

PART I GENERAL

I.1 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 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).
 - .1 ASHRAE STD 135-R2001, BACNET - Data Communication Protocol for Building Automation and Control Network.
- .4 Canadian Standards Association (CSA International).
 - .1 CAN/CSA-Z234.1-89(R1995), Canadian Metric Practice Guide.
- .5 Consumer Electronics Association (CEA).
 - .1 CEA-709.1-B-2002, Control Network Protocol Specification.

I.2 ACRONYMS AND ABBREVIATIONS

- .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 BACnet - Building Automation and Control Network.
 - .6 BC(s) - Building Controller(s).
 - .7 BECC - Building Environmental Control Center.
 - .8 CAD - Computer Aided Design.
 - .9 CDL - Control Description Logic.
 - .10 CDS - Control Design Schematic.
 - .11 COSV - Change of State or Value.
 - .12 CPU - Central Processing Unit.
 - .13 DI - Digital Input.
 - .14 DO - Digital Output.
 - .15 DP - Differential Pressure.
 - .16 ECU - Equipment Control Unit.
 - .17 EMCS - Energy Monitoring and Control System.

- .18 HVAC - Heating, Ventilation, Air Conditioning.
- .19 IDE - Interface Device Equipment.
- .20 I/O - Input/Output.
- .21 ISA - Industry Standard Architecture.
- .22 LAN - Local Area Network.
- .23 LCU - Local Control Unit.
- .24 MCU - Master Control Unit.
- .25 NAFTA - North American Free Trade Agreement.
- .26 NC - Normally Closed.
- .27 NO - Normally Open.
- .28 OS - Operating System.
- .29 O&M - Operation and Maintenance.
- .30 OWS - Operator Work Station.
- .31 PC - Personal Computer.
- .32 PCI - Peripheral Control Interface.
- .33 PCMCIA - Personal Computer Micro-Card Interface Adapter.
- .34 PID - Proportional, Integral and Derivative.
- .35 RAM - Random Access Memory.
- .36 SP - Static Pressure.
- .37 ROM - Read Only Memory.
- .38 TCU - Terminal Control Unit.
- .39 USB - Universal Serial Bus.
- .40 UPS - Uninterruptible Power Supply.
- .41 VAV - Variable Air Volume.

I.3 DEFINITIONS

- .1 Point: may be logical or physical.
 - .1 Logical points: values calculated by system such as setpoints, 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 25 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 shortforms or acronyms. Database must provide 25 character field for each point identifier.
 - .2 Point expansion : comprised of three fields, one for each descriptor. Expanded form of shortform or acronym used in "area", "system" and "point" descriptors is placed into appropriate point expansion field. Database must provide 32 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.

I.4 SYSTEM DESCRIPTION

- .1 Work covered by sections referred to above consists of 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 complete with full documentation.
 - .7 Complete operating and maintenance manuals.
 - .8 Training of personnel.
 - .9 Acceptance tests, technical support during commissioning, full documentation.
 - .10 Wiring interface co-ordination of equipment supplied by others.
 - .11 Miscellaneous work as specified in these sections and as indicated.
- .2 Design Requirements:
 - .1 Design and provide conduit and wiring linking elements of system.
 - .2 Supply sufficient programmable controllers of types to meet project requirements.
 - .3 Provide utility power to EMCS.
 - .4 Metric references: in accordance with CAN/CSA Z234.1.

- .3 Language Operating Requirements:
 - .1 Provide English or French operator selectable access codes.
 - .2 Use non-linguistic symbols for displays on graphic terminals wherever possible. Other information to be in English and French.
 - .3 Operating system executive: provide primary hardware-to-software interface specified as part of hardware purchase with associated documentation to be in English and or French.
 - .4 System manager software: include in English and or French system definition point database, additions, deletions or modifications, control loop statements, use of high level programming languages, report generator utility and other OS utilities used for maintaining optimal operating efficiency.
 - .5 Include, in English and French:
 - .1 Input and output commands and messages from operator-initiated functions and field related changes and alarms as defined in CDL's or assigned limits (i.e. commands relating to day-to-day operating functions and not related to system modifications, additions, or logic re-definements).
 - .2 Graphic "display" functions, point commands to turn systems on or off, manually override automatic control of specified hardware points. To be in French and English at specified OWS and to be able to operate one terminal in English and second in French. Point name expansions in both languages.
 - .3 Reporting function such as trend log, trend graphics, alarm report logs, energy report logs, maintenance generated logs.

