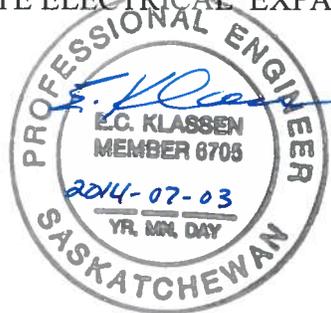


CONTRACT SPECIFICATIONS  
FOR  
Parks Canada – Prince Albert National Park  
BEAVER GLEN CAMPGROUND  
CAMPSITE ELECTRICAL EXPANSION



Seal

Seal

Seal

ASSOCIATION OF PROFESSIONAL ENGINEERS  
AND GEOSCIENTISTS OF SASKATCHEWAN  
CERTIFICATE OF AUTHORIZATION  
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NUMBER  
C116  
Permission to Consult Held By  
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Electrical 06705 E.C. Klassen

ASSOCIATED ENGINEERING  
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Signature: Bob Heubelt  
Date: 2014 JUL 4

Prepared by Associated Engineering (Sask.) Ltd.

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## **1 General**

### **1.1 GENERAL**

- .1 This Section covers items common to Sections of Division 26.
- .2 Work under this section includes but is not necessarily limited to the categories of the work itemized below for Parks Canada at Beaver Glen Campground in Prince Albert Nation Park:
  - .1 Supply of materials and installation of electrical services to 105 campsites, including trenching underground cables from panelboards to new pedestals to be installed at each site.
  - .2 Supply and install new service panelboards as required.
  - .3 Modify existing panelboards as required.
  - .4 Commissioning, documentation, training, and warranty services.

### **1.2 CODES AND STANDARDS**

- .1 Carry out all work in accordance with these drawings and specifications; meet the latest regulations of Canadian Electrical Code and latest applicable Municipal and Provincial Codes and Regulations. In each and every instance of application, the Code, Regulation, Statute, By-law, or these contract documents having most stringent requirement applies.

### **1.3 CARE, OPERATION AND START-UP**

- .1 Instruct operating personnel in the 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 with all aspects of its care and operation.

### **1.4 VOLTAGE RATINGS**

- .1 Operating voltages: to CAN3-C235-83.
- .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

## **1.5 PERMITS, FEES AND INSPECTION**

- .1 The Engineer will submit drawings to the Electrical Inspection Department and Supply Authority for examination and approval prior to commencement of work.
- .2 The electrical Contractor will obtain and pay for all permits required by laws and regulations.
- .3 Notify Engineer of changes required by Electrical Inspection Department prior to making changes.
- .4 After completion of the work, the electrical Contractor will certify to the Owner that the inspection authority having jurisdiction has inspected all work. Provide copies of electrical inspection reports to the Engineer.

## **1.6 SHOP DRAWINGS**

- .1 Submit shop drawings and product data.
- .2 Show on shop drawings, details of construction, dimensions, capacities, weights and electrical performance characteristics of equipment or material.
- .3 Where applicable, include wiring, single line and schematic diagrams.
- .4 Wiring drawings showing interconnection with work of other divisions are required.

## **1.7 OPERATION AND MAINTENANCE DATA**

- .1 Include information as follows:
  - .1 Operation and maintenance instructions to be sufficiently detailed with respect to design elements, construction features, component function and maintenance requirements to permit effective startup, operation, maintenance, repair, modification, extension and expansion of any portion or feature of installation.
  - .2 Technical data to be in form of approved shop drawings, product data, supplemented by bulletins, component illustrations, exploded views, technical descriptions of items, and parts lists. Advertising or sales literature will not be acceptable.
  - .3 Include names and addresses of local suppliers for all items included in maintenance manuals.
  - .4 Include a copy of the electrical inspections permit.
  - .5 Include certificate of guarantee.
  - .6 Material to be English.

## **1.8 MATERIALS AND EQUIPMENT**

- .1 Equipment and material to be CSA certified. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Electrical Inspection Department.
- .2 Factory assemble control panels and component assemblies.

## **1.9 DELIVERY AND STORAGE**

- .1 Assume complete responsibility for maintaining all materials and equipment delivered to the site in new condition. Repair or replace damaged articles to the satisfaction of the Engineer. Make arrangements as necessary for proper storage and security of materials delivered to the site.

## **1.10 PROJECT RECORD DOCUMENTS**

- .1 Indicate accurately significant deviations from contract documents caused by site conditions and changes ordered by Engineer.

## **1.11 FINISHES**

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
  - .1 Outdoor electrical equipment shall be factory finished with industrial powder coat paint to ASA-61 grey.
- .2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .3 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

## **1.12 EQUIPMENT IDENTIFICATION**

- .1 Identify electrical equipment. Hand-painted identification will not be accepted.
- .2 Use phenolic plastic laminate, machine engraved black plate with white letters. Nameplates shall be mechanically attached; self-adhesive types are not acceptable.

