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## **Part 1            General**

### **1.1            REFERENCE STANDARDS**

- .1      Canadian Standards Association (CSA International).
  - .1          CAN/CSA-Z234.1-89(R1995), Canadian Metric Practice Guide.
- .2      Consumer Electronics Association (CEA).
  - .1          CEA-709.1-B-2002, Control Network Protocol Specification.

### **1.2            ABBREVIATIONS AND ACRONYMS**

- .1      Acronyms used in EMCS:
  - .1          AEL - Average Effectiveness Level
  - .2          AI - Analog Input
  - .3          AIT - Agreement on International Trade
  - .4          AO - Analog Output
  - .5          BC(s) - Building Controller(s).
  - .6          BECC - Building Environmental Control Centre.
  - .7          CAD - Computer Aided Design.
  - .8          CDL - Control Description Logic.
  - .9          CDS - Control Design Schematic.
  - .10        COSV - Change of State or Value.
  - .11        CPU - Central Processing Unit.
  - .12        DI - Digital Input.
  - .13        DO - Digital Output.
  - .14        DP - Differential Pressure.
  - .15        ECU - Equipment Control Unit.
  - .16        EMCS - Energy Monitoring and Control System.
  - .17        HVAC - Heating, Ventilation, Air Conditioning.
  - .18        IDE - Interface Device Equipment.
  - .19        I/O - Input/Output.
  - .20        ISA - Industry Standard Architecture.
  - .21        LAN - Local Area Network.
  - .22        LCU - Local Control Unit.
  - .23        MCU - Master Control Unit.
  - .24        NAFTA - North American Free Trade Agreement.
  - .25        NC - Normally Closed.
  - .26        NO - Normally Open.
  - .27        OS - Operating System.
  - .28        O&M - Operation and Maintenance.

- .29 OWS - Operator Work Station.
- .30 PC - Personal Computer.
- .31 PCI - Peripheral Control Interface.
- .32 PCMCIA - Personal Computer Micro-Card Interface Adapter.
- .33 PID - Proportional, Integral and Derivative.
- .34 RAM - Random Access Memory.
- .35 SP - Static Pressure.
- .36 ROM - Read Only Memory.
- .37 TCU - Terminal Control Unit.
- .38 USB - Universal Serial Bus.
- .39 UPS - Uninterruptible Power Supply.
- .40 VAV - Variable Air Volume.

### 1.3 DEFINITIONS

- .1 Point: may be logical or physical.
  - .1 Logical points: values calculated by system such as set points, totals, counts, derived corrections and may include, but not limited to result of and statements in CDL's.
  - .2 Physical points: inputs or outputs which have hardware wired to controllers which are measuring physical properties, or providing status conditions of contacts or relays which provide interaction with related equipment (stop, start) and valve or damper actuators.
- .2 Point Name: composed of two parts, point identifier and point expansion.
  - .1 Point identifier: comprised of three descriptors, "area" descriptor, "system" descriptor and "point" descriptor, for which database to provide character field for each point identifier. "System" is system that point is located on.
    - .1 Area descriptor: building or part of building where point is located.
    - .2 System descriptor: system that point is located on.
    - .3 Point descriptor: physical or logical point description. For point identifier "area", "system" and "point" will be short forms or acronyms. Database must provide character field for each point identifier.
  - .2 Point expansion: comprised of three fields, one for each descriptor. Expanded form of short form or acronym used in "area", "system" and "point" descriptors is placed into appropriate point expansion field. Database must provide character field for each point expansion.
  - .3 Bilingual systems to include additional point identifier expansion fields of equal capacity for each point name for second language.
    - .1 System to support use of numbers and readable characters including blanks, periods or underscores to enhance user readability for each of the above strings.
- .3 Point Object Type: points fall into following object types:
  - .1 AI (analog input).

- .2 AO (analog output).
- .3 DI (digital input).
- .4 DO (digital output).
- .5 Pulse inputs.
- .4 Symbols and engineering unit abbreviations utilized in displays: to ANSI/ISA S5.5.
- .1 Printouts: to ANSI/IEEE 260.1.

#### **1.4 SYSTEM DESCRIPTION**

- .1 Field review and consult building operation staff for system architecture. Existing system uses Prairie Controls Ltd operating system.
- .2 Work covered by sections referred to above consists upgrades to the fully operational EMCS, including, but not limited to, following:
  - .1 Building Controllers.
  - .2 Control devices as listed in I/O point summary tables.
  - .3 OWS(s).
  - .4 Data communications equipment necessary to effect EMCS data transmission system.
  - .5 Field control devices.
  - .6 Software/Hardware changes complete with full documentation.
  - .7 Complete operating and maintenance manuals.
  - .8 Acceptance tests, technical support during commissioning, full documentation.
  - .9 Wiring interface co-ordination of equipment supplied by others.
  - .10 Miscellaneous work as specified in these sections and as indicated.
- .3 Design Requirements:
  - .1 Design and provide conduit and wiring linking elements of system.
  - .2 Supply sufficient programmable controllers of types to meet project requirements. Quantity and points contents as reviewed by Consultant.
  - .3 Metric references: in accordance with CAN/CSA Z234.1.
  - .4 Connect to and update existing building system to meet new requirements.
- .4 Language Operating Requirements:
  - .1 Provide English operator selectable access codes.
  - .2 Use non-linguistic symbols for displays on graphic terminals wherever possible. Operating system executive: provide primary hardware-to-software interface specified as part of hardware purchase with associated documentation.
  - .3 Manager software: Upgrades to existing system. Field review and provide updates to existing system.
  - .4 Include, in English:
    - .1 Field related changes, Input and output commands and messages from operator-initiated functions, alarms to match existing performance.
    - .2 Graphic "display" functions, point commands to turn systems on or off, manually override automatic control of specified hardware points.

- .3 Reporting function such as trend log, trend graphics, alarm report logs, energy report logs, maintenance generated logs.

## **1.5 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Make submittals in accordance with 01 33 00- Submittal Procedures.
- .2 Submit for review:
  - .1 Equipment list with systems manufacturers within ten (10) days after award of contract.
  - .2 Review and List existing field control devices required and review existing building controls system.
- .3 Quality Control:
  - .1 Provide equipment and material from manufacturer's regular production, CSA certified, manufactured to standard quoted plus additional specified requirements.
  - .2 Where CSA certified equipment is not available submit such equipment to inspection authorities for special inspection and approval before delivery to site.
  - .3 Submit proof of compliance to specified standards with shop drawings and product data.

## **1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Material Delivery Schedule: As required to meet project deadline requirements.
- .2 Waste Management and Disposal:
  - .1 Separate waste materials for recycling.

## **1.7 EXISTING CONTROL COMPONENTS AND SYSTEM**

- .1 Re-use field control devices that are usable in their original configuration provided that they conform to applicable codes, standards specifications.
  - .1 Do not modify original design of existing devices without written permission from Consultant.
  - .2 Provide for new devices where re-usability of components is uncertain.
- .2 Inspect and test existing devices intended for re-use within (30) days of award of contract, and prior to installation of new devices.
- .3 Non-functioning items:
  - .1 Consultant will recommend repair or replacement of existing items judged defective yet deemed necessary for EMCS where not indicated on drawing.
- .4 Submit written request for permission to disconnect controls and to obtain equipment downtime before proceeding with Work.
- .5 Assume responsibility for controls to be incorporated into EMCS after written receipt of approval from Consultant.
  - .1 Be responsible for items repaired or replaced and repair costs due to negligence or abuse of equipment.

- .6 Remove existing controls not re-used or not required. Place in approved storage for disposition as directed.
- .7 Integrate new components into existing DDC system.
- .8 Existing sequence of operations to be maintained for systems related to multizone air handler and force flow system.
- .9 Duct heaters to activate based on thermostat call for heating. Thermostat to be controllable in office and by base DDC system. Duct heater to have integral flow sensor and modulating temperature output.

## **Part 2 Products**

### **2.1 EQUIPMENT**

- .1 Review system for existing system compatibility to new components. Reselect components that are not compatible with existing system.

### **2.2 ADAPTORS**

- .1 Provide adaptors between metric and imperial components.

## **Part 3 Execution**

### **3.1 INSTALLATION**

- .1 Control wiring, components, and revisions to controls system to be completed by:
  - .1 Contractor certified and trained in the use of the existing control system. Existing system uses Prairie Controls Ltd. user interface.
  - .2 Contractor to be experienced (3+ Years) in controls installations and capable of providing all wiring, components, and revisions to existing system.

