

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section Includes:
  - .1 General requirements for Control Systems that are common to NMS Control Sections.
- .2 Related Sections:
  - .1 Section 25 05 54 - Controls: Identification.
  - .2 The City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions.

### **1.2 References**

- .1 American National Standards Institute (ANSI)/The Instrumentation, Systems and Automation Society (ISA).
  - .1 ANSI/ISA 5.5-1985, Graphic Symbols for Process Displays.
- .2 American National Standards Institute (ANSI)/ Institute of Electrical and Electronics Engineers (IEEE).
  - .1 ANSI/IEEE 260.1-1993, American National Standard Letter Symbols Units of Measurement (SI Units, Customary Inch-Pound Units, and Certain Other Units).
- .3 Canadian Standards Association (CSA International).
  - .1 CAN/CSA-Z234.1-89(R1995), Canadian Metric Practice Guide.
- .4 Electrical and Electronic Manufacturers Association (EEMAC).
  - .1 EEMAC 2Y-1-1958, Light Gray Colour for Indoor Switch Gear.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
  - .1 Material Safety Data Sheets (MSDS).

### **1.3 System Description**

- .1 The controls shall include but not be limited to:
  - .1 The wet well level control system (MultiRanger)
  - .2 The wet well high level alarm
  - .3 The pump monitoring panel
  - .4 The SCADA control panel (Inputs only)
  - .5 The telephone service

### **1.4 Scope of Control Work**

- .1 The Contractor shall engage a factory trained representative to supervise the installation, setup, calibrate and operationally verify and commission the following:
  - .1 Soft-Starters
  - .2 Level Controller
  - .3 Telephone Service
- .2 The Contractor shall submit written reports identifying the commissioning work, together with any parameter settings and final adjustments.

### **1.5 Submittals**

- .1 Make submittals in accordance with The City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions.
- .2 Submit for review:
  - .1 Equipment list and systems manufacturers 10 days after award of contract.

### **PART 2 - PRODUCTS**

- .1 Not Used

### **PART 3 - EXECUTION**

#### **3.1 Manufacturer's Recommendations**

- .1 Installation: to manufacturer's recommendations.

#### **3.2 Painting**

- .1 Painting: as follows:
  - .1 Clean and touch up marred or scratched surfaces of factory finished equipment to match original finish.
  - .2 Restore to new condition, finished surfaces too extensively damaged to be primed and touched up to make good.
  - .3 Clean and prime exposed hangers, racks, fastenings, and other support components.
  - .4 Paint unfinished equipment installed indoors to EEMAC 2Y-1.

### **PART 4 - MEASUREMENT AND PAYMENT**

#### **4.1 Method of Measurement and Payment**

- .1 Controls: General Requirements
  - .1 Controls – General Requirements shall be considered incidental to the Contract Lump Sum Price for “Electrical”.

~End~

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section Includes.
  - .1 Requirements and procedures for identification of devices, sensors, wiring tubing, conduit and equipment, the Control System Work and nameplates materials, colours and lettering sizes.
- .2 Related Sections.
  - .1 Section 25 05 01 - Controls: General Requirements.
  - .2 Section 26 05 01 - Common Work Results - Electrical.
  - .3 The City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions.

### **1.2 References**

- .1 Canadian Standards Association (CSA International).
  - .1 CSA C22.1-06, The Canadian Electrical Code, Part I (20th Edition), Safety Standard for Electrical Installations.

### **1.3 Definitions**

- .1 For acronyms and definitions refer to Section 25 05 01 - Controls: General Requirements.

### **1.4 System Description**

- .1 Language Operating Requirements: provide identification for control items in English.

### **1.5 Submittals**

- .1 Submittals in accordance with The City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions supplemented and modified by requirements of this Section.
- .2 Submit to Contract Administrator for approval samples of nameplates, identification tags and list of proposed wording.

## **PART 2 - PRODUCTS**

### **2.1 Nameplates for Panels**

- .1 Provide panel identification in accordance with Section 26 05 01 - Common Work Results - Electrical.
- .2 Nameplate for each panel size 4 engraved as indicated.
- .3 Nameplate for each panel mounted device size 2 engraved as indicated.

### **2.2 Nameplates for Field Devices**

- .1 Provide field device identification in accordance with Section 26 05 01 - Common Work Results - Electrical.
- .2 Nameplate for field device size 7 engraved as indicated.

- .3 Nameplate shall be attached by chain.

