

## **1.0 CODES AND STANDARDS**

- .1 Complete installation in accordance with the latest edition of the Canadian Electrical Code Part I (CSA C22.1) and the Saskatchewan Supplement, as well as Municipal and Provincial Codes and Regulations and the local authorities having jurisdiction. Where this specification is at variance with applicable Codes and Standards, the more stringent shall apply.
- .2 Comply with CSA Electrical Bulletins and Certification Standards in force at time of bid submission. While not identified and specified by number in this Division, these Bulletins and Standards are to be considered as forming part of related CSA Part II Standard.
- .3 All references to Codes and Standards refer to the latest edition in force at the time of bid unless specified otherwise.
- .4 Under no circumstances shall the Codes and Standards referred to above and herein, be interpreted to allow a lower standard than specified elsewhere herein.
- .5 Abbreviations for electrical terms: to CSA Z85.
- .6 Complete all work in a neat manner performed by qualified tradesmen. All work shall be completed under the on-site direction of a journeyman electrician.

## **2.0 QUALIFICATIONS**

- .1 Designate a foreman / superintendent holding a journeyman's certificate to assume complete responsibility for the electrical construction work. Minimum experience requirement for this position is five (5) years' experience as a journeyman foreman / superintendent. Submit the name, qualifications, and experience to the electrical representative for approval.
- .2 Furnish qualified personnel to continuously direct and monitor electrical construction work.
- .3 Attend site meetings.

## **3.0 PERMITS, FEES**

- .1 The electrical representative will submit to the Electrical Inspection Department and Supply Authority the necessary number of drawings and specifications for examination and approval prior to commencement of work. The electrical contractor shall pay all fees associated with this examination and approval.
- .2 Obtain and pay fees associated with all electrical inspections.

## **4.0 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES**

- .1 Indicate details of construction, dimensions, capacities, weights and electrical performance characteristics of equipment or material. All shop drawings shall be identified with the project name.
- .2 Where applicable, include wiring, single line and schematic diagrams.

- .3 Include wiring drawings or diagrams showing interconnection with work of other Sections.
- .4 Submit a copy of each shop drawing in electronic PDF format to the electrical representative for review. PDF documents must be generated by manufacturer's software, or from electronically published documentation. PDF documents generated by scanning technology are not acceptable. Departmental Representative will return shop drawing submittals via email for distribution. It is the responsibility of the Contractor to ensure adequate copies of the shop drawings are distributed to required parties, including a copy at the construction site.
- .5 If hard copies are submitted, submit three (3) copies of each shop drawing to the electrical representative for review. Two copies will be returned to the Departmental Representative who will subsequently return one copy to the Contractor (to produce required copies at his expense).
- .6 All electrical shop drawings for the project shall be submitted at one time and within 30 days of contract signing.

## **5.0 DRAWINGS AND SPECIFICATIONS**

- .1 Examine also the mechanical drawings and specifications.
- .2 Drawings do not indicate all construction details. Any installation involving accurate measurements of the building shall be coordinated with construction drawings and/or actual on-site measurements.
- .3 Drawings and specifications are intended to supplement each other, and any information indicated on one and omitted on the other shall be assumed as included on both.
- .4 The electrical sub-contractor shall peruse the mechanical drawings and specifications to confirm size and location of all motors, controls, and other equipment in order to determine exact electrical requirements of all mechanical equipment. Ensure that all electrical work noted on mechanical drawings and specifications are included in the electrical contract bid price.
- .5 In order to provide sufficient detail and clarity, the symbols used for various electrical devices, occupy more space on the drawing, than the device actually occupies when installed. The electrical sub-contractor shall use common sense when actually placing these devices, ensuring that devices are grouped wherever possible. Do not space devices along wall to coincide with the scale location of the electrical device symbol.
- .6 Bidders finding discrepancies or omissions in the specifications or drawings, or having doubt as to the meaning or intent thereof, shall at once notify the Departmental Representative who will, if necessary, send written instructions or explanation to all bidders. Oral interpretations made to any bidder shall not effect a modification of any provision of the bid documents.

