacuation of all workers.
.4 Notify the fire department or other emergency responders.
.5 Notify adjacent workplaces or residences which may be affected if the risk extends beyond the workplace.
.6 Notify Departmental Representative [site staff].

.3 Provide written rescue/evacuation procedures as required for, but not limited to:

.1 Work at high angles.
.2 Work in confined spaces or where there is a risk of entrapment.
.3 Work with hazardous substances.
.4 Underground work.

.5 Work on, over, under and adjacent to water.
.6 Workplaces where there are persons who require physical assistance to be moved.

.4 Design and mark emergency exit routes to provide quick and unimpeded exit.

15. Hazardous Products

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage and disposal of hazardous materials, and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to the Departmental Representative and in accordance with the Canada Labour Code.

.2 Where use of hazardous and toxic products cannot be avoided:
.1 Advise Departmental Representative beforehand of the product(s) intended for use. Submit applicable MSDS and WHMIS documents as per [Section 013300].
.2 In conjunction with Departmental Representative, schedule to carry out work during "off hours" when tenants have left the building.
.3 Provide adequate means of ventilation in accordance with [Section 015100].
.4 The contractor shall ensure that the product is applied as per manufacturers recommendations.
.5 The contractor shall ensure that only pre-approved products are brought onto the work site in an adequate quantity to complete the work.

16. Asbestos Hazard

.1 Carry out any activities involving asbestos in accordance with applicable Territorial / Federal Regulations.

.2 Removal and handling of asbestos will be in accordance with applicable Territorial / Federal Regulations.

17. PCB Removals

.1 Mercury-containing fluorescent tubes and ballasts which contain polychorinated biphenyls (PCBs) are classified as hazardous waste.

.2 Remove, handle, transport and dispose of as indicated in Section [028400].

18. Removal of Lead-Containing Paints

.1 All paints containing TCLP lead concentrations above 5 ppm are classified as hazardous.

.2 Carry out demolition and/or remediation activities involving lead-containing paints in accordance with applicable Territorial Regulations.

.3 Dry Scraping/Sanding of any materials containing lead is strictly prohibited.

.4 The use of Methylene Chloride based paint removal products is strictly prohibited.

19. Silica Hazard

.1 Carry out any activities involving silica in accordance with applicable Territorial / Federal Regulations.

20. Electrical Safety Requirements

.1 Comply with authorities and ensure that, when installing new facilities or modifying existing facilities, all electrical personnel are completely familiar with existing and new electrical circuits and equipment and their operation.

.1 Before undertaking any work, coordinate required energizing and de-energizing of new and existing circuits with Departmental Representative.

.2 Maintain electrical safety procedures and take necessary precautions to ensure safety of all personnel working under this Contract, as well as safety of other personnel on site.

21. Electrical Lockout

.1 Develop, implement and enforce use of established procedures to provide electrical lockout and to ensure the health and safety of workers for every event where work must be done on any electrical circuit or facility.

SPEC NOTE:
Procedures specified for lockout need to be consistent with site procedures for existing facilities or equipment.

.2 Prepare the lockout procedures in writing, listing step-by-step processes to be followed by workers, including how to prepare and issue the request/authorization form. Have procedures available for review upon request by the Departmental

Representative.

.3 Keep the documents and lockout tags at the site and list in a log book for the full duration of the Contract. Upon request, make such data available for viewing by Departmental Representative or by any authorized safety representative.

22. Overloading .1 Ensure no part of work is subjected to a load which will endanger its safety or will cause permanent deformation.

23. Falsework .1 Design and construct falsework in accordance with CSA S269.1-1975 (R2003).

24. Scaffolding .1 Design, construct and maintain scaffolding in a rigid, secure and safe manner, in accordance with CSA Z797-2009 and B.C. Occupational Health and Safety Regulations.

25. Confined Spaces .1 Carry out work in confined spaces in compliance with Territorial Regulations

26. Powder-Actuated Devices .1 Use powder-actuated devices in accordance with ANSI A10.3 only after receipt of written permission from the Departmental Representative.

27. Fire Safety and Hot Work .1 Obtain Departmental Representative's authorization before any welding, cutting or any other hot work operations can be carried out on site.

.2 Hot work includes cutting/melting with use of torch, flame heating roofing kettles, or other open flame devices and grinding with equipment which produces sparks.

28. Fire Safety Requirements .1 Store oily/paint-soaked rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.

.2 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

.3 Portable gas and diesel fuel tanks are not permitted on most federal work sites. Approval from the DR is required prior to any gas or diesel tank being brought onto the work site.

29. Fire Protection and Alarm System

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

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

30. Unforeseen Hazards

.1 Should any unforeseen or peculiar safety-related factor, hazard or condition become evident during performance of the work, immediately stop work and advise the Departmental Representative verbally and in writing.

31. Posted Documents

.1 Post legible versions of the following documents on site:
- .1 Site Specific Health and Safety Plan.
- .2 Sequence of work.
- .3 Emergency procedures.
- .4 Site drawing showing project layout, locations of the first-aid station, evacuation route and marshalling station, and the emergency transportation provisions.
- .5 Notice of Project.
- .6 Floor plans or site plans.
- .7 Notice as to where a copy of the Workers' Compensation Act and Occupational Health and Safety Act are available on the work site for review by employees and workers.
- .8 Workplace Hazardous Materials Information System (WHMIS) documents.
- .9 Material Safety Data Sheets (MSDS).
- .10 List of names of Joint Health and Safety Committee members, or Health and Safety Representative, as applicable.

.2 Post all Material Safety Data Sheets (MSDS) on site, in a common area, visible to all workers and in locations accessible to tenants when work of this Contract includes construction activities adjacent to occupied areas.

.3 Postings should be protected from the weather, and visible from the street or the exterior of the principal construction site shelter provided for workers and equipment, or as approved by the Departmental Representative.

32. Meetings .1 **Attend health and safety pre-construction meeting and all subsequent meetings called by the Departmental Representative.**

33. Correction of Non-Compliance .1 Immediately address health and safety non-compliance issues identified by the Departmental Representative.

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

.3 The Departmental Representative may issue a "stop work order" if non-compliance of health and safety regulations is not corrected immediately or within posted time. The General Contractor/subcontractors will be responsible for any costs arising from such a "stop work order".

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 35 33 – Health and Safety Requirements.

.2 Section 01 64 00 – Common Product Requirements.

.3 Section 01 74 11 – Cleaning.

.4 Section 01 74 21 – Construction & Deconstruction Waste Management and Disposal.

.5 Section 26 05 00 – Common Work Results – Electrical.

1.2 REFERENCES

.1 Not used.

1.3 INSPECTION

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

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

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

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

1.4 INDEPENDENT INSPECTION AGENCIES

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

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

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

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

1.5 ACCESS TO WORK

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

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

1.6 PROCEDURES

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

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

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

1.7 REJECTED WORK

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

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

.3 If in opinion of Owner's Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Owner's Representative.

1.8 REPORTS

.1 Submit 4 copies of inspection and test reports to Owner's Representative.

.2 Provide copies to subcontractor of work being inspected or tested.

1.9 TESTS AND MIX DESIGNS

.1 Furnish test results and mix designs as requested.

.2 Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by Owner's Representative and may be authorized as recoverable.

1.10 EQUIPMENT AND SYSTEMS

.1 Submit adjustment and balancing reports for mechanical, electrical systems.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 45 00 – Quality Control.

1.2 REFERENCES

.1 Within text of each specifications section, reference may be made to reference standards. List of standards reference writing organizations is contained in Section.

.2 Conform to these reference standards, in whole or in part as specifically requested in specifications.

.3 If there is question as to whether products or systems are in conformance with applicable standards, Owner's Representative reserves right to have such products or systems tested to prove or disprove conformance.

.4 Cost for such testing will be born by Owner in event of conformance with Contract Documents or by Contractor in event of non-conformance.

1.3 QUALITY

.1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.

.2 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.

.3 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.

.4 Should disputes arise as to quality or fitness of products, decision rests strictly with Owner's Representative based upon requirements of Contract Documents.

.5 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.

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

1.4 AVAILABILITY

.1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify Owner's Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.

.2 In event of failure to notify Owner's Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Owner's Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.5 STORAGE, HANDLING AND PROTECTION

.1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.

.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.

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

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

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

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

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

.8 Remove and replace damaged products at own expense and to satisfaction of Owner's Representative.

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

1.6 TRANSPORTATION

.1 Pay costs of transportation of products required in performance of Work.

.2 Transportation cost of products supplied by Owner will be paid for by Departmental Representative. Unload, handle and store such products.

1.7 MANUFACTURER'S INSTRUCTIONS

.1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.

.2 Notify Consultant in writing, of conflicts between specifications and manufacturer's instructions, so that Consultant will establish course of action.

.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Owner's Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

1.8 QUALITY OF WORK

.1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Owner's Representative and Consultant if required Work is such as to make it impractical to produce required results.

.2 Do not employ anyone unskilled in their required duties. Owner's Representative and Consultant reserves right to require dismissal from site, workers deemed incompetent or careless.

.3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Owner's Representative, whose decision is final.

1.9 CO-ORDINATION

.1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.

.2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.10 CONCEALMENT

.1 In finished areas conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.

.2 Before installation inform Owner's Representative if there is interference. Install as directed by Owner's Representative.

1.11 REMEDIAL WORK

.1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required.

.2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.12 LOCATION OF FIXTURES

.1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.

.2 Inform Owner's Representative of conflicting installation. Install as directed.

1.13 FASTENINGS

.1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.

.2 Prevent electrolytic action between dissimilar metals and materials.

.3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.

.4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.

.5 Keep exposed fastenings to a minimum, space evenly and install neatly.

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

1.14 FASTENINGS - EQUIPMENT

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

.2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.

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

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

1.15 PROTECTION OF WORK IN PROGRESS

.1 Prevent overloading of parts of building. Do not cut, drill or sleeve load bearing structural member, unless specifically indicated without written approval of Owner’s Representative.

1.16 EXISTING UTILITIES

.1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and/or building occupants.

.2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 11 00 – Summary of Work.

.2 Section 01 33 00 – Submittal Procedure.

.3 Section 01 45 00 – Quality Control.

.4 Section 01 74 21 – Construction/Deconstruction and Waste Management Disposal.

.5 Section 26 05 00 – Common Work Results – Electrical.

1.2 REFERENCES

.1 Not used.

1.3 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Owner or other Contractors.

.2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Owner's Representative. Do not burn waste materials on site.

.3 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.4 Provide on-site containers for collection of waste materials and debris.

.5 Provide and use marked separate bins for recycling. Refer to Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.6 Dispose of waste materials and debris at designated dumping areas on Crown property.

.7 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.

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

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

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

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

1.4 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 Owner's Representative. Do not burn waste materials on site.

.5 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.6 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

1.5 WASTE MANAGEMENT AND DISPOSAL

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

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

.1 Not Used.

END OF SECTION

Part 1 General

1.1 WASTE MANAGEMENT GOALS

.1 Prior to start of Work conduct meeting with Owner's Representative to review and discuss the Waste Management Plan and Goals.

.2 Accomplish maximum control of solid construction waste.

.3 Preserve environment and prevent pollution and environment damage.

1.2 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedure.

.2 Section 01 45 00 – Quality Control.

.3 Section 01 74 11 – Cleaning.

1.3 DEFINITIONS

.1 Class III: non-hazardous waste - construction renovation and demolition waste.

.2 Inert Fill: inert waste - exclusively asphalt and concrete.

.3 Materials Source Separation Program (MSSP): consists of series of ongoing activities to separate reusable and recyclable waste material into material categories from other types of waste at point of generation.

.4 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.

.5 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.

.6 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

.7 Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:

.1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.

.2 Returning reusable items including pallets or unused products to vendors.

.8 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.

.9 Separate Condition: refers to waste sorted into individual types.

.10 Source Separation: acts of keeping different types of waste materials separate beginning from first time they became waste.

1.4 STORAGE, HANDLING AND PROTECTION

.1 Store, materials to be reused, recycled and salvaged in locations as directed by Departmental Representative.

.2 Unless specified otherwise, materials for removal become Contractor's property.

.3 Protect, stockpile, store and catalogue salvaged items.

.4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.

.5 Protect structural components not removed for demolition from movement or damage.

.6 Support affected structures. If safety of building is endangered, cease operations and immediately notify Owner's Representative.

.7 Protect surface drainage, mechanical and electrical from damage and blockage.

.8 Separate and store materials produced during dismantling of structures in designated areas.

.9 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.

.1 On-site source separation is recommended.

.2 Remove co-mingled materials to off-site processing facility for separation.

.3 Provide waybills for separated materials.

1.5 DISPOSAL OF WASTES

.1 Do not bury rubbish or waste materials.

.2 Do not dispose of waste, volatile materials, oil, or paint thinner into waterways, storm, or sanitary sewers.

.3 Keep records of construction waste including:

.1 Number and size of bins.

.2 Waste type of each bin.

.3 Total tonnage generated.

.4 Tonnage reused or recycled.

.5 Reused or recycled waste destination.

.4 Remove materials from deconstruction as deconstruction/disassembly Work progresses.

.5 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in pre-demolition material audit.

1.6 USE OF SITE AND FACILITIES

.1 Execute work with least possible interference or disturbance to normal use of premises.

.2 Maintain security measures established by existing facility.

1.7 SCHEDULING

.1 Co-ordinate Work with other activities at site to ensure timely and orderly progress of Work.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 APPLICATION

.1 Do Work in compliance with WRW.

.2 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

3.2 MATERIALS RECYCLING AND DISPOSAL

.1 All lamps shall be recycled in accordance with federal and provincial guidelines. Where no federal, provincial or territorial stewardship / recycling program exist, include all costs associated with recycling of materials in bid pricing.

.2 For projects in British Columbia, all lamps shall be recycled under the 'LightRecycle' stewardship program, with costs relating to recycling of removed mercury containing fluorescent and high intensity discharge lamps borne by the program.

.3 Lamp recycling process shall recycle at least 95% of lamp components; glass including metal end caps, mercury, and phosphorus.

.4 All packaging, lamps, ballasts, oils, solvents and other disposable components of the work shall be recycled.

.5 Contractor shall provide all recycling bins and containers required for proper disposal. Contactor is not to use Owner's facilities for disposal of recyclable materials.

.6 Non-recyclable materials are to be disposed of in an environmentally responsible manner.

.7 Document all materials recycled; provide manifests and certificates of disposal from recyclers as verification of materials recycled. Certificates of disposal or manifests of transport that list materials picked up, as issued by a waste management or disposal firm, with quantities or weights shall be provided as verification that materials have been properly and responsibly handled. This documentation shall be provided at the completion of the Work, prior to final acceptance.

.8 Metals may be disposed of through delivery to scrap metal vendors. Contractors may keep any proceeds from metal disposal to offset any costs incurred in sorting and transportation of materials to scrap metal vendors.

3.3 CLEANING

.1 Remove tools and waste materials on completion of Work, and leave work area in clean and orderly condition.

.2 Clean-up work area as work progresses.

.3 Source separate materials to be reused/recycled into specified sort areas.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 74 11 – Cleaning.

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

1.2 REFERENCES

.1 Not Used

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Acceptance of Work Procedures:

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

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

.2 Request Consultant's inspection.

.2 Consultant's Inspection:

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

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

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

.2 Defects: corrected and deficiencies completed.

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

.4 Certificates required by Electrical Inspection Branch: submitted.

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

1.4 FINAL CLEANING

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

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

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 FINAL FIELD REVIEW

.1 Submit request upon completion of the Work, in writing, to the Consultant for a Final Field Review of the completed electrical work.

.2 The Contractor is to have qualified manpower present for final field review, with ladders and tools, to provide the Consultant with access to the Work and to demonstrate installations.

.3 Do not submit this written request until:

.1 A minimum of 95% of the value of the project is completed;

.2 Local electrical inspection has been completed and accepted; the Contractor is to submit to the Departmental Representative copies of the accepted electrical inspection forms that have been properly signed by the local, city or municipal electrical inspector;

.3 Deficiencies noted during previous field reviews have been completed;

.4 Commissioning has been completed.

.5 The cleanup is finished in every respect;

.6 Contractor has completed a review of the work and has provided the Consultant with a list of any deficiencies found;

.7 Extended warranty offered by manufacturers beyond one year is outlined in a letter to the Owner;

.8 Owner’s operating personnel have been instructed in operation of systems.

.4 Final field review will be conducted within approximately ten (10) business days of this request. Letter of acceptance or rejection along with a Field Review Report will be issued within approximately seven (7) business days of field review.

.5 The Consultant will perform only one field review of each area of the work upon the above request.

.6 Upon receipt of the Field Review Report, the Contractor will complete the deficiencies within 30 days and to notify the Consultant when the Work is 100% completed. A field review of the areas of deficiency will then be conducted by the Consultant. Should the Work not be completed to the satisfaction of the Departmental Representative or the Consultant and an additional field review is required, the costs for the Consultant will be paid by the Contractor. Costs will be based on time required at the Consultant’s standard billing rates.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 45 00 – Quality Control.

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Pre-warranty Meeting:

.1 Convene meeting one week prior to contract completion to:

.1 Verify Project requirements.

.2 Review manufacturer's installation instructions and warranty requirements.

.2 Departmental Representative to establish communication procedures for:

.1 Notifying construction warranty defects.

.2 Determine priorities for type of defects.

.3 Determine reasonable response time.

.3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.

.4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Two weeks prior to Substantial Performance of the Work, submit to the Consultant, three final copies of operating and maintenance manuals in English.

.3 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.

.4 Provide evidence, if requested, for type, source and quality of products supplied.

.5 After completion of the work, provide the building owner with a set of record drawings ("As-Builts") on a set of clean blackline prints as updated with AutoCAD 2012 or later version, or by contracting with the engineer ($500). Drawing must indicate all changes to equipment layout, final device circuiting, and conduit routing.

1.4 FORMAT

.1 Organize data as 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.

.1 Identify contents of each binder on spine.

.4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.

.5 Arrange content by systems, under Section numbers and sequence of Table of Contents.

.6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

.7 Text: manufacturer's printed data, or typewritten data.

.8 Drawings: provide with reinforced punched binder tab.

.1 Bind in with text; fold larger drawings to size of text pages.

.9 Provide CAD files in *.dwg and *.pdf format on USB flash drive.

1.5 CONTENTS - PROJECT RECORD DOCUMENTS

.1 Table of Contents for Each Volume: provide title of project;

.1 Date of submission; names.

.2 Addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.

.3 Schedule of products and systems, indexed to content of volume.

.2 For each product or system:

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

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

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

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

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

1.6 RECORD DOCUMENTS AND SAMPLES

.1 Maintain, at site for Departmental Representative one record copy of:

.1 Contract Drawings.

.2 Specifications.

.3 Addenda.

.4 Change Orders and other modifications to Contract.

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

.6 Field test records.

.7 Inspection certificates.

.8 Manufacturer’s certificates.

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

.1 Provide files, racks, and secure storage.

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

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

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

.1 Do not use record documents for construction purposes.

.5 Keep record documents and samples available for inspection by Departmental Representative.

1.7 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

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

.2 Record information concurrently with construction progress.

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

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

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

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

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

.4 Field changes of dimension and detail.

.5 Changes made by change orders.

.6 Details not on original Contract Drawings.

.7 References to related shop drawings and modifications.

.4 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.

.5 After completion of the work, provide the building owner with a set of Record Drawings (“As-Builts”) on a set of clean blackline prints, or by contacting with Prism Engineering ($500). Drawing must indicate all changes to equipment layout, final device circuiting, and conduit routing.

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

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

1.8 EQUIPMENT AND SYSTEMS

.1 For each item of equipment and each system include description of unit or system, and component parts.

.1 Give function, normal operation characteristics and limiting conditions.

.2 Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

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

.3 Include installed colour coded wiring diagrams.

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

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

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

.7 Provide installed control diagrams by controls manufacturer.

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

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

1.9 MATERIALS AND FINISHES

.1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations.

.1 Provide information for re-ordering custom manufactured products.

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

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

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

1.10 MAINTENANCE MANUALS

.1 Submit three complete sets of manufacturer's operating and maintenance instructions, bound in three-ring, vinyl covered hard cover binder, 215.9 mm x 279.4 mm (8 ½" x 11") size at completion, and before final acceptance, of Work. Indicate on cover and spine of binder "project title", date of project completion. Contents of books not to include hand-written data.

.2 Title sheet, in each book, to be labelled "Project Title – Generator Replacement - Maintenance Manual" and to bear the following:

- .1 Project Title;
- .2 Building Names;
- .3 Date of Project Completion;
- .4 Table of Contents

.3 Each book to contain the following:

- .1 Contact information including Contractor and Consultant company names, location address, telephone numbers, facsimile numbers, and email addresses;
- .2 Manufacturer's literature, parts list, accepted shop drawing, and name and address of closest service organization and spare parts source, for each item of equipment;
- .3 Voltage and ampere rating for each item of electrical equipment. Note: Suitably fold shop drawings larger than 215.9 mm x 279.4 mm (8 ½" x 11") and place in a manila envelope, 3-holepunched, for inclusion in book;
- .4 Copy of electrical work acceptance by electrical inspector;
- .5 Extended equipment warranties;
- .6 Records of Training Seminars (where applicable).
- .7 Completed reproducible record drawings;
- .8 Test certificates

.4 Review maintenance manual with Owner's operating staff or representatives to ensure a thorough understanding of each item of equipment and its operation.

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

1.11 MAINTENANCE MATERIALS

.1 Spare Parts:

- .1 Provide spare parts, in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in Work.
- .3 Deliver to site at location as directed; place and store.

.4 Receive and catalogue items.

.1 Submit inventory listing to Departmental Representative.

.2 Include approved listings in Maintenance Manual.

.5 Obtain receipt for delivered products and submit prior to final payment.

.2 Extra Stock Materials:

.1 Provide maintenance and extra materials, in quantities specified in individual specification sections.

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

.3 Deliver to site at location as directed; place and store.

.4 Receive and catalogue items.

.1 Submit inventory listing to Owner's Representative.

.2 Include approved listings in Maintenance Manual.

.5 Obtain receipt for delivered products and submit prior to final payment.

1.12 DELIVERY, STORAGE AND HANDLING

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

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

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

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

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

1.13 WARRANTIES AND BONDS

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

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

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

.3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten business 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.

.2 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.

.3 Respond in timely manner to oral or written notification of required construction warranty repair work.

.4 Written verification to follow oral instructions.

.1 Failure to respond will be cause for the Owner's Representative to proceed with action against Contractor.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES.

.1 Commissioning, testing and documentation.

1.2 DEFINITIONS

.1 Commissioning: The process for achieving, verifying, and documenting that the facility and its systems are planned, designed, installed, and tested to ensure that they meet the original project requirements established by the Owner.

.2 Commissioning Team:

.1 Owner's Representative: Project Manager, as defined in the Agreement.

.2 Consultant: as defined in the Agreement.

.3 Contractor Representatives: Representatives of the Contractor, including any sub-contractors whose scope of work includes items requiring commissioning.

.4 Testing Agency: Specialty agency engaged by the Owner to perform tests on components or systems to verify conformance to Owner's requirements or specified requirements.

.3 Commissioning Documents:

.1 Commissioning Plan: A project-specific document which defines the scope and approach to commissioning of this facility.

.2 Static check certificate: A document used to verify equipment data actually installed, prior to start-up or operation.

.3 Operating check certificate. A document used to verify equipment operation, including performance statistics.

.4 Startup Reports: Report prepared by equipment start-up personnel, including start-up sequence, and performance statistics.

.5 Balancing Report: Report prepared by the balancing agency, indicating initial and final system performance.

.6 Maintenance Manual: A document containing detailed descriptions and technical information about start-up, operation and maintenance of equipment.

1.3 METHODOLOGY

.1 The Commissioning Manager shall develop a Commissioning Plan, including as a minimum the management of commissioning meetings, and the management of project-specific commissioning documents.

.2 Commissioning Plan to include:

.1 Assembly of owner's requirements, including design criteria, performance goals, budgets, and schedules.

.2 Scheduling and chairing of commissioning meetings between team members.

.3 Development of static and operating check certificates for individual equipment.

.4 Training owner's representative on the operation of the control system.

.5 Assembly of commissioning reports, including testing and balancing reports, maintenance manuals, start-up reports, and testing reports.

.6 Verification of data by testing agency.

.3 Execute the commissioning plan.

1.4 REGULATORY REQUIREMENTS

.1 Arrange for regulatory authorities to witness those commissioning start up procedures which are also required by regulatory authorities.

.2 Obtain certificates of approval and for compliance with regulations from Authorities Having Jurisdiction; include copies of certificates with start up reports.

1.5 CONTRACT COMMISSIONING REQUIREMENTS

.1 Witnessing: Allow commissioning team members to witness starting, testing, adjusting, and balancing procedures.

.2 Allow Commissioning Manager and Auditor free access to the site.

.3 Costs: Pay costs associated with starting, testing, adjusting, training and relevant instruments and supplies required to perform those duties.

.4 Employ experienced personnel for equipment startup and commissioning, who are able to interpret results of readings and tests, and report the system status in a clear and concise manner.

.5 Provide all equipment required to perform testing, balancing, and commissioning of systems. Calibrate instruments used in start up as accurate; provide calibration certificates if requested by the Commissioning Manager.

.6 Utilize equipment check certificates and other commissioning documents required by the Commissioning Manager.

.7 Verify that equipment is installed in accordance with Contract Documents, and reviewed shop drawings. Sign and date static check certificates.

.8 Do not start up equipment unless static check sheets have been completed and submitted.

.9 Complete in detail, and sign operating check certificates.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 COMMISSION TESTING

.1 Allow for work, effort, and associated costs necessary to assist an Owner appointed and remunerated Commissioning Manager, for fulfilment of a commission testing process of the facility and Work.

.2 Coordinate, cooperate, and harmonize efforts with the Commissioning Manager.

.3 Commission testing will include a random testing and evaluation process as determined by the Consultant.

.4 Remote monitoring system shall include min 4 custom client specific display screens indicating monitoring data and control functions, password protected. Also include for minimum 2 x 4 hour client training session, one session shall be on site in the Yukon and the other in Vancouver, BC.

.5 System and device checks to be suitably logged, tabulated, signed, and incorporated into project Operating and Maintenance Manuals:

.1 Prior to start of testing, provide two (2) complete sets of up-to-date contract drawings and specifications including addenda to the Commissioning Manager.

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

.3 Coordinate site visits by the Commission Manager and the affected parties during warranty periods.

.6 The commissioning process will not:

.1 Preclude the duties and responsibilities described in the Contract Documents nor the requirements and obligations of the Contract.

.2 Circumvent any required warranties

.3 Relieve the Contractor from warranty requirements, responsibilities, or obligations.

.7 Prior to commission testing, perform the following and provide copies to the Commissioning Manager, of component and assembly Contract Document compliance:

.1 Static test certificates.

.2 Equipment operating certificates.

.3 Inspection certificates from authorities having jurisdiction.

.4 Required copies of shop drawings.

.5 Manufacturer’s operating and maintenance brochures of all major equipment.

.8 Ensure all systems have been started, adjusted to design criteria, and are functionally operational, ready for independent testing.

.9 Cooperate with the Commissioning Manager in advance of activating operating systems.

.10 Test results that illustrate failure to conform to the Contract Documents, will result in the Owner arranging and paying to correct the Work at the Owner's discretion, and recovering all associated costs from the Contractor.

3.2 AUDIT TESTING AND THE COMMISSIONING AUDITOR

.1 In the event on non-compliance or test failure described in the commission testing process above, comply with the following requirements.

.2 Allow for work, effort, and associated costs necessary to assist an Owner appointed and remunerated Auditor, for fulfilment of a further audit testing of the facility and Work.

.3 Coordinate, cooperate, and harmonize efforts with the Auditor.

.4 Audit testing will include further random testing and evaluation as determined by the Owner, the Auditor, and the Commissioning Manager.

.5 Suitably log, tabulate, and incorporate signed system and device check certificates into Operating and Maintenance Manuals.

.6 Coordinate site visits by the Auditor, Commission Manager and the affected parties during warranty periods.

.7 The audit process will not:

.1 Preclude the duties and responsibilities described in the Contract nor the requirements and obligations of the Contract.

.2 Circumvent any required warranties.

.3 Relieve the Contractor from warranty requirements, responsibilities, or obligations.

.8 Cooperate with the Auditor prior to testing of operating systems.

.9 Test results that demonstrate failure to conform to the Contract Documents, may result in the following, at the Owner's sole discretion:

.1 Complete rejection of the subject component, assembly, or system.

.2 Removal of defective items from the Work.

.3 An adjustment credit to the Contract Price for the Owner's estimated value of the subject item plus remuneration for associated damages and inconvenience.

.4 Provision of a suitable substitute Product in place of the defective Product.

.5 Substituted Products will be required to be commissioned and audited and undergo the same scrutiny as described for commission testing and audit testing described above.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 45 00 – Quality Control.

.3 Section 01 35 29.06 – Health and Safety Requirements.

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

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.1-12, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.

.2 CSA C22.2

.3 CAN/CSA-C22.3 No. 1-01(current version), Overhead Systems.

.4 CAN3-C235-83(R2010), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

.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 Engineers (IEEE)/National Electrical Safety Code Product Line (NESC)

.1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

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 REGULATORY REQUIREMENTS

.1 Execution of all Work shall be performed to comply with and conform to the following requirements:

- 2012 Canadian Electrical Code C22.1-12 (or current version);
- 2010 National Building Code (or current version);
- 2010 National Fire Code (or current version).

Work shall be performed to meet the above mentioned codes and, where applicable, to the satisfaction of all applicable provincial, city, municipal and / or district bylaws and authorities having jurisdiction of the place of Work.

.2 Where requirements detailed in these specifications exceed code requirements or are more stringent than code requirements, the specification requirements shall take precedence and shall be adhered to.

.3 In the event of a conflict between code requirements and those detailed in these specifications, the former shall prevail. Note that requirements within the specification that are more stringent requirements than codes do not constitute a conflict.

.4 The Contractor shall ensure that all seismic restraint requirements, as directed by building or electrical codes for the city, municipality or district where each facility is located, for new or relocated luminaires are met and adhered to.

.5 The installation of new luminaires or the relocation of existing luminaires must be supported independently of the T-bar ceiling in accordance with construction and local seismic requirements.

1.5 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235.

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.

.1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

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

1.6 SUBMITTALS

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

.2 Shop drawings:

.1 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.

.2 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.

.3 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.

.4 If changes are required, notify Owner’s Representative of these changes before they are made.

.3 Quality Control: in accordance with Section 01 45 00 – 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, inspection authorities for special approval before delivery to site.

.3 Submit test results of installed electrical systems and instrumentation.

.4 Permits and fees: in accordance with General Conditions of contract.

.5 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.

.6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.

.4 Record Drawings

.1 After completion of the work, provide the building owner with a set of Record Drawings ("As-Builts") on a set of clean blackline prints as updated with AutoCAD 2012 or later version, or by contracting with the Engineer ($500). Drawing must indicate all changes to equipment layout, final device circuiting, and conduit routing.

1.7 QUALITY ASSURANCE

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

.2 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold a valid Master Electrical Contractor license or are employed by such an entity. Apprentices may conduct Work under the supervision of a journeyman electrician 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.

.3 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 – Health and Safety Requirements.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Material Delivery Schedule: provide Owner's Representative with a material delivery schedule within two (2) weeks after award of Contract.

.2 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.3 Where the Contractor arranges for product to be delivered to site by third party carrier, the Contractor is to arrange for Contractor staff to meet the carrier, unload all materials and products, move immediately to storage and sign for all deliveries.

.4 Owner, Owner's Representative or Consultant will not sign for or accept delivery of any materials for the project, with the exception of spare materials for maintenance being supplied to the Owner as part of the contract.

.5 Contractor is not to use Owner's staff, equipment or shipping / receiving areas for delivery of materials and products; unless prior agreement and arrangement has been made with the Owner or Owner's Representative.

1.9 SYSTEM STARTUP

.1 Instruct Owner's Representative and operating personnel in operation, care and maintenance of systems, system equipment and components.

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

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

1.10 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.

Part 2 Products

2.1 STANDARD OF MATERIALS

.1 Materials and equipment are specifically described and named in this Specification in order to establish a standard of material and workmanship.

.2 Materials required for performance of work to be new and the best of their respective kinds and of uniform pattern throughout work.

.3 Materials to be of Canadian manufacture where obtainable. Materials of foreign manufacture, unless specified are to be approved before being ordered. Products are to be purchased through manufacturer's Canadian Distributors or Wholesalers, or directly from the manufacturer, when obtainable.

.4 Equipment items are to be standard products of approved manufacture. Identical units of equipment are to be of same manufacture. In any unit of equipment, identical component parts to be of same manufacture, but the various component parts comprising the unit need not be of one manufacture.

.5 Chemical and physical properties of materials and design performance characteristics and methods of construction and installation of items of equipment, specified herein, to be in accordance with latest issue of applicable Standards or Authorities when such are either mentioned herein, or have jurisdiction over such materials or items of equipment.

.6 Materials to bear approval labels as required by Code and / or Local Inspection Authorities and be eligible for sale and installation in Canada. Where it is stated within this specification that equipment "must be CSA approved", or similar wording, it is to be taken that equipment bearing an appropriate certification label from any certification organizations listed in federal, provincial or territorial bulletins is acceptable.

.7 Install materials in strict accordance with manufacturer's recommendations.

.8 Include items of material and equipment not specifically noted on drawings, provided on informational bills of material, or mentioned in specifications but which are necessary to make a complete and operating installation.

.9 Confirm capacity or ratings of equipment being provided, when based on ratings of equipment being provided under other trade Section, before such items are purchased.

.10 Remove materials, condemned as not approved for use, from job site and deliver and install suitable approved materials in their place.

.11 Where requirements of this Specification exceed those of applicable standards, this Specification governs.

2.2 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of authority having jurisdiction.

.2 Decal signs, minimum size 175 x 250 mm.

2.3 BARRIERS AND WARNING AIDS

.1 Barriers and warning aids shall be used to protect those who access or traverse near the space or areas of Work in both interior and exterior areas where the Work could pose a hazard to the passersby. The intent is to cordon off hazard areas and warn of a hazard.

.2 Where required for safety and security of the construction zones and to avoid potential hazards to occupants and users of the space or site, areas of Work that are accessible to the public or unauthorized occupants entering a Work location are to be barriered from public or occupant access with Owner approved barriers and / or fencing.

.3 In locked rooms only accessible by authorized personnel or users, barriers and warning aids are required around Work if there is a potential for tripping hazard, accidental contact with temporary structures, access to scaffolding or lifts, open electrical that could allow for contact with live electrical conductors, buss bars or other components, or open mechanical equipment with rotary component or operable devices, anywhere there is potential for access and contact by occupants not associated with the Work and could present a danger for the unaware.

.4 Where available, follow and adhere to Owner or Owner's Representative site construction guidelines for public safety and barriers in construction areas. Request such documentation from the Owner or Owner's Representative.

.5 Minimally, the Contractor shall provide protection and warning as detailed in the following articles:

.6 During times of construction when contractor personnel are actively working on site and in an area, high visibility cones, barriers and tape shall be utilized to surround areas of Work as warning to staff, the general public and any other occupants / users of the facility, grounds and site that there is construction underway.

.7 Contractor personnel shall actively guard against unauthorized persons entering the areas of work during active construction.

.8 During times where no construction is happening, for example at the end of the work shift, any exposed Work or equipment shall be barriered off with fencing, high visibility tape and, where applicable, safety cones. These barriers must be structured or affixed such that they cannot easily be removed without use of tools, and wherever possible must be locked in position.

.9 Security or facilities staff must have copies of keys for any locks used for barriers and fences. Keys shall be colour coded or otherwise have indicators as to which key works which lock; for quick and easy access to the barriered area.

Barriers, safety cones, and fencing shall NOT impinge or restrict walkways, doorways, or any other commonly used routes of building access or egress. Do not block or restrict use of entire walkways or passageways

2.4 WIRING TERMINATIONS

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

.2 Apply anti-oxidization compounds as required for connections made between dissimilar metals.

2.5 EQUIPMENT IDENTIFICATION

.1 Labels for feeder conduits, cables and bus ducts to indicate their content are to comprise pressure sensitive tape. Print labels on plastic coated tape, 50.8 mm x 152.4 mm (2" x 6") size with black printing on yellow background indicating applicable voltage, i.e. 600 volts.

.2 Provide name plates on each piece of electrical equipment, namely power panels, distribution panels, lighting panels, transformers, disconnect switches, contactors, telephone panels, miscellaneous systems panels, double throw switches and automatic transfer switches.

.3 Indicate panel designation, mains voltage and panel and circuit number from which this panel is fed on nameplates for each electrical panel.

.4 Indicate equipment being controlled and voltage on nameplates for disconnects and contractors.

.5 Indicate system, and voltage and load of area served on nameplates for terminal cabinets.

.6 Nameplates are to be black-white-black lamicoid with bevelled edges and white engraved letters. Fasten or cement nameplates to equipment in a conspicuous location. Locate nameplate on flush mounted panels on front of panel behind hinged door.

.7 Identify feeder pull boxes and junction boxes with lettering stamped on brass or aluminium tags showing feeder or system concerned, voltage involved and data for both termination points whether equipment or panel. Tag to be held to boxes under lid screws using steel wire.

.8 Apply a small dab of paint to inside of each outlet box, pull box and panel as it is installed, using base building standards or colour code as follows:

.1	Red	-	Fire Alarm System
.2	Blue	-	Intercom and Public Address
.3	Orange	-	Computer Signal System
.4	Black	-	Buzzer
.5	Green	-	Telephone System
.6	White	-	Cable TV System
.7	Yellow	-	Alarm Systems
.8	Grey	-	Low Voltage Lighting Control System

.9 No colour code is required for regular lighting and power circuits.

.10 Ensure that colour identification is on both inside and outside of junction boxes in furred ceiling.

.11 Connections in equipment to be Phase A, B, C, from left to right when viewing wiring from front or accessible direction.

.12 Band main bus on lighting and power panels with tape as follows, to confirm to the Canadian Electrical Code.

.1	Red	-	Phase A	White	-	Neutral
.2	Black	-	Phase B	Green	-	Ground
.3	Blue	-	Phase C	Orange	-	Control

.13 Identify control conductors for motors and equipment by pressure sensitive tape markers at each main terminal point and wherever they are introduced into ducts or equipment. Schedule and chart marker numbers with corresponding machine numbers and locations and include with Record Drawings.

.14 Label feeder conduits, cables.

.15 Locate labels as follows:

.1 At every end of every conduit, duct or cable run, adjacent to item of equipment serviced.

.2 On each exposed conduit, duct or cable passing through a wall, partition or floor (one on each side of such wall, partition or floor).

.3 At every access point on concealed conduit duct or cable.

.16 Labels are to be visible from 5’-0” (1524 mm) above adjacent floor or platform.

2.6 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour coding: to CSA C22.1.

.4 Use colour coded wires in communication cables, matched throughout system.

2.7 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

2.8 SLEEVES AND CURBS

.1 Maintain the integrity of the fire rating of the floors and walls around electrical raceways and/or cables passing through such floors and/or walls.

.2 Materials used to maintain rating to have a minimum 2 hour ULC listed rating.

.3 Provide sleeves of galvanized steel for conduit and cable runs passing through concrete walls, beams, slabs and floor. Sleeves for bus ducts, wireways and cable trays to be minimum 3.18 mm (1/8”) galvanized steel.

.4 Provide concrete curbs, minimum 101.6 mm (4”) high above finished floor surrounding openings where bus ducts, wireways and cable trays rise through slabs above grade to prevent debris and water from falling to floor below. Concrete curb are to have sufficient area to adequately carry bus duct support brackets.

.5 Provide concrete curbs, minimum 101.6 mm (4”) high above finished floor for telephone cable risers and other openings intended for electrical use in slabs above grade.

.6 Extend galvanized sleeves for conduit rising through slabs 101.6 mm (4") minimum above finished floors. Provide sleeves, passing through floors having a waterproof membrane, with an integral flashing clamp.

.7 Install fire stop or sealant material between opening or sleeve and raceway or cable in accordance with the recommendations of the manufacture to achieve a minimum 2 hour rating, unless otherwise noted.

2.9 FINISHES

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

.1 Paint outdoor electrical equipment "equipment green" finish.

.2 Paint indoor switchgear and distribution enclosures light gray.

2.10 ACCESS DOORS

.1 Provide access doors in non-accessible ceilings.

.2 Provide a set of prints of the reflected ceiling plan and indicate required access door locations and proposed size prior to installation.

.3 Co-ordinate location of equipment in non-accessible ceiling with all other trades, as to utilize minimum quantities of access doors prior to installation of equipment.

Part 3 Execution

3.1 INSTALLATION

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

.2 Do overhead and underground systems in accordance with CSA C22.3 No.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 CO-ORDINATION OF PROTECTIVE DEVICES

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

3.4 TEMPORARY LIGHTING AND POWER SERVICES

.1 Provide temporary general lighting throughout construction site; existing luminaires may be utilized for this task, where possible. In areas where lighting has been removed to suit construction, provide lighting strings with incandescent, compact fluorescent, or solid-state light emitting diode lamps, to approximate the equivalent lumen output equivalent of incandescent 150W I.F. lamps mounted on 10 foot centres, or through use of high

powered portable work lights. Lamp placement on lighting strings is variable depending upon light source and lumen output of lamps utilized to meet equivalency and minimum footcandle illumination levels as detailed in this section.

.2 Lighting levels in work areas obtain and adhere to regulations of the jurisdiction having authority for the site type and location.

.3 Where no defined illumination levels are detailed in regulations, provide a minimum 50 footcandles of illumination across the work area.

.4 Relocate temporary lighting throughout construction site as often as necessary, such that temporary lighting is provided in all areas where work is being performed.

.5 Provide additional task lighting for specific working conditions where higher lighting levels are required.

.6 Provide temporary power supplies with receptacles and extension cords from existing building services, for construction equipment, e.g.: drills, saws, etc. Locate, relocate and remove services as necessary.

.7 Maintain the temporary facilities in good repair and in safe working condition throughout the duration of the construction project.

.8 Remove, at the end of project, the above noted temporary systems.

3.5 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:

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

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

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

3.6 CLEANING

.1 Refer to 01 74 11 - CLEANING

.2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.3 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for wire and box connectors.

1.2 RELATED SECTIONS

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

1.3 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CAN/CSA-C22.2 No.18.2-06, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.

.2 CSA C22.2 No.65-13, Wire Connectors.

.2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)

.1 EEMAC 1Y-2, 1979 Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

.3 National Electrical Manufacturers Association (NEMA)

1.4 WASTE MANAGEMENT AND DISPOSAL

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

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal all packaging material for recycling in accordance with Waste Management Plan.

.4 Divert unused wiring materials from landfill to metal recycling facility as approved by appropriate government agency as a waste disposal and recycling facility.

Part 2 Products

2.1 MATERIALS

.1 Pressure type wire connectors to: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.

.2 Luminaire type splicing connectors to: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.

.3 Bushing stud connectors: to EEMAC 1Y-2 to consist of:

.1 Connector body and stud clamp for stranded or round copper conductors.
.2 Clamp for stranded or round copper.
.3 Not used.
.4 Stud clamp bolts.
.5 Bolts for copper conductors.
.6 Not used.
.7 Sized for conductors as indicated.

.4 Clamps or connectors for armoured cable as required to: CAN/CSA-C22.2 No.18.2.

Part 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 where 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 NEMA.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 61 00 - Common Product Requirements

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

.3 Section 26 05 00 – Common Work Results – Electrical.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Divert unused metal materials from landfill to metal recycling facility as approved by Owner's Representative.

.4 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 HANGERS

.1 Ensure that hangers used for electrical conduit are galvanized after fabrication.

.2 Do not use perforated strapping (grabbler bars) to hang conduit.

Part 3 Execution

3.1 INSTALLATION

.1 Secure equipment to poured concrete with expandable inserts.

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

.3 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.

.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 diameter threaded rods and spring clips.

.2 Support 2 or more cables or conduits on channels supported by 6 mm diameter threaded rod hangers where direct fastening to building construction is impractical.

.7 For surface mounting of two or more conduits use channels at 1200 mm 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 Departmental Representative.

.12 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

3.2 SUPPORTS AND BASES

.1 Supply and erect special structural and concrete work required for the installation of electrical equipment. Provide anchor bolts and other fastenings unless noted otherwise. Mount equipment required to be suspended above floor level, on a frame or platform bracketed from the wall or suspended from the ceiling. Carry supports to either the ceiling or the floor, or both as required, at locations where, because wall thickness is inadequate, it is not permitted to use such brackets.

.2 Switches or other electrical equipment are to be complete with suitable bases or mounting brackets. Install angle or channel iron supports to bear the equipment where it is shown on or in structural tile walls, or walls are inadequate to bear the equipment.

.3 Provide channel iron or other metal supports where necessary, to adequately support lighting luminaires. Do not use wood unless wood forms part of the building structure.

.4 Support hangers, in general, from inserts in concrete construction or from building structural steel beams, using beam clamps. Provide additional angle or channel steel members, required between beams for supporting conduits, cables and bus ducts. Use coach screw rods or lag screws in any wood construction.

.5 Provide any additional supports required from existing concrete construction for any piping or equipment, by drilling same and installing expansion bolt cinch anchors.

.6 Do not use explosive drive pins in any section of Work without obtaining prior approval from Departmental Representative.

END OF SECTION

Part 1 GENERAL

.1 This Section describes the new weather proof outer Quick Connect and Disconnect Box for the portable Load Bank, to be provided as a new.

.2 The new Quick Connect Box is to be installed as shown on the drawings. Exact location to be coordinated on site.

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 26 05 00 – Common Work Results for Electrical.

.3 Section 26 27 16 – Electrical Cabinet and Enclosures

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.2 CSA C22.1-15, Canadian Electrical Code, Part 1.

1.3 SUBMITTALS

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

.2 Product Data:

.1 Provide manufacturer’s printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Provide shop drawings:

.1 In accordance with Section 01 33 00 - Submittal Procedures.

.4 Provide drawings:

.1 Stamped and signed by professional engineer registered or licensed in Yukon Territories, Canada.

Part 2 PRODUCTS

2.1 LOAD BANK QUICK CONNECT BOX AND BREAKER

.1 Provide standby power quick connect box complete with main breaker as shown and sized on plans and as specified.

.2 New enclosure to be as detailed on plans and specified in Section 26 27 16.

.3 Enclosure shall be outdoor weatherproof, made from heavy duty gauge steel construction, finished to the same standard as the existing electrical equipment, without knockouts, cut outs, or holes, with NEMA 3R rating.

.4 Formed lip on door and top of enclosure opening to exclude flowing liquids and contaminants.

.5 Continuously hinged doors with locking T-handle. Doors to be secure with heavy duty stainless steel clamps with provision for padlocking for safety and controlled access. Seamless poured-in place gasket.

.6 Enclosure to have a lockable hinged side access swing door for connecting temporary cables from the temporary mobile generator.

.7 Door switch with one (1) n/o contact for electrical interlocking. For future connection to security system.

.8 Moulded-case circuit breakers: to CSA C22.2 No. 5

.9 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.

.10 Common-trip breakers: with single handle for multi-pole applications.

.11 Circuit breakers shall have a minimum interrupting capacity of 50,000 AIC at 120/208V.

.12 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

.13 Mechanical lugs to stand-by power disconnect and generator connection with color-coded, labeled, male cam-lock connectors.

.14 Connection box to be equipped with colour coded terminals for phase connection plus one ground terminal. Provide one set of matching inline connectors (male) for load bank connection.

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with manufacturer's instructions.

.2 Mount plumb, true and square to building lines.

.3 Top of enclosure to be mounted at 72" above grade.

.4 Provide min two sets of keys for the enclosure to be turned over to facility manager, provide signed receipt confirming delivery.

3.2 IDENTIFICATION

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

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

END OF SECTION

Part 1 GENERAL

.1 This Section describes the new weather proof outer Quick Connect and Disconnect Box for Generator, to be provided as a new.

.2 The new Quick Connect Box is to be installed as shown on the drawings. Exact location to be coordinated on site.

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 26 05 00 – Common Work Results for Electrical.

.3 Section 26 27 16 – Electrical Cabinet and Enclosures

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.2 CSA C22.1-15, Canadian Electrical Code, Part 1.

1.3 SUBMITTALS

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

.2 Product Data:

.3 Provide manufacturer’s printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.4 Provide shop drawings:

.1 In accordance with Section 01 33 00 - Submittal Procedures.

.2 Stamped and signed by professional engineer registered or licensed in Yukon Territories, Canada.

Part 2 PRODUCTS

2.1 GENERATOR QUICK CONNECT BOX AND BREAKER

.1 Provide standby power quick connect box complete with main breaker as shown and sized on plans and as specified.

.2 Enclosure shall be outdoor weatherproof, made from heavy duty gauge steel construction, finished to the same standard as the existing electrical equipment, without knockouts, cut outs, or holes, with NEMA 3R rating.

.3 Formed lip on door and top of enclosure opening to exclude flowing liquids and contaminants.

.4 Continuously hinged doors with locking T-handle. Doors to be secure with heavy duty stainless steel clamps with provision for padlocking for safety and controlled access. Seamless poured-in place gasket.

.5 Enclosure to have a lockable hinged side access swing door for connecting temporary cables from the temporary mobile generator.

.6 Door switch with one (1) n/o contact for electrical interlocking. For future connection to security system.

.7 Moulded-case circuit breakers: to CSA C22.2 No. 5

.8 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.

.9 Common-trip breakers: with single handle for multi-pole applications.

.10 Circuit breakers shall have a minimum interrupting capacity of 10,000 AIC at 120/208V.

.11 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

.12 Mechanical lugs to stand-by power disconnect and generator connection with color-coded, labeled, male cam-lock connectors.

.13 Connection box to be equipped with colour coded terminals for phase connection plus one ground terminal. Provide one set of matching inline connectors (female) for each generator cabling connections.

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with manufacturer's instructions.

.2 Mount plumb, true and square to building lines.

.3 Top of enclosure to be mounted at 72" above grade.

.4 Provide min two sets of keys for the enclosure to be turned over to facility manager, provide signed receipt confirming delivery.

3.2 IDENTIFICATION

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

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

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 61 00 – Common Product Requirements.

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

.4 Section 26 05 00 – Common Work Results – Electrical.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.1-09, Canadian Electrical Code, Part 1, 21st Edition.

1.3 SUBMITTALS

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

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 – Common Product Requirements.

.2 Waste Management and Disposal:

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

Part 2 Products

2.1 OUTLET BOXES

.1 Conform to CSA Standard C22.2 No. 18.

.2 Ceiling boxes are to be 101.6 mm (4”) octagon or square, complete with fittings, where required to support luminaires.

.3 Where boxes are surface mounted in unfinished areas, they are to be FS condulets.

.4 Standard outlet boxes are to be manufactured from code gauge galvanized steel.

.5 Ensure outlet boxes installed outside building and/or in damp locations are FS weatherproof type. If in direct contact with the ground, they are to be made of cast iron.

.6 Provide a suitable outlet box for each luminaire, switch, receptacle or other outlet, approved for the particular area in which it is to be installed.

2.2 CONDUIT BOXES

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

2.3 FITTINGS - GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to 35 mm and pull boxes for larger conduits.

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

Part 3 Execution

3.1 INSTALLATION

.1 Support outlet boxes independently of conduit and cable.

.2 Locate outlet boxes, mounted in hung ceiling space, so they do not obstruct or interfere with the removal of lay-in ceiling tiles.

.3 Offset outlet boxes, shown back to back in partitions, horizontally to minimize noise transmission between adjacent rooms.

.4 Use gang boxes at locations where more than one device is to be mounted. Use combination boxes with suitable barriers where outlets for more than one system are shown.

.5 Flush mount boxes, panels, cabinets and electrical devices, which are installed in finished areas, and fit with suitable flush trims and doors or covers, unless specifically noted otherwise.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 74 11 – Cleaning.

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

.4 Section 26 05 32 – Outlet Boxes, Conduit Boxes and Fittings.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CAN/CSA C22.2 No. 1-04(R2009), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.

.2 CSA C22.2 No. 45-M1981(R2007), Rigid Metal Conduit.

.3 CSA C22.2 No. 56-04(R2009), Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.

.4 CSA C22.2 No. 83-M1985(R2008), Electrical Metallic Tubing.

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.

1.4 WASTE MANAGEMENT AND DISPOSAL

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

Part 2 Products

2.1 CONDUITS

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

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

.3 Flexible metal conduit: to CSA C22.2 No. 56, steel.

2.2 CONDUIT FASTENINGS

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

.1 Two hole steel straps for conduits larger than 50 mm.

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

.3 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 NPS 1 25 mm and larger conduits.

.3 Watertight connectors and couplings for EMT.

.1 Set-screws are not acceptable.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Use rigid galvanized steel threaded conduit except where specified otherwise.

.3 Use electrical metallic tubing (EMT) except in cast concrete or susceptible to mechanical injury.

.4 Bend conduit cold:

.1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.5 Mechanically bend steel conduit over 19 mm diameter.

.6 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.7 Install fish cord in empty conduits.

.8 Remove and replace blocked conduit sections.

.1 Do not use liquids to clean out conduits.

.9 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 Wherever possible, group conduits on surface channels.

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

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

3.4 CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Do not install horizontal runs in masonry walls.

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

3.5 CLEANING

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

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

END OF SECTION

Part 1 GENERAL

1.1 SECTION INCLUDES

.1 Materials for moulded-case circuit breakers.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International).

.1 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).

1.4 SUBMITTALS

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

Part 2 PRODUCTS

2.1 BREAKERS GENERAL

.1 Moulded-case circuit breakers: to CSA C22.2 No. 5

.1 Electronic trip molded case standard function 80% rated circuit breakers

.2 All electronic circuit breakers shall have the following time/current response adjustments: Long Time Pickup, Long Time Delay, Short Time Pickup, Short Time Delay, Ground Fault Pickup Ground Fault Delay and Instantaneous settings. Each adjustment shall have discrete settings (fully adjustable) and shall be independent of all other adjustments.

.3 Circuit breaker trip system shall be a microprocessor-based true rms sensing designed with sensing accuracy through the thirteenth (13th) harmonic. Sensor ampere ratings shall be as indicated on the associated drawing.

.4 Long Time Pickup indication to signal when loading approaches or exceeds the adjustable ampere rating of the circuit breaker shall be provided.

.2 Common-trip breakers: with single handle for multi-pole applications.

.3 Circuit breakers shall have a minimum interrupting capacity of 50,000 AIC at 120/208V.

.4 Moulded-case circuit breakers shall be Schneider LSI series or approved equivalent.

Part 3 EXECUTION

3.1 INSTALLATION

.1 Install circuit breakers in accordance with manufacturer's instructions.

.2 Provide new doors and panels as required.

.3 Test, Commission and place into working order.

.4 Provide all Lamacoid Name Plates and permanently fix to the Distribution Board.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for fused and non-fused disconnect switches.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 35 29.06 - Health and Safety Requirements.

.3 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

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

1.3 REFERENCES

.1 Canadian Standards Association (CSA International).

.1 CAN/CSA C22.2 No.4-[M89 (R2000)], Enclosed Switches.

.2 CSA C22.2 No.39-[M89 (R2003)], Fuseholder Assemblies.

1.4 SUBMITTALS

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

1.5 HEALTH AND SAFETY

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.6 WASTE MANAGEMENT AND DISPOSAL

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

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Separate for recycling and place in designated containers in accordance with Waste Management Plan.

.5 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 DISCONNECT SWITCHES

.1 Fusible and non-fusible, disconnect switch in CSA Enclosure to CAN/CSA C22.2 No.4, size as indicated on drawings.

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

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

.4 Fuses: size as indicated, in accordance with Section 26 28 13.01 - Fuses - Low Voltage.

.5 Fuseholders: to CSA C22.2 No.39 suitable without adaptors, for type and size of fuse indicated.

.6 Quick-make, quick-break action.

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

2.2 EQUIPMENT IDENTIFICATION

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

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

Part 3 Execution

3.1 INSTALLATION

.1 Install disconnect switches complete with fuses if applicable.

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 Common Work Results

.2 Section 16 01 00 General Provisions

1.2 REFERENCES

.1 American Petroleum Institute (API)

1. API Std. 650, Welded Steel Tanks for Oil Storage 11th Edition.

.2 Canadian General Standards Board (CGSB)

1. CAN/CGSB-3.6, Regular Sulphur Diesel Fuel (USLD only).

.3 Canadian Environmental Protection Act (CEPA)

1. CCME PN 1326, Environmental Code of Practice for Aboveground and Underground Storage Tank Systems for Petroleum Products and Allied Petroleum Products.

.4 CSA International

1. CSA-B139, Installation Code for Oil Burning Equipment.

.5 International Organization for Standardization (ISO)

1. ISO 3046-1, Reciprocating Internal Combustion Engines - Performance - Part 1: Declarations of Power, Fuel and Lubricating Oil Consumptions, and Test Methods - Additional requirements for engines for general use.

.6 National Electrical Manufacturers Association (NEMA)

1. NEMA MG 1, Motors and Generators.

.7 Underwriters' Laboratories of Canada (ULC)

1. CAN/ULC-S601, Standard for Shop Fabricated Steel Aboveground Horizontal Tanks for Flammable and Combustible Liquids.
2. ULC-S603, Standard for Steel Underground Tanks for Flammable and Combustible Liquids.

1.3 SCOPE OF WORK

.1 The Contractor supplying and installing the Prime Power Generator shall be responsible for the installation as completed and including the work by the sub Contractors in respect of every aspect of the work, to ensure that the system will be handed over complete in every respect and in running order.

.2 In addition to the supply and installation of the Generator set and all associated equipment and materials, the Contractor shall also become responsible for the following:

1. All electrical connections between the Genset and the Control Panel.
2. Seismic Springs and supports and earthquake snubbers.
3. All vibration isolators.
4. Exhaust pipe manifold connector and flexible exhaust pipe connector.
5. New flexible connectors at the Genset for the existing fuel piping system.
6. All electrical disconnecting and re-connecting of the two fuel oil transfer pump motors, controls and alarms.
7. Modification to existing exhaust system.
8. Supply and installation of all intake and relieve louvres and the ventilation ductwork; including the installation of new flanges to connect to existing ductwork.
9. Oil cooler installed integral of genset.
10. Supply of the primary fuel filter water separator.
11. Supply and installation of a control system capable of remotely monitoring the Genset; as well as start. Stop and fault reset functions for the Genset.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Supply two 40KW prime power, 120/208V, 3 phase, 4 wire diesel generators.

.2 Submit submittals in accordance with specified requirements.

.3 Product Data:

1. The Generator set offered for this installation shall match existing or approved equivalent, as the design is required to be based on the existing application restraints. Tenderers will be responsible for any changes required, if other than approved is offered.
2. Provide manufacturer’s printed product literature, specifications and data sheets for power generators and include product characteristics, performance criteria, physical size, finish and limitations.
3. The new generator system’s physical dimensions shall be less than or equal to existing generator dimensions.

.4 Shop Drawings:

1. Submit drawings, and include:

- Engine: make and model, with performance curves.
- Alternator: make and model.
- Voltage regulator: make, model and type.
- Close Transition Automatic transfer switch: make, model and type.
- Manual bypass switch: make and model.
- Automatic bypass switch: make and model.
- Battery: make, type and capacity.
- Battery charger: make, type and model.
- Alternator control panel: make and type of meters and controls.
- Governor type and model.
- British standard or DIN rating of engine.
- Dimensioned drawing showing complete generating set mounted on steel base, including vibration isolators, exhaust system, drip trays, and total weight.
- Continuous full load output of set at 0.8 PF lagging.
- Description of set operation including:
  - Automatic starting and transfer between load and genset to genset start controls.
  - Manual starting.
  - Automatic shut down and alarm on:
  - Over cranking.
  - Over speed.
  - High engine temp.
  - Low lube oil pressure.
  - Alternator over voltage.
  - Lube oil high temperature.
  - Manual remote emergency stop.

1.5 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance data for diesel generator for incorporation into manual specified.

.2 Include in Operation and Maintenance Manual instructions for particular unit supplied and not general description of units manufactured by supplier and:

1. Operation and maintenance instructions for engine, alternator, control panel, automatic transfer switch, manual bypass switch, battery charger, battery, fuel system, engine room ventilation system, exhaust system and accessories, to permit effective operation, maintenance and repair.

.3 Technical data:

1. Illustrated parts lists with parts catalogue numbers.

.4 Schematic diagram of electrical controls.

.5 Flow diagrams for:

1. Fuel system.
2. Lubricating oil.
3. Certified copy of factory test results.
4. Maintenance and overhaul instructions and schedules.
5. Precise details for adjustment and setting of time delay relays or sensing controls which require on site adjustment.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Common Product Requirements and with manufacturer’s written instructions.

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

.3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates padding and packaging materials in accordance with Construction/Demolition Waste Management and Disposal.

1.7 MAINTENANCE MATERIAL SUBMITTALS

.1 Provide maintenance materials in accordance with Closeout Submittals.

.2 Include:

1. 2 fuel filter replacement elements.
2. 2 lube oil filter replacement elements.
3. 2 air cleaner filter elements.
4. 2 sets of fuses for control panel.

Special tools for unit servicing.

Part 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

.1 Generating system consists of:

1. Diesel engine.
2. Alternator.
3. Alternator control panel.
4. Automatic transfer equipment.
5. Battery charger and battery.
6. Automatic engine room ventilation system (modifications to existing system as per drawings by contractor).
7. Ensure compatibility with existing fuel supply system and provide modifications on site for a complete system installation.
8. Ensure compatibility with existing exhaust system and provide modifications on site for a complete system installation.
9. Steel mounting base.
10. Controller complete with LCD display and all required devices/software and accessories for remote monitoring and remote stop/start/fault reset functions.

.2 System designed to operate as emergency standby, unattended in remote location.

2.2 DIESEL ENGINE

.1 Diesel engine: to ISO 3046-1.

.2 The Generator set shall be capable of accepting full nameplate rating in one step and shall be rated for full nameplate with low fuel consumption design. The prime power rating must provide for 110% of the output of the generator to provide for inrush capability.

.3 120/208V 3ϕ 4W, 60Hz, 0.80 power factor.

.4 Turbo charged and after cooled, synchronous speed 1800 rpm.

.5 Capacity: 40KW

1. Rated continuous power in KW at rated speed, after adjustment for system losses in auxiliary equipment necessary for engine operation; to be calculated as follows:
2. Rated continuous output Generator KW divided by Generator efficiency at full load.

.6 Under following site conditions:

1. Altitude: 500ft above sea level.
2. Ambient temperature: 25 degrees C.
3. Relative humidity: 75 %.

.7 Engine overload capability 100% of continuous standby output nameplate rating.

.8 Cooling System:

1. To maintain manufacturer's recommended engine temperature range at 100% nameplate continuous in ambient temperature of 40 degrees C.
2. Block heater: thermostatically controlled liquid coolant heater connected to line side of automatic transfer switch to allow engine to start in room ambient 10 degrees C.

.9 Fuel: to CAN/CGSB-3.6, of required Type.

.10 Existing fuel system to be re-used.

.11 Governor: mechanical hydraulic with:

1. Electronic type, electric actuator, speed droop externally adjustable from isochronous to 5%, temperature compensated with steady state speed maintenance capability of plus or minus 0.25%.

.12 Lubrication system:

1. Pressure lubricated by engine driven pump.
2. Lube oil filter: replaceable, full flow type, removable without disconnecting piping.
3. Lube oil cooler.
4. Engine sump drain valve.
5. Oil level dip-stick.

.13 Starting system:

1. Positive shift, gear engaging starter 12 or 24V dc.
2. Cranking limiter to provide trois (3) cranking periods of 10s duration, each separated by 5 s rest.
3. Maintanence free BCI group 24 battery to meet the engine manufacturer's specifications for the ambient conditions. Provide battery rated according to SAE Standards J-537 with a minimum cold cranking amp of 650A and a minimum reserve capacity of 2 hours. The battery plates shall be constructed of a Calcium-Lead alloy to provide long waterless operation and extended battery life. The battery must contain a handle to aid in lifting and the case must be constructed of polypropylene to resist breakage and extend service life
4. Battery Charger – See specifications section 26 43 33.
5. Battery – See specifications section 26 33 16.
6. Regulation: plus or minus 1% output for plus or minus 10% input variation.

7. Automatic boost for 6 hours every 30 days.
8. Equipped with dc voltmeter, dc ammeter and on-off switch.

.14 Vibration isolated engine instrument panel with:

1. Lube oil pressure gauge.
2. Lube oil temperature gauge.
3. Oil level gauge.
4. Coolant temperature gauge.
5. Running time meter: non-tamper type.

.15 Guards to protect personnel from hot and moving parts.

1. Locate guards so that normal daily maintenance inspections can be undertaken without their removal.

.16 Drip tray.

2.3 ALTERNATOR

.1 Alternator: to NEMA MG1.

.2 The Alternator shall provide locked rotor starting capability of 120 skVa at 30% instantaneous voltage dip as defined by NEMA MG 1. Sustained voltage dip is not acceptable. The voltage and the frequency dip for 0-100% load should not exceed 30.8% and 14.9% respectively.