### **NAMEPLATE SIZES**

Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters

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Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

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.3 Labels:

- .1 Embossed plastic labels with 6 mm high letters unless specified otherwise.
- .4 Wording on nameplates to be approved by Engineer prior to manufacture.
- .5 Identification to be English.
- .6 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .8 Terminal cabinets and pull boxes: indicate system and voltage.
- .9 Transformers: indicate capacity, primary and secondary voltages.

**1.13 WIRING IDENTIFICATION**

- .1 Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour code: to CSA C22.1.
- .4 Use colour coded wires in communication cables, matched throughout system.

**1.14 CONDUIT IDENTIFICATION**

- .1 Label pull boxes and other material components of a system providing information as to name and function. Use Size 2 label. Where concealed, identify all junction boxes with black felt marker indicating circuits and/or system; add a second label to the wall or ceiling surface adjacent.

**1.15 WIRING TERMINATIONS**

- .1 Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.

**1.16 MANUFACTURERS AND CSA LABELS**

- .1 Visible and legible, after equipment is installed.

### **1.17 WARNING SIGNS**

- .1 As specified and to meet requirements of Electrical Inspection Department and Engineer.

### **1.18 CONDUIT AND CABLE INSTALLATION**

- .1 Install conduit and sleeves prior to pouring of concrete. Sleeves through concrete: plastic sized for free passage of conduit, and protruding 50 mm.
- .2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- .3 Install cables, conduits and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.

### **1.19 FIELD QUALITY CONTROL**

- .1 All electrical work to be carried out by qualified, licensed electricians or apprentices as per the conditions of the Provincial Act respecting manpower vocational training and qualification. Employees registered in a provincial apprentices program shall be permitted, under the direct supervision of a qualified licensed electrician, to perform specific tasks - the activities permitted shall be determined based on the level of training attained and the demonstration of ability to perform specific duties.
- .2 The work of this division to be carried out by a contractor who holds a valid Master Electrical contractor license as issued by the Province that the work is being constructed.
- .3 Conduct and pay for following tests:
  - .1 Circuits originating from branch distribution panels.
- .4 Insulation resistance testing:
  - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
  - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
  - .3 In all cases, ensure that resistance to ground is not less than required by code prior to energizing.
- .5 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .6 Submit test results for Engineer's review.

### **1.20 DEFECTIVE MATERIALS AND WORKMANSHIP**

- .1 After the work is complete but before final payment, the contractor shall give to the owner a written guarantee that all materials and workmanship are in strict accordance with the plans and specifications and for a period of one year, from date of final

acceptance at no charge to the owners, replace or repair any defects in material and workmanship not due, in the opinion of the Engineer, to misuse and neglect. This guarantee does not cancel or prejudice other longer guarantees.

### **1.21 CO-ORDINATION OF PROTECTIVE DEVICES**

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

### **1.22 DRAWINGS AND SPECIFICATIONS**

- .1 The drawings and specifications are intended to supplement each other and any detail mentioned on one and omitted on the other shall be treated as if included on both.

### **1.23 BREAKDOWN AND PRICES**

- .1 After award of contract and at the request of the Engineer, prepare a breakdown of the contract into major divisions as outlined by the Engineer showing the contract value of each division.
- .2 During the course of construction when requested, submit a price for the performance of additional work, broken down as prescribed by the Engineer, to show the quantity and price of the items of material required to carry out the work together with a separate listing of the labour charges for each item.

### **1.24 EXISTING CONDITIONS**

- .1 Before submitting a tender examine the site and the local conditions affecting the work under this division and verify that the work can be satisfactorily carried out as shown on the plans. Should the examination show the requirements for additional work beyond the scope of the drawings and specifications, advise the engineer at least seven days before tenders close. Failure to do so implies acceptance of existing conditions and that all allowances as may be necessary to complete the work are included in the tender.

### **1.25 CLEANING**

- .1 Clean construction materials from wiring devices, cover plates, outlets, cabinets, enclosures, tubs, etc.
- .2 Electrical contractor will be responsible for keeping his work area clean and free from debris and waste material at all times. The interior of all boxes, control panels, etc. will be cleaned of dust, dirt and loose materials, to the satisfaction of the owner. Any damaged caused by the work is to be repaired to the satisfaction of the owner at the contractors cost. Plug and seal all penetrations.

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**1.26 INSPECTION**

- .1 Take immediate and direct action to respond to items on deficiency lists during the construction period and on completion of project.

**2 Products**

Not Used.

**3 Execution**

Not Used.

**END OF SECTION**

## **1 General**

### **1.1 REFERENCES**

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

### **1.2 PRODUCT DATA**

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

### **1.3 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste wiring materials.
- .2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
- .3 Fold up metal banding, flatten and place in designated area for recycling.

## **2 Products**

### **2.1 ELECTRICAL WIRES**

- .1 Conductors: stranded for 10 AWG and larger.
- .2 Minimum wire size: 12 AWG.
- .3 Conductors: Copper except where otherwise indicated, size as indicated, with insulation of chemically cross-linked thermosetting polyethylene(XLPE) material rated RW90. Insulation rating shall be 1000 V for 600 V circuits, and 600V for 120/240 V circuits.

