

**1 GENERAL**

**1.1 DESIGNATED CONTRACTOR**

- .1 Hire the services of Johnson Controls Inc. or its authorized representative to complete the work of all EMCS ("BAS") Sections.

**1.2 REFERENCES**

- .1 Public Works and Government Services Canada (PWGSC) / Real Property Branch / Architectural and Engineering Services.
  - .1 MD25005-2009, "Energy Monitoring and Control Systems (EMLS) Design Guidelines".

**1.3 SHOP DRAWINGS**

- .1 Submit shop drawings in accordance with Section 01 00 10 – General Instructions.
  - .1 Include devices, schematics and control sequences

**2 PRODUCTS**

**2.1 MATERIALS**

- .1 There is an existing Johnson Controls "Metasys" controls system installed in the existing building. All material must be selected to ensure compatibility with the existing "Metasys" systems.
- .2 Pneumatic controls are present within the building.
  - .1 Where existing pneumatic devices and equipment are retained, controls shall remain pneumatic.
  - .2 Where devices and equipment are shown as new, provide new digital controls, accessories, programming in accordance with 2.1.1 above, except for hydronic control valve actuators which shall be pneumatic.
  - .3 Provide new sensors, controllers network devices wiring, conduit, power supplies, software, programming, record drawings and control sequences.
  - .4 Update interactive OWS graphics.
- .3 Acceptable Products
  - .1 The only acceptable products are those provided by Johnson Controls Inc, as follows:
    - .1 Metasys controllers: DX, UNT, VMA
    - .2 Electronic thermostats: TE-67NP-1N000
    - .3 CO<sub>2</sub> wall mounted detectors: CD-W00-00-1
    - .4 Duct Sensors, temperature: TE6311P-1
    - .5 EP Switch/relay: MAMAC 0-10 V
    - .6 VAV controller/actuator JCI model 111-1

**3 EXECUTION**

**3.1 PREPARATION**

- .1 Verify site conditions to establish site conditions.
- .2 Coordinate system components with Mechanical and Electrical

**3.2 POWER SUPPLIES**

- .1 Electrical power shall be provided by Electrical
- .2 One (1) 120V/1 phase power supply shall be provided in a junction box located in each mechanical room
- .3 Additional power supplies, if required shall be provided by the controls supplier.

**3.3 INSTALLATION**

- .1 Be responsible for all fire stopping required by the controls works in accordance with Section 07 84 00 – Fire Stopping.
- .2 Except for runouts to devices all control wiring shall be run in EMT, rigidly attached to the underside of the structured slab.
- .3 Pneumatic tubing in partitions and major air supply tubing shall be copper tube, soldered. Plastic tubing be used for device connections and runouts only.
- .4 All cabling shall be attached to the slab above, and be provided with 3.5 m spare cable, coiled and attached to the structure.

**3.4 OPERATION INTERFACE, PROGRAMMING**

- .1 Revise system interactive graphics, trend logging and interface for new work.
- .2 Revise programming to new sequences for new equipment.
- .3 Make new system backups in accordance with existing site policy. Leave back-ups on site and retain copies off-site.
- .4 Revise O&M Manual and as-built drawings, schematics, control schematics to represent conditions at end of commissioning. Include all final set-points, alarms, schedules, adjustments made during the Cx process.

**3.5 VERIFICATION**

- .1 Verify all point to point connections, devices and device operation. Provide written record of same.
- .2 Recalibrate all relocated pneumatic thermostats, or pneumatic thermostats that are affected by the work in any way.
- .3 Perform verification of all sequences and interlocks. Provide written record of same.

**3.6 CONTROL SEQUENCES**

- .1 VAV Boxes with Re-Heat (BAS)

1. Operation of new VAV Boxes is to follow same schedule as VAV air handling unit
  2. New VAV boxes are to be tied into the BAS system
  3. Provide space temperature sensor
  4. Provide VAV box supply air temperature data
  5. Provide supply volume data
  6. Provide VAV box controller complete with electronic damper operator
  7. VAV box will have electric heating coil with an SCR controller, 0-10 V input.
  8. Controls contractor to coordinate with TAB contractor for setup of VAV box settings
  9. With Zone air handler in cooling mode:
    1. On a rise in space temperature the VAV box damper shall modulate open.
    2. On a decrease of space temperature the VAV box damper shall modulate to minimum position.
    3. On a further decrease in space temperature the electric heat (SCR) shall be modulated on.
  10. When Zone air-handler changes over to warm air for heating, box action shall reverse and:
    1. On call for heating, the VAV damper shall re-open, and modulate to maintain thermostat setting.
    2. On a further decrease in space temperature, when box is fully open, the electric heat (SCR) shall be modulated on.
    3. On a rise in space temperature above set-point, the box shall modulate towards the minimum.
- .2 Modulating VAV Boxes for CO<sub>2</sub> control (BAS)
1. Operation of modulating type VAV Boxes is to follow same "schedule" as ventilation air handling unit
  2. VAV Boxes are to be tied into the BAS system
  3. Provide VAV box controller complete with electronic damper operator
  4. Provide air flow volume data
  5. Provide CO<sub>2</sub> sensor
  6. When ventilation air handling unit is "off" damper shall close.
  7. When ventilation air handling unit is "on", the VAV boxes are to modulate open to maintain CO<sub>2</sub> set point (adjustable) of 800 ppm nominal (450 ppm above outdoor CO<sub>2</sub> levels).
  8. On low demand for outdoor air, during occupied periods, VAV box shall modulate to minimum position (not closed).
  9. Outdoor CO<sub>2</sub> sensor is existing
  10. Controls contractor shall coordinate with TAB for setup of VAV box settings.
- .3 Outdoor Air Motorized Damper
1. Provide new motorized damper and operator on the new outdoor air supply ducts at the Fan Room shafts
  2. Purpose of damper is to maintain pressure in outdoor air shaft riser when HVAC system is in smoke control mode
  3. Damper operator shall be pneumatic
  4. Sequence of operation to be copied from existing
- .4 BAS Controls System
1. Connect to existing N2 bus in Fan Rooms
  2. Expand system as required
- .5 Fan Coil Units (BAS)

1. Operation of fan coil units is to follow same schedule as ventilation air handling unit.
  2. Fan coils are to be tied into the BAS system.
  3. Provide space temperature sensor.
  4. Provide fan coil supply air temperature data.
  5. Provide fan start/stop and status data.
  6. Provide chilled water modulating control valve complete with pneumatic actuator. and position data, EP switch.
  7. Fan coil will have ECM motor, single speed.
  8. Controls contractor to coordinate with TAB contractor for set up of fan coil units. and set the speed settings required.
  9. Some fan coils will also have downstream electric heating coil with an SCR controller.
  10. Controls contractor to provide modulating control of electric heat, 0-10 V signal.
  11. On a rise in space temperature the cooling control valve shall modulate open.
  12. On a decrease of space temperature the cooling control valve shall modulate closed.
  13. On a further decrease in space temperature the electric heat (SCR) shall be modulated on (where applicable).
- .6 Existing Space Monitoring Temperature Sensor (BAS)
1. Relocate existing space monitoring temperature sensors as noted on drawings
  2. These are used to monitor general space temperature and re-set the VAV air handling unit supply air temperature
- .7 Existing Pneumatic VAV Boxes
1. Relocate existing pneumatic thermostats as shown on drawings
  2. Coordinate with TAB contractors for re-balancing of existing VAV boxes that are being modified