



TRANSFORMER
REPLACEMENT
SPECIFICATION

ISSUED FOR TENDER

DFO-Canadian Coast Guard – Dryad Point Light Station
DFO Project # FP802-160152
June 8, 2016

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END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures
- .2 Section 01 78 00 - Closeout Submittals

1.2 WORK COVERED BY CONTRACT DOCUMENTS

- .1 The objective of the work is to replace the existing 25kVA, 7.2KV- 120/240V, 1 phase transformer with a new transformer rated for same load and voltages. Replacing the existing concrete pad, and the high voltage load break switch and transformer. The original transformer and equipment is to be removed from site.

1.3 CONTRACT METHOD

- .1 Construct Work under stipulated price contract.

1.4 SCOPE OF WORK

- .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 in the Project Specification. All work and provided equipment shall conform to local and national codes and regulations.
- .2 Major items of Work shall consist of but shall not be limited to the following:
 - .1 Provide written detailed schedule of all key work stages including power transfers and expected for approval of Owner.
 - .2 Provide minimum notice of 3 weeks prior to commencing any on site work to owner.
 - .3 Coordinate with BC Hydro for switching off of power (BCH requires a minimum of 3 week notice for scheduling of work). Provide electrical permit and required applications to BC Hydro to allow for de-energizing and re-energizing of services.
 - .4 At award of contract, ensure adequate time allotment in construction schedule, to coordinate with owner and BC Hydro to go to site and draw oil sample from transformer and have sample tested. Tests shall not be limited to but shall include: polychlorinated biphenyl (PCB), dissolved Gas-In-Oil Analysis, Dielectric Breakdown Voltage Test, Acidity Test, Moisture Content (in PPM), and Interfacial Tension Test. Provide test results to departmental representative and consultant.
 - .5 Provide separate price for transformer removal if it is found to contain PCB.
 - .6 Transfer existing power from BC Hydro to generator power. Generator is existing. Contractor to review generator and confirm fuel levels and operation prior to transfer of power.

- .7 Disconnect BC Hydro power from existing transformer. Main Safety switch for transformer located in adjacent shed.
- .8 The safe removal and disposal of existing transformer and associated equipment within enclosure.
- .9 Remove and dispose of the existing concrete base for the transformer.
- .10 Pour new concrete base for transformer, existing conductors to be routed from under new base for transformer. Ensure location and length of conductors sufficient prior to pouring of base.
- .11 Install new transformer and switch in new enclosure on top of concrete base.
- .12 Replace existing customer Hydro Pole with new customer owned Hydro Pole and overhead loadbreak switch for incoming sub cable power.
- .13 Provide and install all hardware components necessary for a complete system installation, including field devices of all types, conduits, raceways, and wiring.
- .14 Reconnect primary and secondary power lines to transformer.
- .15 Ensure all grounding is re-connected to new equipment.
- .16 Perform system testing and energize new transformer.
- .17 Provide all required labour and supervision for the installation, calibration, adjustments, checkouts, commissioning of all components and devices provided and as per section 01 91 13;
- .18 Coordinate all switching of power sources with owner and BC Hydro and obtain written approval prior to activation.
- .19 Switch power from generator back to BC Hydro power connection.
- .20 Update existing documentation including as built drawings, O&M manuals, commissioning reports, etc with complete information of the installed system.

1.5 WORK BY OTHERS

- .1 Co-operate with other Contractors in carrying out their respective works and carry out instructions from Engineer.
- .2 Co-ordinate work with other Contractors. If any part of work under this Contract depends on proper execution by or relies upon work of another Contractor, report immediately to the Engineer, in writing, any situations which may interfere with proper execution of Work.

1.6 CONTRACTOR USE OF PREMISES

- .1 Limit use of premises for Work, and for storage to allow:
 - .1 Owner occupancy.
 - .2 Work by other contractors.
- .2 Co-ordinate use of premises under direction of Owner's Representative.
- .3 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.

- .4 Repair or replace portions of existing work which have been altered during construction to match existing or adjoining work.
- .5 At completion the work: ensure premises condition for the work area to be equal or better than that which existed before the work started.

1.7 OWNER OCCUPANCY

- .1 Owner will occupy premises during entire construction period for execution of normal operations.
- .2 Co-operate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage.

1.8 WORK IN EXISTING BUILDINGS

- .1 All work on site shall be co-ordinated with the Owner's Representative so as to minimize disruptions. Execute work with least possible interference or disturbance to building operations, occupants, and normal use of premises. Arrange with Owner's Representative to facilitate execution of work.
- .2 Work taking place outside of the occupied areas that does not involve power or comfort systems interruptions may occur during the day with prior approval from the Owner's Representative.
- .3 Include in Price any overtime that may be required to interrupt services at night or on weekends as approved by Owner's representative.
- .4 Use only designated routes in building for moving workers and material.
- .5 Obtain approval from the Owner's Representative prior to penetrating any structural surfaces including floor slabs. Obtain from the Owner's Representative 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.
- .6 Carefully route 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.
- .7 Removed equipment and material shall become the property of the Contractor and shall be removed from site unless otherwise requested by the Owner's Representative.
- .8 After completion of work in ceiling space, arrange and pay for the repair of any damaged or dislodged fireproofing or other building materials.
- .9 Protect all existing services and make good any damage occasioned by the work in this contract.

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

1.9 CONTINUITY OF EXISTING SERVICES

- .1 Keep existing building in operation at all times with minimum length of shutdown periods.
- .2 Obtain permission of the Owner before shutting down or disconnecting services. Shutdowns of systems are to be co-ordinated with the owner's representative.
- .3 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 times.
- .4 Notify, Owner's Representative of intended interruption of services and obtain required permission.
- .5 Protect all existing services and make good any damage occasioned by the work in this contract.
- .6 Where Work involves breaking into or connecting to existing services, give Owner's Representative 48 hours notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to tenant operations.
- .7 Submit schedule to and obtain approval from Owner's Representative for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
- .8 Provide temporary services when directed to maintain building systems.
- .9 Where unknown services are encountered, immediately advise Engineer and confirm findings in writing.

1.10 CLEANING

- .1 The Contractor shall be responsible to keep the building, site, and premises clean and tidy with respect to his work at all times.
- .2 On completion, all dirt and rubbish for which the Contractor is responsible shall be removed from the site and premises and the whole left clean and tidy. All soiling of finished walls, floors, ceilings, carpets, or other surfaces, caused by the Contractor shall be cleaned up or made good by the Contractor.
- .3 All equipment shall be thoroughly cleaned of dust, dirt, and debris before start-up and hand-over.

1.11 DOCUMENTS REQUIRED

- .1 Maintain at job site, one copy each document as follows:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Reviewed Shop Drawings.
 - .5 Change Orders.
 - .6 Other Modifications to Contract.
 - .7 Field Test/Coordination Study Reports.
 - .8 Copy of Approved Work Schedule.
 - .9 Health and Safety Plan and Other Safety Related Documents. Other documents as specified.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 11 00 – Summary of Work
- .2 Section 01 78 00 – Closeout Submittal

1.2 ADMINISTRATIVE

- .1 Submit to the Engineer one (1) sets of submittals for review. An electronic version in Adobe pdf format is acceptable. 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. No factory or field fabrication work shall commence, nor shall any materials be delivered to the site(s) until the Shop Drawings have been reviewed by the engineer for conformity with the plan and specifications.
- .3 Present shop drawings, product data in SI units. Where items or information is not produced in SI units converted values are acceptable.
- .4 Review submittals prior to submission to Engineer. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .5 Notify the Engineer, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .6 The location of all devices shall be reviewed with the Owner's Representative prior to installation. Verify field measurements and affected adjacent Work is co-ordinated.
- .7 When Shop Drawings are accepted, the said acceptance does not in any way relieve the Contractor of his responsibility or the necessity of furnishing materials and software or performing work as required by the Contract Documents.
- .8 Keep one reviewed copy of each submission on site.