### **2.3 Wiring**

- .1 Supply and install numbered tape markings on wiring at panels, junction boxes, splitters, cabinets and outlet boxes.
- .2 Colour coding: to CSA C22.1. Use colour coded wiring in communications cables, matched throughout system.
- .3 Power wiring: identify circuit breaker panel/circuit breaker number inside each control panel.

### **2.4 Pneumatic Tubing**

- .1 Numbered tape markings on tubing to provide uninterrupted tracing capability.

## **PART 3 - EXECUTION**

### **3.1 Nameplates and Labels**

- .1 Ensure that manufacturer's nameplates, CSA labels and identification nameplates are visible and legible at all times.

### **3.2 Existing Panels**

- .1 Correct existing nameplates and legends to reflect changes made during Work.

## **PART 4 - MEASUREMENT AND PAYMENT**

### **4.1 Method of Measurement and Payment**

- .1 Controls: Identification
  - .1 Controls – Identification shall be considered incidental to the Contract Lump Sum Price for “Electrical”.

~End~

## **PART 1 - GENERAL**

### **1.1 Summary**

- .1 Section Includes:
  - .1 Instrumentation devices integral to the Control System: transmitters, sensors, controls, meters, switches, transducers, dampers, damper operators, valves, valve actuators, and low voltage current transformers.
  - .2 Related Sections:
    - .1 Section 25 05 01 - Controls: General Requirements.
    - .2 Section 25 05 54 - Controls: Identification.
    - .3 Section 26 05 01 - Common Work Results - Electrical.
    - .4 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings
    - .5 Section 26 27 26 - Wiring Devices.
    - .6 The City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions.

### **1.2 References**

- .1 American National Standards Institute (ANSI).
  - .1 ANSI C12.7-1993(R1999), Requirements for Watthour Meter Sockets.
  - .2 ANSI/IEEE C57.13-1993, Standard Requirements for Instrument Transformers.
- .2 American Society for Testing and Materials International, (ASTM).
  - .1 ASTM B148-97(03), Standard Specification for Aluminum-Bronze Sand Castings.
- .3 National Electrical Manufacturer's Association (NEMA).
  - .1 NEMA 250-03, Enclosures for Electrical Equipment (1000 Volts Maximum).
- .4 Canadian Standards Association (CSA International).
  - .1 CSA-C22.1-06, Canadian Electrical Code, Part 1 (20th Edition), Safety Standard for Electrical Installations.

### **1.3 Definitions**

- .1 Acronyms and Definitions: refer to Section 25 05 01 - Controls: General Requirements.

### **1.4 Submittals**

- .1 Submit shop drawings and manufacturer's installation instructions in accordance with The City of Winnipeg Standard Construction Specifications Section CW1110 – General Instructions.
- .2 Pre-Installation Tests.
  - .1 Submit samples at random from equipment shipped, as requested by Contract Administrator, for testing before installation. Replace devices not meeting specified performance and accuracy.
- .3 Manufacturer's Instructions:
  - .1 Submit manufacturer's installation instructions for specified equipment and devices.

## **PART 2 - PRODUCTS**

### **2.1 General**

- .1 Control devices of each category to be of same type and manufacturer.
- .2 External trim materials to be corrosion resistant. Internal parts to be assembled in watertight, shockproof, vibration-proof, heat resistant assembly.
- .3 Operating conditions: 0 - 32 degrees C with 10 - 90 % RH (non-condensing) unless otherwise specified.
- .4 Terminations: use standard conduit box with slot screwdriver compression connector block unless otherwise specified.
- .5 Transmitters and sensors to be unaffected by external transmitters including walkie talkies.
- .6 Account for hysteresis, relaxation time, maximum and minimum limits in applications of sensors and controls.
- .7 Outdoor installations: use weatherproof construction in NEMA 4 enclosures.

