

## **PART 1 GENERAL**

### **1.1 GENERAL**

- .1 Provide equipment of this Section in full compliance with the following applicable portions of the latest revisions of the following standards:
  - .1 CSA Standard C22.2 No. 225-M90.
  - .2 CSA Standard C22.1 Part 1 Canadian Electrical Code.
  - .3 Measurement Canada Gas and Electricity Act No PSE-04.
  - .4 ANSI C12.1, C12.18 & C12.20.
  - .5 Measurements Canada LMB-EG-07 (AE-1434) & (AE-1665)

### **1.2 PRODUCT DATA**

- .1 Submit product data in accordance with Division 01.
- .2 Indicate:
  - .1 Meter, outline, dimensions, and enclosures.
  - .2 System riser, one line and panel wiring diagram.
- .3 Manufacturer's system and component connection diagram.
- .4 Measurement Canada approvals for meters and current transformers.

### **1.3 RELATED WORK**

- .1 Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.
- .2 Section 26 05 21 – Wires and Cables (0- 1000V).
- .3 Section 26 05 28 – Grounding – Secondary.

## **PART 2 PRODUCTS**

### **2.1 GENERAL**

- .1 Provide a fully digital electrical measurement system. The system shall be:

- .1 The metering system shall be Measurement Canada sealed, commissioned and maintained for revenue metering in tenant billing applications.
  - .2 A set of compatible current transformers sized to the individual loads.
  - .3 The electronic energy management and revenue grade metering system shall be fully automated microprocessor-based electrical energy measurement system for Measurement and Verification purposes. The system shall incorporate complete metering, communications, reporting functions, tenant billing applications; energy monitoring and threshold limit capabilities.
- .2 Meters to be complete with a Liquid Crystal Display (LCD) to access all energy measurements and phase diagnostics when needed.

## 2.2 SUB-METERING SYSTEM

- .1 To consist of Measurement Canada approved electronic multi-meters, socket meters, current transformers, and a communications system as shown on drawing and described herein.
- .2 Meters to be used for Revenue Billing of wharf receptacles electricity usage, demand and power factor.
- .3 The meters shall be capable of remote communication, utilizing one of or a combination of the following systems:
  - .1 Standard Ethernet interface
  - .2 On board V90 modem capable of data transmission up to 56k baud rate.
  - .3 Modbus TCP/IP
  - .4 Ethernet connection to PC or laptop via crossover cable.
- .4 The Metering System shall have integral backup storage power to key components so that no data is lost during power outages. The system shall continue to function after resumption of power. Data to be retained for 8500 hours with a 20 year shelf life.
- .5 Failure of the building electrical normal power system shall not result in loss of data and will not require manual restarting of the metering system.

## 2.3 METER

- .1 Multi-Customer Meter:
  - .1 Voltage 120/208, three phase.

- .2 Configured for combination of meters as indicated on drawings.
- .2 Current Ranges: 15A, 30A, 60A as indicated. System shall accommodate future installation of 100A 2 meter loads without medication of metering system excluding installation of alternate CT.
- .3 Accuracy: 0.5% of 100% registration @ 1.0 pf, 1% to 100% load to meet: ANCI 12.1 (USA) Measurement Canada.
- .4 Operating Temperature Range: -40 degrees to +55 degrees C.
- .5 Dimensions: as indicated.
- .6 Must meet all ISO 9001 standards for quality control where all meters test to a minimum of +Must +/- 0.5% accuracy.

## 2.4

### SYSTEM MEASUREMENT

- .1 Meters to be complete with Liquid Crystal Display (LCD) to access all billing measurements and phase diagnostics.
- .2 Billing Parameters:
  - .1 KWHR real consumption
  - .2 KW instantaneous consumption
  - .3 KVAH apparent consumption
  - .4 KVA apparent demand
  - .5 KVARH reactive consumption
  - .6 KVAR reactive demand
- .3 Phase Diagnostics: Parameters to be displayed for each individual phase of each metered load:
  - .1 Voltage Phase to neutral for each phase
  - .2 Amps instantaneous amperage for each phase
  - .3 KW Instantaneous real energy
  - .4 KVA Instantaneous apparent energy
  - .5 KVAR Instantaneous reactive energy
- .4 Data Logging
  - .1 Logging of kW, kVA, kVAR, Total Harmonic Distortion, Power Factor and Amperage in 15 minute intervals.

## 2.5

### METER CABINET

- .1 Sheet steel CSA enclosure EEMAC 1 with meter back plate, to accommodate meters, test terminal block and associated equipment, factory installed and wired.

**2.6**            **METERING INSTRUMENT TRANSFORMER CABINET**

- .1        Sheet steel CSA enclosure EEMAC 1 to accommodate current transformers.

**2.7**            **CURRENT TRANSFORMERS**

- .1        Provide all current transformers associated with the metering system.
- .2        Loads shall have 100:5 precision current transformers with an accuracy exceeding that specified in ANSI C12.1 and Industry Canada approved.
- .3        5 Amp Secondary CTs, Measurement Canada Approved Models: Electro-Meters 2DARL-101 Solid Core CT, 100A-5A or approved equal for use with transformer rated meters.
- .4        Flexible leads are UL 1015 105oC, CSA approved, #16 AWG, 24” long.
- .5        Solid core current transformers (CT’s), with full scale output of 80mA or 5A.

