

**Part 1            General**

**1.1                RESPONSIBILITY**

- .1        This Contractor shall be responsible for Section 25 05 01 - EMCS Controls and all applicable portions of Common Work Results.
- .2        Contractor shall be responsible for all EMCS requirements shown on all heating, plumbing, ventilation, and controls drawings. Refer to all sequences and miscellaneous requirements. Refer to all mechanical equipment specifications.
- .3        This contractor shall connect to and expand upon existing Delta Controls Systems (process & HVAC) by Controls & Equipment of Saint John.

**1.2                RELATED SECTIONS**

- .1        Section 20 05 01 - Common Work Results for Mechanical.
- .2        Piping Sections and Drawings.
- .3        Heating Sections and Drawings.
- .4        Air Distribution Sections and Drawings.
- .5        Electrical sections and Drawings
- .6        Identification to 20 05 53 – Mechanical Identification.
- .7        This Contractor shall provide all controls points and programming indicated on all mechanical drawings, including plumbing, heating, ventilation and controls.

**1.3                SHOP DRAWINGS**

- .1        Submit shop drawings in accordance with Section 01 33 00.
- .2        Indicate on complete control diagrams, positions, model numbers, settings, set point and reset schedules, piping and wiring layouts.
- .3        Provide damper actuator schedules indicating sizes, configuration, capacity and locations. If size varies greater than (10%), obtain approval of Engineer.
- .4        Provide technical literature on system components.
- .5        Provide “system architecture” diagram, indicating new system and integrating to existing systems identified.
- .6        Provide sample “points verification” sheet.

**1.4                MAINTENANCE AND AS-BUILT DRAWINGS**

- .1        Provide maintenance data for incorporation into maintenance manual specified in Section 01 78 00.
- .2        Provide “As-Built” information in accordance with Section 01 78 00.

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**1.5 GUARANTEE**

- .1 Provide written guarantee against faulty material and workmanship for a period of one year from the date of acceptance.

**1.6 TRAINING & PROGRAMMING**

- .1 Provide one (1) day training to the owner's representative on beneficial operation of the systems installed.
- .2 Allow for one (1) day additional programming on-site as requested by **Departmental Representative**.
- .3 Allow for one (1) day of system verification. Notify Engineer and Departmental Representative one (1) week in advance of system verification. System verification shall be performed two (2) weeks in advance of request for interim inspection.

**1.7 SCOPE OF WORK**

- .1 The words "controls", "BMS", "EMCS", and "HVAC Controls" shall be considered interchangeable and all refer to the system of controls for HVAC systems. The work covered by this specification and related sections consists of providing shop drawings, equipment, labour, materials, engineering, technical supervision and transportation as required to add to the existing Delta EMCS or HVAC controls system to control the equipment as shown on plans and as required to provide operation specified in strict accordance with these specifications and subject to the terms and conditions of the contract. The work in general consists of but is not limited to, the following:
  - .1 This contractor shall adjust and expand on existing Delta control system on site and shall furnish all components, control boards, sensors, switches, software, etc. required to meet design intent.
  - .2 All points associated with startup and operation of new HVAC and process equipment shall be commissioned.
  - .3 The preparation of submittals and provisions of all related services.
  - .4 Furnish and install, programmable control units, sensors, control devices and wire in the facilities as required to provide the operation specified.
  - .5 Prepare, design and reprogram software and provide all "locks" or "keys" required to implement a complete and operational EMCS. EMCS shall be ready for use, including all operating parameters, set points and schedules.
  - .6 Provide system testing of every point associated with new equipment, sequence verification and points verifications prior to interim inspection. Submit point and sequence verifications prior to interim inspections.
  - .7 Upgrading controls graphics shall be included in this work.
  - .8 Process and HVAC systems shall be tied in separately to existing DDC system within central DFO building.

**1.8 LOCAL PROGRAMMING**

- .1 Only Controls and Equipment of Saint John, certified to work on existing Delta Controls System will be acceptable. This will help to ensure that the specified project requirements are interpreted, designed and applied successfully for this project.

- .2 Minor changes as requested by the Engineer, such as setpoint adjustment, minor sequences modifications and graphic site shall be performed at no additional charge during system verifications.