.3 Rating: 3 phase, 120/208 V, 4 wire, 40kW, 60 Hz, at 0.8 PF.

.4 Output at 40 degrees C ambient:

1. 100% full load continuously.
2. 110% full load for 1 hour.
3. 150% full load for 1 minute.
4. Revolving field, brushless, single bearing.
5. Drip proof.
6. Amortise windings.
7. Synchronous type.
8. Dynamically balanced rotor permanently aligned to engine by flexible disc coupling.
9. Exciter: rotating brushless PMG.
10. NEMA class F or H insulation on windings, as required.
11. Voltage regulator: thyristor controlled rectifiers with phase controlled sensing circuit:

    .1 Stability: +/-1 % maximum voltage variation at any constant load from no load to full load.

.2 Regulation: +/-1/2 % maximum voltage deviation between no-load steady state and full-load steady state.

.3 Transient: 30.8 % maximum voltage dip on one-step application of 0.8 PF full load.

.4 Transient: NA % maximum voltage rise on one-step removal of 0.8 PF full load.

.5 Transient: 5.7 s maximum voltage recovery time with application or removal of 0.8 PF full load.

12. Alternator: capable of sustaining 300% rated current for period not less than 10 s permitting selective tripping of down line protective devices when short circuit occurs.

2.4 CONTROL PANEL

.1 Totally enclosed, mounting base isolated from diesel generator.

.2 Instruments:

1. Digital 100% solid state circuitry indicating type 1 % accuracy, rectangular face, flush panel mounting with LCD display:

.1 Voltmeter: ac, scale 0 to 240 V.

.2 Ammeter: ac, scale 0 to 150 A.

.3 Wattmeter scale 0 to 50 kW.

.4 Frequency meter: scale 55 to 65Hz.

2. Voltmeter selector switch, rotary, panel mounting, round notched handle, four position, labelled "Off-Phase A-Phase B-Phase C".

3. Ammeter selector switch, rotary, maintained contacts, panel mounting, designed to prevent opening of current circuits, round notched handle, four position labelled "OFF- Phase A-Phase B-Phase C".

2.5 CONTROLS.

1. Engine start button.

2. Selector switch: Off-Auto-Manual - Test full load test no load.

3. Existing Alternator output Circuit breaker is to be retained, serviced and re-connected.

4. Voltage control rheostat: mounted on inside of control panel.

5. Operating lights, panel mounted:

.1 "Generator 1" pilot light.

.2 "Generator 2" pilot light.

.3 Green pilot lights for breaker on and red pilot lights for breaker off.

.4 Solid state indicator lights for alarm with manually reset NO/NC contacts wired to terminal block for remote annunciation on:

.1 Low fuel level.
.2 Low battery voltage.
.3 Ventilation failure.
.4 Low coolant temperature.
.5 Solid state controller for automatic shutdown and alarms with 2 sets of manually reset NO/NC contacts wired to terminal block for remote annunciation on:
.6 Engine over crank.
.7 Engine over speed.
.8 Engine high temperature.
.9 Engine low lube oil pressure.
.10 Short circuit.
.11 AC over voltage.
.12 Lamp test button.
.13 Provision for remote monitoring.
.14 Form C contracts for run and alarm status.

6. In addition, controller shall have generator load monitoring and customizable load threshold signalling. The controller shall be capable of detecting when the generator exceeds a preset load condition and provide an output signal to a relay for load shedding. Controller shall also “flash” a visual and audible alarm signal at the LCD display and remote monitoring station/e-mail alert via internet connection.

7. Load shedding conditions/alerts shall be:

.1 Alarm for low load; under 40%
.2 Getting high warning 80%
.3 High load 90%.

8. Provide a laminated instruction sheet near visible alarm signal indicating:

.4 Alarm for low load: Turn on lights
.5 Getting high warning: Turn off unnecessary loads
.6 High load 90%: System shall send output signal for automatic load shedding.

9. Controller’s generator load monitoring shall be capable of detecting stable load condition (adjustable setting, set default to 60% load) and provide output signal for automatic pickup of the previously dropped off load.

10. Controller shall be complete with network connection and software for remote monitoring, alarm signalling and load shedding control via BACNet or other protocols for internet connection. Interconnect with Automatic Transfer Switch’s controller to provide remote monitoring and control access on the same platform as the remote generator control.

11. Controller shall be hard wire connected to internet router as located in the main building, utilizing weatherproof wiring in conduit between buildings.
12. Controller shall have the following remote monitoring capabilities/software/accessories
    - .1 Web and Mobile app able to monitor the customer account and site information along with monitoring asset data (generator, transfer switch and sensors).
    - .2 Web and Mobile app able to control the system with start, stop and fault reset commands.
    - .3 Web and Mobile app able to receive alarm/alert signals from controller.
    - .4 Notification: Cloud capability to notify users through email to users when an event becomes active.
    - .5 User Interface for setup purposes and the web and mobile app monitoring purposes.
    - .6 Event Storage and Export.
    - .7 Data Storage and Export including the graphing of data trends.
    - .8 On Device Diagnostics.
    - .9 Software Update: local and remote software update capability.

1.2 AUTOMATIC TRANSFER SWITCH

.1 See Section 26 36 23.

1.3 STEEL MOUNTING BASE

.1 Complete generator mounted on structural steel base of sufficient strength and rigidity to protect assembly from stress or strain during transportation, installation and under operating conditions on suitable level surface securely to the floor.

.2 Assembly fitted with vibration isolators and control console resiliently mounted.

1. Spring type isolators with adjustable side snubbers and adjustable for levelling.

.3 Sound insulation pads for installation between isolators and concrete base.

1.4 EXHAUST SYSTEM MODIFICATIONS

.1 Provide modifications to existing exhaust system to fit the new generator sizing and location.

.2 Exhaust pipe elbows and other fittings shall be Schedule 20 extra strong resistance, seamless welded steel pipe.

.3 Flanges shall be steel, slip-on. Exhaust pipe shall be sized by supplier of Diesel unit, but shall not be less than that shown.

.4 Elbows shall have long sweep elbows with a radius of five times nominal diameter of pipe. Where space is not available, elbows shall have a radius as great as conditions permit.

.5 Muffler shall provide silencing to residential standards.

.6 Hangers shall be adjustable roller type. Hangers and saddles shall be large enough to suit 63mm (2½") of insulation over piping, seismically rated.

.7 Flexible hose connection of stainless steel at Diesel-engine shall have close pitch corrugations and flanged ends. The flexible hose connection shall be capable of taking up 38mm (1½") movement of Diesel-engine, plus pipe expansion of horizontal run between Diesel-engine and anchor point on horizontal run.

.8 Flexible hose connections shall have sufficient length to handle the movement specified and to handle expansion between anchors in the piping plus not less than 25% safety factor, from 0℃ (32℉) ambient temperature to corresponding exhaust gas temperature.

.9 Where pipe anchors are indicated on horizontal runs, weld suitably braced 38mm (½") thick 150mm (6") wide steel collars to piping. Cover steel with 63mm (2½") thick thermobestos. Insulated surfaces shall bear on anchor steel fastened to building.

.10 Provide pipe guides for the exhaust pipe where indicated and where required. Anchor guides to building in an approved manner.

.11 Provide a complete exhaust piping system including flexible piping, muffler, in an arrangement as shown.

.12 Fit pipe with saddles at hanger locations. Support piping at intervals not greater than 4,500 mm (15'-0"). Provide spring hangers where indicated or where required.

.13 Provide flexible hose connections where indicated or where required.

.14 Installations of flexible hose shall be in accordance with Manufacturer's recommendations.

.15 Slope horizontal of exhaust pipe run back towards Diesel unit 6mm (¼") in 3,000mm (10'-0"). Provide a 150mm (6") dirt pocket, 450mm (18") deep with blind flanged bottom on stack side of muffler. Run a 20 mm (¾") valved drain line from side of dirt pocket to an open drain to permit removal of condensation.

1.5 FUEL SYSTEM MODIFICATIONS

.1 Provide new flexible fuel cable to suit new generator.

1.6 COOLING AIR SYSTEM MODIFICATIONS

.1 The Genset heat rejection system shall be suitable for use with existing system. This contractor shall be responsible for the review of the completed installation and shall report any deficiencies in writing to the Engineer of Record.

1.7 EQUIPMENT IDENTIFICATION

.1 As specified in this document.

1.8 FABRICATION

.1 Shop assemble generating unit including:

1. Base.
2. Engine and radiator.
3. Alternator.
4. Control panel.
5. Battery and charger.
6. Automatic transfer equipment.

1.9 FINISHES

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

.2 Alternator control cubicle: paint inside, exterior to match engine and alternator.

.3 Other ducts and racks grey.

.4 Supply 0.25 L of grey touch-up enamel.

1.10 SOURCE QUALITY CONTROL

.1 Factory test generator set including engine, alternator, control panels, transfer switch and accessories in presence of Client's Representative and Consultant.

.2 Notify Client's Representative and Consultant 20 days in advance of date and location of factory test. If testing facility is not located in the lower mainland, include costs for travel and accommodation for Engineer to witness.

.3 Test procedure:

1. Prepare blank forms and check sheet with spaces to record data and at top of first sheet record:
   - .1 Date.
   - .2 Generator set serial no.
   - .3 Engine, make, model, serial no.
   - .4 Alternator, make, model, serial no.
   - .5 Voltage regulator, make and model.
   - .6 Rating of generator set, kW, kVa, V, A, r/min, Hz.
2. Mark check sheet and record data on forms in duplicate as test proceeds.
3. Client's Representative and Consultant's signature on completed forms to indicate concurrence in results of test.
4. Tests:

.1 With 100% rated load, operate set for 4 hours, taking readings at 30 minutes intervals, and record following:

Time of reading.
Running time.
Ambient temp in degrees C.
Lube oil pressure in kPa.
Lube oil temp in degrees C.
Engine coolant temp in degrees C.
Exhaust stack temp in degrees C.
Alternator voltage: phase 1, 2, 3.
Alternator current: phase 1, 2, 3.
Power in kW.
Frequency in Hz.
Power Factor.
Battery charger current in A.
Battery voltage.
Alternator cooling air outlet temp.

.2 At end of 10 hours run increase load to 110% rated value, and take readings every 15 minutes for 1 hour.

.3 After completion of 4 hours run, demonstrate following shut down devices and alarms:

Over cranking.
Over speed.
High engine temp.
Low lube oil pressure.
Short circuit.
Alternator over voltage.
Low battery voltage, or no battery charge.
Manual remote emergency stop.
High alternator temperature.

5. Next install continuous strip chart recorders to record frequency and voltage variations during load switching procedures. Each load change delayed until steady state conditions exist. Switching increments to include:

.1 No load to full load to no load.

.2 No load to 70% load to no load.

.3 No load to 20% load to no load.

.4 20% load to 40% load to no load.

.5 40% load to 60% load to no load.

.6 60% load to 80% load to no load.

6. Demonstrate:
   .1 Automatic starting of set and automatic transfer of load on failure of normal power.
   .2 Automatic shutdown of engine on resumption of normal power.
   .3 That battery charger reverts to high rate charge after cranking.
7. Demonstrate low oil pressure and high engine temperature shutdown devices operation without subjecting engine to these excesses.

Part 2 26 32 13.01 DIESEL POWER GENERATION - EXECUTION

2.1 INSTALLATION

.1 Locate generating unit and install as indicated.

.2 Modify existing fuel supply system complete with flexible cable to connect to new genset.

.3 Modify existing ventilating air duct system as required.

.4 Complete wiring and interconnections as indicated.

.5 Start generating set and test to ensure correct performance of components.

2.2 FIELD QUALITY CONTROL

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

.2 Notify Client’s Representative and Consultant 20 working days in advance of test date.

.3 Provide fuel for testing and leave full tanks on acceptance.

.4 Demonstrate:

1. Unit start, transfer to load, retransfer to normal power, unit shut down, on "Automatic" control.
2. Unit start and shut down on "Manual" control
3. Unit start and transfer on "Test" control.
4. Unit start on "Engine start" control.
5. Operation of manual bypass switch.
6. Operation of automatic alarms and shut down devices.

.5 Run unit on FULL load for minimum period of 8 hours to show load carrying ability, stability of voltage and frequency, and satisfactory performance of dampers in ventilating system to provide adequate engine cooling.

.6 At end of test run, check battery voltage to demonstrate battery charger has returned battery to fully charged state.

2.3 CLEANING

.1 Clean in accordance with specified requirements.

1. Remove surplus materials, excess materials, rubbish, tools and equipment.
2. Divert unused batteries from landfill to battery recycling facility approved by Client’s Representative and Consultant.
3. Divert unused lubricating oil materials from landfill to oil recycling facility approved by Client’s Representative and Consultant.

4. Divert unused antifreeze from landfill to antifreeze recycling facility approved by Client's Representative and Consultant.

2.4 MAINTENANCE CLEARANCES

.1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer and CSA-B139.

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 32 13.01 Diesel Power Generation.

1.2 REFERENCES

1. CSA International
   - .1 CSA B139-[09], Installation Code for Oil-Burning Equipment.
   - .2 CSA C282-[09], Emergency Electrical Power Supply for Buildings.
2. 164.009-[May 2002], Non-Combustible Materials.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with specified Submittal Procedures.

.2 Product Data:

1. Submit manufacturer's instructions, printed product literature and data sheets for generating equipment and include product characteristics, performance criteria, physical size, finish and limitations.
2. Submit verification of diesel electric technician qualification.
3. Submit commissioning report.

1.4 QUALIFICATIONS

.1 Use qualified diesel electric technician.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Include materials as follows:

4. Conduits and boxes as required.
5. Copper fuel lines and fittings as required.
6. ULC automatic fire shut-off valve.
7. Primary fuel filter/water separator.
8. Insulation for exhaust system.
9. Electrical components as indicated.
10. Wiring material.
11. Antifreeze, ethylene glycol.
12. Diesel fuel; storage and day tank initial fill, plus top-up after testing.

13. Manual IPU bypass switch.
14. Wiring and materials, including necessary rigid steel conduits and fittings for making connections.
15. The power circuit cables will be indicated size of conductor, RW90 (-40 degrees C) cross link polyethylene, multiple conductors of shielded and unshielded PVC jacketed.
16. The control circuit cables will not be less than No. 14, RW90, for single multiple conductors, colour or number coded.
17. Electronic governor control cable shall be minimum size No. 18 stranded copper conductor, shielded complete with drain wire and overall PVC jacket.
18. Battery cable shall be welding cable type, extra flexible, rope stranded copper conductor with neoprene oil-resistant insulation, sized to limit voltage drop to 5% at time of peak load.

2.2 INSULATION

.1 Removable fibreglass jacket insulation rated for 650 degrees C minimum with stainless lacing hooks and wires.

.2 Enclose jacket on inside by stainless steel mesh with outside cover silicone coated or aluminized fibreglass cloth.

.3 Calcium Silicate removable insulation rated for 650 degrees C with exterior stainless steel protective cover and fastenings.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for generating equipment installation in accordance with manufacturer’s written instructions.

19. Visually inspect substrate in presence of Client’s Representative and Consultant.

.2 Inform Client’s Representative and Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Client’s Representative and Consultant.

3.2 LOCATING AND MOUNTING

.1 Locate unit as indicated.

.2 Fit and adjust isolators in accordance with manufacturer's installation and adjustment instruction bulletin contained in unit manual.

.3 Do not bolt housings to foundation if isolator housing feet are equipped with 6 mm rubber sound pads.

3.3 ALIGNMENT CHECK

.1 Since Engine-generator shaft alignment is adjusted at factory, check to ensure that no change has occurred due to shipment and handling.

.2 Where engine and generator housings are close coupled and instruments at hand are not suitable for measuring alignment within confines of housings, just loosen engine and generator hold down bolts and ensure that each foot is carrying proportionate amount of weight and feet are level on base plate.

3.4 BATTERY AND BATTERY CHARGER

.1 Supply and install Batteries and Battery Charger as specified in Section 26 33 43 and 26 33 16.

3.5 CONTROL AND TRANSFER PANEL

.1 Locate panels as indicated.

.2 Make control and power circuit connections as indicated.

.3 Identify cables at both ends.

.4 Tag with slip-on wire maker, each wire end with number corresponding to number in panel.

.5 Make terminations with self-insulated terminals of flanged fork or ring type.

.6 Include for local annunciator to NFPA 110 / CSA 282.