**2.8**            **METER COMMUNICATIONS**

- .1        Ethernet interface at each metering device.
- .2        Meters must be a push IP based communication.
- .3        There cannot be any modifications to customer’s existing firewall.
- .4        Modbus TCP communications for interface to client systems.
- .5        V90 modem included in each metering device.
- .6        Non-dedicated phone line for remote meter reading. Analog line required, can be parallel of office fax line or similar.

**2.9**            **WARRANTY**

- .1        Manufacturer shall warranty the products free from defect for a period of 3 years from the date of project Substantial Completion and Departmental Representative acceptance.

**2.10**          **STANDARD OF ACCEPTANCE**

- .1        Quadlogic Controls Corporation Inc. Mini-closet -5C multi-tenant metering system or approved equal.
- .2        Schneider Electric E4800 Series.

- .3 Powerhawk 6320 or 6312 Triacta Power Technologies

### **PART 3 EXECUTION**

#### **3.1 METERING INSTALLATION**

- .1 Install meters and instruments in location free from vibration and shock.
- .2 Make connections in accordance with diagrams.
- .3 Install Current Transformers with a minimum ½ inch clearance to un-insulated live parts in subpanel, and without bearing against dead metal parts.
- .4 Connect meter and instrument transformer cabinet to ground.
- .5 Install enclosure on wall as indicated.
- .6 Wire CT leads, potential lead and neutral lead from cabinet to meter enclosure.
- .7 Install as per manufacturers' instructions.

#### **3.2 CALIBRATION AND MAINTENANCE SERVICE**

- .1 All meters shall be factory calibrated with precision test equipment and shall remain accurate for the life of the product eliminating the need for in-service calibration or adjustments. The manufacturer shall provide the Departmental Representative with repair or replacement service to the extent covered by the warranty.

#### **3.3 FIELD QUALITY CONTROL**

- .1 Conduct tests in accordance with Section 26 05 00 – Common Work Requirements – Electrical and in accordance with manufacturer's recommendations.
- .2 Perform simulated operation tests with metering, instruments disconnected from permanent signal and other electrical sources.
- .3 Verify correctness of connections, polarities of meters, instruments, potential and current transformers, transducers, signal sources and electrical supplies.
- .4 Perform tests to obtain correct calibration.
- .5 Test terminal blocks: as required.

- .6 Do not dismantle meters and instruments.
- .7 Submit a detailed testing and commissioning procedure to the Departmental Representative for review and approval prior to undertaking this Work. The procedure shall indicate all test equipment required and acceptance criteria.
- .8 Upon completion of all testing and commissioning, submit a copy of the test results and certify the system as acceptable for revenue metering purposes.
- .9 Undertake the testing and commissioning Work with the manufacturer's factory representative(s).

### 3.4 **COMMISSIONING AND TRAINING**

- .1 Maintenance Training:
  - .1 Include in the tender cost, the services of skilled instructors to conduct on-site training for a minimum of four local harbour Authority Staff and Departmental Representatives on the operation of all metering components.
  - .2 The training shall include a detailed review of the maintenance manuals and a review of procedures of operation for configuring and using the metering system.
  - .3 Provide all "AS BUILT" DRAWINGS and data showing each meter, serial number, address, cross reference, load and CT ratio prior to field verification.
  - .4 Manufacturer's representative shall verify, adjust and test the system. Verification of the revenue grade metering system is to be carried out with the assistance of an electrical contractor at all times. Upon completion, the manufacturer shall issue a "CERTIFICATE OF ACCEPTANCE" to the Departmental Representative.
  - .5 Manufacturer's representative shall demonstrate operation of the system as follows:
    - .1 Local and Remote Meter readings
    - .2 Phase Diagnostics
    - .3 Provide manual of the chosen installed system.
- .2 Commissioning:
  - .1 Commissioning will be performed after substantial completion and will require the presence of trained technicians in accordance with Section 26 05 00 Common Work Requirements – Electrical to demonstrate operation and accuracy of the system and system components. Update as required.

- .2 Verify system calibration and provide Departmental Representative.
- .3 Conduct tests in accordance with Section 26 05 00 – Common Work Requirements – Electrical and in accordance with manufacturer’s recommendations.
- .4 Perform test to obtain correct calibration.
- .5 Test terminal blocks: as required.
- .6 Do not dismantle meters and instruments.
- .7 Perform final testing, adjustment, and commissioning of the systems, report results to the Departmental Representative, and include the results in the installation, operation, and maintenance manuals. Provide qualified technicians and professional test equipment for the testing and commissioning.
- .8 Perform sufficient technical and operational tests to ensure the technical performance of the system meets the intent of the Contract Documents. Typical testing to include but not be limited to:
  - .1 Verification of each revenue grade meter reading
  - .2 Communication system error checking
- .9 Test every device and control equipment after programming and submit a signed commissioning certificate and report to the Departmental Representative.

**END OF SECTION**