## **6.0 EXAMINATION OF THE SITE**

- .1 Prior to submitting bid, visit the site and thoroughly investigate the location, connection points, and details of all services and systems which, in any way, may affect or tie-in with the work covered in these specifications and accompanying drawings. No extra will be considered for work resulting from conditions that would have been evident upon thorough examination of the site.
- .2 Any discrepancies, points of doubt, or contention shall be made known to the electrical representative in writing not later than seven (7) days prior to closing date of tender; otherwise, allow for the most expensive alternative.

## **7.0 VOLTAGE RATINGS**

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

## **8.0 MATERIALS AND EQUIPMENT**

- .1 Equipment and material to be CSA certified, and manufactured to standard quoted.
- .2 Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Inspection Department.
- .3 Factory assemble control panels and component assemblies.
- .4 Uniformity of manufacturer shall be maintained for any particular item or type of equipment throughout the building.

## **9.0 ELECTRICAL MOTORS, EQUIPMENT AND CONTROLS**

- .1 Supplier and Installer responsibility is indicated in Motor Control and Equipment Schedule on electrical drawings and related Mechanical responsibility is indicated on Mechanical Equipment Schedule on mechanical drawings.
- .2 Control wiring and conduit is specified in Division 26 except for conduit, wiring, and connections below 50V which are related to control systems specified in Division 25 and shown on mechanical drawings.

## **10.0 FINISHES**

- .1 Shop finish metal enclosures by removal of rust and scale, cleaning, application of rust resistant primer inside and outside, and at least two coats of finished enamel.
  - .1 Paint indoor switchgear and distribution enclosures light grey to EEMAC 2Y-1.

- .2 Clean and touch up surfaces to shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .3 Clean, prime, and paint exposed hangers, racks, fastenings to prevent rusting.
- .4 All electrical fittings, supports, hanger rods, pull boxes, channel fittings, conduit racks, outlet boxes, brackets, clamps, etc. shall either have a galvanized finish, or have a painted finish over corrosion resistant primer.
- .5 Where indicated herein and on drawings, provide finishes to match samples as provided by the Departmental Representative.

## **11.0 EQUIPMENT IDENTIFICATION**

- .1 Identify electrical equipment with nameplates as follows:  
Nameplates:
  - .1 Plastic laminate engraving sheet, 3 mm thick, black face, white core, self-adhesive. Nameplates identifying emergency power system circuits shall be red face with white core.
  - .2 Nameplate sizes:
    - Size 1 7 X 25 mm 1 line 3 mm high lettering
    - Size 2 7 x 40 mm 1 line 5 mm high lettering
    - Size 3 12 x 70 mm 2 lines 3 mm high lettering
    - Size 4 20 x 90 mm 1 line 8 mm high lettering
    - Size 5 20 x 90 mm 2 lines 5 mm high lettering
    - Size 6 25 x 100 mm 1 line 12 mm high lettering
    - Size 7 25 x 100 mm 2 lines 6 mm high lettering
  - .3 Wording on nameplates to be approved prior to manufacture.
  - .4 Allow for average of twenty-five (25) letters per nameplate.
  - .5 Identification to be English.
  - .6 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
  - .7 Nameplates for disconnects, starters, contactors and control stations shall indicate equipment being controlled, and voltage.
  - .8 Nameplates for transformers shall indicate capacity, primary, and secondary voltages.
  - .9 All nameplates shall be mechanically attached with a minimum of two chrome self-tapping screws as well as the self adhesive.

## **12.0 WIRING IDENTIFICATION**

- .1 Identify wiring with permanent indelible identifying markings either numbered or coloured plastic tapes, on both ends of phase conductors or 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.

### **13.0 CONDUIT AND CABLE IDENTIFICATION**

- .1 Colour code conduits, and metallic sheathed cables.
- .2 Code with 305 mm band of coloured spray paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals in accessible ceiling spaces and service spaces:

600 V	Yellow
Emergency Power	Orange

### **14.0 JUNCTION BOX IDENTIFICATION**

- .1 Identify all system junction boxes with enamel spray paint on entire cover. Colour shall match those specified for conduit and cable identification.
- .2 Identify all junction boxes, containing branch circuit conductors, with neat hand lettering using black felt marker indicating panel and breaker number (i.e. "B-24"). Provide corresponding identification on surface adjacent to junction box as well.

### **15.0 WIRING TERMINATIONS**

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

### **16.0 MANUFACTURER'S AND CSA LABELS**

- .1 Manufacturer's nameplates and CSA labels to be visible and legible after equipment is installed.

### **17.0 WARNING SIGNS**

- .1 Provide warning signs, as specified or to meet requirements of Inspection Department.
- .2 Use decal signs, minimum 175 x 250 mm size.

### **18.0 MOUNTING HEIGHTS**

- .1 Mounting heights of equipment are from finished roof to centerline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not indicated, verify before proceeding with installation.
- .3 Install electrical equipment at the following heights unless indicated otherwise.
  - .1 Rooftop Equipment
    - 750mm above finished roof

### **19.0 PROTECTION**

- .1 Protect exposed live equipment during construction for personnel safety.

- .2 Shield and mark live parts "LIVE 120 VOLTS" or with appropriate voltage in English.

## **20.0 WORK PROVIDED FOR OTHER DIVISIONS**

- .1 Provide information as to the exact size and location of all required concrete foundations and curbs for equipment.
- .2 All bus ducts, cable tray, and conduit openings through floor, walls, and ceilings shall be sleeved 25 mm larger all around the duct, tray, or conduit. Fill the opening with 3# density acoustic media under 50% compression and seal both ends with the appropriate caulking compound. Refer to "Firestopping" specific requirements.

## **21.0 WORK NOT INCLUDED IN THIS DIVISION**

- .1 Low voltage and control wiring for the mechanical equipment associated with the heating and cooling of the building will not be included in this Division.

## **22.0 CONDUIT AND CABLE INSTALLATION**

- .1 Install cables, conduits, and fittings neatly and close to building structure so furring can be kept to minimum.
- .2 Conduit shall be laid out to avoid interference with other trades, and to maintain maximum headroom. Arrange conduit to conserve space, allow maintenance, and avoid crossovers where possible.
- .3 Holes through exterior walls and roof shall be flashed and made completely weatherproof.

## **23.0 FIRESTOPPING**

- .1 Provide fire stopping and smoke seal system materials in accordance with CAN4-S115. Materials shall be asbestos free and systems shall be capable of maintaining an effective barrier against gases, flame and smoke in compliance with CAN4-S115, not exceeding opening sizes stated and conforming to all requirements of the Standard. Fire-resistance rating of fire stopping material assembly shall meet or exceed the fire-resistance rating of the floor, wall or partition being penetrated.

Damming and backup materials, supports and anchoring devices to manufacturer's recommendations and in strict accordance with tested assembly being installed, and as acceptable to the Authority Having Jurisdiction.

**24.0 ACCESS**

- .1 Provide access doors for installation in walls and ceiling to service electrical equipment. Supply to appropriate trade for installation. Doors shall be ULC labelled when installed in fire separations. Wherever finish and construction allow, access doors shall be installed flush with the finished surface. Access doors shall have 16 gauge frames, 14 gauge door panels, piano hinge, screw driver latch, and mounting channels as required for installation. Minimum size shall be 300 mm x 300 mm.

**25.0 INSULATION RESISTANCE TESTING**

- .1 Megger circuits, feeders, and equipment up to 350V with a 500V instrument.
- .2 Megger 350 - 600V circuits, feeders, and equipment with 1000V instrument.
- .3 Check resistance to ground before energizing.

**26.0 COORDINATION OF PROTECTIVE DEVICES**

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

**27.0 CLEANING**

- .1 Protect all equipment and material from weather and the work of other trades. Remove waste periodically. Clean all materials and equipment prior to acceptance of the Work.
- .2 At time of final cleaning, clean lighting reflectors, lenses, and other lighting surfaces that have been exposed to construction dust and dirt. The electrical installation shall be left in a clean and finished condition, to the satisfaction of the electrical representative.

**28.0 TESTS**

- .1 Conduct and pay for tests of the following:
  - .1 Power distribution system including phasing, voltage, grounding, and load balancing.
  - .2 Circuits originating from branch distribution panels.
  - .3 Motors, heaters, and associated control equipment including sequenced operation of systems where applicable. Take clip on ammeter readings on all phases of motor feeders, with motor operating under full load conditions. Submit test readings to electrical representative.
  - .4 Distribution conductor testing as indicated on drawings.
- .2 Notify electrical representative a minimum of 48 hours prior to test.
- .3 Provide instruments, meters, equipment, and personnel required to conduct tests during and at conclusion of project.
- .4 Submit test results for electrical representative's review.

**29.0 LOAD BALANCE**

- .1 Measure phase current to panelboards and distribution centres with all possible loads operating. Adjust branch circuit connections as required to obtain best balance of current between phases and record final measurements after adjustments have been completed. Load unbalance shall not exceed fifteen percent (15%).
- .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
- .3 Submit, on completion of work, a report listing phase and neutral currents on panelboards, dry type transformers, and motor control centres operating under normal load. State hour and date on which each load was measured, and voltage at time of test.

**30.0 RECORD DRAWINGS**

- .1 Obtain one set of solid white prints to be used for record work as actually installed. Record on this set, all changes associated with the work.
- .2 Obtain one set of electrical drawing prints, and upon completion of the work, transcribe all information from the on-site record prints to the as-builts. Include all changes to the electrical contract including addenda, site instructions, change orders, and site conditions. Contractor shall retain the services of a qualified CAD drafter to transfer the as-built information from the as-built prints to an electronic digital format using the CAD software application used to produce the original drawings. Identify CAD electronic drawing files with "AS BUILT" status. Contractor shall pay all costs associated with transfer of as-built information to electronic digital format.

**31.0 WARRANTY**

- .1 Submit a written warranty stating that all materials and workmanship will be free from defects for a period of one (1) year from date of Substantial Performance of Work. The warranty period shall not begin until:
  - Electrical Operating and Maintenance Manuals are submitted and approved.
  - Systems Demonstration and Training is completed and Systems Demonstration certificate is submitted.
- .2 The electrical sub-contractor shall remain responsible for all electrical equipment and systems until the Electrical Operating and Maintenance Manuals are submitted and approved, and the Systems Demonstration and Training has been completed.

**32.0 OPERATION AND MAINTENANCE DATA**

- .1 Provide operation and maintenance data for incorporation into the operation and maintenance manual as specified in Section 01 78 00. The following are minimum requirements.

- .2 Include in operations and maintenance data:
  - .1 Cover page including project name, year, name of Departmental Representative, electrical representative, and electrical contractor. Cover page shall be enclosed in a clear plastic cover.
  - .2 Index.
  - .3 Electrical Contractor's Guarantee.
  - .4 List of manufacturer and supplier for all items.
  - .5 Name, address and phone number of local suppliers for items included in Maintenance Manual.
  - .6 "SYSTEMS DEMONSTRATION" certificate (refer to document included in Section 26 05 01).
  - .7 Load Balance report.
  - .8 A copy of all panelboard directories.
  - .9 8 1/2" x 11" drawing indicating Single Line Diagram for electrical distribution system.
  - .10 Details of design elements, construction features, component function and maintenance requirements, to permit effective start-up operation, maintenance, repair, modification, extension and expansion of any portion or feature of installation.
  - .11 Technical data, product data, supplemented by bulletins, component illustrations, exploded views, technical descriptions of items and parts lists. Advertising or sales literature not acceptable.
  - .12 Operating Instructions for All Systems.
- .3 The following index tabs and associated product information shall be contained within the binder:
  - Index
  - Contractor Guarantee
  - Manufacturer and Supplier List
  - Supplier Addresses and Phone Numbers
  - Systems Demonstration Certificate
  - Panelboard Directories
  - Load Balance Report
  - Single Line Diagram
  - Distribution Equipment
  - Disconnect Switches
  - Panelboards and Breakers
  - Devices:
    - Receptacles
    - Occupancy Sensors

Divider tab pages shall be laminated mylar plastic with reinforced holes. Plastic tabs with typed insertions will not be accepted.

**33.0 CARE, OPERATION AND START-UP**

- .1 Instruct Departmental Representative's maintenance and operating personnel in the operation, care, and maintenance of equipment. A minimum of four (4) hours of instruction shall be provided. Provide documentation in maintenance manual confirming that instruction has been provided including description of system, Departmental Representative in attendance, date, and signatures.
- .2 Arrange and pay for services of Manufacturer's factory service representative to supervise start-up of installation, check, adjust, balance, and calibrate components.
- .3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.
- .4 Complete the "SYSTEMS DEMONSTRATION" document (Refer to document in this section) and include in maintenance manual.

**34.0 REVIEW OF WORK**

- .1 When the contractor is satisfied that the work is completed, and after making his own inspection of work to verify completion, the electrical contractor shall submit a written request to the electrical representative requesting a review of work.
- .2 Any deficiencies noted by the electrical representative during the review of work, will be listed by the electrical representative, and issued to the contractor.
- .3 Such deficiencies shall be corrected within three (3) weeks of the issuance of the deficiency list, or by a mutually agreed upon date. Once complete, the contractor shall submit a written request to the electrical representative requesting a final deficiency review.
- .4 If subsequent site visits are required by the electrical representative because the deficiencies listed were not complete, all time and expense costs incurred by the electrical representative will be the responsibility of the electrical contractor.
- .5 During construction, the electrical contractor shall make any equipment or wiring accessible for review purposes, as requested by the electrical representative.

**35.0 DEMOLITION**

- .1 Remove all redundant conduit and conductors to the source of supply. Where conduit is embedded in concrete or other inaccessible locations, it shall be abandoned.
- .2 Boxes, fittings, equipment and accessories which become redundant shall be completely removed. All such material shall become the property of the Contractor and he shall remove it from the site. Re-useable items of electrical equipment shall be re-installed where indicated on the drawings.
- .3 Remove all redundant safety switches, contactors, enclosed breakers, panelboards, and other re-useable items of electrical equipment. These items shall be reinstalled where indicated on the drawings or shall be turned over to the Departmental Representative.

- .4 Where existing equipment is shown to be reinstalled, only the best quality items shall be selected for re-use.
- .5 The Contractor shall visit the site prior to submitting a bid to determine the amount of demolition work involved. No extras will be considered for work resulting from conditions that would have been evident upon thorough examination of the site.

**36.0 BREAKDOWN AND PRICES**

- .1 During the course of construction, when the Contractor is requested to submit a price for the performance of additional work, the price shall be broken down as requested by the electrical representative to show quantity, material, and labour charges for each item.
- .2 Submit the following Contract Price Breakdown to the electrical representative within 30 days of award of the contract, and with each monthly progress claim during construction. Alternate formats for Contract Price Breakdown are not acceptable. Submit invoices to support claims for material on site, when requested.

**END OF SECTION 26 05 01**

**BREAKDOWN AND PRICES**

PROJECT: \_\_\_\_\_

PROGRESS CLAIM #: DATE: \_\_\_\_\_

	Contract Amount				Amount Complete to Date			
	Material	Labour	Total	% of Contract	Material	Labour	Total	% Complete
General								
Conduit, Outlet Boxes								
Conductors								
Devices								
Panelboards								
Sub Total								
Change Orders								
<b>TOTAL</b>								

### SYSTEMS DEMONSTRATION

PROJECT: \_\_\_\_\_

DATE: \_\_\_\_\_

TIME: \_\_\_\_\_ to \_\_\_\_\_

A demonstration of electrical systems was conducted on site, to instruct Departmental Representative's personnel in the operation, care, and maintenance of electrical equipment and systems.

Systems included: (indicate)

\_\_\_ Distribution Panel EDP-2

The following persons have witnessed this demonstration:

Departmental Representative's: \_\_\_\_\_  
(name) (signature)

\_\_\_\_\_  
(name) (signature)

\_\_\_\_\_  
(name) (signature)

\_\_\_\_\_  
(name) (signature)

Contractor: \_\_\_\_\_  
(name) (signature)

Manufacturer's Representative: \_\_\_\_\_  
(name) (signature)