I.5 SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Quality Control:
 - .1 Provide equipment and material from manufacturer's regular production, CSA certified, manufactured to standard quoted plus additional specified requirements.
 - .2 Submit proof of compliance to specified standards with shop drawings and product data in accordance with Section 25 05 02 - EMCS: Shop Drawings, Product Data and Review Process. Label or listing of specified organization is acceptable evidence.
 - .3 For materials whose compliance with organizational standards/codes/specifications is not regulated by organization using its own listing or label as proof of compliance, furnish certificate stating that material complies with applicable referenced standard or specification.
 - .4 Permits and fees: in accordance with general conditions of contract.
 - .5 Existing devices intended for re-use: submit test report.

I.6 QUALITY ASSURANCE

- .1 Have local office within 50 km of project staffed by trained personnel capable of providing instruction, routine maintenance and emergency service on systems,

- .2 Provide record of successful previous installations submitting tender showing experience with similar installations utilizing computer-based systems.
- .3 Have access to local supplies of essential parts and provide 7 year guarantee of availability of spare parts after obsolescence.
- .4 Ensure qualified supervisory personnel continuously direct and monitor Work and attend site meetings.

PART 2 PRODUCTS

2.1 EQUIPMENT

- .1 Control Network Protocol and Data Communication Protocol: to CEA 709.1 ASHRAE STD 135.
- .2 Complete list of equipment and materials to be used on project and forming part of bid tender documents by adding manufacturer's name, model number and details of materials, and submit for approval.

2.2 ADAPTORS

- .1 Provide adaptors between metric and imperial components.

PART 3 EXECUTION

3.1 MANUFACTURER'S RECOMMENDATIONS

- .1 Installation: to manufacturer's recommendations.

END OF SECTION

PART I GENERAL

I.1 DEFINITIONS

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

I.2 DESIGN REQUIREMENTS

- .1 Preliminary Design Review: to contain following contractor and systems information.
 - .1 Location of office.
 - .2 Description and location of installing and servicing technical staff.
 - .3 Location and qualifications of programming design and programming support staff.
 - .4 List of spare parts.
 - .5 Location of spare parts stock.
 - .6 Names of sub-contractors and site-specific key personnel.
 - .7 Sketch of site-specific system architecture.
 - .8 Specification sheets for each item including memory provided, programming language, speed, type of data transmission.
 - .9 Descriptive brochures.
 - .10 Sample CDL and graphics (systems schematics).
 - .11 Response time for each type of command and report.
 - .12 Item-by-item statement of compliance.
 - .13 Proof of demonstrated ability of system to communicate utilizing Proprietary Communications Protocol BACnet Lontalk.

I.3 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures and coordinate with requirements in this Section.
- .2 Submit preliminary design document within 5 working days after tender closing and before contract award, for review by Consultant.
- .3 Shop Drawings to consist of 3 hard copies and 1 soft copy of design documents, shop drawings, product data and software.
- .4 Hard copy to be completely indexed and coordinated package to assure compliance with contract requirements and arranged in same sequence as specification and cross-referenced to specification section and paragraph number.
- .5 Soft copy to be in Autocad - latest version and WordPerfect latest version Microsoft Word latest version format, structured using menu format for easy loading and retrieval on OWS.

I.4 PRELIMINARY SHOP DRAWING REVIEW

- .1 Submit preliminary shop drawings within 30 working days of award of contract and include following:
 - .1 Specification sheets for each item. To include manufacturer's descriptive literature, manufacturer's installation recommendations, specifications, drawings, diagrams, performance and characteristic curves, catalogue cuts, manufacturer's name, trade name, catalogue or model number, nameplate data, size, layout, dimensions, capacity, other data to establish compliance.
 - .2 Detailed system architecture showing all points associated with each controller including, signal levels, pressures where new EMCS ties into existing control equipment.
 - .3 Spare point capacity of each controller by number and type.
 - .4 Controller locations.
 - .5 Auxiliary control cabinet locations.
 - .6 Single line diagrams showing cable routings, conduit sizes, spare conduit capacity between control centre, field controllers and systems being controlled.

