

Part 1 General

1.1 Note: Refer to Section 25 05 01 for scope of work description for Controls Work.

1.2 Note: All references to 'DDC' and 'DDC System' in Division 25 refer to EMSC.

1.3 SUMMARY

.1 Section Includes.

.1 Methods and procedures for start-up, verification and commissioning, for building Energy Monitoring and Control System (EMCS) and includes:

.1 Start-up testing and verification of systems.

.2 Check out demonstration or proper operation of components.

.3 On-site operational tests.

1.4 DEFINITIONS

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

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals in accordance with Section 01330 - Submittal Procedures.

.2 Final Report: submit report to Departmental Representative

.1 Include measurements, final settings and test results.

.2 Bear signature of commissioning technician and supervisor

.3 Report format to be approved by Departmental Representative before commissioning is started.

.4 Revise "as-built" documentation, commissioning reports to reflect changes, adjustments and modifications to EMCS as set during commissioning and submit to Departmental Representative in accordance with Section 01 78 00 - Closeout Submittals.

.5 Recommend additional changes and/or modifications deemed advisable in order to improve performance, environmental conditions or energy consumption.

1.6 CLOSEOUT SUBMITTALS

.1 Provide documentation, O M Manuals, and training of O M personnel for review of Departmental Representative before interim acceptance in accordance with Section 01 78 00 - Closeout Submittals.

1.7 COMMISSIONING

.1 Do commissioning in accordance with Section 01 91 13 - General Commissioning (Cx) Requirements.

- .2 DDC controls contractor shall carry out commissioning under direction of Departmental Representative.
- .3 Inform, and obtain approval from, Departmental Representative in writing at least 14 days prior to commissioning or each test. Indicate:
 - .1 Location and part of system to be tested or commissioned.
 - .2 Testing/commissioning procedures, anticipated results.
 - .3 Names of testing/commissioning personnel.
- .4 Correct deficiencies, re-test in presence of Departmental Representative until satisfactory performance is obtained.
- .5 Acceptance of tests will not relieve Contractor from responsibility for ensuring that complete systems meet every requirement of Contract.
- .6 Perform tests as required.

1.8 COMPLETION OF COMMISSIONING

- .1 Commissioning to be considered as satisfactorily completed when objectives of commissioning have been achieved by the DDC contractor and reviewed by Departmental Representative.

1.9 ISSUANCE OF FINAL CERTIFICATE OF COMPLETION

- .1 Final Certificate of Completion will not be issued until receipt of written approval indicating successful completion of specified commissioning activities including receipt of commissioning documentation.

Part 2 Products

2.1 EQUIPMENT

- .1 Provide sufficient instrumentation to verify and commission the installed system(s). Provide two-way radios. Note: Standard two-way radios may have insufficient range for testing at Stony Mountain Institution. In the event that two-way radios are inadequate, controls contractor shall coordinate with the SMI construction management office for communications assistance through SMI radios.
- .2 Instrumentation accuracy tolerances: higher order of magnitude than equipment or system being tested.
- .3 Independent testing laboratory to certify test equipment as accurate to within approved tolerances no more than 2 months prior to tests.
- .4 Locations to be approved, readily accessible and readable.
- .5 Application: to conform to normal industry standards.

Part 3 Execution

3.1 PROCEDURES

.1 DDC System Upgrades

- .1 Test the interconnection of the Unit 6 and Works Building DDC systems with the centralized DDC system.
- .2 Verify that all monitoring and control functionalities inherent to the existing Unit 6 and Works Building DDC systems are accessible and operational through the centralized DDC system. This includes:
 - .1 Manual verification of all building alarms.
 - .2 Verification of adjustments to programming and graphics.