### **2.2 Level Transmitters**

- .1 High performance ultrasonic level controller with the following features:
  - .1 Provide ultrasonic level sensing systems suitable for water applications as indicated on drawings.
  - .2 Wall mounted continuous level monitoring device to provide operation of two (2) pumps with independent start and stop setpoints. Pumps to cycle on a first one, first off rotating basis to ensure equal run hours.
  - .3 Enclosure NEMA 4X suitable for wet environment;
  - .4 Power input: 100 - 230 Vac  $\pm$  15 % at 60 Hz.
  - .5 Range 0.3 m to 15 m (1 to 50 feet) dependent on transducer.
  - .6 Two (2) level transducer inputs.
  - .7 Six (6) relays rated a 5 A at 250 Vac non-inductive.
    - .1 Four (4) Form 'A' contacts.
    - .2 Two (2) Form 'C' contacts.
  - .8 Two (2) discrete inputs, for high level over-ride, 10 – 50 Vdc switching level. 3 mA maximum draw.
  - .9 One (1) analog input, 4 – 20 mA.
  - .10 One (1) analog output, 4 – 20 mA isolated
  - .11 Multi-field back lit LCD display.
- .2 Ultrasonic transducers complete with built in temperature compensation.
- .3 Transducer to be chemically resistant to water/oil environments. Remotely mount the transducer in standpipe as indicated on drawings.
- .4 Acceptable Product: Siemens Milltronics MultiRanger 200 complete with Siemens Milltronics Echomax XPS-15 transducer or approved equivalent.

## 2.3 Temperature Switches

- .1 Requirements:
  - .1 Operate automatically. Reset automatically.
  - .2 Adjustable setpoint and differential.
  - .3 Accuracy: plus or minus 1 degrees C.
  - .4 Snap action rating: 120 Vac, 15 amps as required. Switch to be DPST for hardwire and control system connections.
  - .5 Type as follows:
    - .1 Room: for wall mounting on standard electrical box with protective guard as indicated.

## 2.4 Sump Level Switches

- .1 Requirements:
  - .1 Liquid level activated switch sealed in waterproof and shockproof enclosure.
  - .2 Complete with float, flexible cord, weight. Instrument casing to be suitable for immersion in measured liquid.
  - .3 N.O./N.C. Contacts rated at 10 amps at 120V AC. CSA approval for up to 250 volt 10 amps AC.
  - .4 Acceptable Product: Flygt ENM-10.

## 2.5 Electromechanical Relays

- .1 Requirements:
  - .1 Double voltage, DPDT, plug-in type with termination base.
  - .2 Coils: rated for 120 Vac or 24 Vdc. Other voltage: provide transformer.
  - .3 Contacts: rated at 5 amps at 120 Vac.
  - .4 Relay to have visual status indication

## 2.6 Watthour Meters and Current Transformers

- .1 Requirements:
  - .1 Include three phases, test and terminal blocks for watthour meter connections and connections for monitoring of current. Accuracy: plus or minus 0.25 % of full scale.
  - .2 Watthour meter sockets: to ANSI C12.7.
  - .3 Potential and current transformers: to ANSI/IEEE C57.13.
  - .4 Potential transformers: provide two primary fuses.
  - .5 Demand meters: configure to measure demand at 15 minute intervals.

## 2.7 Panels

- .1 Free-standing or wall mounted enamelled steel cabinets with hinged and key-locked front door as indicated on drawings.
- .2 Multiple panels as required to handle requirements with additional space to accommodate 25% additional capacity as required by Contract Administrator without adding additional cabinets.
- .3 Panels to be lockable with same key.

## 2.8 Wiring

- .1 In accordance with Section 26 27 26 - Wiring Devices.
- .2 For wiring under 70 volts use FT6 rated wiring where wiring is not run in conduit. Other cases use FT4 wiring.
- .3 Wiring must be continuous without joints.
- .4 Sizes:
  - .1 Field wiring to digital device: #14 AWG.
  - .2 Analog input and output: shielded #18 minimum stranded twisted pair.

## PART 3 - EXECUTION

### 3.1 Installation

- .1 Instrument components are not specifically located on drawings, but located on drawings in the general vicinity. The instrument components shall be field located as defined by mechanical piping and in accordance with the following:
  - .1 Instrument components shall not be attached to vibrating equipment, but shall be remotely mounted to a solid structure or on approved instrument mounting stands.
  - .2 Location of instruments, when shown on the drawings, is only approximate. The Contractor is responsible for actual location of field devices and must avoid interferences between conduit, pipes, equipment and instruments while providing maximum accessibility.
  - .3 Locate instruments components at eye level and in an easily accessible location.
  - .4 Instrument components that must be removed for servicing shall be installed with re-usable connectors, unions and flexible conduit.
  - .5 Electrical connections and terminations for field instruments and other field devices shall be in strict compliance with the manufacturer's instructions and loop drawings. This will include wire, wire termination, labelling, rigid and flexible conduit, fittings, and seals where required.
- .2 Install equipment, components so that manufacturer's and CSA labels are visible and legible after commissioning is complete.
- .3 Temperature transmitters, humidity transmitters, current-to-pneumatic transducers, solenoid air valves, controllers, relays: install in NEMA I enclosure or as required for specific applications. Provide for electrolytic isolation in cases when dissimilar metals make contact.
- .4 Support field-mounted panels, transmitters and sensors on wall or pipe stands with approved mounting brackets or stands at a nominal height of 1.4 meters off floor.
- .5 For instruments with pre-terminated cable lengths provide a junction box as close as practical to connect with armoured cable or cable in conduit.
- .6 Allow for a variation of 3 meters from locations of devices as shown on drawings without extra cost provided pertinent information is provided prior to installation. Exact location will be determined by the installation of piping and mechanical equipment.
- .7 Threaded fastenings for mounting instrument components shall have either lock nuts or double nuts.

- .8 Cover locally mounted instrument components, after installation, with plastic bags to protect them from dust, dirt, paint spray, insulation materials, etc. Protect from mechanical damage.
- .9 Set output pressure of local air sets to pressure recommended for instrument to which it is to be connected.
- .10 Independently support solenoids, regulators or similar control devices on solid, vibration free structures and not on control valves. Minimize load on pneumatic tubing.
- .11 Field instruments located out doors shall be winterized to prevent process or measurement fluids from freezing. The use of steam or electrical tracing, fill fluids, or enclosures will be shown on the Installation Detail drawings.
- .12 All instrument signal wiring and 120 Vac wiring shall be run by the Contractor from the field instrument to the field device as shown on the loop drawings. This includes wiring, rigid and flexible conduit, fittings and seals where shown. Conduit penetrations are not permitted into the top of any field junction box.
- .13 Electrical:
  - .1 Provide and route all instruments, power and control signal cabling.
  - .2 Complete installation in accordance with Section 26 05 01 - Common Work Results - Electrical.
  - .3 Refer to electrical control schematics included as part of control design schematics on drawings. Trace existing control wiring installation and provide updated wiring schematics including additions, deletions to control circuits for review by Contract Administrator before beginning Work.
  - .4 Terminate wires with screw terminal type connectors suitable for wire size, and number of terminations.
  - .5 Install communication wiring in conduit.
    - .1 Provide complete conduit system to link Building Controllers, field panels and OWS(s).
    - .2 Conduit sizes to suit wiring requirements and to allow for future expansion capabilities specified for systems.
    - .3 Maximum conduit fill not to exceed 40%.
    - .4 Design drawings do not show conduit layout.
  - .6 Install conduit systems in accordance with Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.

### **3.2 Instrument Supports**

- .1 Clean and paint fabricated galvanized carbon steel mounting stands and brackets.
- .2 Before a mounting stand is attached to a concrete floor the surface of the concrete to be in contact with grout shall be roughed and cleaned of all dirt, oil, grease and loose material.

### **3.3 Temperature and Humidity Sensors**

- .1 Stabilize to ensure minimum field adjustments or calibrations.
- .2 Readily accessible and adaptable to each type of application to allow for quick easy replacement and servicing without special tools or skills.

### **3.4 Panels**

- .1 Arrange for conduit and tubing entry from bottom or either side.
- .2 Wiring and tubing within panels: locate in trays or individually clipped to back of panel.
- .3 Identify wiring and conduit clearly.

### **3.5 Calibration Tagging**

- .1 When satisfactorily inspected and calibrated, the item shall have a tag affixed to it in an immediately visible location, which shall indicate that the device has been calibrated, by whom and the date of the calibration. Calibration procedures and records shall be available to the Contract Administrator throughout the course of the project and shall be delivered to the Contract Administrator upon the completion of work.

### **3.6 Identification**

- .1 All field-mounted instrument items shall have an approved identification tag permanently attached by the Contractor upon completion of the initial inspection and calibration. This tag shall reflect the device's identification as shown on the appropriate drawing.
- .2 The tag will be permanently attached to the instrument with screws, rivets, or stainless steel or Monel wire, as appropriate. If an instrument is inside a protective enclosure or mounted behind a panel, instrument identity tags shall be mounted twice, once on the instrument and again on the enclosure. All instruments mounted on a control panel shall have an identity tag mounted on the instrument body and again on the face of the panel below the instrument face.
- .3 Identify field devices in accordance with Section 25 05 54 - Controls: Identification.

### **3.7 Testing and Commissioning**

- .1 Calibrate and test field devices for accuracy and performance.

## **PART 4 - MEASUREMENT AND PAYMENT**

### **4.1 Method of Measurement and Payment**

- .1 Controls: Identification
  - .1 Controls – Identification shall be considered incidental to the Contract Lump Sum Price for “Electrical”.

~End~