I.5 DETAIL SHOP DRAWING REVIEW

- .1 Submit detailed shop drawings within 60 working days after award of contract and before start of installation and include following:
 - .1 Corrected and updated versions (hard copy only) of submissions made during preliminary review.
 - .2 Wiring diagrams.
 - .3 Piping diagrams and hook-ups.
 - .4 Interface wiring diagrams showing termination connections and signal levels for equipment to be supplied by others.
 - .5 Shop drawings for each input/output point, sensors, transmitters, showing information associated with each particular point including:
 - .1 Sensing element type and location.
 - .2 Transmitter type and range.
 - .3 Associated field wiring schematics, schedules and terminations.
 - .4 Complete Point Name Lists.
 - .5 Software and programming details associated with each point.
 - .6 Manufacturer's recommended installation instructions and procedures.
 - .7 Input and output signal levels or pressures where new system ties into existing control equipment.
 - .6 Control schematics, narrative description, CDL's fully showing and describing automatic and manual procedure required to achieve proper operation of project, including under complete failure of EMCS.
 - .7 Graphic system schematic displays of air systems with point identifiers and textual description of system.
 - .8 Complete system CDL's including companion English language explanations on same sheet but with different font and italics. CDL's to contain specified energy optimization programs.

- .9 Listing and example of specified reports.
- .10 Listing of time of day schedules.
- .11 Mark up to-scale construction drawing to detail control room showing location of equipment and operator work space.
- .12 Type and size of memory with statement of spare memory capacity.
- .13 Full description of software programs provided.
- .14 Sample of "Operating Instructions Manual" to be used for training purposes.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

- .1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International).
- .1 CSA C22.1-02, The Canadian Electrical Code, Part I (19th Edition), Safety Standard for Electrical Installations.

1.2 DEFINITIONS

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

1.3 SYSTEM DESCRIPTION

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

1.4 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures supplemented and modified by requirements of this Section.

PART 2 PRODUCTS

2.1 NAMEPLATES FOR PANELS

- .1 Identify by 3 mm thick Melamine, matt white finish, black core, square corners, lettering accurately aligned and engraved into core.
- .2 Sizes: 25 x 67 mm minimum.
- .3 Lettering: minimum 7 mm high, black.
- .4 Inscriptions: machine engraved to identify function.

2.2 NAMEPLATES FOR FIELD DEVICES

- .1 Identify by plastic encased cards attached by chain plastic tie.
- .2 Sizes: 50 x 100 mm minimum.
- .3 Lettering: minimum 5 mm high produced from laser printer in black.
- .4 Data to include: point name and point address.
- .5 Companion cabinet: identify interior components using plastic enclosed cards with point name and point address.

2.3 NAMEPLATES FOR ROOM SENSORS

- .1 Identify by stick-on labels using point identifier.
- .2 Letter size: to suit, clearly legible.

2.4 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 EMCS panel.

2.5 CONDUIT

- .1 Colour code EMCS conduit.
- .2 Pre-paint box covers and conduit fittings.
- .3 Coding: use fluorescent orange paint and confirm colour with Departmental Representative during "Preliminary Design Review".

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.

END OF SECTION

PART I GENERAL

I.1 REFERENCES

- .1 American Society of Heating, Refrigeration and Air-Conditioning Engineers, Inc. (ASHRAE).
 - .1 ASHRAE 2003, Applications Handbook, SI Edition.
- .2 Canadian Standards Association (CSA International).
 - .1 C22.2 No.205-M1983(R1999), Signal Equipment.
- .3 Institute of Electrical and Electronics Engineers (IEEE).
 - .1 IEEE C37.90.1-02, Surge Withstand Capabilities (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus.
- .4 Public Works and Government Services Canada (PWGSC)/Real Property Branch/Architectural and Engineering Services.
 - .1 MD13800-September 2000, Energy Management and Control Systems (EMCS) Design Manual. English: <ftp://ftp.pwgsc.gc.ca/rps/doccentre/mechanical/me214-e.pdf>