.2 Fan Coil Installation

- .1 After installation is complete, test each part of the fan coil controls system to verify correct installation and functioning. This includes verification of:
 - .1 Fan coil power supply (24V)
 - .2 Fan coil on/off control (0-10V)
 - .3 Fan motor status monitor.
 - .4 Solenoid valve actuation.
 - .5 Hot water supply temp.
 - .6 Hot water return temp.
 - .7 Air supply temp.
 - .8 Air return temp.
- .2 Verify operational sequencing.
- .3 Correct defects when they occur and before resuming tests.
- .4 Commission each system using procedures prescribed by the Departmental Representative and Consultant.
- .5 Test full scale emergency evacuation and life safety procedures including operation and integrity of smoke management systems under normal and emergency power conditions as applicable. Note: Testing of emergency and life safety procedures shall be coordinated with and approved by the Departmental Representative and CSC Representative.

3.2 FIELD QUALITY CONTROL

- .1 Upon satisfactory completion of installation work, perform point-by-point test of necessary functions under direction and supervision of Departmental Representative. Provide:
 - .1 Commissioning personnel.
 - .2 Detailed schedule showing items to be tested.
 - .3 Commissioning to commence during final start-up testing.
 - .4 O M personnel to assist in commissioning procedures as part of training.
 - .5 Operate systems as long as necessary to commission entire project.

- .6 Monitor progress and keep detailed records of activities and results.
- .7 System will be accepted when:
 - .1 EMCS equipment operates to meet overall performance requirements.
 - .2 Requirements of Contract have been met.
- .8 Departmental Representative to review commissioning results for acceptance.

3.3 ADJUSTING

- .1 Final adjusting: upon completion of commissioning as reviewed by Departmental Representative, set and lock devices in final position and permanently mark settings.

3.4 DEMONSTRATION

- .1 Demonstrate to Departmental Representative operation of systems including sequence of operations in regular and emergency modes, under normal and emergency conditions, start-up, shut-down interlocks and lock-outs in accordance with Section 01 79 00 - Demonstration and Training.

END OF SECTION

Part 1 General

1.1 SCOPE OF WORK (CONTROLS)

Note: All references to 'DDC' and 'DDC System' refer to EMSC.

.1 DDC System Upgrades (Connection of Unit 6 and Works Buildings)

.1 Existing Systems:

Delta Controls systems are currently installed in Unit 6, the Works Building, and in several other buildings at Stony Mountain Institution. The Unit 6 DDC system is not connected to the central DDC system, which is controlled from a operating station in the Powerhouse. The DDC panel for Unit 6 is located in the second floor mechanical room. The Works Building is connected to the central DDC system via an MSTP cable. There are two DDC panels in the Works Building, one in a main floor mechanical room and one in a second floor mechanical room. The 'Works building DDC panel' referred to in this project is the one on the main floor.

.2 Connect the Unit 6 and Works buildings to the central DDC system using the three new continuous sections of fibre optic cable installed between:

- .1 Powerhouse DDC Panel and Works Building DDC Panel**
- .2 Works Building DDC Panel and Unit 6 DDC Panel**
- .3 Unit 6 DDC Panel and Powerhouse DDC Panel**

.3 Supply and install the necessary devices and cabling within enclosures to connect the DDC systems. This includes media converters, power supply transformers, terminations, and switches. Note: Fibre optic cables, junction boxes, and enclosures are specified in Division 26.

.4 Reprogram and reconfigure the existing primary operating station located in the Powerhouse to allow control of the Works Building and Unit 6 DDC systems. Reconfigure the existing operating work station (OWS) located in Unit 6 to act as a remote auxiliary OWS.

.5 Provide switches to allow network connections to be toggled between each of the two fibre optic cables pulled to each location (at Works Building, Unit 6, and Powerhouse).

.6 Draw 120V power from the existing DDC panels in each location.

.2 Fan Coil Installation

.1 Existing Systems:

Delta controllers are currently installed in two locations in the Unit 6 gallery hallways. The first location is half way down the gallery hallway between Ranges I and J, in a 610 x 610 enclosure. The second location is half way down the gallery hallway between Ranges G and H, also in a 610 x 610 enclosure. The existing controllers do not have enough capacity to support the new fan coils.

- .2 Supply and install equipment and cabling needed to power, control, and monitor the new fan coils (8 locations). This work includes but is not limited to the following tasks:
 - .1 Supply and install two new DDC controllers, each one in a new 610 x 610 metal enclosure (See Division 26), each located next to an existing enclosure described above. Controllers shall provide adequate connection points to allow control and monitoring functionality as described below and as shown on drawings.
 - .2 Connect the low voltage control wiring (0-10 V and 24 V) and low voltage power supply (24 VDC) for the fan coil (See Division 26) and related sensors to the new DDC controllers. All wiring shall be concealed in new conduits and enclosures as shown on the drawings.
 - .3 Integrate the new controllers into the Unit 6 building DDC system. Update programming and graphics to allow the central DDC system to start/stop the fan, monitor fan status, open/close the hydronic solenoid valve, monitor fluid supply and return temperatures, and monitor air supply and return temperatures.
 - .4 Disconnect the wiring to the existing control damper actuator and exhaust fan to support mechanical work described in Division 23. Reconnect wiring to the new control damper actuator and reinstalled exhaust fan when mechanical work is complete.
 - .5 Note: The hydronic solenoid valve and fan coil shall be supplied and installed by the mechanical contractor. See Division 23.

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 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.
- .6 Department of Justice Canada (Jus).
 - .1 Canadian Environmental Assessment Act (CEAA), 1995, c. 37.

- .2 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
- .7 Electrical and Electronic Manufacturers Association (EEMAC).
 - .1 EEMAC 2Y-1-1958, Light Gray Colour for Indoor Switch Gear.
- .8 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .9 Transport Canada (TC).
 - .1 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

1.3 ACRONYMS AND ABBREVIATIONS

- .1 Acronyms used in EMCS:
 - .1 AEL - Average Effectiveness Level.
 - .2 EMCS - Energy Monitoring and Control System.
 - .3 DDC – Direct Digital Control (Also refers to EMSC systems)
 - .4 HVAC - Heating, Ventilation, Air Conditioning.
 - .5 O M - Operation and Maintenance.
 - .6 OWS - Operator Work Station.

1.4 DEFINITIONS

- .1 Symbols and engineering unit abbreviations utilized in displays: to ANSI/ISA S5.5.
 - .1 Printouts: to ANSI/IEEE 260.1.

1.5 SYSTEM DESCRIPTION

- .1 Refer to drawings for the schematic configuration of interconnections between DDC systems and fan coil control wiring.
- .2 Work covered by Division 25 consists of fully operational EMCS, including, but not limited to, following:
 - .1 DDC Controllers
 - .2 Control devices, actuators and sensors.
 - .3 OWS(s).
 - .4 Data communications equipment necessary to effect EMCS data transmission system.
 - .5 Complete operating and maintenance manuals.
 - .6 Training of personnel.
 - .7 Acceptance tests, technical support during commissioning, full documentation.
 - .8 Miscellaneous work as specified in these sections and as indicated.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

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

- .2 Submit for review:
 - .1 Shop drawings of equipment and a schematic drawing of upgrades to the DDC network(s) within 10 days after award of contract.
- .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 in accordance with Section 25 05 02 - EMCS: Shop Drawings, Product Data and Review Process. Label or listing of specified organization is acceptable evidence.
 - .4 In lieu of such evidence, submit certificate from testing organization, approved by Consultant, certifying that item was tested in accordance with their test methods and that item conforms to their standard/code.
 - .5 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.
 - .6 Permits and fees: in accordance with general conditions of contract.
 - .7 Submit certificate of acceptance from authority having jurisdiction to Departmental Representative.
 - .8 Existing devices intended for re-use: submit test report.

1.7 QUALITY ASSURANCE

- .1 Have local office within 100 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.
- .5 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Material Delivery Schedule: provide Departmental Representative with schedule within 2 weeks after award of Contract.
- .2 Waste Management and Disposal:

- .1 Separate waste materials for reuse/recycling in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material for recycling in accordance with Waste Management Plan.
- .4 Separate for reuse/recycling and place in designated containers in accordance with Waste Management Plan.
- .5 Place materials defined as hazardous or toxic in designated containers.
- .6 Handle and dispose of hazardous materials in accordance with Municipal regulations.
- .7 Label location of salvaged material's storage areas and provide barriers and security devices.
- .8 Ensure emptied containers are sealed and stored safely.
- .9 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.
- .10 Fold up metal / plastic banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 EQUIPMENT

- .1 Contractor to supply all equipment and wiring necessary to perform the scope of work listed above, including, but not limited to:

.2 DDC System Upgrades (Connection of Unit 6 and Works Buildings)

Install in each new enclosure/sub-panel (3 locations):

- .1 Two fibre optic to Ethernet media converters (single mode).
- .2 One network switch.
- .3 One 120V to 24V transformer.

.3 Fan Coil Installation

Install in each new enclosure/sub-panel (2 locations):

- .1 One DDC controller.
- .2 One 120V to 24V transformer.

Part 3 Execution

3.1 MANUFACTURER'S RECOMMENDATIONS

- .1 Installation: to manufacturer's recommendations.

3.2 PAINTING

- .1 Painting: in accordance with Section 09 91 23 - Interior Painting, supplemented 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.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes.
 - .1 Methods and procedures for shop drawings submittals for building Energy Monitoring and Control System (EMCS), also referred to as DDC or DDC Systems.

1.2 DEFINITIONS

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

1.3 DESIGN REQUIREMENTS

NOT USED

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures and coordinate with requirements in this Section.
- .2 One electronic copy of shop drawings to be submitted.

1.5 DETAILED SHOP DRAWING REVIEW

- .1 Submit detailed shop drawings within 14 working days after award of contract and before start of installation 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 Single line diagrams showing control system configuration and interconnection.
 - .3 Shop drawings for each input/output point and sensor showing information associated with each particular point including:
 - .1 Sensing element type and location.
 - .2 Associated field wiring schematics, schedules and terminations.
 - .3 Manufacturer's recommended installation instructions and procedures.
 - .4 Sample of "Operating Instructions Manual" to be used for training purposes.
 - .5 Outline of proposed start-up and verification procedures. Refer to Section 25 01 11 - EMCS: Start-up, Verification and Commissioning.

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 SUMMARY

- .1 Section Includes.
 - .1 Requirements and procedures for warranty and activities during warranty period and service contracts, for building Energy Monitoring and Control System (EMCS), also referred to as DDC or DDC Systems.
- .2 References.
 - .1 Canada Labour Code (R.S. 1985, c. L-2)/Part I - Industrial Relations.
 - .2 Canadian Standards Association (CSA International).
 - .1 CSA Z204-94(R1999), Guidelines for Managing Indoor Air Quality in Office Buildings.

1.2 DEFINITIONS

- .1 OWS - Operator Work Station.
- .2 For additional acronyms and definitions refer to Section 25 05 01 - EMCS: General Requirements.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit detailed preventative maintenance schedule for system components to Departmental Representative.
- .3 Submit detailed inspection reports to Departmental Representative.
- .4 Records and logs: in accordance with Section 01 78 00 - Closeout Submittals.
 - .1 Maintain records and logs of each maintenance task on site.
 - .2 Submit records to Departmental Representative, after inspection indicating that planned and systematic maintenance have been accomplished.
- .5 Revise and submit to Departmental Representative in accordance with Section 01 78 00 - Closeout Submittals "Record drawings" documentation and commissioning reports to reflect changes, adjustments and modifications to EMCS made during warranty period.

1.4 MAINTENANCE SERVICE DURING WARRANTY PERIOD

- .1 Provide services, materials, and equipment to maintain EMCS for specified warranty period. Provide detailed preventative maintenance schedule for system components as described in Submittal article.
- .2 Emergency Service Calls:
 - .1 Initiate service calls when EMCS is not functioning correctly.
 - .2 Qualified control personnel to be available during warranty period to provide service to "CRITICAL" components whenever required at no extra cost.

- .3 Furnish Departmental Representative with telephone number where service personnel may be reached at any time.
- .4 Service personnel to be on site ready to service EMCS within 2 hours after receiving request for service.
- .5 Perform Work continuously until EMCS restored to reliable operating condition.
- .3 Operation: foregoing and other servicing to provide proper sequencing of equipment and satisfactory operation of EMCS based on original design conditions and as recommended by manufacturer.
- .4 Work requests: record each service call request, when received separately on approved form and include:
 - .1 Serial number identifying component involved.
 - .2 Location, date and time call received.
 - .3 Nature of trouble.
 - .4 Names of personnel assigned.
 - .5 Instructions of work to be done.
 - .6 Amount and nature of materials used.
 - .7 Time and date work started.
 - .8 Time and date of completion.
- .5 Provide system modifications in writing.
 - .1 No system modification, including operating parameters and control settings, to be made without prior written approval of Departmental Representative.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 FIELD QUALITY CONTROL

- .1 Perform inspections during warranty period per Section 01 78 00 – Closeout Submittals.
- .2 Following inspections are minimum requirements and should not be interpreted to mean satisfactory performance:
 - .1 Perform calibrations using test equipment having traceable, certifiable accuracy at minimum 50% greater than accuracy of system displaying or logging value.
 - .2 Check each field input/output device in accordance with CSA Z204.
 - .3 Provide dated, maintenance task lists, as described in Submittal article, as proof of execution of complete system verification.
- .3 Minor inspections to include, but not limited to:

- .1 Perform visual, operational checks to DDC controllers, fan coils and related sensors, control dampers DDC sub-panels/enclosures.
- .2 Review system performance with Operations Supervisor to discuss suggested or required changes.
- .4 Rectify deficiencies revealed by maintenance inspections and environmental checks.
- .5 Continue system debugging and optimization.
- .6 Testing/verification of occupancy and seasonal-sensitive systems to take place during four (4) consecutive seasons.
 - .1 Test weather-sensitive systems twice: first at near winter design conditions and secondly under near summer design conditions.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

- .1 Hardware and software requirements for a primary Operator Work Station (OWS) in a Building Energy Monitoring and Control System (EMCS), also referred to as DDC or DDC system.

1.2 DEFINITIONS

- .1 Acronyms and definitions: refer to Section 25 05 01 - EMCS: General Requirements.
- .2 Remote Auxiliary OWS: performs identical user interface functions as primary OWS.

1.3 OWS SYSTEM DESCRIPTION

- .1 Consists of commercially available personal computer in current production, with sufficient memory and processor capacity to perform functions specified.

Part 2 Products

2.1 OWS HARDWARE

- .1 Leave in place the existing OWS located in the Unit 6 mechanical room. This OWS shall be re-purposed as a Remote Auxiliary OWS to the primary OWS located in the Powerhouse. The Controls Contractor shall reconfigure the Unit 6 OWS to provide this functionality.
- .2 The Works Building will continue to be controlled from the primary OWS located in the Powerhouse.

Part 3 Execution

3.1 INSTALLATION REQUIREMENTS

- .1 The Controls Contractor shall reconfigure the Unit 6 OWS to perform as a Remote Auxiliary OWS to the primary OWS located in the Powerhouse.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Control devices integral to the Building Energy Monitoring and Control System (EMCS): sensors, controls, transducers, low voltage current transformers.
 - .2 Related Sections:
 - .1 Section 07 84 00 - Firestopping.
 - .2 Section 25 01 11 - EMCS: Start-Up, Verification and Commissioning.
 - .3 Section 25 05 01 - EMCS: General Requirements.
 - .4 Section 25 05 02 - EMCS: Shop Drawings, Product Data and Review Process.
 - .5 Section 25 05 54 - EMCS: Identification.
 - .6 Section 25 90 01 - EMCS: Site Requirements Applications and Systems Sequences of Operation.
 - .7 Section 26 05 00 - Common Work Results for Electrical.

1.2 REFERENCES

- .1 Canadian Electrical Code, Part 1 CSA-C22.1-15 (23rd Edition) Standard
- .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 25 05 02 - EMCS: Submittals and Review Process.
- .2 Manufacturer's Instructions:

- .1 Submit manufacturer's installation instructions for specified equipment and devices.

1.5 EXISTING CONDITIONS

- .1 Cutting and Patching: as specified herein.
- .2 Repair surfaces damaged during execution of Work.
- .3 Turn over to Departmental Representative 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 Operating conditions: 0 - 32 degrees C with 10 - 90% RH (non-condensing) unless otherwise specified.
- .3 Terminations: use enclosures specified in Division 26 with slot screwdriver compression connector block.
- .4 Transmitters and sensors to be unaffected by external transmitters including walkie talkies.
- .5 Account for hysteresis, relaxation time, maximum and minimum limits in applications of sensors and controls.
- .6 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.
- .7 Range: including temperature, humidity, pressure, as indicated in I/O summary in Section 25 90 01 - EMCS: Site Requirements, Applications and System Sequences of Operation.

2.2 TEMPERATURE SENSORS

- .1 General: to be resistance or thermocouple type to following requirements:
 - .1 Thermocouples: limit to temperature range of 200 degrees C and over.
 - .2 RTD's: 100 or 1000 ohm at 0 degrees C (plus or minus 0.2 ohms) platinum element with strain minimizing construction, 3 integral anchored leadwires. Coefficient of resistivity: 0.00385 ohms/ohm degrees C.
 - .3 Sensing element: hermetically sealed.
 - .4 Stem and tip construction: copper or type 304 stainless steel.
 - .5 Time constant response: less than 3 seconds to temperature change of 10 degrees C.
- .2 Duct temperature sensors:
 - .1 General purpose duct type: suitable for insertion into ducts at various orientations, insertion length 460 mm.

2.3 CURRENT TRANSDUCERS

- .1 Requirements:
- .2 Purpose: combined sensor/transducer, to measure line current and produce proportional signal in one of following ranges:
 - .1 4-20 mA DC.
 - .2 0-1 volt DC.
 - .3 0-10 volts DC.
 - .4 0-20 volts DC.
- .3 Frequency insensitive from 10 - 80 hz.
- .4 Accuracy to 0.5% full scale.
- .5 Zero and span adjustments. Field adjustable range to suit motor applications.
- .6 Adjustable mounting bracket to allow for secure/safe mounting inside MCC.

2.4 PANELS

- .1 Per Division 26.

2.5 WIRING

- .1 Per Division 26

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 Terminate wires with screw terminal type connectors suitable for wire size, and number of terminations.

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 Duct installations:
 - .1 Do not mount in dead air space.
 - .2 Locate within sensor vibration and velocity limits.

- .3 Thermally isolate elements from brackets and supports to respond to air temperature only.

3.3 PANELS

- .1 Per Division 26.

3.4 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 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Narrative description of Sequence of Operation of the fan coil systems.

1.2 REFERENCES

- .1 Not Used.

1.3 SEQUENCING

- .1 Sequencing of operations for typical fan coil system as follows:
 - .1 Fan to run continuously during heating season.
 - .2 DDC system to monitor supply and return air temperatures.
 - .3 DDC system to monitor supply and return fluid temperatures.
 - .4 DDC system to open/close solenoid valve on hot water supply to regulate return air temperature to 21C +/- 2C.
 - .5 DDC system to monitor fan status.
- .2 Refer to Section 25 05 01 for general controls requirements.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION