Part 1 General

1.1 RELATED SECTIONS

.1 Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

.2 Section 23 74 00 Packaged Outdoor HVAC Equipment.

.3 Section 25 01 11 - EMCS: Start-Up, Verification and Commissioning.

.4 Section 25 05 01 - EMCS: General Requirements.

.5 Section 25 05 02 - EMCS: Shop Drawings, Product Data and Review Process.

.6 Section 25 05 54 - EMCS: Identification.

.7 Section 25 90 01 - EMCS: Site Requirements Applications and Systems Sequences of Operation.

.8 Section 26 05 00 - Common Work Results for Electrical.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).

.1 CSA-C22.1-12, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.

1.3 DEFINITIONS

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

1.4 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.

Part 2 Products

2.1 GENERAL

.1 Control devices of each category to be of same type and manufacturer.

.2 Operating conditions: 0 - 50 degrees C with 10 - 90% RH (non-condensing) unless otherwise specified.

.3 Terminations: use standard conduit box with slot screwdriver compression connector block unless otherwise specified.

.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 Some field devices indicated as control points are supplied and installed by other divisions, see Section 23 74 00 - Packaged Outdoor HVAC Equipment:

.1 Division 25 shall be responsible for terminating these new DDC points at the manufacturer's terminal strip, verification and commissioning:

.1 Report any deficiencies with such material to the Departmental Representative immediately.

2.2 TEMPERATURE SENSOR - T

.1 General: to be resistance type to following requirements:

.1 RTD's: 1000 or 10,000 ohm platinum element with strain minimizing construction. Coefficient of resistivity: 0.00385 ohms/ohm degrees C.

.2 Sensing element: hermetically sealed.

.3 Stem and tip construction: copper or type 304 stainless steel.

.4 Time constant response: less than 3 seconds to temperature change of 10°C.

.2 Room temperature sensors.

.1 Separate mounting base.

.2 Element accuracy of plus or minus 0.2 degrees C.

.3 Immersion sensor:

.1 Immersion type sensor for piping installation. Insertion length 64 mm. Operating range -40 to 121 degrees C.

.2 Immersion wells: Stainless steel spring loaded construction, with heat transfer compound compatible with sensor.

.3 Complete with IP65/NEMA-4X enclosure.

.4 Duct temperature sensors:

.1 General purpose duct type: suitable for insertion into ducts at various orientations, insertion length 460 mm.

.2 Averaging duct type: incorporates numerous sensors inside assembly which are averaged to provide one reading. Minimum insertion length 6000 mm. Bend probe at field installation time to 100 mm radius at point along probe without degradation of performance.

2.3 HUMIDITY SENSORS

.1 Room and Duct Requirements:

.1 Range: 5 - 90 % RH minimum.

.2 Operating temperature range: 0 - 60 degrees C.

.3 Absolute accuracy:

.1 Duct sensors: plus or minus 3 %].

.2 Room sensors: plus or minus 2 %].

.4 Sheath: stainless steel with integral shroud for specified operation in air streams of up to 10 m/s.

.5 Maximum sensor non-linearity: plus or minus 2% RH with defined curves.

.6 Room sensors: where currently existing.

.7 Duct mounted sensors: locate so that sensing element is in air flow in duct.

2.4 TRANSFORMER (LOW VOLTAGE)

.1 Single phase transformer, enclosed type complete with fuse holder and fuse. Capacity in VA of each transformer must be at least 20% greater than the rated charge to be connected.

2.5 DIFFERENTIAL PRESSURE SENSOR

.1 Suitable for positive, negative and differential pressure measurements.

.2 Accuracy: 0.4 % of span.

.3 Repeatability: within 0.1 % of span.

.4 Linearity: within 1 % of span.

.5 Hysteresis: 0.1 % of span.

.6 Zero and span adjustment.

.7 0-5 VDC output.

.8 Provide complete with manifold block with sensing line isolation valves.

2.6 ELECTROMECHANICAL RELAYS - R

.1 Requirements:

.1 4PDT, plug-in type with termination base and LED status indicators.

.2 Coils: rated for 120V AC or 24V DC.

.3 Contacts: rated at 10 amps at 120 V AC.

.4 In applications where relay is subject to vibration, provide hold-on clips.

2.7 CURRENT RELAYS – R

.1 Current Relay:

.1 Suitable to detect belt loss or motor failure.

.2 Trip point adjustment, output status LED.

.3 Amperage range: 1 – 135 A.

.4 Isolation: 600 V AC rms.

.5 Induced sensor power.

.6 Relay contacts: NO solid state. (1 A at 30 VAC / DC).

.2 Current Transmitter:

.1 Amperage range : 1 – 120 A.

.2 Isolation : 600 V AC rms.

.3 Induced sensor power.

.4 Temperature : -15 to 60 ºC

.5 Relative humidity ratio : 10 - 90% without condensation

.6 Output signal : 4 to 20 mA

2.8 COMBINATION COMMAND AND STATUS RELAY (FOR FAN-COIL)

.1 Operating Temperature -15° to 60°C (13.8A max.), -15° to 50°C (20A max.)

.2 Operating Humidity 10-90% RH non-condensing

.3 Expected Relay Life (mechanical) 10 million cycles

.4 Relay Status LED ON indicates relay energized

.5 Approvals UL 508 closed type device listing, CAT III.

.6 Lead Wire Specifications:

.1	Lead Length:	350 mm min.
.2	Style and Gauge:	UL1015
.3	Coil:	18 AWG
.4	Contacts:	12 AWG
.5	Status:	16 AWG

.7 Motor load rating: 208V, 1 hp

2.9 LOCAL CONTROL PANEL - CP

.1 Unitized Cabinet type complete with key-lockable front door mounted on concealed hinges, easily removable to provide interior access. Installed on rigid support for mounting on wall, floor, ceiling or ductwork.

.2 Locate to provide a minimum clearance of 1000 mm in front of panel.

.3 All controls equipment including relays, switches, fuses, terminal blocks, etc., to be installed inside the panel. Push buttons, pilot lights, selector switches, filter pressure indicators, etc., to be surface mounted on the panel's front door. All wiring shall be inside raceways of adequate size with 40% of free space.

.4 Control panel and all its associated equipment, field devices, wiring and pneumatic tubing must be identified in accordance with Section 25 05 54 – EMCS: Identification.

.5 Supply and install a manual switch inside the panel for the 120V power supply.

.6 Terminal blocks:

.1 All joints and connections inside the panel must be done on screw-type terminal blocks.

.2 Industrial grade modular type terminal blocks, DIN-rail mounted with vibration proof screw connections and color coded labelled terminals and voltage and current separators.

.3 Supply and install on the interior of the panel's front door, a detailed schematic drawing of the system's arrangement, including all wiring and devices identification. Schematic drawing to be sealed in a transparent plastic.

2.10 FLOW METER – HYDRONIC, GLYCOL APPLICATION

.1 Sensing Method: Electromagnetic sensing (no moving parts)

.2 Ambient Temperature Range : Electronics: -10° to 50° C

.3 Outer Body Material Options : Carbon Steel, painted

.4 Flow Tube (Internal) : 304 Stainless steel

.5 Connection: ANSI Class 150 flange

.6 Fluid Conductivity: 5 µS/cm minimum

.7 Power Supply Requirement: 18 to 45 VDC or VAC, 44 to 66 Hz, 300 mA maximum

.8 Display:

.1 16 character, 2-line alphanumeric LCD displays: flow rate and velocity, flow direction, totals, and alarm messages.

.9 Output Signals Required:

.1 Isolated 4 - 20 mA analog output for flow rate

.2 (2) Programmable digital/pulse outputs (configurable for frequency, pulse or directional flow)

.10 Electronics Enclosure : NEMA 4X

.11 Maximum Operating Pressure: 4 MPa

.12 Body Size: match to pipe size.

2.11 CONTROL VALVES

.1 Type:

.1 Chilled or hot water, 60% glycol

.2 Characterized ball, globe, or plug

.3 Two or three way, as indicated

.2 Flow characteristic

.1 A-port and 2-way: equal percentage

.2 B-port modified for constant common port fl ow

.3 Type of end fitting

.1 Up to an including 63 mm:

.1 NPT female ends

.2 Over 63 mm:

.1 ANSI 125 flange pattern

.4 Materials

.1 Body :

.1 Up to an including 63 mm:

.1 Forged brass, nickel plated

.2 Over 63 mm:

.1 Epoxy or powder coated cast iron

.2 Ball - stainless steel

.3 Stem - stainless steel

.4 Seats - PTFE

.5 Packing - EPDM O-rings, lubricated

.5 Media temp range: -18°C to 120°C

.6 Body pressure rating

.1 Up to an including 63 mm: 2,760 kPa

.2 Over 63 mm: 690 kPa

.7 Close-off pressure: 690 kPa

.8 Maximum differential pressure: 345 kPa

.9 Cv, sizing, body style, flow rating: As indicated.

.10 Actuator

.1 Control – proportional or two-position, as indicated

.2 Signal: 4-20 mA

.3 Nominal voltage: 24 VAC 50/60 Hz, range 19.2…28.8 VAC

.4 Power consumption 0.5 W

.5 Electrical connection screw terminals

.6 Angle of rotation - 90°

.7 Direction of rotation reversible with switch under cover

.8 Position indication - integrated into handle

.9 Running time 90 seconds

.10 Humidity - 5 to 95% non-condensing

.11 Ambient temperature - 30°C to 50°C

.12 Housing - NEMA 1

.13 Agency listing: CAN/CSA E60730-1:02

.14 Action: Spring to open, spring to close, non-spring return – as indicated.

2.12 UNINTERRUPTIBLE POWER SUPPLY (UPS)

.1 Each standalone digital controller (SDC) is connected to emergency power via an uninterruptible power supply. Control valves and flow meters also to be powered via an uninterruptible power supply, but can be powered with one UPS on a common loop.

.2 In addition, power supply management system can provide the following functions:

.1 Scheduled shutdown following a power failure, in order to close applications/software and allow data saving.

.2 Independent control of connected loads.

.3 System shutdown and restart based on a programmed schedule.

.4 Sequential start-up for components powered by the system.

.5 Restart sequentially component powered by the system.

.6 Regulated power supply.

.7 Monitor and trigger power supply alarms.

.8 Perform routine verifications of system, including batteries and generation of alarms in case of system failure or faults.

.3 The uninterruptible power supply unit shall be able to provide power to connected equipment for a minimum of 15 minutes. The unit has the following features:

.1 Power supply: 120 V A.C.

.2 Output: minimum extra capacity of 15%, dependant of the connected load.

.3 On line double conversion type.

.4 Batteries can be replaced while the unit is operational.

.5 Line regulation : -10% to + 6%.

.6 Rechargeable acid/lead batteries, maintenance-free.

.7 Battery life expectancy: three to six years.

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 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 pipe stands or channel brackets.

.5 Fire stopping: provide space for fire stopping. Maintain fire rating integrity.

.6 Electrical:

.1 Complete installation in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Modify existing starters to provide for EMCS as indicated in I/O Summaries and as indicated.

.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 Departmental Representative 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 Do not run exposed conduits in normally occupied spaces unless otherwise indicated or unless impossible to do otherwise. Departmental Representative to review before starting Work. Wiring in mechanical rooms, wiring in service rooms and exposed wiring must be in conduit.

3.2 TEMPERATURE AND HUMIDITY SENSORS

.1 Stabilize to ensure minimum field adjustments or calibrations.

.2 For quantities of room temperature sensors to be removed, added, and relocated – refer to ventilation drawings and the VAV box schedule.

.3 Outdoor installation:

.1 Protect from solar radiation and wind effects by non-corroding shields.

.2 Install in NEMA 4 enclosures.

.4 Duct installations:

.1 Do not mount in dead air space.

.2 Locate within sensor vibration and velocity limits.

.3 Securely mount extended surface sensor used to sense average temperature.

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

.5 Support sensor element separately from coils, filter racks.

.5 Averaging duct type temperature sensors.

.1 Install averaging element horizontally across the ductwork starting 300 mm from top of ductwork. Each additional horizontal run to be no more than 300 mm from one above it. Continue until complete cross sectional area of ductwork is covered. Use multiple sensors where single sensor does not meet required coverage.

.2 Wire multiple sensors in series for low temperature protection applications.

.3 Wire multiple sensors separately for temperature measurement.

.4 Use software averaging algorithm to derive overall average for control purposes.

.6 Thermowells: install for piping installations.

.1 Locate well in elbow where pipe diameter is less than well insertion length.

.2 Thermowell to restrict flow by less than 30%.

.3 Use thermal conducting paste inside wells.

3.3 PANELS

.1 Arrange for conduit and tubing entry from top, 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.

3.4 FLOW METER AND CONTROL VALVES

.1 Turn over to Division 23 for installation in pipe work. Verify Manufacturer's installation requirements are satisfied before applying power or control terminations.

3.5 CURRENT SENSOR

.1 For fluid-coolers:

.1 Install in enclosure provided by Division 26.

.2 Coordinate with Division 23 to calibrate the 8 required status signals from the two fluid-coolers (four per fluid cooler):

.1 Measure current reading on one phase supplying fluid cooler, record current after energizing each successive bank of fans, and record.

.2 Submit this information to the Departmental Representative.

.3 Program the amperages so as to determine how stages are running at any given time (fluid cooler stage status).

3.6 DIFFERENTIAL PRESSURE SENSOR

.1 Turn over to manifold block complete with selection valves to Division 23 for installation. Coordinate for wall-mounted installation.

3.7 IDENTIFICATION

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

3.8 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