I.2 DEFINITIONS

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

I.3 DESIGN REQUIREMENTS

- .1 To include:
 - .1 Scanning of AI and DI connected inputs for detection of change of value and processing detection of alarm conditions.
 - .2 Perform On-Off digital control of connected points, including resulting required states generated through programmable logic output.
 - .3 Perform Analog control using programmable logic, (including PID) with adjustable dead bands and deviation alarms.
 - .4 Control of systems as described in sequence of operations.
 - .5 Execution of optimization routines as listed in this section.
- .2 Field Termination and Interface Devices:
 - .1 To: CSA C22.2 No.205.
 - .2 Electronically interface sensors and control devices to processor unit.
 - .3 Include, but not be limited to, following:
 - .1 Programmed firmware or logic circuits to meet functional and technical requirements.
 - .2 Power supplies for operation of logics devices and associated field equipment.
 - .3 Lockable wall cabinet.

- .4 Required communications equipment and wiring (if remote units).
- .5 Leave controlled system in "fail-safe" mode in event of loss of communication with, or failure of, processor unit.
- .6 Input Output interface to accept as minimum AI, AO, DI, DO functions as specified.
- .7 Wiring terminations: use conveniently located screw type or spade lug terminals.
- .4 AI interface equipment to:
 - .1 Convert analog signals to digital format with 10 bit analog-to-digital resolution.
 - .2 Provide for following input signal types and ranges:
 - .1 4 - 20 mA;
 - .2 0 - 10 V DC;
 - .3 100/1000 ohm RTD input;
 - .3 Meet IEEE C37.90.1 surge withstand capability.
 - .4 Have common mode signal rejection greater than 60 dB to 60 Hz.
 - .5 Where required, dropping resistors to be certified precision devices which complement accuracy of sensor and transmitter range specified.
- .5 AO interface equipment:
 - .1 Convert digital data from controller processor to acceptable analog output signals using 8 bit digital-to-analog resolution.
 - .2 Provide for following output signal types and ranges:
 - .1 4 - 20 mA.
 - .2 0 - 10 V DC.
 - .3 Meet IEEE C37.90.1 surge withstand capability.
- .6 DI interface equipment:
 - .1 Able to reliably detect contact change of sensed field contact and transmit condition to controller.
 - .2 Meet IEEE C37.90.1 surge withstand capability.
 - .3 Accept pulsed inputs up to 2 kHz.
- .7 DO interface equipment:
 - .1 Respond to controller processor output, switch respective outputs. Each DO hardware to be capable of switching up to 0.5 amps at 24 V AC.
 - .2 Switch up to 5 amps at 220 V AC using optional interface relay.
- .3 Controllers and associated hardware and software: operate in conditions of 0 degrees C to 44 degrees C and 20 % to 90 % non-condensing RH.
- .4 Provide surge and low voltage protection for interconnecting wiring connections.

I.4 SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures and Section 25 05 02 - EMCS: Shop Drawings, Product Data and Review Process.

- .1 Submit product data sheets for each product item proposed for this project.

PART 2 PRODUCTS

2.1 TERMINAL/EQUIPMENT CONTROL UNIT (TCU/ECU)

- .1 Microprocessor capable of supporting necessary software and hardware to meet TCU/ECU functional specifications.
 - .1 TCU/ECU definition to be consistent with those defined in ASHRAE HVAC Applications Handbook section 45.
- .2 Controller to communicate directly with EMCS through EMCS LAN and provide access from EMCS OWS for setting occupied and unoccupied space temperature setpoints, flow setpoints, and associated alarm values, permit reading of sensor values, field control values (% open) and transmit alarm conditions to EMCS OWS.
- .3 VAV Terminal Controller.
 - .1 Microprocessor based controller with integral flow transducer, including software routines to execute PID algorithms, calculate airflow for integral flow transducer and measure temperatures as per I/O Summary required inputs. Sequence of operation to ASHRAE HVAC Applications Handbook.
 - .2 Controller to support point definition; in accordance with Section 25 05 01 - EMCS: General Requirements.
 - .3 Controller to operate independent of network in case of communication failure.
 - .4 Controller to include damper actuator and terminations for input and output sensors and devices.