### **2.2 UNDERGROUND CABLES**

- .1 Aluminum conductors: size as indicated.
- .2 Manufacturer shall verify compliance with the requirement per CAN/CSA C22.2 No. 38-05 for stranded AA-8000 series aluminum alloy conductors on wires taken from the conductor after stranding.
- .3 Insulation rating shall be 1000 V for 600 V circuits, and 600V for 120/240 V circuits made of cross-linked thermosetting polyethylene (XLPE) material RWU90, Sunlight Resistant (SR) and -40°C rated.

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**3 Execution**

**3.1 INSTALLATION OF CABLES**

- .1 Install wiring as follows:
  - .1 In conduit systems in accordance with Section 26 05 34.
  - .2 In trenches in accordance with Section 26 05 44.
  
- .2 Provide permanent identification tag on all cables and conduits. Tag to state the feeder name and operating voltage.

**END OF SECTION**

## **1 General**

### **1.1 PRODUCT DATA**

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

## **2 Products**

### **2.1 CONNECTORS AND TERMINATIONS**

- .1 Connectors shall be dual rated (AL7CU or AL9CU) and Listed by CSA for use with aluminum and copper conductors and sized to accept aluminum conductors of the ampacity specified.
- .2 Contact aid (anti-oxidant) for aluminum cables where applicable.

## **3 Execution**

### **3.1 CONNECTIONS FOR CONDUCTORS**

- .1 Using Mechanical Screw Type Connectors:
  - .1 Using a suitable stripping tool, to avoid damage to the conductor, remove insulation from the required length of the conductor.
  - .2 Clean the conductor surface using a wire brush and apply a listed joint compound.
  - .3 Tighten the connection per the connector manufacturer's recommendation.
  - .4 Wipe off any excess joint compound.
- .2 Using Mechanical Compression Type Connectors:
  - .1 The lugs shall be marked with wire size, die index, number and location of crimps and shall be suitably color coded. Lug barrel shall be factory pre-filled with a joint compound Listed by CSA.
  - .2 Using a suitable stripping tool, to avoid damage to the conductor, remove insulation from the required length of the conductor.
  - .3 Clean conductor surface using a wire brush.
  - .4 Crimp the connection per the connector manufacturer's recommendation.
  - .5 Wipe off any excess joint compound.
- .3 Termination of Aluminum Conductor to Aluminum Bus:
  - .1 Prepare a mechanical connection conforming to 3.1.1 or 3.1.2.
  - .2 Hardware:
    - .1 Bolts: Anodized aluminum alloy 2024-T4 and conforming to ANSI B18.2.1 and to ASTM B211 or B221 chemical and mechanical property limits.
    - .2 Nuts: Aluminum alloys 6061-T6 or 6262-T9 and conforming to ANSI B18.2.2.

- .3 Washers: Flat aluminum alloy 2024-T4, Type A plain, standard wide series conforming to ANSI B27.2.
  - .4 Lubricate and tighten the hardware as per the manufacturer's recommendations.
- .4 Termination of Aluminum Conductor to Copper Bus:
- .1 Prepare a mechanical connection conforming to 3.1.1 or 3.1.2.
  - .2 Hardware:
    - .1 Bolts: Plated or galvanized medium carbon steel; heat treated, quenched and tempered equal to ASTM A-325 or SAE grade 5.
    - .2 Nuts: Heavy semi-finished hexagon, conforming to ANSI B18.2.2, threads to be unified coarse series (UNC), class 2B.
    - .3 Washers: Should be of steel; Type A plain standard wide series conforming to ANSI B27.2.
    - .4 Belleville conical spring washers: shall be of hardened steel, cadmium plated or silicone bronze.
    - .5 Lubricate and tighten the hardware as per the manufacturer's recommendations.
- .5 Termination of Aluminum Conductor to Equipment Not Equipped for Termination of Aluminum Conductor:
- .1 Prepare compression connection using an adapter Listed by CSA for the purpose or by pig-tailing a short length of suitable size of copper conductor to the aluminum conductor with a compression connector Listed by CSA.
  - .2 Provide an insulating cover over adapter body or the compression connector.
  - .3 Terminate the adapter or the pigtail on to the equipment per manufacturer's recommendation.

**END OF SECTION**

## **1 General**

### **1.1 REFERENCES**

- .1 CSA C22.2 No.41.

## **2 Products**

### **2.1 EQUIPMENT**

- .1 Rod electrodes: copper clad steel 19 mm diameter by 3m long.
- .2 Plate electrodes: galvanized steel, surface area minimum 0.093 meters square, 6.35 mm thick.
- .3 Grounding conductors: bare stranded copper, soft annealed, size as indicated.
- .4 Ground bus: copper, complete with insulated supports, fastenings, connectors.
- .5 Provide compression type connectors, Burndy #Y35 Hypress or approved equal, using proper compression tooling and dies. Exothermic welds (Erico Cadweld) are also acceptable.

## **3 Execution**

### **3.1 INSTALLATION GENERAL**

- .1 Install the ground system in accordance with the requirements of the Canadian Electrical Code.
- .2 Coordinate with the Electrical Inspector and the Engineer to provide opportunity for inspection during installation. If Engineer is unable to attend, provide detailed photos of installation.

### **3.2 INSTALLATION – SERVICE ENTRANCE/PANELBOARDS**

- .1 Install the electrodes in non-excavated soil.
- .2 Space electrodes minimum 3000 mm apart.
- .3 Connect the neutral lug in the Main Breaker to the ground grid to ensure a solidly grounded system.

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### **3.3      INSTALLATION – CAMPSITE PEDESTALS**

- .1    Ground the neutral lug in each RV Pedestal to the grounding electrode at the pedestal to establish a distributed grounding system.
  
- .2    Bond pedestal to ground.

**END OF SECTION**

## **1 General**

### **1.1 SHOP DRAWINGS AND PRODUCT DATA**

- .1 Submit shop drawings and product data for cabinets in accordance with Section 01 33 00 - Submittal Procedures.

## **2 Products**

### **2.1 SPLITTERS**

- .1 Sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.
- .2 Connection bars to match required size and number of incoming and outgoing conductors as indicated.
- .3 Rated NEMA 3R.

### **2.2 JUNCTION AND PULL BOXES**

- .1 Welded steel construction with screw-on flat covers for surface mounting.
- .2 Rated NEMA 3R.

## **3 Execution**

### **3.1 SPLITTER INSTALLATION**

- .1 Install splitters and mount plumb, true and square.
- .2 Extend splitters full length of equipment arrangement except where indicated otherwise.

### **3.2 JUNCTION, PULL BOXES AND CABINETS INSTALLATION**

- .1 Install pull boxes in inconspicuous but accessible locations.
- .2 Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed 30 m of conduit run between pull boxes.

### **3.3 IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 01 – Common Work Results - Electrical.
- .2 Install size 2 identification labels indicating system name, voltage and phase.

**END OF SECTION**

## **1 General**

### **1.1 REFERENCES**

- .1 Canadian Standards Association (CSA)
  - .1 CAN/CSA C22.2 No. 18-98, Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware.
  - .2 CSA C22.2 No. 211.2-M1984(R1999), Rigid PVC (Unplasticized) Conduit.

## **2 Products**

### **2.1 CONDUITS**

- .1 Rigid pvc conduit: to CSA C22.2 No. 211.2.

### **2.2 CONDUIT FITTINGS**

- .1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.
- .2 Factory "ells" where 90° bends are required for 25 mm and larger conduits.

## **3 Execution**

### **3.1 INSTALLATION**

- .1 Unless otherwise indicated, use rigid PVC conduit underground, and where underground sleeves are indicated.
- .2 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.
- .3 Dry conduits out before installing wire.

### **3.2 CONDUITS IN CAST-IN-PLACE CONCRETE**

- .1 Locate to suit reinforcing steel. Install in centre one third of slab.
- .2 Protect conduits from damage where they stub out of concrete.
- .3 Install sleeves where conduits pass through slab or wall.
- .4 Encase conduits completely in concrete with minimum 25 mm concrete cover.
- .5 Organize conduits in slab to minimize cross-overs.

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### **3.3 CONDUITS UNDERGROUND**

- .1 Install conduit so that it can drain and have no pockets in which water can be collected.

**END OF SECTION**

## **1 General**

### **1.1 RELATED SECTIONS**

- .1 Section 31 11 00 – Clearing and Grubbing.
- .2 Section 31 23 10 - Excavating, Trenching and Backfilling.
- .3 Section 26 05 01 – Common Work Results - Electrical.

## **2 Products**

Not Used.

## **3 Execution**

### **3.1 ROUTING OF CABLES**

- .1 Routing shown on site plan is approximate.
- .2 Locate and mark all existing underground wiring, existing underground campsite cables, water and sewer (shallow buried) piping, electrical utility power, gas, telephone utilities, and culverts.
- .3 Determine optimum on-site routing in coordination with Parks personnel having authority. Minimize disturbance to trees and other large vegetation staying outside of tree drip-lines wherever possible. Avoid areas with sensitive species.

### **3.2 DIRECT BURIAL OF CABLES**

- .1 After sand bed specified in Section 31 23 10 - Excavating, Trenching and Backfilling, is in place, lay cables maintaining 75mm clearance from each side of trench to nearest cable. Do not pull cable into trench.
- .2 Provide offsets for thermal action and frost driven earth movements. Offset cables 150mm for each 60m run, maintaining minimum cable separation and bending radius requirements.
- .3 Provide slack where cable transitions from trench into pedestal base.
- .4 Underground cable splices not acceptable.
- .5 Minimum permitted radius at cable bends for rubber, plastic or lead covered cables, 8 times diameter of cable; for metallic armoured cables, 12 times diameter of cables or in accordance with manufacturer's instructions.

- .6 Cable separation:
  - .1 Maintain 190mm minimum separation between cables of different circuits or for parallel runs and install according to Diagram B4-3 of the CEC.
  - .2 Maintain 300mm horizontal separation between low and high voltage cables.
  - .3 When low voltage cables cross high voltage cables maintain 300mm vertical separation with low voltage cables in upper position.
  - .4 At crossover, maintain 75mm minimum vertical separation between low voltage cables and 150mm between high voltage cables.
  - .5 Install treated planks on lower cables 0.6m in each direction at crossings.
- .7 After sand protective cover specified in Section 31 23 10 - Excavating, Trenching and Backfilling, is in place, install continuous plastic marking strip 300 mm from grade the length of entire run.

### **3.3 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 01 – Common Work Results - Electric.
- .2 Perform tests using qualified personnel. Provide necessary instruments and equipment.
- .3 Check phase rotation and identify each phase conductor of each feeder.
- .4 Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 50 megohms.
- .5 Acceptance tests.
  - .1 After installing cable but before splicing and terminating, perform insulation resistance test with 500V megger on each phase conductor.
  - .2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for accepting load.
- .6 Provide Engineer with list of test results showing location at which each test was made, circuit tested and result of each test.
- .7 Remove and replace entire length of cable if cable fails to meet any of test criteria.

**END OF SECTION**

## **1 General**

### **1.1 SHOP DRAWINGS**

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

## **2 Products**

### **2.1 PANELBOARDS**

- .1 Panelboards: product of one manufacturer.
  - .1 Install circuit breakers in panelboards before shipment.
  - .2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.
- .2 250 V panelboards: bus and breakers rated for 10,000 A symmetrical interrupting capacity or as indicated.
- .3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.
- .4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.
- .5 Two keys for each panelboard and key panelboards alike.
- .6 Copper bus with neutral of same ampere rating as mains.
- .7 Mains: suitable for bolt-on breakers.
- .8 Trim with concealed front bolts and hinges.
- .9 Trim and door finish: baked grey enamel ASA-61.
- .10 Rated NEMA-3R suitable for outdoor installation.

### **2.2 CUSTOM BUILT PANELBOARD ASSEMBLIES**

- .1 Provide Load Feeder lugs capable of accepting large feeder cables as indicated.
- .2 Isolated Neutral bus.
- .3 Copper bar ground bus.

- .4 Incorporate 400A 240V self-contained meter socket as per Saskpower Electric Service Requirements.
- .5 Main breaker to be service entrance rated.
- .6 Integrate Main breaker, branch circuit breakers and load feeder lugs into one complete unit.
- .7 Rated NEMA-3R suitable for outdoor installation.
- .8 Acceptable Manufacturers:
  - .1 Valid Manufacturing.
  - .2 Eaton.
  - .3 Square D.

## **2.3 BREAKERS**

- .1 Breakers: to Section 26 28 21- Moulded Case Circuit Breakers.
- .2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.
- .3 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.

## **2.4 EQUIPMENT IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 01 Common Work Results - Electrical.
- .2 Nameplate for each panelboard size 4 engraved.
- .3 Nameplate for each circuit in distribution panelboards size2 engraved.
- .4 Complete circuit directory with typewritten legend showing location and load of each circuit.

## **3 Execution**

### **3.1 INSTALLATION**

- .1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.
- .2 Install surface mounted panelboards on plywood backboards.
- .3 Mount panelboards to height specified in Section 26 05 01 Common Work Results - Electrical.

- .4 Connect loads to circuits.
- .5 Connect neutral conductors to common neutral bus with respective neutral identified.

**END OF SECTION**

## **1 General**

### **1.1 SHOP DRAWINGS AND PRODUCT DATA**

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

## **2 Products**

### **2.1 RECEPTACLES**

- .1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, with following features:
  - .1 Ivory urea molded housing.
  - .2 Suitable for No. 10 AWG for back and side wiring.
  - .3 Break-off links for use as split receptacles.
  - .4 Eight back wired entrances, four side wiring screws.
  - .5 Triple wipe contacts and rivetted grounding contacts.
  - .6 Ground Fault Circuit Interrupter protection.
- .2 Single receptacles CSA type TT-30 R, 125 V, 30 A, U ground with following features:
  - .1 Ivoryurea molded housing.
  - .2 Suitable for No. 10 AWG for back and side wiring.
  - .3 Four back wired entrances, 2 side wiring screws.
- .3 Receptacles of one manufacturer throughout project.

### **2.2 CAMPSITE PEDESTALS**

- .1 Padmount.
- .2 Rated CSA Type 3R. Base and stand large enough to accommodate multiple large diameter cables as indicated.
- .3 One 15A GFI duplex receptacle, type 5-15R and one 30A 125V receptacle, type TT-30R.
- .4 Branch circuit breakers:
  - .1 One 15A single pole.
  - .2 One 30A single pole.
  - .3 10kA symmetrical short-circuit interrupt rating.
- .5 Complete with "While-in-use" cover approved for wet locations.
- .6 Splitter blocks: as required for wire size indicated on drawings, up to max 600 kcmil. Provide removable access cover.

- .7 Finish: ASA 61 grey industrial powder coat
- .8 Welded stud for bonding enclosure to ground.
- .9 Approved Manufacturers:
  - .1 Valid Manufacturing.
  - .2 Ace Manufacturing.
  - .3 AC Dandy.

**END OF SECTION**

## **1 General**

### **1.1 PRODUCT DATA**

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

## **2 Products**

### **2.1 BREAKERS GENERAL**

- .1 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 deg C ambient.
- .2 Plug-in moulded case circuit breakers: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 deg C ambient.
- .3 Common-trip breakers: with single handle for multi-pole applications.
- .4 Circuit breakers with interchangeable trips as indicated.
- .5 Branch circuit breakers to have minimum of 10,000 A symmetrical rms interrupting capacity rating.
- .6 Main circuit breakers to have minimum 10,000 A symmetrical rms interrupting capacity rating.

### **2.2 THERMAL MAGNETIC BREAKERS**

- .1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.
- .2 All new 400A main breakers are to be 100% rated. Replace existing 400A breakers with 100% rating, as indicated.

## **3 Execution**

### **3.1 INSTALLATION**

- .1 Install circuit breakers as indicated.

**END OF SECTION**

## **1 General**

### **1.1 RELATED SECTIONS**

- .1 Section 01 35 43 - Environmental Procedures.
- .2 Section 26 05 44 – Installation of Cables in Trenches and in Ducts.
- .3 Section 31 23 10 - Excavation, Trenching and Backfilling.

### **1.2 MEASUREMENT PROCEDURES**

- .1 Measure following items in square meters within limits as indicated:
  - .1 Clearing.
  - .2 Grubbing.
  - .3 Close cut clearing.
  - .4 Underbrush clearing.
- .2 Measure clearing isolated trees and grubbing isolated tree stumps as number of isolated trees cleared and number of isolated stumps grubbed.
- .3 Fixed price payment will be made for:
  - .1 Clearing.
  - .2 Close cut clearing.
  - .3 Clearing isolated trees.
  - .4 Grubbing.

### **1.3 DEFINITIONS**

- .1 Clearing consists of cutting off trees and brush vegetative growth to not more than a specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.
- .2 Close-cut clearing consists of cutting off standing trees, brush, scrub, roots, stumps and embedded logs, removing at, or close to, existing grade and disposing of fallen timber and surface debris.
- .3 Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees, and disposing of felled trees and debris.
- .4 Underbrush clearing consists of removal from treed areas of undergrowth, deadwood, and trees smaller than 50 mm trunk diameter and disposing of all fallen timber and surface debris.
- .5 Grubbing consists of excavation and disposal of stumps and roots [boulders and rock fragments of specified size] to not less than a specified depth below existing ground surface.

## **1.4 STORAGE AND PROTECTION**

- .1 Prevent damage to trees, landscaping, natural features, bench marks, existing buildings, existing pavement, utility lines, site appurtenances, water courses, root systems of trees which are to remain.
  - .1 Repair any damaged items to approval of Parks Canada.
  - .2 Replace any trees designated to remain, if damaged, as directed by Parks Canada.

## **2 Products**

### **2.1 MATERIALS**

- .1 Not Used.

## **3 Execution**

### **3.1 PREPARATION**

- .1 Inspect site and verify with Parks Canada, items designated to remain.
- .2 Locate and protect utility lines. Preserve in operating condition active utilities traversing site.
- .3 Notify utility authorities before starting clearing and grubbing.

### **3.2 CLEARING**

- .1 Clear as directed by Parks Canada, by cutting at a height of not more than 300 mm above ground. In areas to be subsequently grubbed, height of stumps left from clearing operations to be not more than 1000 mm above ground surface.
- .2 Cut off unsound branches on trees designated to remain as directed by Parks Canada.

### **3.3 CLOSE CUT CLEARING**

- .1 Close cut clearing to ground level.
- .2 Perform close cut clearing by hand so that existing muskeg is not damaged.
- .3 Cut off unsound branches on trees designated to remain as directed by Parks Canada.

### **3.4 ISOLATED TREES**

- .1 Cut off isolated trees as directed by Parks Canada at height of not more than 300 mm above ground surface.
- .2 Grub out isolated tree stumps.

### **3.5 UNDERBRUSH CLEARING**

- .1 Clear underbrush from areas as indicated at ground level.

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### **3.6 GRUBBING**

- .1 Grub out stumps and roots to not less than 200 mm below ground surface.
- .2 Grub out visible rock fragments and boulders, greater than 300 mm in greatest dimension, but less than 0.25 m<sup>3</sup>.

### **3.7 REMOVAL AND DISPOSAL**

- .1 Remove cleared and grubbed materials to disposal area as designated by Parks Canada.
- .2 Cut timber greater than 125 mm diameter to 400 mm lengths and stockpile as directed. Stockpiled timber becomes property of Parks Canada.
- .3 Chip or mulch and spread cleared and grubbed vegetative material on site as directed by Parks Canada.
- .4 Remove diseased trees identified by Parks Canada and dispose of this material to approval of Parks Canada.

### **3.8 FINISHED SURFACE**

- .1 Leave ground surface in condition suitable for trenching and backfilling to approval of Parks Canada.
- .2 Leave final finished surface in condition suitable for re-growth of natural vegetation.

**END OF SECTION**

## **1 General**

### **1.1 COORDINATION**

- .1 Routes for trenching/excavating to be marked and approved by Parks before any work shall commence.

### **1.2 CODES AND STANDARDS**

- .1 Excavating and backfilling to conform to the following codes and standards:
  - .1 Saskatchewan Labour (Occupational Health and Safety Act and Regulations).
  - .2 Local Codes and Bylaws.

### **1.3 DEFINITIONS**

- .1 Rock Excavation: excavation of massive ledge rock, boulders or bedrock which cannot be removed by a track excavator with a minimum operating weight of 36 tonnes and a minimum bucket capacity of 1.2 m<sup>3</sup> without drilling and blasting.
- .2 Boulders: all forms of rock, detached masses of rock, boulders, concrete or masonry, greater than 600 mm in average diameter, that can be removed by a track excavator with a minimum operating weight of 36 tonnes and a minimum bucket capacity of 1.2 m<sup>3</sup> without drilling or blasting.
- .3 Common Excavation/Trench Excavation: excavation of all materials which are not included under definition of rock excavation or boulder excavation.
- .4 Waste Material: excavated material unsuitable for use in work or surplus to requirements.
- .5 Unsuitable Material: very weak, compressible or saturated materials which in the opinion of the Engineer are not suitable for fill.
- .6 Select Native Material: material excavated from the trench from which all boulders larger than 400 mm in maximum dimension, large roots, stumps or other debris that would prevent consolidation of the backfill have been removed.
- .7 Unshrinkable Fill: very weak mixture of Portland cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.
- .8 Topsoil: humus, peat, or other material containing organics which make up the top layer of the soil.
- .9 Granular Trench Fill Material: material such as sand, natural gravel and reclaimed concrete aggregate, free of reclaimed asphalt which meets the specifications set out herein.

- .10 Borrow Material: suitable material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of work.
- .11 Pipe Surround: granular material 100 mm below the bottom of pipe to a height of 150 mm above the top of the pipe or as shown on the drawings.
- .12 Pipe Bedding: granular material within the pipe zone that supports the pipe and other appurtenances which meets the specifications set out herein.
- .13 Haunch: portion of the pipe zone from the bottom of the pipe to the springline or midpoint of the pipe.
- .14 Tunnelling: the process of installation of a pipeline by means of coring, auguring or directional drilling where an open cut excavation is not employed.
- .15 Course Stabilizing Gravel: clean angular material required for stabilization of trench bottom due to over excavation of unsuitable trench bottom conditions.

#### **1.4 PROTECTION OF EXISTING FEATURES**

- .1 Existing buried utilities and structures:
  - .1 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
  - .2 Prior to commencing excavation work, notify applicable owner or authorities having jurisdiction, establish location and state of use of buried utilities and structures.
  - .3 Confirm locations of buried utilities by careful test excavations. Hand expose all shallow utilities.
  - .4 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
  - .5 Where utility lines or structures exist in area of excavation, obtain direction of Engineer before removing or re routing.
  - .6 Record location of maintained, re routed and abandoned underground lines.
- .2 Existing buildings and surface features:
  - .1 Conduct, with Engineer, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by work.
  - .2 Protect existing buildings and surface features from damage while work is in progress. In event of damage, immediately make repair to approval of Engineer.
  - .3 Where required for excavation, cut roots or branches only as approved by Parks.

## **2 Products**

### **2.1 Select Native BACKFILL MATERIAL**

- .1 Approved material that does not contain boulders or rocks larger than 400 mm diameter, organic soils, frozen lumps of earth, rubble or debris from trench excavation.

### **2.2 GRANULAR TRENCH FILL MATERIAL**

- .1 Where required, provide granular material for trench fill to the following gradation limits.

<b>Sieve Size</b>	<b>% Passing</b>
28 mm	100
20 mm	90-100
12.5 mm	70-100
5 mm	45-85
2 mm	30-65
0.8 mm	15-40
0.4 mm	12-30
0.16 mm	9-20
0.08 mm	7-15

## **3 Execution**

### **3.1 SITE PREPARATION**

- .1 Remove obstructions, ice and snow from surfaces to be excavated within limits indicated.

### **3.2 STOCKPILING**

- .1 Stockpile fill materials in areas designated by Engineer. Stockpile granular materials in manner to prevent segregation.
- .2 Excavated material that cannot be piled along the trench is to be stockpiled and returned for backfilling as required.

- .3 Protect fill materials from contamination.

### **3.3 DEWATERING AND HEAVE PREVENTION**

- .1 Keep excavations free of water while work is in progress.
- .2 Where requested by Engineer, submit for his review details of proposed dewatering or heave prevention methods, such as dikes, well points and sheet pile cut offs.
- .3 Avoid excavation below groundwater table if quick condition or heave is likely to occur. Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut offs or other means.
- .4 Protect open excavations against flooding and damage due to surface run off.
- .5 Dispose of water in manner not detrimental to public and private property, or any portion of work completed or under construction. Do not discharge to sewer system.
- .6 When required, provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, water courses or drainage areas.
- .7 All water encountered in the trench to be pumped or bailed out. Do not use pipe to drain water unless approved by the Engineer.

### **3.4 EXCAVATION**

- .1 Advise Engineer at least seven days in advance of excavation operations.
- .2 Excavate to lines, grades, elevations and dimensions as indicated or as directed by Engineer.
- .3 Remove concrete, masonry, paving, walks, demolished foundations, rubble and other obstructions encountered during excavation.
- .4 Excavation must not interfere with 45° angle of bearing from bottom of any footing.
- .5 Do not disturb soil within branch spread of trees or shrubs that are to remain. If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .6 For trench excavation, unless otherwise authorized by Engineer in writing, do not excavate more than 50 m of trench in advance of installation operations and do not leave open more than 5 m at end of day's operation.
- .7 Keep excavated and stockpiled materials a safe distance away from edge of trench as directed by Engineer.

- .8 Dispose of surplus and unsuitable excavated material off site or as approved on site by Engineer.
- .9 Do not obstruct flow of surface drainage or natural watercourses.
- .10 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .11 Remove unsuitable material from trench bottom to extent and depth as directed by Engineer.
- .12 Backfill over excavation to the level of normal bedding with coarse stabilizing gravel material.
- .13 Correct unauthorized over excavation as follows:
  - .1 Fill under bearing surfaces and footings with concrete specified for footings.
  - .2 Fill under other areas with coarse stabilizing gravel compacted to not less than 97% of Standard Proctor Dry Density.
- .14 The trench bottom is to provide a pipe vertical alignment within +/- 5 mm of the grade indicated on the drawings.
- .15 Hand trim, make firm and remove loose material and debris from excavations. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil. Clean out rock seams and fill with concrete mortar or grout to approval of Engineer.
- .16 Pile excavation material alongside the trench, provided working space is adequate. Ensure excavation material does not spill onto private properties.
- .17 Remove ledge rock, boulders and large stones to provide a minimum clearance of 150 mm below the pipe.
- .18 Where the maximum trench width is exceeded provide special bedding as directed by the Engineer.
- .19 Night work, from sunset to sunrise, will only be allowed if written permission is given by the Engineer. Work carried out at night to have adequate lighting to enable the work to be done in a satisfactory manner. No pipe shall be laid nor work done if in the opinion of the Engineer there is insufficient light to perform the work safely and satisfactorily.

### **3.5 BACKFILLING**

#### **.1 General:**

- .1 Do not proceed with backfilling operations until Engineer has inspected and approved installations.
- .2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .3 Do not use backfill material which is frozen or contains ice, snow or debris.
- .4 Backfill around installations.
- .5 Place backfill material in uniform layers not exceeding 150 mm compacted thickness. Compact each layer before placing succeeding layer.
- .6 Place bedding and surround material as specified elsewhere.

#### **.2 Granular trench fill material:**

- .1 Where requested by the engineer, provide granular trench fill material.
- .2 Backfill in uniform layers not to exceed the thickness required to obtain the specified density. The maximum allowable layer thickness shall be 150 mm of granular materials unless otherwise approved by the Engineer.
- .3 Compact backfill to a minimum of 97% Standard Proctor Dry Density and within one (1) percent of optimum moisture content.

### **3.6 SURFACE MAINTENANCE DURING CONSTRUCTION**

- .1 Maintain all trench surfaces and working surfaces affected by construction until the project is accepted by the Owner.
- .2 Finish berms over trenches as specified prior to acceptance. Provide and place material to fill depressions resulting from the settlement of backfill.
- .3 Maintain gravelled surfaces free of pot holes and washboard conditions. Grade surfaces to eliminate irregularities as often and as soon as they occur.
- .4 Mark locations which cannot be immediately reinstated to the specified standard by approved means to warn traffic of hazards until defects are rectified.
- .5 Maintain all surfaces as required to prevent dust being a nuisance to the public and concurrent performance of other work on-site.

### **3.7 RESTORATION**

- .1 Upon completion of work, stockpile excess materials on site, remove waste materials and debris, trim slopes and correct defects as directed by Engineer.
- .2 Replace topsoil as indicated or as directed by Engineer.

- .3 Reinstall pavement, sidewalks, gravel roads, parking lots and lawns to elevation which existed before excavation.
- .4 Clean and reinstall areas affected by work as directed by Engineer.

### **3.8 TRENCH SETTLEMENT DURING WARRANTY PERIOD**

- .1 Replace materials and rectify all failures that occur as a result of settlement of trench backfill or collapse of trench walls during the warranty period. Refill settled trench areas with specified backfill material.

### **3.9 DISPOSAL OF BOULDERS**

- .1 Dispose of boulders by:
  - .1 Transportation to off-site and buried at location determined by contractor and approved by Parks Canada.

**END OF SECTION**