### **3.2 MANUFACTURER'S RECOMMENDATIONS**

- .1 Installation: to manufacturer's recommendations and all industry standards.
- .2 Installing to be done by experienced controls contractor with minimum three (3) years of experience in similar work.

**END OF SECTION**

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## **Part 1            General**

### **1.1                SUMMARY**

- .1    Section Includes:
  - .1    Control devices integral to the Building Energy Monitoring and Control System (EMCS): transmitters, sensors, dampers, damper operators, low voltage current transformers, controls, meters, valves.
  - .2    Related Sections:
    - .1    Section 25 05 01- EMCS: General Requirements.
    - .2    Section 26 05 00- Common Work Results for Electrical

### **1.2                REFERENCE STANDARDS**

- .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    Air Movement and Control Association, Inc. (AMCA).
  - .1    AMCA Standard 500-D-98, Laboratory Method of Testing Dampers For Rating.
- .5    Canadian Standards Association (CSA International).
  - .1    CSA-C22.1-02, Canadian Electrical Code, Part 1 (19th Edition), Safety Standard for Electrical Installations.

### **1.3                DEFINITIONS**

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

### **1.4                ACTION AND INFORMATIONAL SUBMITTALS**

- .1    Submit shop drawings and manufacturer's installation instructions in accordance with Section 01 33 00 Submittal Procedures for review and stamping by consultant.
- .2    Pre-Installation Tests.
  - .1    Test equipment 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.

## **1.5 EXISTING CONDITIONS**

- .1 Cutting and Patching: in accordance with Section 01 73 00- Execution Requirements supplemented as specified herein.
- .2 Repair surfaces damaged during execution of Work.

## **Part 2 Products**

### **2.1 GENERAL**

- .1 To be compatible with existing controls system in building (Prairie Control Lts.)
- .2 Control devices of each category to be of same type and manufacturer.
- .3 External trim materials to be corrosion resistant.
- .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 rated enclosures.

### **2.2 TEMPERATURE SENSORS**

- .1 Room temperature sensors and display wall modules (Thermostats - T).
  - .1 Temperature sensing and display wall module.
    - .1 LCD display to show space temperature and temperature setpoint.
    - .2 Buttons for occupant selection of temperature setpoint and occupied/unoccupied mode.
    - .3 Jack connection for plugging in laptop personal computer for access to zone bus.
    - .4 Integral thermistor sensing element 10,000ohm at 24degrees.
    - .5 Accuracy 0.2 degrees C over range of 0 to 70 degrees C.
    - .6 Stability 0.02 degrees C drift per year.
    - .7 Separate mounting base for ease of installation.
  - .2 Room temperature sensors (Zone Sensor - TS)
    - .1 Wall mounted.
    - .2 Element 10-50 mm long RTD with ceramic tube or equivalent protection or thermistor, 10,000 ohm, accuracy of plus or minus 0.2 degrees C.

### **2.3 WIRING**

- .1 In accordance with all Division 26 sections.

- .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: #18AWG.
  - .2 Analog input and output: shielded #18 minimum solid copper.

### **Part 3 Execution**

#### **3.1 INSTALLATION**

- .1 Install equipment, components so that manufacturer's and CSA labels are visible and legible after commissioning is complete.
- .2 Install field control devices in accordance with manufacturers recommended methods, procedures and instructions.
- .3 Support field-mounted panels, transmitters and sensors on pipe stands or channel brackets.
- .4 Fire stopping: provide and provide space for fire stopping. Maintain fire rating integrity of wall.
- .5 Electrical:
  - .1 Complete installation in accordance with all Division 26 standards.
  - .2 Terminate wires with screw terminal type connectors suitable for wire size, and number of terminations.
  - .3 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.
  - .4 Do not run exposed conduits in normally occupied spaces.

#### **3.2 TEMPERATURE 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.

#### **3.3 I/P TRANSDUCERS**

- .1 Install air pressure gauge on outlet.



**3.4 AIR PRESSURE GAUGES**

- .1 Install pressure gauges on pneumatic devices, I/P, pilot positioners, motor operators, switches, relays, valves, damper operators, valve actuators.
- .2 Install pressure gauge on output of auxiliary cabinet pneumatic devices.

**3.5 IDENTIFICATION**

- .1 Identify field devices with label. See Division 1 requirements for labelling.

**3.6 TESTING AND COMMISSIONING**

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

**END OF SECTION**