## **1.9 EQUIPMENT COMPATABILITY**

- .1 All BACNet capable equipment shall be “BTL” certified and supplied complete with “Factory Trained Certified” equipment manufacturer representative to perform on site equipment start-up including BACNet, (LonWorks, Modbus, etc.) start-up. If equipment requires a specific wiring harness it shall be provided with same equipment and installed and terminated by Controls Contractor under the direction of the equipment supplier representative. Equipment representative shall be responsible to provide supporting documentation and on-site guided instructions on how to mount and wire ancillary controllers and control boards supplied with unit to their equipment and to the BAS. Equipment manufacturer representative shall provide lists of BACNet read / write points matching installed firmware in equipment and programming assistance to Controls Contractor to set-up same and advise on particular limitations of the equipment specific to the specified sequence. Controls Contractor shall be responsible to mount and wire ancillary controllers and control boards supplied with unit to equipment and shall connect to building automation system. Where equipment is to be connected to an EMCS system via BACNet, the Controls Contractor shall assign IP address to equipment manufacturer representative and equipment representative shall be responsible to setup and program on-board and ancillary controls supplied with unit to meet specified sequence and test on site with Controls Contractor to ensure all equipment functions completely to the intent of the specification. In general terms the Controls Contractor shall be responsible to wire all control components including those supplied with equipment and equipment supplier shall be responsible to set up and start-up their own equipment with Controls Contractor assistance.
- .2 If proposed sequence cannot be met with on-board controls the Engineer of record and the Owner or Departmental Representative shall be advised in writing prior to tender close to obtain specific permission to bid this project whether unit manufacturer is approved by name or not in this or other sections of specification and drawings. Failure by the manufacturer representative to provide the information described above may result in rejection of the equipment without penalty to Owner or compensation to equipment manufacturer.

## **Part 2 Products**

### **2.1 USER INTERFACE COMPUTER**

- .1 There is an existing user interface P.C. installed within main DFO building.

### **2.2 HVAC SYSTEMS GRAPHICS**

- .1 Update existing graphics as required to communicate with and control all new HVAC equipment.

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### 2.3 PROCESS SYSTEMS GRAPHICS

- .1 Update existing graphics as required to communicate with and control all new process equipment.

### 2.4 NETWORK

- .1 On site network is existing.

### 2.5 D.D.C. CONTROLLERS

- .1 Be compatible with existing Delta EMCS.
- .2 Resident Software
  - .1 General
    - .1 All necessary software to form a complete operating system as described in this specification shall be provided. Upgrade existing software if required.
    - .2 The software programs specified in this section shall be provided as an integral part of DDC Controllers and shall not be dependent upon any higher level computer for execution.
    - .3 All custom programs and routines shall be fully programmable on-site without the use of any special software or hardware. The owner shall have the capability of adding or deleting points and modify control strategies from an on-site keyboard.

### 2.6 FIELD DEVICES

- .1 Space Sensors
  - .1 Type 1: Concealed S/S sensor plate temperature transmitter to be coordinated with remote temp. controller. (Applicable to sump room only).
  - .2 Type 2: Room temp. sensor c/w LED display screen, manual set point adjustment.
- .2 Damper Actuators
  - .1 Two Position
    - .1 Spring return, brushless DC motor, direct shaft mounting, manual override, position indicator, conduit connector, adjustable range stop, integrated preload spring.
    - .2 Control Voltage: line or low voltage as specified. Operating Temperature: -32 to 50°C. Torque: 6.7 Nm.min. (133 lb.in.) (Min. 8 lb.in. Per S.F. damper area). Stroke time: 150 sec Max.
    - .3 Acceptable Material: Belimo AF series or approved equal.
  - .2 Modulating
    - .1 Spring return, brushless DC motor, direct shaft mounting, manual override, position indicator, conduit connector, adjustable range stop, integrated preload spring.

- .2 Control Voltage: line or low voltage as specified, 4-20 mA. Operating Temperature: -32 to 50°C. Torque: 6.7 Nm.min. (133 lb.in.) (Min. 8 lb.in. Per S.F. damper area). Stroke time: 150 sec Max.
- .3 Acceptable Material: Belimo AF series or approved equal.

### Part 3 Execution

#### 3.1 INSTALLATION ELECTRICAL

- .1 Furnish electrical control wiring and conduit (24 and/or 120 volt) unless indicated otherwise on plans. All controls wiring including 120 V and 24 V shall be run in metal conduit (EMT). 120V power shall be provided in dedicated EMCS junction boxes where indicated on Electrical Drawing by Electrical Division. This contractor shall obtain power from nearest provided junction box and provide all necessary 120 V or low voltage power distribution from that point.
- .2 All conduit shall be run concealed in all finished areas (i.e. all areas except service areas such as penthouses).
- .3 All conduit shall be water proof, corrosion resistant PVC.
- .4 Where conduit is run exposed, it shall be neat in appearance and run parallel to the structural grid of the building. Suitable fittings and covers shall be used. Proper offsets shall be made where conduit enters or leaves fittings and boxes. All conduit shall be securely fastened by approved PVC hangers/clips at the following intervals:

<u>Conduit Size</u>	<u>Horizontal Hanging Points</u>	<u>Vertical Hanging Points</u>
12 and 29 mm	1500 mm	2000 mm
25 and 31 mm	1800 mm	2400 mm
Over 31 mm	3000 mm	3000 mm
- .5 All threads shall be set neatly, the ends squared and the inner diameter reamed smooth to remove burrs.
- .6 Conduit boxes for all receptacles, thermostats and switches where conduit is run exposed shall be of the FS type.
- .7 Cover screws for all conduit fittings and boxes shall be carefully cut to avoid damage to conductors.
- .8 During construction all open ends of conduit shall be capped with threaded caps immediately after installation.
- .9 All conduit fittings shall form a continuous metallic path and shall be grounded in accordance with the latest requirements of the Canadian Electrical Code.
- .10 Conduit terminations at equipment whose position is adjustable or which is subject to vibration shall be flexible, galvanized steel for a length not exceeding 0.5 m. Where moisture conditions are such to require waterproof wiring, the flexible conduit shall have a plastic jacket seal-tight or equal.

- .11 Wire cable and conduit shall be installed to meet or exceed CSA Electrical Code latest edition.
- .12 All conductors and branch circuit wiring shall be of sufficient size so that the voltage drop from the services entrance to the device being fed is not greater than 3% with the circuit loaded as shown.

### **3.2 START-UP AND ADJUSTMENT**

- .1 Upon completion of installation, test, adjust and regulate controls or safety equipment provided under this section.
- .2 Adjust and place in operating condition.
- .3 Plasticized control and wiring schematics shall be provided for each fan system mounted inside the cabinet.
- .4 Supply all necessary hardware and software for full on site programming.

### **3.3 SEQUENCE OF OPERATION**

- .1 Sequencing of operations for systems as follows:
  - .1 General Ventilation Systems:
    - .1 MUA-1, EF-1 and EF-2 are intended to operate simultaneously based on time-of-day schedule (user-defined).
    - .2 MUA-1, EF-1 and EF-2 shall operate to maintain defined pressures in spaces to ensure proper inward directional airflow towards “dirtiest” space (Sump Room). BMS shall monitor room differential pressures at all times as indicated on drawings to ensure proper room pressurization is maintained.
      - .1 If room pressurization deviates out of specified parameters, alarm shall be indicated on BMS and strobe shall be illuminated until alarm is rectified.
      - .2 If either MUA-1, EF-1 or EF-2 indicate alarm or “off” status, alarm shall be indicated on BMS and strobe shall be illuminated until alarm is rectified.
    - .3 MUA-1 electric heating coil shall modulate to maintain SAT setpoint temperature via SCR control.
    - .4 Increase differential pressure as measured across filter-bank FB-1 or MUA-1 filter bank shall indicate alarm to BMS.
    - .5 Room occupancy sensors shall be provided in each room. Trigger of any occupancy sensor shall enter system into “occupied” mode.
      - .1 During occupied mode, MUA-1, EF-1 and EF-2 shall run at design airflows.
      - .2 If after 30 minutes no occupancy sensor detects occupancy, system shall go into “unoccupied” mode and airflows of MUA-1, EF-1 and EF-2 shall be reduced by half.
  - .2 General Space Heating Systems:

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- .1 Space temperature sensors shall control electric heaters in designated spaces via relay – refer to control schematics for wiring requirements.

### **3.4 MISCELLANEOUS REQUIREMENTS**

- .1 Coordinate actuators with existing ventilation system.
- .2 Refer to 20 05 53 Mechanical Identification for identification requirements. All controls conduit shall be identified on min. 3.05 m (10 ft.) C/C with one 25 mm (1 in.) orange and one 25 mm (1 in.) brown stripes.
- .3 Controls contractor shall work as required with HVAC and balancing contractor for proper room pressurization coordination.
- .4 Controls contractor shall program alarms for all points in the system with industry standard alarm trigger points. Devices requiring alarms include but not limited to the following sensors, transducers, switches actuators, motors, VFD'S, all pieces of equipment etc.
- .5 Alarm trigger points shall cover all conditions for when a system, component or device as part of a system, is at of comfort range or out of code requirement range has failed, this lost status, has a general alarm or is not meeting intended level of performance. Contractor shall program typical time delays as per industry standard.
- .6 Program specific alarms as requested by owner representative whether they are implied to these documents or not to the satisfaction of the owner.

**END OF SECTION**