1.3 SHOP DRAWINGS AND PRODUCT DATA

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

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- .2 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
 - .3 Allow 10 days for the Engineer's review of each submission.
 - .4 Adjustments made on shop drawings by the Engineer are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to the Engineer prior to proceeding with Work.
 - .5 Make changes in shop drawings as Engineer may require, consistent with Contract Documents. When resubmitting, notify Engineer in writing of revisions other than those requested.
 - .6 Accompany submissions with transmittal letter containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
 - .7 Note each shop drawing as applicable with the following information:
 - .1 Date and revision dates.
 - .2 Project title and identification number.
 - .3 Name and address of:
 - .1 Contractor.
 - .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.
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- .9 Single line and schematic diagrams.
- .10 Relationship to adjacent work.
- .6 Prior to manufacturing, provide two copies of drawings for the proposed primary service kiosk. Each cell, cubicle or compartment of the primary service kiosk, which are for the exclusive use of, and restricted access to, BC Hydro personnel, must be equipped with a padlocking hasp, or BC Hydro proprietary security bolts, or other security restraining means with sealing provisions.
The primary service kiosk shop drawings must show the following:
 - .1 Fully dimensioned switchboard cells and details, access doors and locking provisions;
 - .2 Ground bus layout, equipment grounding pads and personnel safety ground balls;
 - .3 Primary service cable compartment and cable termination provisions as per BC Hydro drawings;
 - .4 Main switch / fusing switchboard cell;
 - .5 Interlocking diagram, equipment nameplates and 'High Voltage' warning signs.
- .8 Supplement standard information to provide details applicable to project.
- .9 If upon review by Engineer, no errors or omissions are discovered or if only minor corrections are made, one copy 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.
- .10 Review of shop drawings is for sole purpose of ascertaining conformance with general concept. This review shall not mean that Owner approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting all requirements of construction and Contract Documents. Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of all sub-trades.

1.4 PHOTOGRAPHIC DOCUMENTATION

- .1 Submit electronic copy of colour digital photography in jpg format, standard resolution as directed by the Engineer. Photos to be provided at key stages of the project; removal of transformer, concrete base installation, transformer installation, connections and other as directed by engineer.
- .2 Project identification: name and number of project and date of exposure indicated.
- .3 Number of viewpoints: 4 locations.
 - .1 Viewpoints and their locations as determined by the Engineer.
 - .2 Upon completion of installation and as directed by the Engineer.

1.5 CERTIFICATES AND TRANSCRIPTS

- .1 Immediately after award of Contract, submit Workers' Compensation Board of BC status.
- .2 Submit transcription of insurance immediately after award of Contract.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 – Submittal Procedures.

1.2 SECTION INCLUDES

- .1 Health and safety considerations required to ensure that the contractor shows due diligence towards health and safety on construction sites, and meets the requirements laid out in PWGSC/RPB Departmental Policy DP 073 - Occupational Health and Safety - Construction.

1.3 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, RSBC 1996 - Updated 2006.

1.4 SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
 - .1 Results of site specific safety hazard assessment.
 - .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
- .3 Submit 3 copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative weekly.
- .4 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .5 Submit copies of incident and accident reports.
- .6 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 3 business days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 3 business days after receipt of comments from Departmental Representative.
- .7 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .8 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of

Work, and submit additional certifications for any new site personnel to Departmental Representative.

1.5 FILING OF NOTICE

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

1.6 SAFETY ASSESSMENT

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

1.7 MEETINGS

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

1.8 GENERAL REQUIREMENTS

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
- .2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

1.9 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.

1.10 COMPLIANCE REQUIREMENTS

- .1 Comply with Workers Compensation Act, B.C. Reg.
- .2 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

1.11 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.

1.12 HEALTH AND SAFETY CO-ORDINATOR

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:

- .1 Have site-related working experience specific to activities associated with electrical systems installation.
- .2 Have working knowledge of occupational safety and health regulations.
- .3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
- .4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
- .5 Be on site during execution of Work and report directly to and be under direction of site supervisor.

1.13 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.

1.14 CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

1.15 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 REQUIREMENTS

- .1 Section 01 35 29.06 – Health and Safety Requirements.
- .2 Section 01 74 11 – Cleaning.

1.2 REFERENCES

- .1 Definitions:
 - .1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade environment aesthetically, culturally and/or historically.
 - .2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.
- .2 Reference Standards:
 - .1 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2-2008 Stipulated Price Contract.
 - .2 U.S. Environmental Protection Agency (EPA)/Office of Water
 - .1 EPA 832/R-92-005-[92], Storm Water Management for Construction Activities, Chapter 3.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prior to commencing construction activities or delivery of materials to site, provide Environmental Protection Plan for review and approval by Departmental Representative.
- .3 Ensure Environmental Protection Plan includes comprehensive overview of known or potential environmental issues to be addressed during construction.
- .4 Address topics at level of detail commensurate with environmental issue and required construction tasks.
- .5 Include in Environmental Protection Plan:
 - .1 Names of persons responsible for ensuring adherence to Environmental Protection Plan.

- .2 Names and qualifications of persons responsible for manifesting hazardous waste to be removed from site.
- .3 Names and qualifications of persons responsible for training site personnel.
- .4 Descriptions of environmental protection personnel training program.
- .5 Erosion and sediment control plan identifying type and location of erosion and sediment controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations, EPA 832/R-92-005, Chapter 3 requirements.
- .6 Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.
- .7 Traffic Control Plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather. Ensure plans include measures to minimize amount of mud transported onto paved public roads by vehicles or runoff.
- .8 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use. Ensure plan includes measures for marking limits of use areas and methods for protection of features to be preserved within authorized work areas.
- .9 Spill Control Plan including procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.
- .10 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.
- .11 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, are contained on project site.
- .12 Contaminant Prevention Plan identifying potentially hazardous substances to be used on job site; intended actions to prevent introduction of such materials into air, water, or ground; and detailing provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.
- .13 Waste Water Management Plan identifying methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.
- .14 Historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands.
- .15 Pesticide treatment plan to be included and updated, as required.

1.4 FIRES

- .1 Fires and burning of rubbish on site not permitted.

1.5 DRAINAGE

- .1 Provide Erosion and Sediment Control Plan identifying type and location of erosion and sediment controls provided. Ensure plan includes monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations, EPA 832/R-92-005, Chapter 3 requirements.
- .2 Storm Water Pollution Prevention Plan (SWPPP) to be substituted for erosion and sediment control plan.
- .3 Provide temporary drainage and pumping required to keep excavations and site free from water.
- .4 Ensure pumped water into waterways, sewer or drainage systems is free of suspended materials.
- .5 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

1.6 SITE CLEARING AND PLANT PROTECTION

- .1 Protect trees and plants on site and adjacent properties as indicated.
- .2 Wrap in burlap, trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2m minimum.
- .3 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .4 Minimize stripping of topsoil and vegetation.
- .5 No tree removal, only if approved by Departmental Representative

1.7 WORK ADJACENT TO WATERWAYS

- .1 Construction equipment to be operated on land only.
- .2 Do not use waterway beds for borrow material without Departmental Representative's approval.
- .3 Waterways to be free of excavated fill, waste material and debris.
- .4 Design and construct temporary crossings to minimize erosion to waterways.
- .5 Do not skid logs or construction materials across waterways.
- .6 Avoid indicated spawning beds when constructing temporary crossings of waterways.

- .7 Blasting to be above water and 100m minimum from indicated spawning beds.

1.8 POLLUTION CONTROL

- .1 Maintain temporary erosion and pollution control features installed under this Contract.
- .2 Control emissions from equipment and plant to local authorities' emission requirements.
- .3 Prevent sandblasting and other extraneous materials from contaminating air and waterways beyond application area.
 - .1 Provide temporary enclosures where indicated or directed by Departmental Representative.
- .4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

1.9 HISTORICAL/ARCHAEOLOGICAL CONTROL

- .1 Provide historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands known to be on project site: and/or identifies procedures to be followed if historical archaeological, cultural resources, biological resources and wetlands not previously known to be onsite or in area are discovered during construction.
- .2 Plan: include methods to assure protection of known or discovered resources and identify lines of communication between Contractor personnel and Departmental Representative

1.10 NOTIFICATION

- .1 Departmental Representative and/or Consultant will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.
- .2 Contractor: after receipt of such notice, inform Departmental Representative and Consultant of proposed corrective action and take such action for approval by Departmental Representative.
 - .1 Do not take action until after receipt of written approval by Departmental Representative.
- .3 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.
- .4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 11 - Cleaning.
- .3 Bury rubbish and waste materials on site after receipt of written approval from Departmental Representative.
- .4 Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 35 29.06 – Health and Safety Requirements.
- .2 Section 01 61 00 – Common Product Requirements.
- .3 Section 01 74 11 – Cleaning.
- .4 Section 01 74 21 – Construction/Deconstruction Waste Management and Disposal.
- .5 Section 26 05 00 – Common Work Results – Electrical.

1.2 REFERENCES

- .1 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2-94, Stipulated Price Contract.

1.3 INSPECTION

- .1 Refer to CCDC 2, GC 2.3.
- .2 Allow Departmental Representative 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 Departmental Representative'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 Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Owner shall pay cost of examination and replacement.

1.4 INDEPENDENT INSPECTION AGENCIES

- .1 The consultant will be engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Owner. If owner so chooses to have independent third party testing agency for purposes of inspecting and/or testing portions of the Work, cost of such services will be borne by Owner.
- .2 Provide equipment required for executing inspection and testing by appointed agencies.
- .3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.

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

1.5 ACCESS TO WORK

- .1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
- .2 Co-operate to provide reasonable facilities for such access.

1.6 PROCEDURES

- .1 Notify appropriate agency and Owner's Representative in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.7 REJECTED WORK

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

1.8 REPORTS

- .1 Submit 4 copies of inspection and test reports to Owner's Representative.
- .2 Provide copies to subcontractor of work being inspected or tested.

1.9 TESTS AND MIX DESIGNS

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

1.10 EQUIPMENT AND SYSTEMS

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

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 45 00 – Quality Control.

1.2 REFERENCES

- .1 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2-2008 - 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's Representative 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.
- .6 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.4 AVAILABILITY

- .1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify Owner's Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.
- .2 In event of failure to notify Owner's Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Owner's Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.5 STORAGE, HANDLING AND PROTECTION

- .1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Store cementations products clear of earth or concrete floors, and away from walls.
- .5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- .6 Store sheet materials on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
- .8 Remove and replace damaged products at own expense and to satisfaction of Owner's Representative.
- .9 Touch-up damaged factory finished surfaces to Owner's Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.6 TRANSPORTATION

- .1 Pay costs of transportation of products required in performance of Work.
- .2 Transportation cost of products supplied by Owner will be paid for by Departmental Representative. Unload, handle and store such products.

1.7 MANUFACTURER'S INSTRUCTIONS

- .1 Unless otherwise indicated in specifications install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
- .2 Notify Consultant in writing, of conflicts between specifications and manufacturer's instructions, so that Consultant will establish course of action.

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

1.8 QUALITY OF WORK

- .1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative and Consultant if required Work is such as to make it impractical to produce required results.
- .2 Do not employ anyone unskilled in their required duties. Departmental Representative and Consultant reserves right to require dismissal from site, workers deemed incompetent or careless.
- .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

1.9 CO-ORDINATION

- .1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.
- .2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.10 CONCEALMENT

- .1 In finished areas conceal conduits and wiring in floors, walls as required, except where indicated otherwise.
- .2 Before installation inform Departmental Representative if there is interference. Install as directed by Departmental 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 electrical items indicated as approximate. Ensure connections of existing conductors are adequate with existing lengths.
- .2 Inform Owner's Representative of conflicting installation. Install as directed.

1.13 FASTENINGS

- .1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.
- .2 Prevent electrolytic action between dissimilar metals and materials.
- .3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.
- .4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.
- .5 Keep exposed fastenings to a minimum, space evenly and install neatly.
- .6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

1.14 FASTENINGS - EQUIPMENT

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.
- .3 Bolts may not project more than one diameter beyond nuts.
- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

1.15 PROTECTION OF WORK IN PROGRESS

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

1.16 EXISTING UTILITIES

- .1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and/or building occupants.
- .2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 11 00 – Summary of Work.
- .2 Section 01 33 00 – Submittal Procedure.
- .3 Section 01 45 00 – Quality Control.
- .4 Section 26 05 00 – Common Work Results – Electrical.

1.2 REFERENCES

- .1 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2-2008 - 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 Departmental Representative. Do not burn waste materials on site.
- .3 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .4 Provide on-site containers for collection of waste materials and debris.
- .5 Provide and use marked separate bins for recycling. Refer to Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .6 Dispose of waste materials and debris at designated dumping areas on Crown property.
- .7 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
- .8 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .9 Provide adequate ventilation during use of volatile or noxious substances.
- .10 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .11 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.4 FINAL CLEANING

- .1 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 products and debris including that caused by other sub-contractors.
- .6 Remove waste materials from site at regularly scheduled times or dispose of as directed by Owner's Representative. Do not burn waste materials on site.
- .7 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .8 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.
- .2 Provide departmental Representative and Consultant documentation certifying that waste management, recycling, reuse of recyclable and reusable materials have been extensively practiced
- .3 Preserve environment and prevent pollution and environment damage
- .4 Accomplish maximum control of solid construction waste
- .5 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse
- .6 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.
- .7 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste
- .8 Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:
 - .1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
 - .2 Returning reusable items including pallets or unused products to vendors.
- .9 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.
- .10 Provide containers to deposit reusable and recyclable materials
- .11 Locate containers in locations, to facilitate deposit of materials without hindering daily operations
- .12 Do not dispose of waste, volatile materials, mineral spirits, oil, paint thinner and any other materials into waterways, storm, or sanitary sewers.
- .13 Remove materials from deconstruction as deconstruction/disassembly Work progresses.

- .14 If transformer is found to contain PCBs, it must be disposed of in accordance with governmental regulations. As it poses an environmental hazard it will need to be properly contained and disposed through the use of a registered environmental waste disposal firm. Notify in writing to department representative and consultant.
- .15 If the report is negative for PCBs, the transformer is to be recycled in conformance with transformer and electrical distribution recycling procedures. Dispose of and handle transformer oil with federal and provincial guidelines, protect surface and any potential drainage, ensure adequate coverage of ground surrounding transformer is covered when removal of oil and no contamination of surrounding environment.
- .16 Execute work with least possible interference or disturbance to normal use of premises.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 74 11 – Cleaning.

1.2 REFERENCES

- .1 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2-2008, 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 Departmental Representative in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
 - .2 Request Consultant's inspection.
 - .2 Consultant's Inspection:
 - .1 Consultant and Contractor to inspect Work and identify defects and deficiencies.
 - .3 Completion Tasks: submit written certificates in English that tasks have been performed as follows:
 - .1 Work: completed and inspected for compliance with Contract Documents.
 - .2 Defects: corrected and deficiencies completed.
 - .3 Equipment and systems: tested, adjusted and balanced and fully operational.
 - .4 Certificates required by Electrical Inspection Branch: submitted.
 - .5 Operation of systems: demonstrated to Owner's personnel.

1.4 FINAL CLEANING

- .1 Clean in accordance with Section 01 74 11 – Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse and recycling for all materials.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 FINAL FIELD REVIEW

- .1 Submit request upon completion of the Work, in writing, to the Consultant for a Final Field Review of the completed electrical work.
- .2 The Contractor is to have qualified manpower present for final field review, with ladders and tools, to provide the Consultant with access to the Work and to demonstrate installations.
- .3 Do not submit this written request until:
 - .1 A minimum of 95% of the value of the project is completed;
 - .2 Local electrical inspection has been completed and accepted; the Contractor is to submit to the Departmental Representative copies of the accepted electrical inspection forms that have been properly signed by the local, city or municipal electrical inspector;
 - .3 Deficiencies noted during previous field reviews have been completed;
 - .4 The cleanup is finished in every respect;
 - .5 Commissioning has been completed.
 - .6 Contractor has completed a review of the work and has provided the Consultant with a list of any deficiencies found;
 - .7 Extended warranty offered by manufacturers beyond one year is outlined in a letter to the Owner;
 - .8 Owner's operating personnel have been instructed in operation of systems.
- .4 Final field review will be conducted within approximately ten (10) business days of this request. Letter of acceptance or rejection along with a Field Review Report will be issued within approximately seven (7) business days of field review.
- .5 The Consultant will perform only one field review of each area of the work upon the above request.
- .6 Upon receipt of the Field Review Report, the Contractor will complete the deficiencies within 30 days and to notify the Consultant when the Work is 100% completed. A field review of the areas of deficiency will then be conducted by the Consultant. Should the Work not be completed to the satisfaction of the Departmental Representative or the Consultant and an additional field review is required, the costs for the Consultant will be paid by the Contractor. Costs will be based on time required at the Consultant's standard billing rates.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures

1.2 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .3 Revise content of submittal documents as required prior to final submittal.
- .4 Two weeks prior to Substantial Performance of the Work, submit to the Engineer, three final copies of operating and maintenance manuals.

1.3 AS-BUILT DRAWINGS

- .1 Changes made to the Work during installation and before completion of the Work shall be documented by the Contractor to ensure that the changes are recorded as they occur; they are to be indicated by use of coloured lines and suitable notations on one complete set of Drawings set aside exclusively for this purpose.
- .2 The Contractor shall turn over to the Engineer each Drawing after completely incorporating the revisions as above. These Drawings shall be clearly identified with the notation "Revised As-built" imprinted adjacent to the title block.
- .3 Provide electronic version of all drawings on a USB stick or CD to the Engineer.

1.4 OPERATING AND MAINTENANCE MANUALS

- .1 The existing Operating and Maintenance manuals shall be revised to include the changes made under this contract. Out of date and not applicable information shall be removed from the manual and new information shall be added to form a complete document for the Owner. Contents shall not include hand-written data. The contractor's responsibility is limited to the updating of system information relative to the version upgrade.
- .2 One copy of the Operating and Maintenance Manuals for the Control Systems shall be submitted in draft form to the Engineer for acceptance before Substantial Completion Testing.

1.5 CONTENTS - EACH VOLUME

- .1 The O & M manual shall include as-built versions of the submittal product data.
- .2 In addition to that required for the submittals, the O & M manual shall also include:
 - .1 Names, address and 24-hour telephone numbers of Contractors installing equipment, and the control systems and service representative of each.
 - .2 Licenses, Guarantee, and Warrantee documents for all equipment and systems.
 - .3 Recommended preventive maintenance procedures for all system components including a schedule of tasks (inspection, cleaning, calibration, etc.), time between tasks, and task descriptions.
 - .4 Testing and Commissioning Reports and Checklists.
 - .5 Project Record Drawings - These shall be as-built versions of the submittal shop drawings. One set of CAD .DWG or .DXF drawing files shall also be provided on CD.
 - .6 Description of systems controlled, system drawings, sequence of operation and schedules.
- .3 Should the Contractor thereafter amend the manuals, he shall promptly provide one copy of any such amendments to the Engineer for acceptance. Upon acceptance by the Engineer, the Contractor shall provide three copies of such amendments.

1.6 FORMAT

- .1 Organize data as instructional manual.
- .2 Following acceptance by the Engineer, submit three (3) complete sets of operating and maintenance instructions, bound in vinyl covered hard backed binder, 8 1/2" x 11" (210 mm x 297 mm) size, three-ring covers at completion, and before Substantial Completion of the Work. Contents of books shall not include hand-written data. Provide all documentation that is included in manuals on a separate CD or USB drive.
- .3 When multiple binders are used correlate data into related consistent groupings. Identify contents of each binder on spine.
- .4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content by systems under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

- .9 Provide full manual and scaled CAD files in dwg or dxf format on CD.

1.7 WARRANTY

- .1 At the end of the final start-up/testing and commissioning, if equipment and systems are operating satisfactorily to the Owner and Engineer, the Owner shall sign certificates certifying that the variable speed drives and transformer's operation has been tested and accepted in accordance with the terms of this specification. The date of Owner's acceptance shall be the start of warranty.
- .2 Labour & materials for control system specified shall be warranted free from defects for a period of twelve (12) months after final completion acceptance by the Owner. Control System failures of upgrade components during the warranty period shall be adjusted, repaired, or replaced at no charge or reduction in service to the Owner. The Contractor shall respond to the Owner's request for warranty service within 24 hours during customary business hours.
- .3 The warranty shall provide all material, parts and labour, including labour provided on an emergency response basis outside of normal working hours. Labour shall include any related travel time and other related costs associated with providing the warranty service.
- .4 The warranty shall cover all aspects of the control system upgrade provided under this contract, including control devices, transducers, and software.
- .5 A detailed service report must be filed with the Engineer after each warranty visit, detailing the work performed, time spent, devices replaced or repaired, and the personnel involved.
- .6 Emergency calls during the warranty period shall be addressed by the Contractor within four (4) hours of notification. Service shall be available 24 hours per day, seven days a week. The Engineer shall be provided an emergency phone number for contacting service personnel. The service call shall only be chargeable if inspection reveals any defect not directly covered under the terms of the specification.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 General requirements relating to testing and commissioning of project's components and systems, specifying general requirements to PV of components, equipment, sub-systems, systems, and integrated systems.
 - .2 Acronyms:
 - .1 BMM - Building Management Manual.
 - .2 Cx - Commissioning.
 - .3 O&M - Operation and Maintenance.
 - .4 PI - Product Information.
 - .5 PV - Performance Verification.
 - .6 TAB - Testing, Adjusting and Balancing.

1.2 RELATED SECTIONS

- .1 Section 01 11 00 – Summary of Work.
- .2 Section 01 78 00 – Closeout Submittal.

1.3 GENERAL

- .1 Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Cx is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved. Objectives:
 - .1 Verify installed equipment operates in accordance with contract documents and design criteria and intent.
 - .2 Ensure appropriate documentation is compiled into the BMM.
 - .3 Effectively train O&M staff.
- .2 Contractor assists in Cx process, operating equipment and systems, troubleshooting and making adjustments as required.
 - .1 Systems to be operated at full capacity under various modes, to determine if they function correctly and consistently at peak efficiency as intended in accordance with Contract Documents and design criteria.
 - .2 During these checks, adjustments to be made to enhance performance to meet environmental or user requirements.
- .3 Design Criteria: To meet Project functional and operational requirements.

1.4 COMMISSIONING OVERVIEW

- .1 Cx activities supplement field quality and testing procedures described in relevant technical sections.
- .2 Cx is conducted in concert with activities performed during stage of project delivery. Cx identifies issues in Planning and Design stages which are addressed during Construction and Cx stages to ensure the facility is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. Cx activities include transfer of critical knowledge to facility operational personnel.
- .3 Engineer will issue Interim Acceptance Certificate when:
 - .1 Completed Cx documentation has been received, reviewed for suitability and approved by the Engineer and owners Commissioning Manager (if applicable).
 - .2 Equipment, components and systems have been commissioned.

1.5 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS

- .1 Should equipment, system components, and associated controls be incorrectly installed or malfunction during Cx, correct deficiencies, re-verify equipment and components within the un-functional system, including related systems as deemed required by the Engineer or Commissioning Manager, to ensure effective performance.
- .2 Costs for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be borne by Contractor. Above costs to be in form of progress payment reductions or hold-back assessments.

1.6 PRE-CX REVIEW

- .1 Before start of Cx:
 - .1 Ensure installation of related components, equipment, and systems are complete.
 - .2 Fully understand Cx requirements and procedures.
 - .3 Have Cx documentation shelf-ready.
 - .4 Understand completely design criteria and intent and special features.
 - .5 Ensure systems have been cleaned thoroughly.
 - .6 Complete TAB procedures on systems; submit TAB reports to Engineer and Commissioning Manager, for review and approval.
 - .7 Ensure "As-Built" system schematics are available.
- .2 Inform Engineer in writing of discrepancies and deficiencies on finished works.

1.7 CONFLICTS

- .1 Report conflicts between requirements of this section and other sections to Engineer before start-up and obtain clarification.
- .2 Failure to report conflict and obtain clarification will result in application of most stringent requirement.

1.8 COMMISSIONING DOCUMENTATION

- .1 Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms for requirements and instructions for use.
- .2 Installation / Start-up Check List:
 - .1 Product manufacturer's installation instructions and recommended checks.
 - .2 Special procedures as specified in relevant technical sections.
 - .3 Items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.
 - .4 Equipment manufacturer's installation/start-up check lists are acceptable for use. As deemed necessary by Engineer supplemental additional data lists will be required for specific project conditions.
- .3 Product Information (PI) Report Forms
 - .1 Product Information (PI) forms compiles gathered data on items of equipment produced by equipment manufacturer, includes nameplate information, parts list, operating instructions, maintenance guidelines and pertinent technical data and recommended checks that is necessary to prepare for start-up and functional testing and used during operation and maintenance of equipment. This documentation is included in the BMM at completion of work.
- .4 Performance Verification (PV) Forms
 - .1 PV forms to be used for checks, running dynamic tests and adjustments carried out on equipment and systems to ensure correct operation, efficiently and function independently and interactively with other systems as intended with project requirements.
 - .2 PV report forms include those developed by Contractor records measured data and readings taken during functional testing and Performance Verification procedures.
- .5 Commissioning Forms
 - .1 Use Commissioning forms to verify installation and record performance when starting equipment and systems.
 - .2 Contractor to provide project-specific Commissioning forms with Specification data included.
 - .3 Confirm operation as per design criteria and intent.
 - .4 Identify variances between design and operation and reasons for variances.
 - .5 Record analytical and substantiating data.
 - .6 Verify reported results.
 - .7 Form to bear signatures of recording technician and reviewed and signed off by Engineer and Commissioning Manager.
 - .8 Submit immediately after tests are performed.
 - .9 Reported results in true measured SI unit values.
- .6 Provide completed and approved Cx documentation to Engineer.
- .7 Completed commissioning forms to be included in the Building Management Manual.

- .8 Results of all tests shall be documented by the Contractor and a hard copy of the commissioning sheets shall be submitted to Prism for review.

1.9 NOTIFICATION OF TESTING

- .1 Notify Engineer/Commissioning Manager at least 10 days prior to start testing.
- .2 Start Cx after elements of building affecting start-up and performance verification of systems have been completed.
- .3 Contractor's Cx Agent to be present at tests performed and documented by sub-trades, suppliers and equipment manufacturers.

1.10 MANUFACTURER'S INVOLVEMENT

- .1 Obtain manufacturer's installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with Engineer.
 - .1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.
 - .2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.
- .2 Integrity of warranties:
 - .1 Use manufacturers trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty.
 - .2 Verify with manufacturer that testing as specified will not void warranties.
- .3 Qualifications of manufacturer's personnel:
 - .1 Experienced in design, installation and operation of equipment and systems.
 - .2 Ability to interpret test results accurately.
 - .3 To report results in clear, concise, logical manner.

1.11 PROCEDURES

- .1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and Cx.
- .2 Conduct start-up and testing in following distinct phases:
 - .1 Included in delivery and installation:
 - .1 Verification of conformity to specification, approved shop drawings and completion of PI report forms.
 - .2 Visual inspection of quality of installation.
 - .2 Start-up: follow accepted start-up procedures.
 - .3 Operational testing: document equipment performance.
 - .4 System PV: include repetition of tests after correcting deficiencies.
 - .5 Complete testing and verifications on fault level and high voltage study on equipment
 - .6 Coordination study on new transformer interconnected with existing distribution and its components characteristics, etc.

- .3 Correct deficiencies and obtain approval from Engineer after distinct phases have been completed and before commencing next phase.
- .4 Document required tests on approved PV forms. Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by Engineer. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following:
 - .1 Minor equipment/systems: implement corrective measures approved by Engineer.
 - .2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by Engineer.
 - .3 If evaluation report concludes that major damage has occurred, Engineer shall reject equipment.
 - .1 Rejected equipment to be removed from site and replace with new.
 - .2 Subject new equipment/systems, to specified start-up procedures.

1.12 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS

- .1 With assistance of manufacturer develop written maintenance program and submit to Engineer for approval before implementation.

1.13 TEST RESULTS

- .1 If start-up, testing and/or PV produce unacceptable results, repair, replace or repeat specified starting and/or PV procedures until acceptable results are achieved.
- .2 Provide manpower and materials, assume costs for re-commissioning.

1.14 INSTRUMENTS / EQUIPMENT

- .1 Provide the testing instruments/equipment as required to complete work.

1.15 COMMISSIONING PERFORMANCE VERIFICATION

- .1 Carry out Cx under actual operating conditions.
- .2 Cx procedures to be repeatable and reported results are to be verifiable.
- .3 Follow equipment manufacturer's operating instructions.

1.16 AUTHORITIES HAVING JURISDICTION

- .1 Where specified start-up, testing or commissioning procedures duplicate verification requirements of authority having jurisdiction, arrange for authority to witness procedures so as to avoid duplication of tests and to facilitate expedient acceptance of facility.
- .2 Obtain certificates of approval, acceptance and compliance with rules and regulation of authority having jurisdiction.
- .3 Provide copies Commissioning Manager and Engineer within 5 days of test and with Cx report.

1.17 EXTRAPOLATION OF RESULTS

- .1 Where Cx of weather, occupancy, or seasonal-sensitive equipment or systems cannot be conducted under near-rated or near-design conditions, extrapolate part-load results to design conditions when approved Engineer in accordance with equipment manufacturer's instructions, using manufacturer's data, with manufacturer's assistance and using approved formulae.

1.18 EXTENT OF VERIFICATION

- .1 Provide manpower and instrumentation to verify up to 100% of reported results, unless specified otherwise in other sections.
- .2 Conduct tests repeated during verification under same conditions as original tests, using same test equipment, instrumentation.
- .3 Perform additional commissioning until results are acceptable to Engineer and/or Commissioning Manager.

1.19 DEFICIENCIES, FAULTS, DEFECTS

- .1 Correct deficiencies found during start-up and Cx to satisfaction of Engineer and Commissioning Manager.
- .2 Report problems, faults or defects affecting Cx to Engineer and Commissioning Manager in writing. Stop Cx until problems are rectified. Proceed with written approval from Engineer and Commissioning Manager.

1.20 COMPLETION OF COMMISSIONING

- .1 Upon completion of Cx leave systems in normal operating mode.
- .2 Except for warranty and seasonal verification activities specified in Cx specifications, complete Cx prior to issuance of Interim Certificate of Completion.
- .3 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by Engineer and/or Commissioning Manager.

1.21 ACTIVITIES UPON COMPLETION OF COMMISSIONING

- .1 When changes are made to baseline components or system settings established during Cx process, provide updated Cx form for affected item.

1.22 PERFORMANCE VERIFICATION TOLERANCES

- .1 Application tolerances:
 - .1 Specified range of acceptable deviations of measured values from specified values or specified design criteria. Except for special areas to be within +/- 10% of specified values.
- .2 Instrument accuracy tolerances:
 - .1 To be of higher order of magnitude than equipment or system being tested.

1.23 OWNER'S PERFORMANCE TESTING

- .1 Performance testing of equipment or system by Commissioning Manager will not relieve Contractor from compliance with specified start-up and testing procedures.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.1-06, Canadian Electrical Code, Part 1 (20th Edition), Safety Standard for Electrical Installations.
 - .2 CAN/CSA-C22.3 No. 1-01(Update March 2005), Overhead Systems.
 - .3 CAN3-C235-83(R2000), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
- .2 Electrical and Electronic Manufacturer's Association of Canada (EEMAC)
 - .1 EEMAC 2Y-1-1958, Light Gray Colour for Indoor Switch Gear.
- .3 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
 - .1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

1.2 DEFINITIONS

- .1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.
- .2 The word "provide" shall mean to "supply and install" unless otherwise indicated.

1.3 DESIGN REQUIREMENTS

- .1 Operating voltages: to CAN3-C235.
- .2 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.

1.4 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data: submit WHMIS MSDS in accordance with Section 01 47 15 - Sustainable Requirements: Construction and Section 02 81 01 - Hazardous Materials.

1.5 QUALITY ASSURANCE AND QUALIFICATIONS

- .1 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices in accordance with authorities having jurisdiction as per the conditions of Provincial Act respecting manpower vocational training and qualification. Any unsatisfactory workmanship shall be replaced to the satisfaction of the Engineer.
- .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 Engineer. 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, prior to the start of the Work.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Material Delivery Schedule: provide Engineer with schedule within 2 weeks after award of Contract.
- .2 Provide labour, materials, miscellaneous services, shop drawings, maintenance manuals, equipment identification by means of lamicoid nameplates, testing and balancing and any other items necessary to complete the Work as shown and specified. Include all items necessary to comply with latest edition of electrical and building codes, by-laws and authorities having jurisdiction and necessary for complete and operating electrical systems.
- .3 Store electrical material and equipment such as transformers in a dry, clean location and cover with polyethylene plastic to preserve factory finish.
- .4 Protect exposed or freestanding equipment with plastic to minimize entry of dust and dirt and marring of finished surfaces during progress of Work.
- .5 Repair and finish factory finished equipment, damaged or scratched during installation, in an approved manner.

1.7 SYSTEM STARTUP

- .1 Instruct operating personnel in operation, care and maintenance of systems, system equipment and components.
- .2 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant will aspects of its care and operation.

1.8 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 operating instructions and frame under approved laminated plastic.
 - .4 Post instructions where directed.

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 shall be new and the best of their respective kinds and of uniform pattern throughout work.
- .3 Materials shall be of Canadian manufacture where obtainable. Materials of foreign manufacture, unless specified shall be approved before being ordered. Products shall be purchased through manufacturer's Canadian Distributors or Wholesalers, or directly from the manufacturer, when obtainable.
- .4 Equipment items shall be standard products of approved manufacture. Identical units of equipment shall be of same manufacture. In any unit of equipment, identical component parts shall be of same manufacture, but the various component parts comprising the unit need not be of one manufacture.
- .5 Chemical and physical properties of materials and design performance characteristics and methods of construction and installation of items of equipment, specified herein, shall 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 shall bear approval labels as required by Code and/or Local Inspection Authorities. All equipment shall 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 shall be taken that equipment bearing an appropriate certification label from any of the above listed organizations is acceptable.
- .7 Install materials in strict accordance with manufacturer’s recommendations.
- .8 Include items of material and equipment not specification noted on Drawings 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 shall govern.

2.2 MATERIALS AND EQUIPMENT

- .1 Material and equipment to be CSA certified. Where CSA certified material and equipment is not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval.

2.3 WIRING TERMINATIONS

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

2.4 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, numbered, 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.

Part 3 Execution

3.1 INSTALLATION

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.
- .2 Do overhead and underground systems in accordance with CSA C22.3 No.1 except where specified otherwise.

3.2 NAMEPLATES AND LABELS

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

3.3 MOUNTING HEIGHTS

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

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 Load Balance:
 - .1 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
 - .2 Provide upon completion of work, load balance report as directed in PART 1 - SUBMITTALS: transformer operating under normal load, as well as hour and date on which each load was measured, and voltage and kW load at time of test.
- .2 Carry out tests in presence of Departmental Representative and Engineer.
- .3 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .4 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 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.
 - .4 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.
 - .5 Schedule site visits, to review Work.

3.6 CLEANING

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

3.7 CUTTING AND PATCHING

- .1 Cutting and patching of existing work to accommodate the Work, unless otherwise noted, will be done by and paid for by the trade requiring same. Layout such work for approval by Owner's Representative before undertaking same.
- .2 Should any cutting or repairing of either unfinished or finished Work be required because such installation was not done, employ the particular trade, whose Work is involved, to do such cutting and patching. Pay for any resulting costs. Layout such Work for approval by Owner's Representative before undertaking same.
- .3 Holes required in existing construction to accommodate conduit or wire ways shall be cut neatly or drilled.

3.8 TESTING

- .1 Make tests of equipment and wiring at time requested.
- .2 Tests shall 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 Arrange and pay for services of applicable manufacturer's factory service engineer to supervise initial start-up of specialized portions of installation and to check, adjust, balance and calibrate components including related wiring and controls. 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 Owners' operating personnel are fully conversant with every aspect of the operation, care and maintenance thereof.

3.9 SLEEVES AND BASES

- .1 The integrity of the fire rating of the walls shall be maintained around, raceways or cables passing through such walls.
- .2 Remove remaining existing concrete curb.
- .3 Provide concrete pad, refer to detail on drawings.

- .4 Exact size of concrete base to be determined based on transformer enclosure size.

3.10 REPAIR OF SURFACES

- .1 Contractor shall include for patching, filling and painting of surfaces where the Work will expose wall, ceiling or other surfaces.
- .2 Concrete surfaces shall be topped or coated with sealant to prevent exposed areas from chipping or erosion.
- .3 All surfaces shall be painted, varnished or finished to conform to immediate surrounding materials. Paint colour shall be determined by paint chip analysis or confirmation of paint code provided by Owner.

3.11 SEISMIC SUPPORTS

- .1 The installation of all major electrical equipment not limited to but including; transformers 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 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.

3.12 GROUNDING

- .1 Ground electrical equipment and wiring in accordance with Canadian Electrical Code and Local Inspection Authority's Rules and Regulations.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-C22.2 No. 131-07, Type TECK 90 Cable.
 - .2 CAN/CSA-C61089-2003, Round Wire Concentric Lay Overhead Electrical Stranded Conductors.
- .2 National Electrical Manufacturers' Association (NEMA)/Insulated Cable Engineers Association (ICEA)
 - .1 ICEA S-93-639/NEMA WC74-06, 5-46 KV Shielded Power Cable for Use in the Transmission and Distribution of Electrical Energy.

Part 2 Products

2.1 TECK POWER CABLE (1001 - 15000 V)

- .1 Cable: to CSA-C22.2 No. 131 and in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Bare copper grounding conductor, size as indicated.
- .3 Copper circuit conductors, size and number as indicated.
- .4 Strand shielding.
- .5 Insulation: chemically cross-linked thermosetting polyethylene rated RW90 15 kV to ICEA S-93-639/NEMA WC74.
- .6 Insulation shielding: semi-conducting non-metallic tape over insulation and served wire shield over tape to ICEA S-93-639/NEMA WC74.
- .7 Separator tape over conductor assembly.
- .8 Inner jacket of PVC.
- .9 Interlocked steel armour.
- .10 Overall PVC jacket rated minus 40 degrees C.

Part 3 Execution

3.1 INSTALLATION

- .1 Install power cable as indicated and in accordance with manufacturer's instructions.
- .2 Provide supports and accessories for installation of high voltage power cable.
- .3 Install stress cones, terminations and splices in accordance with manufacturer's instructions
- .4 Install grounding in accordance with local inspection authority having jurisdiction.
- .5 Provide cable identification tags and identify each phase conductor of power cable.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 CSA C22.2 No .0.3-96, Test Methods for Electrical Wires and Cables.

Part 2 Products

2.1 CONDUCTORS, WIRES AND CABLES

- .1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.
- .2 All conductors shall be copper conductors. All AWG sizes given in this specification refer to the copper AWG size.
- .3 Copper conductors: size as indicated, with 600 V insulation of cross-linked thermosetting polyethylene material rated RW90.
- .4 Conductors shall be colour coded. Conductors No. 2 gauge and smaller shall have colour impregnated into insulation at time of manufacture. Conductor's size larger than No. 2 gauge may be colour coded with adhesive colour coding tape but only black insulated conductors shall be employed in this case, except for neutrals which shall be white whenever possible. Conductors of No. 8 gauge and larger must be stranded.
- .5 Colour Coding shall be as follows:

Phase "A"	Red	Ground	Green
Phase "B"	Black	Neutral	White
Phase "C"	Blue	Control	Orange

- .6 Neutral conductors may be identified by a coloured insulation with three or more extruded longitudinal white stripes along the insulation, and will be deemed to have a white or natural covering. All neutral conductors used in the Work must match building standard.
- .7 Neatly train circuit wiring in cabinets, panels, pull boxes and junction boxes and hold with nylon cable ties.
- .8 Splice wire, up to and including No. 6 gauge, with twist-on style connections rated minimum 600 volts (1000 volts in luminaires). Connection body shall be moulded of thermoplastic. Spring insert shall have an expandable square-edge. Splice large conductors using split-bolt or compression type connections wrapped with PVC tape.
- .9 Where colour coding tape is utilized, it shall be applied for a minimum of 50.8 mm (2") at terminations, junction and pull boxes and conduit fittings. Do not paint conductors under any circumstances. Colour coding shall also apply to bussing in panels.
- .10 Supply and install medium voltage (MV) cables complete with stress cones.
- .11 Supply and install insulators for wall standoffs to support MV cables.
- .12 Supply and install secondary feeders from transformers to secondary bus duct.

2.2 CONDUIT ACCESSORIES, CONDULETS AND FITTINGS

- .1 Conduit accessories, condulets and fittings shall conform to CSA Standard C22.2 No. 18.
- .2 EMT couplings shall be steel concrete tight to match connectors.
- .3 Use condulets with suitable covers where conduits are exposed. Each conduit fitting shall be of a type suitable to its particular use and of a type, which will allow installation of future conduits without blocking covers of existing condulets.
- .4 Install junction boxes or cable anchor boxes wherever necessary for proper pulling or anchoring of cables. Install so as to be accessible after building is completed and set to come within finished lines of building.
- .5 Terminate EMT entering boxes or enclosures with nylon insulated steel concrete tight connectors.

Part 3 Execution

3.1 GENERAL CABLE INSTALLATION

- .1 Conductor length for parallel feeders to be identical.
- .2 Lace or clip groups of feeder cables at pull boxes, and termination points.
- .3 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

3.2 WIRING METHODS

- .1 Install wiring in conduit unless otherwise specified.
- .2 Use thin wall conduit for branch circuit and signal wiring.
- .3 Conduit shall be of sufficient size to permit easy removal of conductors at any time. Conduit sizes, where shown, are minimum and shall not be reduced. Do not bend conduit over sharp objects. Improperly formed bends and running threads will not be accepted. Do not use bends and fittings together.
- .4 Run conduit and cables in unfinished areas, such as electrical rooms, 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. They shall be installed 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 shall not be run within 152.4 mm (6") of such pipes except where crossings are unavoidable, in which case they shall be kept at least 25 mm (1") from covering of pipe crossed.

END OF SECTION

Part 1 General**1.1 RELATED SECTIONS**

- .1 Section 26 05 00 – Common Work Results
- .2 Section 26 05 14 – Power Cable and Overhead Conductors

Part 2 Products**2.1 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.
- .2 Switches or other electrical equipment shall 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 Support hangers, in general, from inserts in concrete construction. Provide additional angle or channel steel members, required for supporting conduits, cables and bus ducts.
- .4 Provide any additional supports required from existing concrete construction for any equipment, by drilling same and installing expansion bolt cinch anchors.
- .5 Do not use explosive drive pins in any section of Work without obtaining prior approval from Commissioning Manager.

2.2 HANGERS

- .1 Hangers for electrical conduit shall be galvanized after fabrication.
- .2 Do not use perforated strapping (grabber 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-hole straps to secure surface conduits and cables 50 mm and smaller.

- .2 Two-hole steel straps for conduits and cables larger than 50 mm.
- .3 Beam clamps to secure conduit to exposed steel work.
- .5 Suspended support systems.
 - .1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
 - .2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.
- .6 For surface mounting of two or more conduits use channels at max 1200mm 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 Engineer.
- .11 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 26 05 00 – Common Work Results

1.2 REFERENCES

- .1 All characteristics, definitions, and terminology except as specifically covered in this specification, shall be in accordance with the latest revisions of the standards required.
- .2 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-C2.1-06, Single-Phase and Three-Phase Distribution Transformers, Types ONAN and LNAN.
- .3 Electrical and Electronic Manufacturer’s Association of Canada
 - .1 EEMAC L9-3-Interchangeability of HV Bushings on Pole Type Distribution Transformers.

1.3 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer’s printed product literature, specifications and datasheet and include product characteristics, performance criteria, and limitations.
- .3 Submit shop drawings and indicate:
 - .1 Dimensioned positions of mounting devices.
 - .2 Dimensioned positions of terminations.
 - .3 Identified internal and external component layout on assembly drawing.
 - .4 Insulating liquid capacity.
 - .5 Core and winding losses
 - .6 Impedance
- .4 Quality Assurance Submittals:
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .2 Instructions: submit manufacturer’s installation instructions.
 - .1 Departmental Representative will make available 1 copy of systems supplier’s installation instructions.
- .5 Closeout Submittals
 - .1 Provide maintenance data for liquid filled transformers for incorporation into manual specified in Section 01 78 00 - Closeout Submittals

- .2 Include insulating liquid maintenance data.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Ship transformers with first fill of liquid as per standards and regulations for shipment.
- .2 Ship transformers pressurized with inert gas at manufacturer recommended positive pressure and per CSA requirements.
- .3 Waste Management and Disposal:
 - .1 Separate waste materials for recycling in accordance with local and manufacturer-Construction/Demolition Waste Management and Disposal requirements.

1.5 MAINTENANCE

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

Part 2 Products

2.1 SWITCHGEAR

- .1 Switchgear and transformer to be in same enclosure as a complete unitized tamperproof pad mount substation.
- .2 Primary switchgear to have a fused load break switch in accordance with C22.2 No. 31 0.
- .3 To be complete with all appropriate interlocks and safety features.

2.2 TRANSFORMER CHARACTERISTICS

- .1 Transformers: to CAN/CSA C2.1-06.
- .2 Liquid cooled, outdoor, distribution transformers type ONAN.
- .3 Rated for use in wet and corrosive environment
- .4 Primary voltage: 7.2KV, 60 Hz, 1 phase, 3 wire, 15kV cover mount bushing. 2 high voltage terminals
- .5 Secondary voltage: 120/240V, 1 phase, 3 wire, grounded, H spade with 1 ...12 stud (4-hole) bushings (1).
- .6 Capacity: 25 kVA.
- .7 Basic impulse level: 125 kV.
- .8 Polarity: additive.
- .9 Average Winding Rise (AWR): 65 C.

- .10 Impedance: Nominal 2.8%.
 - .1 Single phase transformers with same impedance, from same manufacturer, when used in multi-phase configuration.
- .11 No load losses not to exceed 10% of kW rating.
- .12 Full load losses not to exceed 6% of kW rating.
- .13 The tank shall include a pressure relief device as a means to relieve pressure in excess of pressure resulting from normal operation. The venting and sealing characteristics shall be as follows:
 - .1 Cracking pressure: 10psig +/- 2psig
 - .2 Resealing pressure: 6 psig minimum
 - .3 Zero leakage from reseal pressure to -8 psig
 - .4 Flow at 15 psig: 35 SCFM minimum

2.3 MOUNTING

- .1 Transformers suitable for floor mounting in enclosure.

2.4 VOLTAGE TAPS

- .1 Two-2.5% taps, above and below rated voltage 2-FCAN, 2-FCBN.

2.5 HIGH VOLTAGE BUSHINGS

- .1 Bushing: to EEMAC L9-3.
- .2 One high voltage bushing on single phase transformer.

2.6 INSULATING LIQUID

- .1 Insulating liquid: (FR3 fluid).
 - .1 Dielectric coolant fluid used shall be non-toxic, non-bioaccumulating and biodegradable. It shall be 100% derived from edible seed oils and food grade performance enhancing additives. The fluid shall be verified to comply with all regulatory requirements and codes.
 - .2 All transformer components shall be certified to comply with industry standards when tested.

2.7 ACCESSORIES

- .1 Factory install all accessories.
- .2 Top filter press connection.
- .3 Tank ground connector
- .4 Anchor devices, setting templates means for bolting down.

- .5 Tamperproof, removable, bolted-on cabinet with open bottom, removable liftoff doors, stainless steel hinges and three point latching mechanism. doors designed to prevent access to hv compartment until lv compartment door is opened. Provisions for padlocking on lv compartment door. Captive penta head compartment door locking bolt provided.
- .6 Removable salt and corrosion proof cover (tamperproof)
- .7 Welded on cover
- .8 Bolted on inspection plate
- .9 Lifting lugs (4ea. required)
- .10 Diagrammatic corrosion resistant nameplate
- .11 Steel barrier between HV & LV compartments
- .12 One lv bushing with NEMA 4 hole spade terminals
- .13 One each neutral bushing with NEMA 4 hole spade terminal and removable
- .14 Ground strap (1/2" – 13 tap ground boss)
- .15 One high voltage bushing with eyebolt terminal
- .16 Transformer undercoated to prevent corrosion
- .17 Tank ground bosses (1/2" – 13 taps) (each compartment)
- .18 Transformer base with provisions for rolling
- .19 Enclosure to be salt resistant
- .20 Automatic pressure relief valve
- .21 Drain plug
- .22 Filler plug
- .23 Externally operated no-load tap changer
- .24 Provisions for mounting surge arresters

2.8 FINISH

- .1 Finish tank exterior in accordance with Section 26 05 00 - Common Work Results - for Electrical.
- .2 Paint colour Munsell 7.0 gy 3.29/1.5 bell green.

2.9 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - for Electrical.
- .2 Owner's equipment reference label: size 7.
- .3 Primary/secondary voltage decals

2.10 SOURCE QUALITY CONTROL

- .1 Provide test certificates to Consultant.

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 transformers only after other work in area is completed and in accordance with manufacturer's instructions.
- .2 Ensure concrete base fully cured before installation of transformers.
- .3 Concrete base to be coated with approved epoxy coating, approved for use in transformer oil containment. Installed as per manufacturer recommendations and requirements.
- .4 Use spreader bars on slings when lifting transformers into place.
- .5 Set and secure transformers in place rigid, plumb, square.
- .6 Ensure internal connections are mechanically tight.
- .7 Make connections.
- .8 Connect transformer ground terminal to system ground.
- .9 Fill transformers when required with metal hose and ensure care is taken to prevent contamination of liquid and components.
- .10 Set taps to produce rated secondary voltage at no-load.

3.3 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results - for Electrical.
- .2 Carry out following insulation tests using megger with 20,000 megohm scale and resulting insulation resistance corrected to base of 20 degrees C.
 - .1 High voltage to ground with secondary grounded for duration of test.
 - .2 Low voltage to ground with primary grounded for duration of test.
 - .3 High to low voltage.
- .3 Inspect primary and secondary connections for tightness and for signs of overheating.
- .4 Inspect and clean bushings and insulators.
- .5 Check oil level and temperature indicators.
- .6 Set transformer taps to rated voltage as specified.
- .7 Inspect for oil leaks and excessive rusting.
- .8 Inspect oil level.
- .9 Check fuses for correctness of type and size.
- .10 Check for grounding and neutral continuity between primary and secondary circuits of transformer.

3.4 CLEANING

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

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Materials and installation for one new customer owned Hydro Pole installation together with distribution-class, gang operated overhead load break switch, as a replacement for the existing customer owned pole LAT 52.170760, LOG 128,141064, overhead supplied by BC Hydro with a cable size #2ACSR, from pole LAT52.170880, LOG 128.142772.
- .2 The supply is sized for 6.3 Amp at 7.2 kV P/N, feeding a 25 kV pad mounted Transformer, 7,200V / 120 - 240V, 1Ph, 3W transformer, through a Customer Service Entrance Fused Switch DIN Style SE Fuse 6.3 Amp in Outdoor Unit Sub-Station.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 Canadian Electrical Code, Part 1, C22.1-2015
 - .2 BC Hydro Engineering Standards 43 B1-11
 - .3 BC Hydro Overhead Service Design Manual

Part 2 Products

2.1 HYDRO POLE

- .1 Supply and installation of one Hydro Pole made from full length, pressure treated, class 6 or higher timber and have the installation accepted by BC Hydro.
- .2 **Pole Requirements**
 - .1 Minimum diameter at the top to be 5.5 inches.
 - .2 Minimum diameter 6 feet from butt, is to be 9 inches
 - .3 Gain mark 12 feet from butt.
 - .4 Near the top of the pole, insert a bolt through the clevis.
- .3 **Installation Requirements**
 - .1 For holes in normal ground or loose rock the minimum depth shall be 5 feet for a pole of 30 feet or less, or
 - .2 10 percent total height of pole plus 2 feet for poles longer than 30 feet.
 - .3 The required clearance shall determine the length of the pole and shall be in accordance with the requirements of the CEC Rule 36-110, Tables 32 and 34.
 - .4 The point of attachment must not exceed 7 meters above grade or sidewalk, and the clearance of supply conductors above grade must not be less than :
 - .1 Across highways, freeways and expressways, 7.1 meters
 - .2 Across streets, lanes, alleys and pipeline right of way, 5.5 meters
 - .3 Across driveways to commercial and industrial premises, 5.5 meters
 - .4 Across driveways to residential garages, 4.5 meters
 - .5 Across ground normally accessible to pedestrians only, 3.5 meters

- .5 Provide and install all required guide wires and stays for a dead-ended installation to ensure installation stability, even under seismic event conditions.
- .4 Location**
 - .1 The location of the service entrance (wire holder) must not create an aerial trespass and be:
 - .1 In direct line of sight with BC Hydro's service pole.
- .5 Length**
 - .1 The maximum service length from a BC Hydro pole to the customer's point of attachment is 30 metres (100 feet). If the service length exceeds 30 metres and is approved by BC Hydro, an extension fee will apply, which shall form part of this contract.
- .6 Other**
 - .1 Service connections to private property poles may help alleviate problems resulting from clearances and other BC Hydro, WorkSafe BC and Electrical Code requirements.
 - .2 Trees must be cleared to 3 metres on each side of any secondary conductor
 - .3 Mid span-taps are not typically allowed.
 - .4 If it is not possible to meet overhead connection requirements, please contact BC Hydro's Electric Service Coordination Centre at 1 877 520 1355 Monday to Friday, 8 a.m. and 4 p.m.
 - .5 Or speak to **Scott Northridge**, Design Technical Leader, Distribution Engineering & Design, **BC Hydro**, 5220 Keith Ave, Terrace, B.C. V8G 4R5
Ph: 250.638.5612
Fax: 250.638.5695
Email: scott.northridge@bchydro.com
 - .6 Perform the installation with reference to BC Hydro Engineering Standards 43 B1-11.

2.2 **OVREHEAD LOADBREAK SWITCH**

- .1 General**
 - .1 Supply and install one distribution-class overhead load-break switch for gang-operation for a distribution voltage classifications of 15.5 kV. The use of the switch is for line sectionalizing or isolating. The load-break switch shall have reverse loop contacts found on distribution-class side-break transmission switches. The reverse loop contacts shall utilize high current magnetic forces for added reliability. The reverse loop design shall allow for high contact pressure to be maintained during fault conditions. This feature shall prevent pitting and distorting of the switch blade and contacts even under severe momentary overload.
- .2 Contacts**
 - .1 The stationary contact shall be constructed of silver-plated hard drawn copper in a reverse loop configuration. The reverse loop design shall ensure that pressure is applied to the blade when subjected to high fault currents.

.3 Blades

- .1 The blade shall be constructed of silver-plated hard drawn copper of solid blade buss design. The blade shall not use a truss type design that requires backup springs to insure contact pressure. The blade and contact design shall be self-wiping and capable of 20,000 mechanical operations without detrimental wear. The internal mechanism of the interrupter shall be manufactured from non-ferrous components ensuring long term resistance to corrosion in all environments. The interrupter mechanism shall be able to handle 2500 successful mechanical operations. The interrupter shall be capable of 10 successful 900 A interruptions at 38 kV or 50 successful 600 A interruptions at a rated 25.8 kV. The body of the interrupter shall be manufactured from UV stabilized Lexanfi 103 material and shall be easily replaced with a hot-stick. The interrupter operating arm shall be made of stainless steel (304) with UV stabilized Lexanfi 103 insulation molded permanently onto the arm.

.4 Phase Units

- .1 All current-carrying parts shall be manufactured from copper. Terminal pads shall be NEMAfi two hole, silver or tin-plated. The rotating insulator stack shall incorporate oil-impregnated bronze bearings to ensure maintenance free operation for life of the switch. The spindle shall be manufactured from stainless steel and shall be supported by bushings spaced at four inches to eliminate rocking of the insulator and to ensure proper blade and contact alignment. Each phase unit shall be secured to the cross-arm with locking spacers to eliminate distortion of the phase unit base. Dead-end brackets shall incorporate locking tabs that will eliminate movement under side forces present when conductor is dead-ended at an angle. The switch shall be capable of opening or closing under a 3/8" ice layer without ice shields. The switch shall be capable of opening or closing under a 3/4" ice layer with ice shields. Insulator bolt pattern shall be standard as 2.25" for 15 kV.
- .2 Provisions for cross arm support brackets shall be provided. Supply two adjustment mounting brackets on cross arm. This shall allow the contractor to install support brackets/alley arms to the cross arm. The support brackets shall be included.
- .5 If compression terminals are used, provide two 1 3/4" captive stainless steel studs on each NEMAfi two -hole pad.
- .6 Provide two 14" extension links on each conductor dead-end bracket, six per switch if required.
- .7 Provide a grounding strap and connector that is attached to the manual operating handle. This shall be a standard feature on torsional control designs.
- .8 Provide a 1" O.D. steel interphase rod. The standard rod shall be UV inhibited fiberglass.
- .9 Provide a hole and spacing for a pin type insulator to be located on the cross-arm to accommodate the neutral wire.

- .10 Provide a nameplate fixed to the manual control handle in addition to the nameplate mounted on the switch cross-arm.
- .11 Provide ice shields on each switch clip contact. This shall allow the switch to be opened or closed under a 3/4" ice build-up.
- .12 Provide for a grounding lug on the cross-arm mounting bracket. This allows for the utility to ground the switch base to the pole ground.
- .13 Provide connectors on each two-hole NEMAfi pad for conductors.
- .14 Provide the additional support of adjusting pole bands that are attached to the pole mounting bracket.

Part 3 Execution

3.1 INSTALLATION

- .1 Install the new customer owned end-of-line pole and overhead gang-operated load break switch in accordance with BC Hydro Engineering Standard 43 B1-11 and the Canadian Electrical Code C22.1-15 in the location directed by BC Hydro, as a replacement of the existing customer owned pole LAT 52.170760, LOG 128,141064.
- .2 BC Hydro expects that the customer owned pole and all attachments to it will be owned, operated, and maintained by the customer. Therefore, the installation of the new pole, load break switch, pilaster and cable dip for the underground and underwater marine type cable and the transfer of the existing equipment to it, forms part of this contract.

END OF SECTION