3.6 ADDITIONAL WORKS

.1 Complete any additional work as instructed by Client's Representative and Consultant to:

1. Ensure equipment is safe to operate.
2. Provide complete and operating system.

3.7 FIELD QUALITY CONTROL

.1 Qualified diesel electric technician to: inspect and verify that installation of interruptible power unit is acceptable and complete. Provide inspection report to the Client's Representative and Consultant.

.2 Commissioning: do site commissioning of diesel electric generator unit by qualified diesel electric technician in accordance with specified requirements.

.3 Develop and submit commissioning report including time delay settings, set points and adjustment ranges.

3.8 SYSTEM STARTUP

.1 Preparation: before starting unit, carry out thorough mechanical and electrical inspection of equipment, and perform following checks and adjustments:

1. Disconnect battery cables from batteries to prevent accidental starting.
2. Turn engine several revolutions by means of hand-barring devices to ensure parts are free and there are no obstructions to its running.
3. Check engine/generator alignment readings to ensure they match readings attained at time of manufacture.
4. Check fluid levels and top up as necessary. Pre-lubricate engine and turbochargers as recommended by engine manufacturer. Install drip pan beneath engine.
5. Confirm cooling system antifreeze is effective to at least minus 40 C.
6. Check belts for correct tension and adjust as necessary.
7. Check and grease points.
8. Check and tighten properly nuts, bolts.
9. Confirm safety guards are in place and properly secured.
10. Check linkages for damage and freedom of movement.
11. Check fuel supply system for leakage.
12. Ensure fuel supply and fuel injection systems are properly primed.
13. Check and tighten properly electrical connections.
14. Check starting battery electrolyte level specific gravity and for proper installation.
15. Check battery charger for proper operation and adjust as necessary.
16. Carry out generator winding insulation resistance test. If reading is unacceptable, carry out recognized drying procedure. Do not start unit until satisfactory reading has been achieved.
17. Check jacket coolant heater for proper operation.
18. Complete additional preparations deemed necessary.

.2 Performance verification: on completion of start-up preparations, take following action:

1. Have at hand, during initial start-up, means for choking off air supply to engine air induction manifold in event of engine run away or other emergency.
2. Reconnect starting battery cables to starting battery.
3. Start unit only in presence of Client's Representative and Consultant and allow to warm up. Stop unit if abnormal conditions are encountered.
4. Check for and correct leakage from exhaust system, fuel system, cooling system, and lubricating oil system.
5. Adjust vibration isolators.
6. Observe and confirm lubricating oil pressure and coolant temperature are within limits and no harmful vibration or sounds are evident.
7. Ensure voltage is within operating parameters and automatic voltage regulator is operating correctly.
8. Ensure manual voltage control is operating correctly.
9. Ensure frequency is within operating parameters and electronic governor is operating correctly.
10. Check engine air ventilation system for proper operation.
11. Check operation of engine-mounted protective sensing devices and adjust as necessary.
12. Check phase sequence of Generator A and Generator B and ensure power supply are in same sequence.
13. Check operation of electronic controller protection, transfer, timing, metering, and annunciator functions and adjust as necessary.
14. Check operation and calibration of analog metering and adjust as necessary.
15. Apply electrical load, read the metres, and correlate these readings.
16. Demonstrate:

    .3 Unit start, transfer to load, retransfer to normal power, unit shutdown, on "automatic" control.

    .4 Unit start, transfer to load, retransfer to normal power, unit shutdown, on "test control".

    .5 Unit cranking, start, and shut-down by means of engine-mounted key switch.

    .6 Run unit on full nameplate load for minimum period of 10 hours to show load-carrying capability, stability of voltage and frequency, and satisfactory performance of engine ventilating system to provide adequate cooling, exhaust system.

    .7 Every 1/2 hour carry out and record readings on Test Chart.

17. Perform additional tests as required by Departmental Client's and Consultant to confirm unit is operating satisfactorily.

3.9 CLEANING

.1 Progress Cleaning: clean in accordance with specified requirements.

1. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with specified requirements.

.3 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.10 DEMONSTRATION AND TRAINING

.1 As directed by Client's Representative and Consultant and in accordance with specified requirements carry out demonstrations of complete interruptible power unit.

.2 Deliver familiarization training of operating and maintenance staff.

2. Include instruction to site operation and maintenance staff for proper care, operation, and maintenance of equipment.

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

4. Include fuel required for performing diesel-generator site test and top-up after acceptance test completion.

3.11 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Protect fuel lines from mechanical damage.

.3 Repair damage to adjacent materials caused by electric power generating equipment installation.

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Same as section 26 33 43

.2 Contractor to supply, install and warrant battery against defects in material and workmanship for five years.

1. The warranty shall be for 100% replacement for first year and prorated replacement value in equal yearly decreasing amounts for remaining four (4) years until expiration of warranty at end of five (5) years after delivery of battery.
2. Cells to be warranted for 100% replacement for 60 months against electrolyte leakage and corrosion at post seals.

Part 2 PRODUCTS

2.1 BATTERY CHARACTERISTICS

.1 Nominal battery voltage, full charge, 24 V.

.2 Designed to supply required load current for five start attempts of the specified Generator.

.3 Minimum end voltage: 19 V per cell after discharge at rated load for period specified.

.4 Capable of being recharged in period of eight (8) hours to not less than 95% full charge after supplying rated load for period specified, with no harmful effects on battery, including leaking or foaming of electrolyte.

.5 Battery to deliver specified output at 25 degrees C, in ambient temperature from 20 degrees C to 40 degrees C.

2.2 LEAD ACID BATTERIES

.1 Type: Sealed Absorptive glass microfiber (AGM) valve regulated lead acid.

.2 Electrolyte: solution of sulphuric acid with correct specific gravity at 25C.

.3 Cell containers: fire retardant polycarbonate.

.4 Electrolyte level lines: high and low on container surfaces.

.5 Cover: one piece molded plastic, flame retardant to ANSI/UL 94.

.6 Plate retainers: synthetic fibre.

.7 Plate separators: fibreglass

.8 Posts: bolted type with 4 stainless steel nuts and bolts per cell.

.9 Inter-cell connectors: lead plated copper, bolted to battery posts.

.10 Bolt holes slightly oversized to facilitate cell replacement.

.11 Connectors, bolts and nuts: corrosion resistant.

.12 Cells: of identical construction and from same production run.

.13 Batteries: in clean state with no evidence of electrolyte on outside of cell containers.

2.3 BATTERY RACK

.1 Frames: angle iron with welded joints ground smooth.

.2 Rails: steel channels, bolted to Generator frames.

.3 Plastic strips to insulate rails from cells.

.4 Insulated from ground and floor.

.5 Free standing - not bolted to floor.

.6 Primed and epoxy painted to prevent corrosion.

.7 Corrosion resistant bolts and hardware.

.8 Configuration permitting any one cell to be removed without removing any other cell.

.9 Dimensions of space available as indicated.

2.4 SOURCE QUALITY CONTROL

.1 To CAN3-Z299.3.

.2 Complete battery factory tested in presence of Client's Representative and Consultant.

.3 Connect load designed to fully discharge battery to rated end voltage in 10 min.

.4 Install dc indicating voltmeter and ammeter.

.5 Charge battery to ensure cells fully charged. When voltage reaches steady state, record: ambient temperature, temperature of each cell, voltage of each cell, voltage of battery, specific gravity of each cell.

.6 Discharge battery by applying load for 10 min, and record at 85%, 90%, 95% and 100% of rated discharge time: voltage of battery, load current, voltage of each cell, ambient temperature, battery temperature, specific gravity of few random cells.

.7 At completion of discharge test, recharge battery at maximum specified rate, and record at 15 min intervals: battery voltage, charging current.

.8 At start and finish of charging cycle record ambient and battery temperatures, and specific gravity of each cell.

.9 Submit copy of test results to Client's Representative and Consultant.

Part 3 EXECUTION

3.1 INSTALLATION

.1 Locate and erect battery assembly.

.2 Install battery cells on assembly.

.3 Clean posts and connectors and apply no-oxide grease.

.4 Install inter-cell and inter-tier connectors, and hand tighten nuts in accordance with manufacturer's instructions.

.5 Using torque wrenches, tighten nuts in accordance with manufacturer's recommended value.

.6 Connect battery to load circuit.

3.2 FIELD QUALITY CONTROL

.1 Check battery voltage and specific gravity, of each cell in accordance with manufacturer's instructions.

.2 Float charge battery for 8 hours to ensure battery fully charged and in stable condition.

.3 Discharge battery at rated load for 1 hour.

.4 Check battery voltage at terminals and specific gravity of each cell.

.5 Recharge battery to full charge.

.6 Check battery voltage and specific gravity of each cell.

.7 Leave battery in fully charged state.

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 45 00 – Quality Control.

.3 Section 01 35 29.06 – Health and Safety Requirements.

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

1.2 REFERENCES

.1 Not Used.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

1. Submit manufacturer's instructions, printed product literature and data sheets for battery charger and include product characteristics, performance criteria, physical size, finish and limitations.
2. Charger data: type and capacity, battery charging sequence, current-time data for Silicon Controlled Rectifier (SCR) protective devices, estimated noise level, metering, alarms, controls and efficiency.

.3 Shop Drawings: Charger and control.

.4 Sustainable Design Submittals:

1. Construction Waste Management:

.1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for battery chargers for incorporation into manual.

.3 Operation and maintenance instructions covering design elements, construction features, component functions and maintenance requirements to permit effective operation, maintenance and repair.

.4 Copy of approved shop drawings.

.5 Technical description of components.

.6 Parts lists with catalogue numbers and names and addresses of suppliers.

1.5 DELIVERY, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:

2. Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

3. Store and protect battery charger from nicks, scratches, and blemishes.

4. Replace defective or damaged materials with new.

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

Part 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

.1 The battery charger shall offer accurate, automatic charging of lead-acid and nickel; cadmium batteries. The output voltage shall automatically adjusts to changing input, load, battery and ambient conditions. The battery charger shall prevent over-charging and consequent loss of battery electrolyte. Standard features shall include AC line compensation, precision voltage regulation, current limiting, automatic 2-rate charging, voltmeter and ammeter, temperature compensation and UL Listing. The user interface shall be easy to understand with digital metering, NFPA 110 alarms and a battery fault alarm.

.2 Automatically maintain battery in fully charged state while mains power available. Maintain DC float voltage within plus or minus 1% of setting.

.3 Float charging rate such that after battery has provided full power output for specified duration, charger returns battery to 95% of fully charged state in 8 hours.

.4 Automatic current limiting adjustable between 33% and 110% of normal rating.

.5 Output regulated by sensed battery voltage.

.6 Alarm System, audible noise level not to exceed 65 dBA at 1.5 m.

.7 All digital design, no potentiometers.

.8 Dual microprocessor controlled AC-DC power.

.9 Backwards battery protection.

.10 Auto AC line compensation.

.11 NEMA 1, IP 20 protection rating.

.12 AC isolated from DC.

.13 Battery Temperature Compensation.

.14 On board temperature sensor with remote port.

2.2 CHARGER CHARACTERISTICS

.1 Battery charger: to CAN/CSA C22.2 No.107.2.

.2 Input: 120 Vac, 1 phase, 3 wire, grounded neutral, 60Hz.

.3 Output: 50 A, DC at 24 V, DC, ripple voltage less than 2 %.

2.3 ACCESSORIES

.1 DC voltmeter: switchboard type, accuracy plus or minus 2% of full scale, to measure rectifier output voltage.

.2 DC ammeter: switchboard type, accuracy plus or minus 2% of full scale, to measure rectifier output current.

.3 Relay and alarm for ac power failure with time delay to prevent alarm during short power outages.

.4 Low DC voltage alarm to indicate over discharge 8 hours emergency time available.

.5 High DC voltage alarm and high DC voltage automatic shutdown.

.6 Ground detector relay and alarm.

.7 Equalizing timer: automatic reset type for unattended stations, 28 day period.

.8 Filter to reduce ripple voltage in rectifier output from 2% to 100 mV.

.9 LEDs mounted on front to indicate: failure AC power, low DC voltage, high DC voltage, no rectifier output.

.10 Alarms: audible alarm when any LED indicates trouble. Silence pushbutton not to extinguish trouble light.

.11 Common LED test switch and one common Form C alarm contact.

.12 Cables and connectors.

.13 Temperature compensation system for voltage output, including remote, battery mounted, temperature sensor.

2.4 ENCLOSURE

.1 Housing constructed of rustproof anodized aluminum and tough baked polyester finish.

.2 Access from front.

.3 Convection ventilated.

.4 Meters, indicating lamps and controls group mounted on front panel.

.5 Apply finish in accordance with Section 26 05 00 - Common Work Results for Electrical.

2.5 EQUIPMENT IDENTIFICATION

.1 Identify equipment in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Use size 4 nameplates for major components such as input breakers, output breaker.

.3 Use size 2 nameplates for mode lights alarms, meters.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that installation can be carried out in accordance with manufacturer's written instructions.

.2 Inform Client's Representative and Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Client's Representative and Consultant.

3.2 INSTALLATION

.1 Locate and install battery charger as directed.

.2 Connect input terminals to AC mains.

.3 Connect output terminals to battery.

3.3 TESTS

.1 Energize battery charger and operate until battery shows full charge.

.2 Discharge battery to full discharge condition.

.3 Recharge battery, recording DC voltage and current once per hour for 8 hours. Test battery to ensure it has reached at least 95% full charge.

.4 Continue charging to ensure charger changes from bulk rate to float charge rate.

.5 Demonstrate that automatic timer controls charging and correctly transfers from equalize to float charge after selected period.

.6 Simulate faults to demonstrate that alarm lights and audible alarms are performing as designed.

.7 At end of tests, with battery in fully charged condition, operate charger on "float" for minimum period of 24 hours to ensure stable condition is reached and held.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

6. Leave Work area clean at end of each day.

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

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by battery installation.

END OF SECTION

Part 1 General

1.1 Not Used.

1.2 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 45 00 – Quality Control.

.3 Section 01 35 29.06 – Health and Safety Requirements.

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

1.3 REFERENCES

.1 CSA International

1. CSA C22.2 No.5-[09], Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, NMX-J-266-ANCE-2010).
2. CSA C22.2 No.178.1-2014 Transfer switch equipment.
3. CAN/CSA C60044-1-[07], Instrument Transformers.

.2 National Electrical Manufacturers Association (NEMA)

4. NEMA ICS 2-[1996(R2009)], Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC, Part 8: Disconnect Devices for Use in Industrial Control Equipment.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide new automatic transfer switch, to provide closed transition. Provide for interconnection for close transition operation of stand-by generator without transmission impact. Allow for synchronizing of operation between generators and all required motor operated switches and key-interlocks, required for the dis-connect of generators during system testing. System to be complete in every respect including all required control and interconnections.

.2 Submit details in accordance with specified requirements.

.3 Product Data:

1. Submit manufacturer’s instructions, printed product literature and data sheets for transfer switch and include product characteristics, performance criteria, physical size, finish and limitations.

.4 Shop Drawings:

1. Submit drawings stamped and signed by professional engineer registered or licensed in Yukon, Canada.

.1 Indicate on drawings:

.1 Make, model and type.

.2 Load classification:

.2 Lighting and Power load.

.3 Motor load.

.4 Restricted use: resistance and general loads, 0.8 pf or higher.

.3 Single line diagram showing controls and relays.

.4 Description of equipment operation including:

.1 Automatic starting and transfer to standby unit and back to normal power.

.2 Test control.

.3 Manual control.

.4 Automatic shutdown.

.5 Sustainable Design Submittals:

1. Construction Waste Management:

.1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

.2 Submit calculations on end-of-project recycling rates, salvage, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.

1.5 CLOSEOUT SUBMITTALS

.1 Submit in accordance with specified requirements.

.2 Operation and Maintenance Data: submit operation and maintenance data for transfer switch for incorporation into manual.

.3 Detailed instructions to permit effective operation, maintenance and repair.

.4 Technical data:

2. Schematic diagram of components, controls and relays.

3. Illustrated parts lists with parts catalogue numbers.

4. Certified copy of factory test results.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with specified requirements and with manufacturer’s written instructions.

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

.3 Storage and Handling Requirements:

1. Store materials in dry location and in accordance with manufacturer’s recommendations in clean, dry, well-ventilated area.

2. Store and protect transfer switches from nicks, scratches, and blemishes.
3. Replace defective or damaged materials with new.

Part 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

.1 Under normal operating condition, the automatic transfer switch (ATS) shall:

.1 Provide transfer between the two generators via the transfer switch in a closed transition operation.

.2 System shall be programmed via the control panel and/or the remote interface such that the automatic transfer switch transfer the loads to the alternate generator on a 10-day schedule as reviewed and approved by the building operator.

.2 Under an equipment failure condition, the automatic transfer switch (ATS) shall:

.1 Automatically transfer the building load to the standby generator in the event of the active generator failure.

.2 Automatically respond to the active generator power failure condition by issuing an engine start signal to the standby generator in the system.

.3 Transfer load from active generator to standby generator when standby generator reaches rated frequency of the active generator and voltage pre-set adjustable limits.

.4 At discretion of the building operator, the exterior temporary may be brought into place as a back-up system during repair of faulty generator.

.5 Restore stand system operation upon repair of faulty generator.

.6 Shut down standby unit after running unloaded to cool down using adjustable time delay relay.

.3 The transfer switch shall be furnished in a NEMA Type 12 enclosure, sprinkler proof.

.4 Enclosure door shall have locking type handle.

.5 Transfer switch control power shall be obtained from the source being transferred to. The controls shall not require any connection to external power sources for normal automatic operation. Transfer switches requiring control power solely from the engine starting (or other) batteries are not acceptable.

.6 The transfer switch shall have control plugs for all interconnection to provide superior serviceability. Separate plugs shall be provided for voltage sensing, ATS controller, engine start outputs, programmable I/O and communications. All plugs shall be keyed to prevent incorrect installation.

.7 The automatic transfer switch shall include a fully integrated microprocessor-based Transfer Switch Controller which shall provide the following key features:

.1 Graphical Colour Touch Screen Operator Interface Display

.2 The control panel shall include full programming capabilities including scheduling capabilities.

.3 Open and/or Closed Transition Transfer Control

.4 Gen1/Gen2/Temp. Gen Voltage and Frequency Metering

.5 Load Bus 3 Phase Power Metering

.6 Engine Start Output Contact

.7 Network connection for remote monitoring and control

.8 BACNet Interface, RS485 or other accepted protocol along with internet connection

.9 Full customized software providing remote monitoring and switching control capabilities via internet web based control.

.10 Controller shall be interconnected with the generator/generator controller for monitoring generator load, voltage, current, phase, temperature and fuel tank.

.11 Interconnect with Generator's controller to provide remote monitoring and control access on the same platform as the remote generator control.

.12 Controller shall be hard wire connected to internet router as located in the main building, utilizing weatherproof wiring in conduit between buildings.

.13 Controller shall have the following remote monitoring capabilities/software/accessories

.1 Web and Mobile app able to monitor the customer account and site information along with monitoring asset data (generator, transfer switch and sensors).

.2 ATS status and telemetry information

.8 When the test mode is activated, the ATS shall automatically transfer the building load to the standby generator supply and return the load to the alternate generator upon test completion.

.9 Monitor voltage on phases of normal power supply.

2.2 MATERIALS

.1 Instrument transformers: to CAN/CSA C60044-1.

.2 Contactors: to NEMA ICS2.

2.3 CIRCUIT BREAKER TYPE TRANSFER EQUIPMENT

.1 Circuit Breaker Type Transfer Equipment: to CSA C22.2 No.5.

.2 Rated: 120/208 V, 60Hz, 400 A, 4 wire, solid neutral.

1. Fault withstand rating: 85 kA symmetrical for 3 cycles with maximum peak value of 85 kA.

2. One normal-single 3 pole moulded-case non-automatic circuit breaker, mounted on common base, designed for double throw action, motor operated, mechanically held and interlocked, wall mounted CSA enclosure.

3. Circuit breakers:
   .1 Trip free in closed position.
   .2 Interrupting rating: 85 kA symmetrical.
4. Dead front construction with access to relays and controls for inspection and maintenance, and manual operating lever for transfer switch.
5. Auxiliary contact: to initiate emergency generator start-up on failure of normal power.
6. Solid neutral bar, rated: 400 A.
7. 3 Pole switching complete with solid neutral.

2.4 CONTROLS

.1 Voltage and frequency on both the normal and emergency sources shall be continuously monitored. The normal source pick up shall be set at 95% of the nominal voltage and the emergency source pick up set at 90% of nominal voltage and 95% nominal frequency.

.2 The controller shall be capable (when activated by the keypad or through the serial port) of sensing the phase rotation of both the normal and emergency sources. The source shall be considered unacceptable if the phase rotation is not the preferred rotation selected (ABC or CBA).

.3 Selector switch - 4 position "Test", "Auto", "Manual", "Engine start".

1. Test position - normal power failure simulated. Engine starts and transfer takes place. Return switch to "Auto" to stop engine.
2. Auto position - normal operation of transfer switch on failure of normal power; retransfers on return of normal voltage and shuts down engine.
3. Manual position - transfer switch may be operated by manual handle but transfer switch will not operate automatically and engine will not start.
4. Engine start position - engine starts but unit will not transfer unless normal power supply fails. Switch must be returned to "Auto" to stop engine.

.4 Control transformers: dry type with 120 V secondary to isolate control circuits from:

1. Normal power supply.
2. Emergency power supply.
3. Relays: continuous duty, industrial control type, with wiping action rated 10 A minimum:
   .3 Voltage sensing: 3 phase for normal power and on one phase only for emergency, solid state type, adjustable drop out and pick up, close differential, 2 V minimum under voltage and over voltage protection.
   .4 Time delay: normal power to standby, adjustable solid state, 0 to 60s.

.5 Time delay on engine starting to override momentary power outages or dips, adjustable solid state, 0 to 60 s delay.

.6 Time delay on retransfer from standby to normal power, adjustable 0 to 60 s.

.7 Time delay for engine cool-off to permit standby set to run unloaded after retransfer to normal power, adjustable solid state, 0 to 60 s.

.8 Time delay during transfer to stop transfer action in neutral position to prevent fast transfer, adjustable, 5 s intervals to 180 s.

.9 Frequency sensing, to prevent transfer from normal power supply until frequency of standby unit reaches preset adjustable values.

.10 Neutral disconnected position delay: allow time for motors to delay between live sources, adjustable, 0 to 5 s.

2.5 ACCESSORIES

.1 Ensure pilot lights indicate power availability normal and standby, switch position, green for normal, red for standby, mounted in panel.

.2 Auxiliary relay to provide 2 N.O. and 2 N.C. contacts for remote alarms.

.3 Instruments:

1. Digital true RMS, indicating type 2 % accuracy, indicating the flowing readings for each phase and the summary, flush panel mounting:

   .1 Demand meter kW.

   .2 Power factor.

   .3 Voltmeter: ac, scale 0 to 240 V.

   .4 Ammeter: ac, scale 0 to 400A.

   .5 Frequency meter: scale 55 to 65 Hz.

.4 Current transformers - dry type for indoor use:

1. Ratio: 200 to 5.
2. Rating: 120/208 V, 60Hz, BIL .6 kV.
3. Accuracy rating: 1%.
4. Positive action automatic short circuiting device in secondary terminals.

.5 Manual bypass and isolator: to normal supply to emergency supply to both supplies.

2.6 EQUIPMENT IDENTIFICATION

.1 Identify equipment in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Control panel:

1. For selector switch and manual switch: size 4 nameplates.

2. For meters, indicating lights, minor controls: use size 2 nameplates.

2.7 SOURCE QUALITY CONTROL

.1 Complete equipment, including transfer mechanism, controls, relays and accessories factory assembled and tested in presence of Client's Representative Consultant.

.2 Notify Client's Representative Consultant 5 days minimum in advance of date of factory test.

.3 Tests:

1. Operate equipment both mechanically and electrically to ensure proper performance.
2. Check selector switch, in modes of operation Test, Auto, Manual, Engine Start and record results.
3. Check voltage sensing and time delay relay settings.
4. Check:

.11 Automatic starting and transfer of load on failure of normal power.

.12 Retransfer of load when normal power supply resumed.

.13 Automatic shutdown.

.14 In-phase monitor operation.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate are acceptable for transfer switches installation in accordance with manufacturer's written instructions and as specified.

5. Visually inspect substrate in presence of Client's Representative Consultant.
6. Inform Client's Representative Consultant of unacceptable conditions immediately upon discovery.
7. Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Client's Representative Consultant.

3.2 INSTALLATION

.1 Locate, install and connect transfer equipment.

.2 Check relays solid state monitors and adjust as required to ensure correct operation.

.3 Install and connect battery and remote alarms.

.4 Power Cabling: All power cabling entering/exiting the transfer switch enclosure shall be installed in suitably sized conduit per NEC/CEC requirements. Ampacity, type and voltage rating of all power conductors shall also comply with NEC/CEC requirements and local authorities having jurisdiction. To ensure satisfactory installation of this equipment, all power cabling connections shall utilize approved lugs and shall be adequately torqued as specified by the ATS manufacturer. All mechanical and electrical connections shall be checked for tightness prior to placing this equipment in service to ensure proper operation and to validate applicable warranty coverage.

.5 Control Wiring: All control wiring for engine start, load shed, alarm and remote test shall be installed in separate conduits from all power cabling and shall be suitably sized conduits per NEC/CEC requirements. All control wiring shall be sized for minimum #18 AWG. Control wiring type and voltage rating shall also comply with NEC/CEC requirements and local authorities having jurisdiction. All field wiring/communication cabling that maybe field installed directly onto any ATS door mounted components shall be suitably routed and protected across the door hinge to prevent possible mechanical damage upon door opening and/or door closing.

.6 Generator Set Automatic Starting: The transfer switch shall operate in conjunction with any generator set with remote automatic starting capabilities utilizing a 2 wire, remote start control contact input. A dry contact shall be provided for remote generator starting control (contact shall close to start generator and shall opens to stop generator).

.7 Remote monitoring system shall include min 4 custom client specific display screens indicating monitoring data and control functions, password protected. Also include for min 2 x 4 hour client training sessions on site as well as at remote location (Vancouver BC).

3.3 FIELD QUALITY CONTROL

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

.2 Energize transfer equipment from normal power supply.

.3 Set selector switch in "Test" position to ensure proper standby start, running, transfer, retransfer. Return selector switch to "Auto" position to ensure standby shuts down.

.4 Set selector switch in "Manual" position and check to ensure proper performance.

.5 Set selector switch in "Engine start" position and check to ensure proper performance. Return switch to "Auto" to stop engine.

.6 Set selector switch in "Auto" position and open normal power supply disconnect. Standby should start, come up to rated voltage and frequency, and then load should transfer to standby. Allow to operate for 10 minutes, then close main power supply disconnect. Load should transfer back to normal power supply and standby should shutdown.

.7 Repeat, at 1 hour intervals, 2 times, complete test with selector switch in each position, for each test.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with specified requirements.

1. Leave Work area clean at end of each day.
2. Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with specified requirements.
3. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 45 00 – Quality Control.

.3 Section 01 35 29.06 – Health and Safety Requirements.

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

1.2 REFERENCES

.1 CSA International

.1 CSA C22.2 No.5-[09], Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, NMX-J-266-ANCE-2010).

.2 CSA C22.2 No.178.1-2014 Transfer switch equipment.

.2 National Electrical Manufacturers Association (NEMA)

1. NEMA ICS 2-[1996(R2009)], Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC, Part 8: Disconnect Devices for Use in Industrial Control Equipment.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide a new manual (non-automatic) transfer switch; 400A, 120/208V 3ϕ to provide a closed transition.

.2 Submit details in accordance with specified requirements.

.3 Product Data:

.1 Submit manufacturer’s instructions, printed product literature and data sheets for transfer switch and include product characteristics, performance criteria, physical size, finish and limitations.

.4 .Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Yukon, Canada.

.1 Indicate on drawings:

.1 Make, model and type.

.2 .Load classification:

.1 Lighting and Power load.

.2 Motor load.

.3 Restricted use: resistance and general loads, 0.8 pf or higher.

.3 Single line diagram showing controls and relays.

.5 Sustainable Design Submittals:

.1 Construction Waste Management:

.1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

.2 Submit calculations on end-of-project recycling rates, salvage, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with specified requirements.

.2 Operation and Maintenance Data: submit operation and maintenance data for transfer switch for incorporation into manual.

.3 Detailed instructions to permit effective operation, maintenance and repair.

.4 Technical data:

.1 Schematic diagram of components, controls and relays.

.2 Illustrated parts lists with parts catalogue numbers.

.3 Certified copy of factory test results.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with specified requirements and with manufacturer's written instructions.

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

.3 Storage and Handling Requirements:

.1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect transfer switches from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

.1 Non-Automatic Transfer Switch (NATS) shall be electrically operated by integrally mounted pushbuttons. The transfer switch shall consist of completely enclosed contact assemblies. Control power for electrical operation shall be derived from a control power transformer connected to the line side of the source to which the load is being transferred. Transfer switch shall have pilot lights that indicate the following:

.1 "Electrical Panel"

.2 "Load Bank"

.3 "Generator" Power

.2 Non-automatic transfer switch shall be mechanically held. The transfer switch unit shall include both electrical and mechanical interlocks to prevent both sets of main contacts from being closed at the same time. Main operators which include over current disconnect devices or do not include electrical and mechanical interlocks shall not be accepted.

.3 Non-automatic transfer switch shall be positively locked and unaffected by the momentary outages, so that contact pressure is maintained at a constant value and contact temperature rise is minimized for maximum reliability and operating life.

.4 Transfer switches shall be capable of being operated manually under full rated load conditions. Removable manual operating handles are not acceptable. Manual operators requiring source or load disconnection prior to manual operation are not acceptable.

.5 On transfer switches requiring a fourth pole for switching the neutral, the neutral shall be fully rated with equal withstand, closing and interrupting ratings to the power poles. Switched neutral poles which are add-on or overlap, or that are not capable of breaking full rated load current are not acceptable

.6 Inspections of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors.

.7 The transfer switch shall be furnished in a NEMA Type 12 enclosure, sprinkler proof.

.8 Enclose door shall have locking type handle.

.9 The transfer switch shall be 100% equipment rated for continuous duty as shown on the drawings and shall conform to the applicable requirements of UL 1008 for emergency system total load.

.10 The manual transfer switches shall be fully rated for all types of loads, inductive and resistive, without over-sizing, either open or enclosed.

.11 Additional features and requirements

.1 A mult-position momentary- type test switch shall be provided for the test / automatic / reset modes. The test position will simulate a normal source failure. The reset positions shall bypass the time delays on either transfer to emergency or retransfer to normal. Switches which require utilizing the keypad and display function of have no manual time delay bypass means are not acceptable.

.1 Electrical Panel

.2 Generator

.3 Load Bank

.12 Provide a controller for network connection for remote monitoring and control

.13 Controller shall be complete with BACNet Interface, RS485 or other accepted protocol for internet connection

.14 Controller shall be complete with full software providing remote monitoring and switching control capabilities via internet

.15 Controller shall be interconnected with the generator/generator controller for monitoring generator load, voltage, current, phase, temperature and fuel tank.

.16 Non-automatic transfer switch shall be as manufactured by ASCO or Thompson technologies or approved equivalent.

2.2 CIRCUIT BREAKER TYPE TRANSFER EQUIPMENT

.1 Circuit Breaker Type Transfer Equipment: to CSA C22.2 No.5.

.2 Rated: 120/208 V, 60Hz, 400 A, 4 wire, solid neutral.

.1 Fault withstand rating: 85 kA symmetrical for 3 cycles with maximum peak value of 85 kA.

.2 One normal-single 3 pole moulded-case non-automatic circuit breaker mounted on common base, designed for double throw action, motor operated, mechanically held and interlocked, wall mounted CSA enclosure.

.3 One emergency -single 3 pole moulded-case circuit breaker with thermal magnetic trip, motor operated, and interlocked.

.4 Circuit breakers:

.1 Trip free in closed position.

.2 Interrupting rating: 85 kA symmetrical.

.5 Dead front construction with access to relays and controls for inspection and maintenance, and manual operating lever for transfer switch.

.6 Auxiliary contact: to initiate emergency generator start-up on failure of normal power.

.7 Solid neutral bar, rated: 400 A.

.8 3 Pole switching complete with solid neutral.

2.3 EQUIPMENT IDENTIFICATION

.1 Identify equipment in accordance with Section 26 05 00 - Common Work Results for Electrical.

.1 Size 4 nameplates.

2.4 SOURCE QUALITY CONTROL

.1 Complete equipment, including transfer mechanism, controls, relays and accessories factory assembled and tested in presence of Client’s Representative Consultant.

.2 Notify Client’s Representative Consultant 5 days minimum in advance of date of factory test.

.1 Tests:

.1 Operate equipment both mechanically to ensure proper performance.

.2 Check selector switch in all modes of operation

.3 Start and record results.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate are acceptable for transfer switches installation in accordance with manufacturer's written instructions and as specified.

.2 Visually inspect substrate in presence of Client's Representative Consultant.

.3 Inform Client's Representative Consultant of unacceptable conditions immediately upon discovery.

.4 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Client's Representative Consultant.

3.2 INSTALLATION

.1 Locate, install and connect transfer equipment.

.2 .Install and connect remote alarms.

3.3 FIELD QUALITY CONTROL

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

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with specified requirements.

.2 Leave Work area clean at end of each day.

.3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with specified requirements.

.4 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

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

.3 Section 26 05 00 – Common Work Results for Electrical.

1.2 PRODUCT DATA

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

.2 CSA C22.2 No. 0.3-09 Test Methods for Electrical Wires and Cables.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Packaging Waste Management: remove for reuse and recycle in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 BUILDING WIRES

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

.2 Copper conductors: size as indicated, with 600 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE Jacketted.

.3 Copper conductors: size as indicated, with thermoplastic insulation type TWH rated at 600 V.

.4 Neutral supported cable: 3 phase insulated conductors of Copper and one neutral conductor of Copper steel reinforced, size as indicated. Type: NS90 Insulation: Type NS-1 rated 300 V

2.2 CONDUCTORS, WIRES AND CABLES

.1 All conductors are to be copper conductors. All AWG sizes given in this specification refer to the copper AWG size.

.2 Wiring installed in conduit, unless otherwise noted, to be 600 volt RW-90 X-Link. Wiring in channel back of fluorescent luminaires to be 600 volt type GTF or TEW.

.3 Use copper wiring, minimum No. 12 gauge for lighting and power wiring. Size wires for 2% maximum voltage drop to farthest outlet on a loaded circuit.

2.3 TECK 90 CABLE

.1 Cable: in accordance with Section 26 05 00 – Common Work Results for Electrical.

.2 Conductors:

.1 Grounding conductor: copper as indicated.

.2 Circuit conductors: copper as indicated, size as indicated.

.3 Insulation:

.1 Ethylene propylene rubber EP.

.2 Cross-linked polyethylene XLPE.

.3 Rating: , 600V.

.4 Inner jacket: polyvinyl chloride material.

.5 Armour: aluminum.

.6 Overall covering: thermoplastic polyvinyl chloride

.7 Fastenings:

.1 One hole steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.

.2 Channel type supports for two or more cables at 1200mm centers.

.3 Threaded rods: 6 mm diameter to support suspended channels.

.8 Connectors:

.1 Watertight approved for TECK cable.

2.4 ARMOURED CABLES

.1 Conductors: insulated, copper, size as indicated.

.2 Type: AC90

.3 Armour: interlocking type fabricated from galvanized steel strip.

.4 Type: PVC jacket over armour and compliant to applicable Building Code classification for this project.

.5 Connectors: anti short connectors.

2.5 CONTROL CABLES

.1 Type: LVT: 2soft annealed copper conductors, sized as indicated:

.1 Insulation: thermoplastic.

.2 Sheath : thermoplastic jacket.

.2 Type: low energy 300 V control cable: solid annealed copper conductors sized as indicated LVT: 2 soft annealed copper conductors, sized as indicated:

.1 Insulation: PVC.

.2 Shielding: tape coated with paramagnetic material over each conductor

.3 Overall covering: PVC jackets

.3 Type: 600 V stranded annealed copper conductors, sizes as indicated:

.1 Insulation: PVCWH

.2 Shielding: magnetic tape.

.3 Overall covering: thermoplastic jacket.

Part 3 Execution

3.1 FIELD QUALITY CONTROL

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

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

.3 Perform tests before energizing electrical system.

3.2 WIRING METHODS

.1 Install wiring in conduit unless otherwise specified.

.2 Use rigid galvanized steel conduit for wiring in poured concrete, or where conduit could be exposed to mechanical injury.

.3 Conduit is to be of sufficient size to permit easy removal of conductors at any time. Conduit sizes, where shown, are minimum and shall not be reduced. Do not bend conduit over sharp objects. Improperly formed bends and running threads will not be accepted. Do not use bends and fittings together.

.4 Run conduit and cables in unfinished areas, such as fan rooms and penthouses, exposed and install at right angles or parallel to building lines, accurate in line and level.

.5 Runs of conduit and cables, where shown are indicated only by general location and routing. Install conduits and cables to provide maximum head room and to interfere as little as possible with free use of spaces through which they pass. Install as close to building structure as possible, so that, where concealed, necessary furring can be kept to a minimum. Arrange conduits, installed in suspended ceilings, to provide minimum interference with removal of tiles.

.6 Install conduit and cables to avoid proximity to water and heating pipes. They are not be run within 152.4 mm (6") of such pipes except where crossings are unavoidable, in which case they are to be kept at least 25 mm (1") from covering of pipe crossed.

.7 Provide expansion joint sleeves with ground jumpers in conduit runs where they cross building expansion joints.

.8 Provide a minimum of one (1) hour fire protection around all emergency service feeders routed through non fire rated rooms in accordance with CAN/CSA – C282-M89.

3.3 GROUNDING

.1 Ground electrical equipment and wiring in accordance with Canadian Electrical Code and Local Inspection Authority's Rules and Regulations.

.2 Condition or existence of grounding of existing luminaries must be reviewed and proper grounding confirmed. Inform Consultant if ungrounded luminaries or service feeder to luminaires are identified.

3.4 CONDUCTORS, WIRES AND CABLES

.1 Colour code all conductors. Conductors No. 2 gauge and smaller to have colour impregnated into insulation at time of manufacture. Conductors size larger than No. 2 gauge may be colour coded with adhesive colour coding tape but only black insulated conductors are to be employed in this case, except for neutrals which are to be white whenever possible. Conductors of No. 8 gauge and larger must be stranded.

.2 Colour code as follows:

Phase “A”	Red	Ground	Green
Phase “B”	Black	Neutral	White
Phase “C”	Blue	Control	Orange

.3 Neutral conductors may be identified by a coloured insulation with three or more extruded longitudinal white stripes along the insulation, and will be deemed to have a white or natural covering. All neutral conductors used in the Work must match building standard.

.4 Neatly train circuit wiring in cabinets, panels, pull boxes and junction boxes and hold with nylon cable ties.

.5 Splice wire, up to and including No. 6 gauge, with twist-on style connections rated minimum 600 volts (1000 volts in luminaires). Connection body to be moulded of thermoplastic. Spring insert to have an expandable square-edge. Splice large conductors using split-bolt or compression type connections wrapped with PVC tape.

.6 Where colour coding tape is utilized, it is to be applied for a minimum of 50.8 mm (2”) at terminations, junction and pull boxes and condulet fittings. Do not paint conductors under any circumstances. Colour coding also applies to bussing in panels.

3.5 EQUIPMENT AND WIRING TESTING

.1 Make tests of equipment and wiring at time requested.

.2 Tests are to include measured insulation values, voltage and current readings to determine balance of panels and feeders under full load, and operation of each piece of equipment for correct operation.

.3 Supply meters, materials and personnel as required, to carry out these tests.

.4 Test electrical work to standards and function of Specification and applicable codes in an approved manner. Replace defective equipment and wiring with new material and leave entire system in complete first class operating condition.

.5 Connect single phase loads so that there is the least possible unbalance of the supply phases.

.6 Where specialized equipment or controls systems requiring commissioning are installed as part of Work, arrange and pay for services of manufacturer’s factory service engineer / technician to supervise initial start-up or calibration of such equipment or controls. Engineer / technician shall check systems installation and verify operation is correct or shall adjust, balance and calibrate components, or direct installer to perform these tasks, including installation related wiring and operation of controls, to the satisfaction of the engineer / technician and the Consultant.

.7 Instruct Owner's operating personnel in the operation of the installations. Provide these services for such periods, and for as many visits as may be necessary to put applicable portion of installation in complete working order, and to ensure that Owner's operating personnel are fully conversant with every aspect of the operation, care and maintenance thereof.

3.6 GENERAL CABLE INSTALLATION

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

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

.3 Conductor length for parallel feeders to be identical.

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

.5 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.

.6 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

3.7 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:

.1 In conduit systems in accordance with Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.

3.8 INSTALLATION OF TECK90 CABLE (0 -1000 V)

.1 Group cables wherever possible on channels.

.2 Install cable concealed, securely supported by straps or hangers.

3.9 INSTALLATION OF ARMOURED CABLES

.1 Group cables wherever possible on channels.

3.10 INSTALLATION OF CONTROL CABLES

.1 Install control cables in conduit.

.2 Ground control cable shield.

END OF SECTION

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PRELIMINARY HAZARD ASSESSMENT FORM

Project Number: R.0	
Location:	Little Gold Creek, CBSA, P.O.E, Y.T.
Date:	
Name of Departmental Representative:	Mike Gilbert (PWGSC)
Name of Client:	Canada Border Service Agency (CBSA)

Site Specific Orientation Provided at Project Location ☐ **Yes**

Notice of Project Required ☐ **Yes**

NOTE:
PWGSC REQUIRES A Notice of Project FOR ALL CONSTRUCTION WORK RELATED ACTIVITIES

NOTE:
OHS law is made up of many municipal, provincial, and federal acts, regulations, bylaws and codes. There are also many other pieces of legislation in British Columbia that impose OHS obligations.

Important Notice: This hazard assessment has been prepared by PWGSC for its own project planning process, and to inform the service provider of actual and potential hazards that may be encountered in performance of the work. PWGSC does not warrant the completeness or adequacy of this hazard assessment for the project and the paramount responsibility for project hazard assessment rests with the service provider.

TYPES OF HAZARDS TO CONSIDER	Potential Risk for:				COMMENTS
Examples: Chemical, Biological, Natural, Physical, and Ergonomic Listed below are common construction related hazards. Your project may include pre-existing hazards that are not listed. Contact the Regional Construction Safety Coordinator for assistance should this issue arise.	**PWGSC, OGD's, or tenants**		**General Public or other contractors**		Note: When thinking about this pre-construction hazard assessment, remember a **hazard** is anything that may cause harm, such as chemicals, electricity, working from heights, etc; the **risk** is the chance, high or low, that somebody could be harmed by these and other hazards, together with an indication of how serious the harm could be.
	Yes	**No**	**Yes**	**No**	
Typical Construction Hazards					
Concealed/Buried Services (electrical, gas, water, sewer etc)	No		Yes		
Slip Hazards or Unsound Footing		no		no	
Working at Heights		no		no	
Working Over or Around Water		no		no	
Heavy overhead lifting operations, mobile cranes etc.		no	Yes		
Marine and/or Vehicular Traffic (site	yes		Yes		

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vehicles, public vehicles, etc.	Yes		Yes		
Fire and Explosion Hazards		No	Yes		
High Noise Levels		No	Yes		
Excavations		No		no	
Blasting		No		no	
Construction Equipment		No	Yes		
Pedestrian Traffic (site personnel, tenants, visitors, public)	yes				
Multiple Employer Worksite		no		no	Example: Contractor working in an occupied Federal Employee space.

Electrical Hazards					**Comments**
Contact With Overhead Wires		No		no	
Live Electrical Systems or Equipment		No	Yes		
Other:					
Physical Hazards					
Equipment Slippage Due To Slopes/Ground Conditions		no		no	
Earthquake	yes		Yes		
Tsunami		no		no	
Avalanche	yes		Yes		
Forest Fires		no		no	
Fire and Explosion Hazards		no	Yes		
Working in Isolation	yes		Yes		
Working Alone		no		no	
Violence in the Workplace	yes			no	
High Noise Levels	yes		Yes		
Inclement weather	yes		Yes		
High Pressure Systems		no		no	
Other:					
Hazardous Work Environments					
Confined Spaces / Restricted Spaces PSPC employees do not enter confined space.		No		no	If available, provide the contractor with the existing confined space assessment(s) for information only. Contractor must perform their own confined space assessment as per provincial regulations.
Suspended / Mobile Work Platforms		no		no	
Other:					
Biological Hazards					
Mould Proliferations		no		no	
Accumulation of Bird or Bat Guano		no		no	
Bacteria / Legionella in Cooling Towers / Process Water		no		no	
Rodent / Insect Infestation		no		no	
Poisonous Plants		no		no	
Sharp or Potentially Infectious Objects in Wastes	yes		Yes		
Wildlife	yes		Yes		Wildlife may be on roads

Chemical Hazards					
Asbestos Materials on Site		no		no	
Designated Substance Present		no		no	
Chemicals Used in work		no		Yes	
Lead in paint		no		no	
Mercury in Thermostats or Switches		no		no	
Application of Chemicals or Pesticides		no		no	
PCB Liquids in Electrical Equipment		no		Yes	
Radioactive Materials in Equipment		no		no	
Other:					
Contaminated Sites Hazards					
Hazardous Waste		no		No	
Hydrocarbons		no		No	
Metals		no		No	
Other:					

Security Hazards					Comments
Risk of Assault	yes			no	
Other:					
Other Hazards					

Other Compliance and Permit Requirements	YES	NO	Notes / Comments[2]
Is a Building Permit required?			
Is an Electrical permit required?			
Is a Plumbing Permit required?			
Is a Sewage Permit required?			
Is a Dumping Permit required?			
Is a Hot Work Permit required?			
Is a Confined Space Entry Permit required?			Mandatory for all Confined Spaces
Is a Confined Space Entry Log required **Discharge Approval for treated water required**			Mandatory for all Confined Spaces
Notes:			

Service Provider Acknowledgement: We confirm receipt and review of this Pre-Project Hazard Assessment and acknowledge our responsibility for conducting our own assessment of project hazards, and taking all necessary protective measures (which may exceed those cited herein) for performance of the work.			
Service Provider Name			
Signatory for Service Provider		**Date Signed**	
RETURN EXECUTED DOCUMENT TO PSPC DEPARTMENTAL REPRESENTATIVE PRIOR TO ANY WORK COMMENCING			

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Confirmation of Constructor's Role and Responsibilities Under the Yukon Territories Occupational Health and Safety Act and *Worker's Compensation Act*

Name and Location of Project: Owner: Government of Canada – Canada Border Services Agency

Constructor: Consulting Engineer: (if applicable)

	YES	NO
1.The Contractor acknowledges appointment as Constructor on the construction project noted below	☐	☐
2.The name of the Constructor's Qualified Coordinator of occupational health and safety activities for this project has been submitted to the Owner and is as shown below.	☐	☐
3. The Constructor understands that in any conflict of directions, WCB OH&S Regulations and/or the Worker's Compensation Act shall prevail.	☐	☐
4. The Constructor understands and will direct that all supervisors/coordinators must immediately report any apparent conflict as described above.	☐	☐
5. The Constructor agrees that their supervisor shall immediately notify the PSPC Departmental representative of any reported conflict.	☐	☐
6. The Constructor has requested and received information from the Owner regarding any known hazards to the health and safety of persons pre-existing at the workplace.(Pac Region Preliminary Hazard Assessment Form)	☐	☐
7. The Constructor has conducted or will perform an inspection of the workplace to verify the presence of any hazards.	☐	☐
8. The Constructor will communicate hazards information to any persons who may be affected and ensure that appropriate measures are taken to effectively control or eliminate the hazards.	☐	☐
9. The Constructor accepts that written documentation such as notes, records, inspections, meeting minutes, etc., on all health and safety issues must be available upon request to the PSPC departmental representatives and/or to a WCB officer at the workplace.	☐	☐
10. The Constructor will confirm that all workers are suitably trained and competent to perform the duties for which they have been assigned.	☐	☐
11. The Constructor confirms that safety orientation of all young and new workers will be conducted.	☐	☐
12. The Constructor's written Safety Program has been provided to the Owner's representative.	☐	☐
13. The Constructor confirms that meetings to exchange information on any safety issues, concerns, hazards or safety directives will be conducted weekly or more often if required.	☐	☐
14. The Constructor confirms that before the commencement of work, crews will attend a daily crew safety meeting.	☐	☐
15. The Constructor confirms that their supervisor has assessed and will coordinate the workplace first-aid requirements	☐	☐
16. The Constructor confirms that the procedure to transport injured workers is established	☐	☐

Constructor's Representative's Name:_____

Title:_____ Signature:_____ Date:_____

Constructor's OH&S Coordinator Name:_____

Title:_____ Signature:_____ Date:_____

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