2.2 LEVELS OF ADDRESS

- .1 Upon operator's request, EMCS to present status of any single 'point', 'system' or point group, entire 'area', or entire network on printer or OWS as selected by operator.
 - .1 Display analog values digitally to 1 place of decimals with negative sign as required.
 - .2 Update displayed analog values and status when new values received.
 - .3 Flag points in alarm by blinking, reverse video, different colour, bracketed or other means to differentiate from points not in alarm.
 - .4 Updates to be change-of-value (COV)-driven or if polled not exceeding 2 second intervals.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Install Controllers in secure locking enclosures.
- .2 Provide necessary power from local 120 V branch circuit panel for equipment.
- .3 Install tamper locks on breakers of circuit breaker panel.

END OF SECTION

PART 1 GENERAL

1.1 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 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 I (19th Edition), Safety Standard for Electrical Installations.

1.2 DEFINITIONS

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

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit shop drawings and manufacturer's installation instructions in accordance with Section 25 05 02 - EMCS: Submittals and Review Process.
- .2 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions for specified equipment and devices.

1.4 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. Turn over to Departmental Representative DCC Representative Consultant existing materials removed from Work not identified for re-use.

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 Devices installed in user occupied space not exceed Noise Criteria (NC) of 35. Noise generated by any device must not be detectable above space ambient conditions.

2.2 TEMPERATURE SENSORS

- .1 Room temperature sensors and display wall modules.
 - .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 Integral thermistor sensing element 10,000 ohm at 24 degrees.
 - .4 Accuracy 0.2 degrees C over range of 0 to 70 degrees C.
 - .5 Stability 0.02 degrees C drift per year.
 - .6 Separate mounting base for ease of installation. Room temperature sensors.
 - .7 Wall mounting, in slotted type covers having brushed stainless steel finish, with guard.
 - .8 Element 10-50mm 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 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: #18AWG 20AWG stranded twisted pair.
 - .2 Analog input and output: shielded #18 minimum solid copper #20 minimum stranded twisted pair.

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 Fire stopping: provide space for fire stopping in accordance with Section 07 84 00 - Firestopping. Maintain fire rating integrity.
- .4 Electrical:
 - .1 Complete installation in accordance with Section 26 05 00 - Common Work Results for Electrical.
 - .2 Terminate wires with screw terminal type connectors suitable for wire size, and number of terminations.
- .5 VAV Terminal Units: supply, install and adjust as required.
 - .1 Air probe, actuator and associated vav controls.
 - .2 Tubing from air probe to dp sensor as well as installation and adjustment of air flow sensors and actuators.
 - .3 Co-ordinate air flow adjustments with balancing trade.

3.2 IDENTIFICATION

- .1 Identify field devices in accordance with Section 25 05 54 - EMCS: Identification.

3.3 TESTING AND COMMISSIONING

- .1 Calibrate and test field devices for accuracy and performance in accordance with Section 25 01 11 - EMCS: Start-up, Verification and Commissioning.

END OF SECTION

PART I GENERAL

I.1 REFERENCES

- .1 Public Works and Government Services Canada (PWGSC) / Real Property Branch / Architectural and Engineering Services.
- .1 MD 50005-2009, Energy Monitoring and Control Systems (EMCS) Design Guidelines.

I.2 SEQUENCING

- .1 Present sequencing of operations for system[s], in accordance with MD 50005-2009, Energy Monitoring and Control Systems (EMCS) Design Guidelines.
- .2 Sequencing of operations for system[s] as follows:
 - .1 Fume Hood: Rm.170
 - .1 The existing fume hood being relocated from Rm.148-1 will be relocated c/w it's associated controls to Rm.170. Interlock the relocated fume hood with the existing fume hood exhaust fan which is currently serving Rm.170
 - .2 Recalibrate the existing fume hood air flow monitor alarm as required.
 - .2 VAV boxes: Rm.175-1
 - .1 Provide new space thermostat and space static pressure sensor to modulate new supply/return VAV boxes to maintain room setpoint as required.
 - .3 Fan Coil Unit: Rm.175 & 176
 - .1 Fan coil unit's packaged controls shall modulate cooling to meet space temperature setpoint; user adjustable.
 - .4 Cylinder Storage Exhaust Fan(s): Rm.173-1
 - .1 Fan runs continuously.
 - .2 Provide air proving switch at fan and indication panel outside room door. Panel shall be by controls contractor and shall have green "fan-on" and red "fan-off" indicating lights suitably labelled.
 - .3 Fan status shall be monitored and alarmed at the EMCS.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION