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Garden Bay Waterworks District
Garden Bay Road P122

Generator Replacement Specifications

Prepared for: Sunshine Coast Regional District
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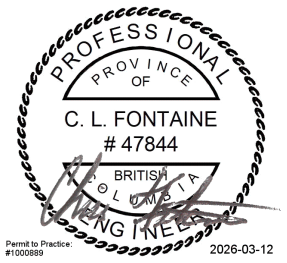
Part 1 General

1.1 PROFESSIONAL SEALS

Discipline	Responsibility	Seal
Electrical	Divisions 01, 26	

Part 2 Products - NOT USED

Part 3 Execution - NOT USED

END OF SECTION

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

.1 Obtain all required permits including: building, electrical, and all subtrades, as required.

.2 Engage a structural engineer to complete concrete pad design and provide letters of assurance.

.3 Confirm all new equipment sizes, locations, cable routings, stub-out conduit duct locations within the building.

.4 Provide new generator and concrete pad for generator.

.5 Provide new ATS.

.6 Provide a status output signal from the automatic transfer switch and connect to the existing SCADA system for monitoring such that SCADA system indicates whether generator is on/off. Test to ensure that the signal is active and functioning as intended as part of generator/ATS commissioning. Coordinate with the SCADA technician on site.

.7 Perform on site commissioning steps.

.8 Provide restoration of all earth works completed on site. Site shall be restored to original state after completion of work. Work is to include the fire stopping and sealing of all building penetrations required for scope of work.

.9 Provide all documentation including Operating and Maintenance manuals.

.10 Provide one (1) full size copy of the up-dated single line diagram mounted under clear framed Perspex or Tampered Glass on the wall in the Electrical Room.

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 CONTRACTOR USE OF PREMISES

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

.1 Owner occupancy during the construction period.

.2 Co-ordinate use of premises under direction of the Owner.

.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.

1.4 OWNER OCCUPANCY

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

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

1.5 WORK IN EXISTING BUILDINGS

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

.2 Obtain approval from the Owner prior to penetrating any structural surfaces including floor slabs. Obtain from the Owner 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.

.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 shutdowns, in order to maintain the Owner's operation.

1.6 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 Owner of intended interruption of services and obtain required permission.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 USE OF SITE AND FACILITIES

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

.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.

1.2 EXISTING SERVICES

.1 Notify the Owner's Representative and Consultant of intended interruption of services and obtain required permission.

.2 Where Work involves breaking into or connecting to existing services, give the Owner 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.

1.3 SPECIAL REQUIREMENTS

.1 Work may occur during normal work hours, provided that such work is not noisy or disruptive to operations.

.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.

1.4 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.

.2 CCDC 2 – 2020 GC 3.8 and Owner's Supplemental Condition SC14

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 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.

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

.5 Verify field measurements and affected adjacent Work are co-ordinated.

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

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

.8 Keep one (1) 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 Provide all shop drawings at one time, unless extenuating circumstances temporarily delay obtaining of a minor number of drawings.

.4 Allow fourteen (14) business days for Consultant's review of each submission.

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

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

.7 Accompany submissions with transmittal letter, containing:

.1 Date.

.2 Project title and number.

.3 Contractor's name and address.

.4 Identification and quantity of each shop drawing, product data and sample.

.5 Other pertinent data.

.8 All shop drawings are to be produced by manufacturer, manufacturer representative, or manufacturer agent. Drawings are **NOT** to be produced by other parties in the distribution chain without written acceptance of such actions by the Consultant.

.9 Manufacturer’s printed data sheets for standard items are acceptable, provided that pertinent characteristics are identified and related to specified items.

.10 Submission of **scanned catalogue pages, website information sheets or product brochures** that **do not** contain relevant technical details, drawings / depictions and notations are **NOT** acceptable and will result in rejection of submissions.

.11 Submission of drawings that are improperly labelled, not labelled, or that are deemed unsightly shall be rejected.

.12 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.

.13 If above requirements are not complied with, **shop drawings will be rejected and returned forthwith**

.14 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.

.15 After Consultant's review, distribute copies.

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

.17 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.

.18 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

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

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

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

.22 Delete information not applicable to project.

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

.24 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.

.25 Do not have products or equipment delivered to site until a shop drawing for the item have been reviewed, stamped as "Reviewed" or "Reviewed as 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 (3) 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 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 – NOT USED

Part 3 Execution

3.1 GENERAL

.1 Submittals shall be submitted promptly and in an orderly sequence so as to not cause delay in the Work. No extension of the contract time, or any standby claims will be considered should the Contractor fail to submit the required Submittals in the required time.

.2 The Contractor shall review submittals prior to submission to the Consultant. This review represents that all the necessary requirements have been determined and verified, and that each submittal has been checked and coordinated with the requirements of the Work and the Contract Documents. Submittals not stamped, signed, dated and identified by the Contractor will be returned without being examined and will be considered rejected.

.3 The Contractor is responsible for the accuracy and completeness of information submitted. The Contractor shall notify the Consultant in writing of materials, equipment or methods of work that deviates from the Contract Documents.

.4 Once reviewed the Contractor shall keep one (1) copy of each approved submittal on site.

3.2 SUBMITTALS FOR REVIEW

.1 All submittals shall be submitted by the Contractor to the Consultant for review, except where specified to be submitted for information only.

.2 Submittals for review will be returned to the Contractor with one (1) of the following notations:

.1 "Reviewed" - Material or equipment complies with the Contract Documents. In this event, the Contractor may begin to implement the work method or incorporate the material or equipment covered by the submittal.

.2 "Reviewed as Modified" - Indicates limited modifications are required. The Contractor may begin implementing the work method or incorporating the material and equipment covered by the Submittal in accordance with the noted corrections. Where submittal information will be incorporated in operation and maintenance data, the Contractor shall provide a corrected copy.

.3 "Revise and Resubmit" Indicates that the submittal is insufficient or contains incorrect data. The Contractor shall not undertake work covered by this submittal until it has been revised, resubmitted and returned marked either "Reviewed" or "Reviewed as Modified".

.4 "Rejected - See Remarks" – Indicates that the material, equipment, or work method does not comply with the Contract Documents. The Contractor shall not undertake the work covered by such submittals until a new submittal is made and returned marked either "Reviewed" or "Reviewed as Modified".

.3 Where it is known by the Contractor that a submittal does not comply with the Contract documents, the deviation from compliance shall be clearly marked. Failure to do so may result in the submittal being rejected.

.4 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.

.5 If any materials or equipment noted as "Revise and Resubmit" or "Rejected", or as "Reviewed as Modified" without the required modifications as noted, are installed on the project, these materials or equipment shall be removed and replaced with accepted material or equipment by the Contractor at no additional cost to the Owner.

.6 The Owner may deduct, from payments due to Contractor, costs of additional Engineering reviews incurred if shop drawings and data sheets are not corrected after two (2) reviews by the Consultant.

3.3 SUBMITTALS FOR INFORMATION ONLY

.1 'Submittals for information only' will be used by the Consultant for general information and filed without comment. The Consultant retains the right to return 'Submittals for information only' if the submittal does not comply with the Contract Documents and general design criteria.

.2 'Submittals for information only' are not subject to review procedures. They are to be provided as part of the Work under the Contract and their acceptability determined under normal inspection procedures.

.3 Request for Material Substitution

.1 Submittals for substitution shall contain sufficient technical detail to allow the Consultant to determine if the proposed product is truly equivalent or better than the specified product. Submittals lacking detail will not be considered.

.2 Submittals shall also contain any details on cost savings to the Corporation, should the substitution be approved.

.3 The final decision on the use of the proposed product, or material is at the sole discretion of the Consultant.

.4 All requests for material substitutions must be submitted no later than three (3) business days prior to the close of tender or request for pricing.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

1.2 REFERENCES

.1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations

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

.1 Material Safety Data Sheets (MSDS).

.3 Province of British Columbia

.1 Workers Compensation Act

1.3 FILING OF NOTICE

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

1.4 SAFETY ASSESSMENT

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

1.5 MEETINGS

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

1.6 GENERAL REQUIREMENTS

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

1.7 RESPONSIBILITY

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

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

1.8 COMPLIANCE REQUIREMENTS

.1 Comply with Workers Compensation Act, B.C. Reg.

.2 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

1.9 UNFORSEEN HAZARDS

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

1.10 POSTING OF DOCUMENTS

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

1.11 CORRECTION OF NON-COMPLIANCE

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

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

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

1.12 WORK STOPPAGE

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

Part 2 Products

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 35 29.06 – Health and Safety Requirements.

1.2 REFERENCES

.1 Canadian Construction Documents Committee (CCDC)

.1 CCDC 2-2020, Stipulated Price Contract.

1.3 INSPECTION

.1 Refer to CCDC 2, GC 2.3.

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

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

.4 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.

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

1.4 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.

1.5 PROCEDURES

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

1.6 REJECTED WORK

.1 Refer to CCDC, GC 2.4.

.2 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 or Consultant as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.

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

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

Part 2 Products - NOT USED

Part 3 Execution - NOT USED

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 01 45 00 – Quality Control.

1.2 REFERENCES

.1 Canadian Construction Documents Committee (CCDC)
  .1 CCDC 2-2020 - Stipulated Price Contract.

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

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

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

.5 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.

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 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 at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Owner 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.

.9 Touch-up damaged factory finished surfaces to Owner’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.

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 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 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 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, 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 if there is interference. Install as directed by Owner Representative.

1.11 REMEDIAL WORK

.1 Refer to CCDC 2.

.2 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.

.3 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 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 (1) 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.

Part 2 Products - NOT USED

Part 3 Execution - 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 Canadian Construction Documents Committee (CCDC)
.1 CCDC 2-2020 - Stipulated Price Contract.

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

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

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

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

.10 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 Refer to CCDC 2, GC 3.14.

.2 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.

.3 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.

.4 Prior to final review remove surplus products, tools, construction machinery and equipment.

.5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Owner. Do not burn waste materials on site.

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

.7 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 - NOT USED

Part 3 Execution – NOT USED

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedure.

.2 Section 01 45 00 – Quality Control.

.3 Section 01 74 11 – Cleaning.

1.2 STORAGE, HANDLING AND PROTECTION

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

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

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

.4 Support affected structures. If safety of building is endangered, cease operations and immediately notify Owner.

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

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

.7 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.

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

.4 The Contractor shall be responsible for removal and disposal of all generator and generator related equipment and associated electrical equipment that are being removed as part of this project.

1.4 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.

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

3.2 MATERIALS RECYCLING AND DISPOSAL

.1 All packaging shall be recycled where possible.

.2 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.

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

.4 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.

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 Canadian Construction Documents Committee (CCDC)

.1 CCDC 2-2020, Stipulated Price Contract.

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 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 - 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 Commissioning has been completed.

.3 The clean up is finished in every respect.

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

.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 (1) 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. Photographic documentation verifying completions of deficiencies and the deficiency report shall be submitted to the Consultant. A field review of the areas of deficiency will then be conducted at the discretion of the Consultant. Should the Work not be completed to the satisfaction of the Owner 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.

.3 Section 01 77 00 – Closeout Procedures.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Two (2) weeks prior to Substantial Performance of the Work, submit to the Consultant, three (3) final copies of operating and maintenance manuals in English.

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

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

1.3 FORMAT

.1 Organize data as instructional manual.

.2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 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 Electronic: one (1) copy of the manuals shall be submitted in .pdf format on a 32 GB (minimum) USB drive.

.1 Upon review and acceptance of the hard copy manuals, submit electronically to the Consultant for approval.

.2 Once reviewed and accepted include USB drive in the final submission of the manuals to the owner.

.3 The electronic folder structure to be organized as per the following:

.1 One (1) complete, compiled manual complete with table of contents and links to defined sections in .pdf format.

.1 Each section to include a title page.

.2 One (1) folder containing all equipment submittal information.

.1 Cutsheets shall be organized in folders based on discipline.

.2 Individual .pdf documents shall be named: "Equipment TAG – Description - Location.pdf" e.g. "EF-1 – General Exhaust – Administration Bldg Roof.pdf"

.3 Provide CAD files in .dwg and .pdf format on electronic submittal.

.4 One (1) folder containing all project record drawings in .pdf format.

.1 Record drawing files to be consistent and clearly defined as discipline, drawing number, drawing name.

.5 One (1) folder containing all warrantees, start-up and material test results, commissioning reports and balancing reports.

1.4 RECORD DRAWINGS

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

.6 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 2018 or later version, or by contracting with the engineer. Drawing must indicate all changes to equipment layout, final device circuiting, and conduit routing. The Contractor shall provide three (3) complete sets of Record Drawings in hard copy format, as well as in

digital format, stored on a USB. This is to include up-dated single line distribution diagrams listing new equipment details.

.7 Record drawings submitted, if not satisfactory, shall be corrected and resubmitted, with a fresh set of white prints taken from corrected transparencies as often as necessary, until they are satisfactory and approved.

.8 One (1) full size copy of the up-dated single line diagram shall be mounted under clear framed Perspex or Tampered Glass on the wall in the Electrical Room.

Part 2 Products - NOT USED

Part 3 Execution - NOT USED

END OF SECTION

Part 1 General

1.1 GENERAL

.1 The articles of this Section 26 00 10 shall apply to each Section enclosed.

.2 All work shall be completed to Owner's requirements and building standards in accordance with the relevant section, articles and details of the existing building specifications and drawings.

1.2 DEFINITIONS

.1 Where the words "indicated", "designated", "shown", "noted", "listed", or similar words or phrases are used in the Specification they shall be understood, unless the context otherwise provides, to mean that material or item referred to is "indicated", "designated", "shown", "listed" or "noted" in the Specifications or on the Drawings.

.2 Wherever the words "approved", "satisfactory", "as directed", "submit", "permitted", "inspected" or similar words or phrases are used in the Specification they shall be understood, unless the context otherwise provides, to mean that material or item referred to shall be "approved by", "satisfactory to", "as directed by", "submitted to", "permitted by" or "inspected by" the Consultant.

.3 The term "provide" where used, shall be understood to include labour, materials and services necessary to supply and install the item or work referred to.

1.3 GENERAL PRODUCT NOTATION

.1 Product manufacturer names, product nomenclature, model numbers, availability, options and features can and do change regularly. As a result, manufacturer and product nomenclature determined at time of design and as presented in these specifications may differ from most recent nomenclature.

.2 It is incumbent upon the Contractor and Suppliers to confirm all product nomenclature, options and features, in comparison to descriptions and performance criteria detailed within these specifications, with the manufacturer or sales agency prior to quoting on the project and prior to ordering of materials.

.3 No accommodation will be made for cost implications due to failure to provide information to and confirm product description and product nomenclature as shown in the tender and at time of ordering with the manufacturer or sales agency. This is an especially critical step to be taken when dealing with solid-state light emitting diode lighting product, automated local controls and low voltage controls systems.

1.4 CONTRACTOR / SUPPLIER RESPONSIBILITY

.1 Provide products listed in these specifications or Consultant accepted equivalents. See requirements in Article: Equivalency; below.

.2 No product substitutions or alternates are to be provided. No deviations from specified products are allowed without Consultant acceptance in writing.

1.5 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 in writing no later than five (5) business days prior to the close of the solicitation document and shall include the following:

- Project Number;
- Date of submission;
- Name and contact information of entity requesting equivalency;
- Identification of what products equivalency is being requested for, including type identifier or product name;
- Nomenclature and supporting technical documentation (shop drawings, etcetera) for all products for which equivalency is being requested.

.4 Incomplete equivalency request submissions will not be reviewed.

1.6 EXAMINATION OF SITE CONDITIONS

.1 Carefully examine local conditions affecting the Work and building site, together with all other trades to make sure that Work under Specification and as shown on Drawings can be satisfactorily carried out without changes. Work of all trade Divisions shall be examined, before commencing Work, and any defect or interference affecting Work shall be reported at once.

.2 No allowance will be made for any expense incurred through failure to make these examinations or on account of any condition on site or item existing thereon which was visible or known to exist at time Tender for Work was submitted.

1.7 WORK UPON AWARD OF WORK

.1 Upon award of contract, perform a "general review" of the Work throughout the building. These efforts must be done before ordering of any materials.

.2 All site assessment conditions found that require changes to specified equipment, controls, design methodology, or other components of the modification or new products shall be relayed to the Consultant and reflected in shop drawings and construction drawings. Ensure that changes to equipment nomenclature or descriptions are included in shop drawings before sending shop drawings to Consultant for review.

.3 For general project tasks for all project types, the review will not be limited to, but to include the following:

.1 Confirm with Consultant scheduling of project, Owner's requirements, phasing

of Work, hours when work can be conducted, storage location for materials, security and access procedures;

.2 Confirm voltage service for area of Work.

.3 Confirm methodology and routing of conduit and conductors.

.4 For Work related to new construction, tenant upgrades or installation of new systems as part of a lighting retrofit or upgrade project, the review will not be limited to, but to include the following:

.1 Throughout the area of Work confirm existing equipment voltages. Products must be ordered to match existing voltages unless specifically requested to change voltages;

.2 Confirm that new equipment can be installed in the allocated space while maintaining necessary CEC and BC Hydro approved clearances;

.3 Confirm the existing wiring method to ensure feeds that need to be extended can be extended, and determine if existing equipment are properly grounded.

.5 Upon completion of this review, identify the areas and notify the Consultant of any discrepancies with tender documents. Failure to do this review will result in a reject for claims for any major changes to scope-of-work due to product items or voltage changes.

.6 Changes required as identified by this review must be submitted for accepted by the Owner prior to ordering of products or materials.

.7 Cost adjustments will be made based on the pricing as submitted in the Add/Delete Pricing of the Tender (where applicable). Any ssubsequent minor quantity or product adjustments are to be based on the tender amounts as identified in the Add/Delete Pricing.

.8 Where no Add/Delete Pricing are requested as part of the tender bid pricing, provide a quote for all requested changes. Quotes will be reviewed by the Consultant, Owner and written acceptance will be provided authorizing the change prior to ordering of products or materials.

.9 Conduct an on-site orientation and procedure meeting for all personnel who will be working on-site prior to commencing the Work. During this orientation, workers are to be advised of sign-in procedures, location of staging areas, location of storage facilities, security requirements / procedures, locations of first aid stations and emergency contact numbers.

1.8 DETAIL DRAWINGS AND INSTRUCTIONS

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

.2 On request of the Owner, the Contractor shall submit all his drawings respecting the work to the Owner for acceptance before using them, but the Contractor is responsible for performing the work properly notwithstanding such acceptance.

.3 The Contractor shall perform the work in accordance with drawings and instructions supplied by the Owner but shall not use such drawings for construction, manufacture or installation unless the Owner has released them for such use.

.4 The Contractor shall inform the Owner 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.

1.9 SHOP DRAWINGS AND PRODUCT DATA

.1 Refer to Section 01 33 00 Submittal Procedures.

1.10 WARRANTY AND CORRECTION AFTER COMPLETION.

.1 Submit a written warranty to Owner for one (1) year from date of final acceptance for any part of Work accepted by the Consultant. Should any defects, failure or unacceptable workmanship become apparent during the warranty period, the work shall be replaced or repaired at no cost to the Owner.

1.11 CERTIFICATES AND PAYMENTS

.1 Arrange and pay for permits, tests and certificates of inspection for the Work. Do Work in compliance with all laws, rules, ordinances and regulations having jurisdiction.

.2 Inspection certificates, as follows, shall be submitted before final acceptance will be issued:

.1 Electrical Inspection

.2 Seismic Engineer Certification

.3 Infrared scanning report.

1.12 DRAWINGS

.1 Drawings as provided do not show every architectural or structural detail and are diagrammatic only. Take any information requiring accurate measurements from the building and not the drawings.

.2 Drawings as provided, showing the Work, have been prepared from information provided after completion of previous construction. These drawings have been provided as an aid to the Contractor, the Owner and the Consultant. Drawings do not guarantee the accuracy of the existing or “as-built” conditions. The Contractor shall verify all conditions affecting the work of this contract.

.3 Equipment dimensions are based on the first or top named manufacturers indicated on the Equipment List. Dimensions of items by other listed manufacturers shall not exceed available space with necessary allowance for service and maintenance.

.4 Make necessary change to existing electrical equipment to accommodate structural conditions, where location of new raceways and equipment must be altered to suit job conditions. Obtain approval from Owner and note changes on Record Drawings.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

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 C22.1-24, Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.

.2 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:

- 2024 Canadian Electrical Code C22.1-24 (or current version);
- 2018 BC Building Code (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 and electrical equipment are met and adhered to.

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.

.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 electrical equipment are met and adhered to.

1.6 SUBMITTALS

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

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

.1 Provide CSA certified equipment and material.

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

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

.4 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Consultant.

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 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.

1.9 SYSTEM STARTUP

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

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

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

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 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 (1) 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. All equipment to be approved by a certification agency listed in BC Electrical Bulletin 0-7-0. 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.

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 In the absence of such documentation, adhere to WorkSafe BC (WCB) guidelines for such safety equipment and procedures.

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

.1 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.

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

.3 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.

.4 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.

.5 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 new electrical equipment, namely power panels, distribution panels, lighting panels, transformers, disconnect switches, contactors, telephone panels, miscellaneous systems panels, double throw switches, generators 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 lamacoid 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 Typical Identification Standards.

.1 Lighting, Receptacle and Power panels shall each be identified with an engraved lamacoid plate secured to top interior trim as:

.1 ATS 12.7 mm (1/2”) high lettering

.2 347/600 volts 4.8 mm (3/16”) high lettering

.8 Identify equipment not listed above, such as incoming service cables, communicating cables, switchgear, transformers, disconnects, contactor motors, instruments, fire alarm, clock program equipment and control panels, in a similar manner showing name and number of the equipment, voltage and load information.

.9 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.

.10 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

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

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

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

.14 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

.15 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.

.16 Label feeder conduits, cables.

.17 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 (1) on each side of such wall, partition or floor).

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

.18 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	

	Prime	Auxiliary
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 (two) 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 curbs 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 two (2) hour rating, unless otherwise noted.

2.9 SEISMIC SUPPORT

.1 The installation of all major electrical equipment not limited to but including; transformers, distribution and power panels, and generators, must be installed in accordance with project related seismic and building code requirements. In addition, the installation must be done in accordance with ECABC Seismic Restraint Standards Manual – Guidelines for Electrical Systems.

.2 The seismic support installation must be clean, without any loose tails, so that the seismic supports do not interfere with maintenance or safety when working in the ceiling space or rooms with seismically restrained equipment.

.3 Include in the tender to retain a seismic specialist licensed as a professional engineer in BC. The seismic engineer shall submit prior to commencement of equipment installation a letter of assurance indicating responsibility for design and field review of seismic restraints related to the installation of relevant electrical equipment. At completion of installation, seismic engineer shall submit a letter of total acceptance without any deficiencies and appropriate schedules.

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 Provide grounding in accordance with CSA C22.1,

3.2 NAMEPLATES AND LABELS

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

3.3 CONDUIT AND CABLE INSTALLATION

.1 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

3.4 CO-ORDINATION OF PROTECTIVE DEVICES

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

3.5 FIELD QUALITY CONTROL

.1 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.2 Manufacturer's Field Services:

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

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

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

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 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 (1) neutral conductor of Copper steel reinforced, size as indicated. Type: NS75.

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 SPEC NOTE: Add special fastenings where required.

Fastenings:
- .1 One (1) hole steel straps to secure surface cables 50 mm and smaller. Two (2) hole steel straps for cables larger than 50 mm.
- .2 Channel type supports for two (2) 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: ACWU90 jacket over armour and compliant to applicable Building Code classification for this project.

.5 Connectors: anti short connectors.

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 thin wall conduit for branch circuit and signal wiring in ceilings, and furred spaces. 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 conduits and cables in finished areas concealed, above finished ceilings, under floors, in walls and in partitions. 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.

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 equipment must be reviewed and proper grounding confirmed. Inform Consultant if ungrounded luminaries or service feeder to luminaires are identified.

3.4 CIRCUITING REQUIREMENTS

.1 Extend existing circuit as required to connect to new switchboard.

3.5 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 (3) 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.

3.6 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.

3.7 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 Branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment to be 2-wire circuits only, i.e. common neutrals not permitted.

.7 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

3.8 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.

3.9 INSTALLATION OF TECK90 CABLE (0 -1000 V)

.1 Group cables wherever possible on channels.

.2 Install cable concealed, securely supported by straps or hangers.

3.10 INSTALLATION OF ARMOURED CABLES

.1 Group cables wherever possible on channels.

3.11 INSTALLATION OF CONTROL CABLES

.1 Install control cables in conduit

.2 Ground control cable shield.

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

.4 Fasten exposed conduit or cables to building construction or support system using straps.

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

.2 Two (2) -hole steel straps for conduits and cables larger than 50 mm.

.3 Beam clamps to secure conduit to exposed steel work.

.5 Suspended support systems.

.1 Support individual cable or conduit runs with 6 mm diameter threaded rods and spring clips.

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

.6 For surface mounting of two (2) or more conduits use channels at 1200 mm on-centre spacing.

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

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

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

.10 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Owner's Representative.

.11 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 Owner's Representative.

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 SUBMITTALS

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

1.3 DELIVERY, STORAGE AND HANDLING

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

.2 Waste Management and Disposal:

.1 Separate waste materials for 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 Switch and receptacles boxes to be:

.1 No. 1104, where flush mounted in wood or drywall, with stud fasteners as required.

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

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

.6 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.

.7 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 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 (1) device is to be mounted. Use combination boxes with suitable barriers where outlets for more than one (1) 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, or most recent edition), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.

.2 CSA C22.2 No. 45-M1981(R2007, or most recent edition), Rigid Metal Conduit.

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

.4 CSA C22.2 No. 83-M1985(R2008 or most recent edition), 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 (1) hole steel straps to secure surface conduits 50 mm and smaller.

.1 Two (2) 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.

2.4 BC HYDRO DUCTS AND FITTINGS

.1 Shall be as per BC Hydro standards.

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 REFERENCE STANDARDS

.1 American Petroleum Institute (API)

.1 API Std. 650-2007(A2008), Welded Steel Tanks for Oil Storage 11th Edition, or most recent edition.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-3.6-2000, Amend. 2, Regular Sulphur Diesel Fuel, or most recent edition.

.3 Canadian Environmental Protection Act (CEPA)

.1 CCME PN 1326-2008, Environmental Code of Practice for Aboveground and Underground Storage Tank Systems for Petroleum Products and Allied Petroleum Products, or most recent edition.

.4 CSA Group (CSA)

.1 CSA-B139-09, Installation Code for Oil Burning Equipment, or most recent edition.

.2 CSA-C282-09, Emergency Electrical Power Supply for Buildings (BC)

Or

CSA- C282-15, Emergency Electrical Power Supply for Buildings (Vancouver)

.5 International Organization for Standardization (ISO)

.1 ISO 3046-1-2002, 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, or most recent edition.

.6 National Electrical Manufacturers Association (NEMA)

.1 NEMA MG 1-2006(R2007), Motors and Generators, or most recent edition.

.7 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S601-07, Standard for Shop Fabricated Steel Aboveground Horizontal Tanks for Flammable and Combustible Liquids, or most recent edition.

.2 ULC-S603-00, Standard for Steel Underground Tanks for Flammable and Combustible Liquids, or most recent edition.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Provide manufacturer's printed product literature, specifications and data sheets for power generators and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance data for diesel generator for incorporation into manual specified in Section 01 78 00- Closeout Submittals.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

1.5 MAINTENANCE MATERIAL SUBMITTALS

.1 Provide maintenance materials in accordance with Section 01 78 00- Closeout Submittals.

1.6 QUALITY ASSURANCE

.1 Warranty shall be minimum of two (2) years.

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 Exhaust system.
.7 Steel mounting base.
.8 Baseplate and Drip Pan.
.9 Manual by-pass switch.
.10 Weatherproof sound barrier enclosure to meet project specified noise allowances.
.11 Vibration isolators.
.12 Governor.
.13 Engine Exhaust System.
.14 Engine Cooling System.
.15 Starting Motor(s).
.16 Heaters.
.17 Internal electrical panel.
.18 Fuel supply system/Fuel tank.

.19 Alternator and exciter, diesel set, instruments, meters and switches shall be CSA approved.

.20 Controller complete with LCD display and all required devices/software and accessories for remote monitoring and remote stop/start/fault reset functions and remote annunciator.

.2 System designed to operate as standby.

.3 Provide design, fabrication, testing, transportation, demonstration and equipment warranty.

.4 The Contractor supplying and installing the standby 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.

2.2 SUPPLIERS

.1 Diesel set and system shall be as assembled by one (1) of the following:

- Frontier Power Solutions (Kohler)
- Total Power (Generac)
- Cullen Diesel (MTU)
- Accepted equivalent

2.3 DIESEL ENGINE

.1 Diesel engine: to ISO 3046-1.

.2 Turbo charged, synchronous speed 1800 rpm.

.3 Capacity:

.1 Sized as per Drawings.

.2 Engine shall be sized to ensure that generator can deliver rated voltage and frequency within 15 seconds after signal to start has been given by automatic transfer switch.

.4 Fuel/Fuel system:

.1 Engine shall operate on commercial grades of diesel fuel oil readily available in Canada and shall give satisfactory performance on No. 2 grade domestic fuel oil in an emergency.

.2 Fuel system: engine-driven, solid injection, fuel transfer pump, fuel filters and air cleaner, fuel rack solenoid energized when engine running.

.3 Fuel filter shall have replaceable elements that can be easily removed without disturbing other parts of the engine.

.4 Engine shall incorporate dry type air cleaner, of replaceable element type, with an efficiency of at least 99.8%, complete with restriction indicator.

.5 Governor:

.1 Electronic isochronous, steady state speed band of plus or minus 0.5%.

.6 Lubrication system:

.1 Engine shall be provided with full pressure lubrication with gear driven pump, pressure regulator, replaceable element filter, supplying filtered lubricating oil under pressure to main bearings, crank pin bearings, piston pins, timing gears, camshaft bearings, valve rocker mechanism, governor and turbo-chargers.

.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.

.6 Readily accessible drain valves with suitable piping shall be provided for convenient draining of complete lubricating oil system.

.7 Starting system:

.1 Electric starting system shall be minimum 12 or 24 volt and shall include starting motor, charging alternator, cut-out regulator and lead acid batteries, capable of providing six (6) consecutive normal starts without recharging.

.2 Batteries/battery charger: constant voltage, solid state, two (2) stage from trickle charge at standby to boost charge after use.

.1 Fully automatic battery charger with monitor circuit to prevent overcharging batteries in 30 minutes following one (1) normal start shall be complete with battery rack, jumpers, cables and hydrometer.

.2 Lead acid, 12 or 24V storage battery with sufficient capacity to crank engine for 1 min at 0 degrees C without using more than 25% of ampere hour capacity.

.3 Regulation: plus or minus 1% output for plus or minus 10% input variation.

.4 Equipped with dc voltmeter, dc ammeter and on-off switch.

.5 Minimum charger capacity: 5 A.

.6 Provide new 15A, 120V circuit to supply battery/battery charger, as needed.

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

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

.9 Dynamically balance complete engine-flywheel generator arrangement after assembly.

.1 Torsional or other vibration tolerance within 10% above or below rated speed of unit, when operating unloaded or connected to any load within its rating.

.2 Cyclic irregularity: 1/250 maximum.

.10 Provide engine flywheel with graduated marking around its periphery to facilitate fuel injection and valve timing.

.11 Provide removable wet type cylinder liners.

.12 Furnish cylinder head with removable valve seat insert and guides.

.13 Provide platform for servicing upper part of engine where applicable.

.14 Drip tray.

2.4 ALTERNATOR

.1 Diesel-driven alternator shall be complete with necessary controls and accessories, to comprise a fully automatic standby generating plant capable of producing power in event of failure or normal supply.

.2 Alternator: to NEMA MG1.

.3 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 Amortisseur windings.

.7 Synchronous type.

2.5 CONTROL PANEL

.1 Mounted on generator.

.2 Provide combined control, transfer and bypass panel.

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

.1 Voltmeter.

.2 Ammeter.

.3 Wattmeter.

.4 Frequency meter.

.5 Demand watt meter to indicate load on unit.

.6 Power factor.

.7 Reactive power.

.8 Coolant temperature.

.9 Lube oil pressure.

.10 Tachometer.

.11 Hour meter.

.12 Battery voltage.

.13 Alternator frequency.

.14 Time.

.15 Date.

.16 Transfer switch status.

.17 Service reminders.

.18 Trending.

.19 Fault history (alarm log).

.4 Provide circuit breakers for equipment protection: use fuses where breakers are not applicable.

.5 Provide bottom entry for power and control cables.

.6 Automatic start/manual shut-down relay system including “Auto”, “Off” and “Manual” selector switch and indicating lights.

.7 Engine emergency stop button and provision for remote emergency stop button.

.8 Alternator output breaker:

.1 Thermo-magnetic molded case circuit breaker complete with shunt trip-magnetic tripping device actuated by signal from static sensor to open breaker contacts. Requires no external source of power.

.9 Load bank breaker (if applicable):

.1 Thermo-magnetic molded case circuit breaker complete with shunt trip- magnetic tripping device actuated by signal from static sensor to open breaker contacts. Requires no external source of power. Breaker can be located in a separate enclosure if space is not available, mounted on generator.

.10 Solid state amber indicator lights for alarm with one (1) set 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.

.11 Solid state controller for automatic shutdown and alarms with one (1) set manually reset NO/NC contacts wired to terminal block for remote annunciation on:

.1 Engine overcrank.

.2 Engine overspeed

.3 Engine high temperature.

.4 Engine low lube oil pressure.

.5 Short circuit.

.6 AC over voltage.

.12 A set of normally open/normally closed contacts, electrically isolated, activated by running engine for connection to fire alarm system.

.13 A set of normally open/normally closed contacts, electrically isolated, activated by any of the trouble conditions, for connection to the fire alarm system.

2.6 MOUNTING

.1 Refer to Drawings.

2.7 EXHAUST SYSTEM

.1 Included within enclosure.

.2 Exhaust shall terminate inside hood of generator enclosure as per Drawings.

2.8 FUEL STORAGE TANK

.1 Generator shall come complete with belly tank with local fuel storage for minimum 48-hr runtime at 75% full load.

2.9 EQUIPMENT IDENTIFICATION

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

.2 Control panel:

.1 Size 4 nameplates for controls including alternator breakers and program selector switch.

.2 Size 2 nameplates for meters, alarms, indicating lights and minor controls.

.3 Provide at front top of each panel and on each generator junction box, Lamicoid or metal engraved identification nameplate.

2.10 FABRICATION

.1 Shop assemble generating unit including:

.1 Base.

.2 Engine and radiator.

.3 Alternator.

.4 Control panel.

.5 Battery and charger.

2.11 SOURCE QUALITY CONTROL

.1 Factory test generator set to standard load test and test report standards.

.2 Test procedure:

.1 Supplier shall conduct performance and full load upon completion of assembly at factory and prior to shipping to prove that unit will start automatically, pick up load and operate as required.

.2 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, kV.A, V, A, r/min, Hz.

.3 Mark check sheet and record data on forms in duplicate as test proceeds.

.3 Tests:

.1 With 100% rated load, operate set for two (2) hours, taking readings at five (5) minutes intervals, and record following:

.1 Time of reading.

.2 Running time.

.3 Ambient temp in degrees C.

.4 Lube oil pressure in kPa.

.5 Lube oil temp in degrees C.

.6 Engine coolant temp in degrees C.

.7 Exhaust stack temp in degrees C.

.8 Alternator voltage: phase 1, 2, 3.

.9 Alternator current: phase 1, 2, 3.

.10 Load.

.11 Power in kW.

.12 Engine speed.

.13 Frequency in Hz.

.14 Power Factor.

.15 Battery charger current in A.

.16 Battery voltage.

.17 Alternator cooling air outlet temp.

.18 Fuel consumption for duration of test.

.2 After completion of 1 hour run, demonstrate following shut down devices and alarms:

.1 Overcranking.

.2 Overspeed.

.3 High engine temp.

.4 Low lube oil pressure.

.5 Short circuit.

.6 Alternator over voltage.

.7 Low battery voltage, or no battery charge.

.8 Manual remote emergency stop.

.9 High alternator temperature.

.4 Demonstrate:

.1 Automatic starting of set and automatic transfer of load on failure of normal power.

.2 Operation of manual bypass switch.

.3 Automatic shut down of engine on resumption of normal power.

.4 That battery charger reverts to high rate charge after cranking.

.5 Demonstrate low oil pressure and high engine temperature shutdown devices operation without subjecting engine to these excesses.

.6 Any undue overheating or failure of any component, caused by this overload, shall be considered a cause for rejection of plant design.

Part 3 Execution

3.1 INSTALLATION

.1 Room/site layout for all components shall be reviewed on-site prior to installation.

.2 Provide a complete diesel-generator set as specified and as shown and a main fuel storage tank as specified and as shown for diesel fuel oil.

.3 Install complete starting system including batteries, jumpers and cables.

.4 Install fuel supply system as indicated in CSA-B139.

.5 Install main fuel tank complete with fill connection, vent, suction, return and gauge connection.

.6 Provide flexible fuel and electrical connections to diesel-generator.

.7 Complete wiring and interconnections as indicated.

.8 Provide interconnecting wiring between diesel-generator and control panel.

.9 Provide control circuits connection to Control Console as specified.

.10 Start generating set and test to ensure correct performance of components.

.1 Conduct an acceptance test after preliminary runs and test have been made. Conduct this test on-site after completion of installation. This acceptance test shall not be of less than two (2) hours duration with full rated load. At the end of the four (4) hour test, a 10% overload shall be connected and the set run for 30 minutes without touching any controls.

3.2 FIELD QUALITY CONTROL

.1 Include in the tender price for the services of the engine Supplier's technical representatives for as long as necessary for on-site commissioning of the system and for all work necessary during the warranty period.

.2 A competent Diesel-generator expert shall be supplied for minimum one (1) working day, at a time convenient to Owner, to instruct Owner's staff in maintenance and operation, and shall be present during on-site acceptance test.

.3 Notify Owner's Representative 14 working days in advance of test date.

.4 Provide fuel for testing and leave full tanks on acceptance.

.5 Non-operational tests and checks: perform following test and checks before starting the unit:

- .1 Shaft alignment, end float, angular and parallel.
- .2 Cold resistance of generator windings.
- .3 Belt tensioning.
- .4 Equipment grounds.
- .5 Electrical wiring.
- .6 All grease lubricating points.
- .7 Personnel safety guards.
- .8 Air cleaner.
- .9 Coolant.
- .10 Lubricating oil type and level.
- .11 Type of fuel.
- .12 Vibration isolator adjustment.
- .13 Temperature and pressure sensors.
- .14 Engine exhaust system.
- .15 Tools.
- .16 Spares.

.6 Operation test and check: on completion of non-operational tests and checks, start unit cold. Provide multichannel recorder and record following:

- .1 Time for unit to start and reach settled voltage and frequency.
- .2 Time from initiation of start to full load application, with voltage and frequency settled.
- .3 Voltage and frequency transient and steady state limits for full load to no load, 3/4 load to no load, 1/2 load to no load, 1/4 load to no load and vice versa. Measure machine vibration levels under the same load conditions
- .4 Record battery voltage drop during cranking.

.7 Protection and control demonstration: on completion of operation test and check, demonstrate following:

- .1 Overheat protection.
- .2 Low oil pressure protection.
- .3 Cranking cut-out.
- .4 Over-crank protection (three (3) tries).
- .5 Over-speed protection.
- .6 Under and over frequency.
- .7 Under and over voltage.
- .8 Electrical fault protection:
  - .1 Failure to close breaker.
  - .2 Failure to build up voltage.
  - .3 Generator short circuit and over-current.

.9 All control functions.

.8 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.

.9 At end of test run, check battery voltage to demonstrate battery charger has returned battery to fully charged state.

.10 Following commissioning and/or testing set both generator and ATS to "Auto".

.11 Load tests: load test unit for four (4) hours at full rated load and further one (1) hour at 110% rated load in ambient room temperature of 40°C. Take following data at start of load test and every one (1) hour interval thereafter:

.1 Frequency.

.2 Voltage.

.3 Current.

.4 Kilowatts.

.5 Generator winding temperature.

.6 Generator frame temperature.

.7 Engine coolant temperature.

.8 Oil temperature and pressure.

.9 Manifold pressure.

.10 Ambient room temperature.

.11 Generator cooling air outlet temperature.

.12 Exciter field current and voltage.

.13 Vibration displacement.

.14 Ambient air temperature inside panel with all doors closed.

.12 Voltage output testing

.1 Test voltage output at the generator as well as utility voltage at the transfer switch.

.2 Test voltage at the furthest point away, such as at the elevator machine room at the top of the building. Provide voltage readings from this location for both utility power as well as under generator operation.

.3 Provide a report with test results.

.4 Voltage output from the generator shall be adjusted to ensure that differences between utility and generator power are within 5% at both the testing locations.

.13 Miscellaneous: provide accurate means for determining fuel and lubricating oil consumption.

.1 Provide strip chart recorders for monitoring frequency, voltage and load.

.2 Provide recorder with ability to select speeds to allow accurate measurement of voltage, frequency and time during tests.

.3 Calibrate recorder by the recorder manufacturer (or designated representative) within three (3) months of factory testing.

.14 Voltage and frequency regulation tests: on completion of load tests take hot resistance reading of generator windings.

.1 Subject unit to hot voltage and frequency regulation tests for full load to no load, 3/4 load to no load, 1/2 load to no load, 1/4 load to no load and vice versa.

.15 Panel performance and functions: check sequence of operation under service conditions.

.1 Make provision for supplying and connecting required levels of voltage for primary circuits.

.16 Record test data on appendix forms, recording charts and manufacturers' test forms and be complete with diagrams and description of test results, deficiencies and corrective action.

.1 Ensure test data sheets signed by Supplier and Engineer.

3.3 CLEANING

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

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

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 CSA Group (CSA)

.1 CSA C22.2 No.5-09, Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures.

.2 CSA C22.2 No.178.1-2007, Automatic Transfer Switches, or current edition.

.3 CAN/CSA C60044-1-07, Instrument Transformers, or current edition.

.2 National Electrical Manufacturers Association (NEMA)

.1 NEMA ICS 2-1996(R2009) or current edition, 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.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for transfer switches and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in British Columbia, Canada.

.1 Indicate on drawings:

.1 Make, model and type.

.2 Single line diagram showing controls and relays.

.3 Description of equipment operation including:

.1 Automatic starting and transfer to standby unit and back to normal power.

.2 Test control.

.3 Manual control.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00- Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for transfer switches 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.

Part 2 Products

2.1 SYSTEM DESCRIPTION

.1 Provide new 3 – pole automatic digital transfer switch, sized as shown, to provide open transition. 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 Automatic transfer switches shall be enclosed in oversized NEMA 1 enclosures to accommodate the number of cables entering switch. Phase collection shall take place within closure.

.3 The automatic transfer switch (ATS) shall:

.1 Monitor voltage on phases of normal power supply.

.2 Provide in-phase re-transfers.

.3 The transfer switch shall automatically transfer its load circuit to standby power supply upon failure of the normal or original supply. In order to override momentary fluctuations in the system, a time delay transfer from normal to alternate power supply shall be adjustable. Upon restoration of the normal supply, the transfer switch shall automatically retransfer its load circuits to the normal supply. Mechanically held transfer mechanisms shall be energized only momentarily during transfer or retransfer.

.4 If the standby power should fail while carrying the load, transfer to the normal supply shall be made instantaneously upon restoration of the normal source to satisfactory conditions.

.5 An engine test button shall be provided that will initiate an engine test.

.6 A silence alarm button shall be provided that will silence the alarm buzzer.

.4 Provide a status output signal from the automatic transfer switch and connect to the existing SCADA system for monitoring such that SCADA system indicates whether generator is on/off. Test to ensure that the signal is active and functioning as intended as part of ATS/generator commissioning.

2.2 MATERIALS

.1 Instrument transformers: to CAN/CSA C60044-1.

.2 Contactors: to NEMA ICS2.

2.3 CONTACTOR TYPE TRANSFER EQUIPMENT

.1 Contact Type Transfer Equipment: to CSA C22.2 No.178.1.

.2 3 pole contactors mounted on common frame, in double throw arrangement, mechanically and electrically interlocked.

.3 Main contacts: silver surfaced, protected by arc disruption means.

.4 Switch and relay contacts, coils, spring and control elements accessible for inspection and maintenance from front of panel.

.5 Auxiliary contact: gold or silver plated, to initiate emergency generator start-up on failure of normal power.

.6 Fault withstand rating: 18kA.

.7 Neutral bar, solid.

2.4 CONTROLS

.1 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.

.2 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 contacts rated 10 A minimum:

.1 Voltage sensing: three (3) phase for normal power and on one (1) phase only for emergency, solid state type, adjustable drop out and pick up, close differential, 2 V minimum undervoltage and over voltage protection.

.2 Voltage sensing: three (3) phase for normal power and on one (1) phase only for emergency, solid state type, adjustable drop out and pick up, close differential, 2 V minimum undervoltage and over voltage protection.

.3 Time delay: normal power to standby, adjustable solid state, five (5) seconds.

.4 Time delay on retransfer from standby to normal power, adjustable , five (5) minutes.

.5 Frequency sensing, to prevent transfer from normal power supply until frequency of standby unit reaches preset adjustable values.

.4 Solid state electronic in-phase monitor.

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 Metering:

.1 Provide a digital multifunction power meter. Meter shall be capable of measuring at a minimum:

.1 Voltage (LL/LN).
.2 Current.
.3 Unbalance (V & I).
.4 Frequency.
.5 Utilization.
.6 kW Demand.
.7 Min/Max Historical Values.

2.6 EQUIPMENT IDENTIFICATION

.1 Identify equipment in accordance with Section 26 05 00- Common Work Results for Electrical.

2.7 SOURCE QUALITY CONTROL

.1 Complete equipment, including transfer mechanism, controls, relays and accessories factory assembled and tested.

.2 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:

.1 Automatic starting and transfer of load on failure of normal power.
.2 Retransfer of load when normal power supply resumed.
.3 Automatic shutdown.
.4 In-phase monitor operation.

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 transfer switches installation in accordance with manufacturer's written instructions.

3.2 INSTALLATION

.1 Locate, install and connect transfer equipment as indicated.

.2 Check relays and adjust as required to ensure correct operation.

.3 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.

.4 Control Wiring: All control wiring for engine start shall be installed in separate conduits from all power cabling and shall be suitably sized conduits per CEC requirements. All control wiring shall be sized for minimum #18 AWG. Control wiring type and voltage rating shall also comply with 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.

.5 Ground automatic transfer switches as required.

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 ten (10) minutes, then close main power supply disconnect. Load should transfer back to normal power supply and standby should shutdown.

END OF SECTION