
Part 1 General

1.1 RELATED SECTIONS

- .1 Common work results set out in other Divisions.
- .2 Heating.
- .3 Air distribution.
- .4 Electric service.

1.2 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Division 01 – General Requirements.
- .2 Indicate on complete control diagrams, positions, model numbers, settings, set point and reset schedules, piping and wiring layouts.
- .3 Provide valve and damper schedules indicating size, 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.

1.3 TRAINING & PROGRAMMING

- .1 Allow for sufficient verification time for HVAC controls verification and Commissioning with Commissioning Agent.

1.4 SCOPE OF WORK

- .1 The words “controls”, “BMS” and “EMCS” 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 furnish and install a fully operational Energy Management Control System (EMCS) to control the two new heat pumps as shown on plans and as required to provide the operation specified in strict accordance with these specifications and subject to the terms and conditions of the contract. The Work provided in this Section in general consists of, but is not limited to, the following:
 - .1 The preparation of submittals and provisions of all related services.
 - .2 Furnish and install user interface, server, programmable control units, sensors, control devices and wire in the facilities as required to provide the operation specified.
 - .3 Load all 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.

- .4 Provide system testing of every point, sequence verification and points verifications prior to interim inspection. Submit point and sequence verifications prior to interim inspection.

1.5 LOCAL PROGRAMMING

- .1 Only Subcontractors that perform local engineering and programming in their New Brunswick offices will be acceptable.
- .2 Minor changes as requested by the Engineer, such as setpoint adjustment, minor sequence modifications, graphic representation, schedule adjustment shall be programmable on site and shall be performed at during system verifications as part of the Construction Work.

Part 2 Products

2.1 EXISTING BUILDING CONNECTION

- .1 Provide and install controls products by Delta Controls only.
- .2 Provide materials and services to interface with existing Building Management System.
- .3 Provide verification of all controls devices and sequences prior to formal commissioning.

2.2 AIR TERMINAL CONTROLLERS

- .1 Selected compatible with “Air Terminals”, Section 23 36 00 Air Terminal Units.
- .2 Installed with protective cover, rigid conduit connector, mounted firmly to parent duct.

2.3 FIELD DEVICES

- .1 Temperature Sensors:
 - .1 Space Temperature Sensors: Note – all space sensors shall be installed in a 2” x 4” metal box, complete with ½” EMT stubbed to an accessible location in ceiling.
 - .1 Indicated as “T” on drawings prepared as part of Existing Design.
 - .1 10K ohm $\pm 0.2^{\circ}\text{C}$ at 25°C . Features shall include:
 - .1 Set point adjustment, up and down.
 - .2 Temperature indication – LCD.
 - .3 Networking sensor c/w serial bus connection.
 - .4 Override button for unoccupied override.
 - .2 Standard of Acceptance: Delta Model eZNS-T100.
 - .2 CO₂ sensor 4-20mA (0 to 10 volt) calibrated sensor, LEED accepted, measures 0-1000 ppm.

2.4 CONTROLS SEQUENCES

- .1 Heat Pump Control

Time Schedule

Provide a time schedule for each heat pump; user adjustable during commissioning.

Provide for each:

Occupied:

07:30 – 17:00 hours, Monday to Friday.

Unoccupied:

All other.

Temperature Schedule:

Occupied:

Fan runs continuous. Maintain 22°C at space sensor by DO commands to compressor and reversing valve.

Unoccupied:

Interior zones are off. Perimeter: Maintain 17°C by heating only commands to compressor or reversing valve. Cycle fan. Accept no cooling.

VAV Box Schedule (VAV-XI):

Occupied:

VAV box shall modulate open to maintain a CO₂ setpoint of 600 ppm.

Unoccupied:

VAV box shall remain closed.

Temperature Points:

Provide and install temperature sensors:

SAT-1 – Supply Air,

RAT-1 – Return Air

Read at BMS

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 120V and 24V shall be run in metal conduit (EMT) as specified. Emergency power shall be provided in dedicated EMCS junction boxes both under AHU's and on the floors by Electrical.
- .2 This Contractor shall obtain power from nearest source and provide all necessary 120V or low voltage power distribution from that point.

- .3 All conduit shall be run concealed in all finished areas (i.e. all areas except service areas such as the electrical room).
- .4 All conduit under floor slabs, exposed to mechanical injury, or in wet locations shall be of the highest quality, rigid steel type for electrical service and shall be galvanized on the outside and enamelled on the inside. Electrical metallic tubing (thin wall) may be used where it is not wet location or subject to mechanical injury.
- .5 Where conduit is run exposed, it shall be neat in appearance and run parallel to the structural lines of the building. Suitable fittings and covers shall be used.
- .6 Proper offsets shall be made where conduit enters or leaves fittings and boxes. All conduit shall be securely fastened by approved hangers or malleable iron one-hole straps at the following intervals:

<u>Conduit Size</u>	<u>Horizontal Hanging Points</u>	<u>Vertical Hanging Points</u>
12 and 20 mm	1500 mm	2000 mm
25 and 31 mm	1800 mm	2400 mm
Over 31 mm	3000 mm	3000 mm

- .7 All threads shall be set neatly, the ends squared and the inner diameter reamed smooth to remove burrs.
- .8 Conduit boxes for all receptacles, thermostats and switches where conduit is run exposed shall be of the FS type.
- .9 Cover screws for all conduit fittings and boxes shall be carefully cut to avoid damage to conductors.
- .10 During construction all open ends of conduit shall be capped with threaded caps or push pennies immediately after installation. The use of wooden plugs will not be permitted.
- .11 All conduit and fittings shall form a continuous metallic path and shall be grounded in accordance with the latest requirements of the Canadian Electrical Code, latest edition.
- .12 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.
- .13 Wire cable and conduit shall be installed to meet or exceed Canadian Electrical Code, latest edition.
- .14 All conductors and branch circuit wiring shall be of sufficient size so that the voltage drop from the service 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 cabinet enclosure.
- .4 Supply all necessary hardware and software for full on site programming.

3.3 ACRONYMS

- .1 Where the following are used in this Section, the following acronyms shall have the following meanings:

TOD	=	Time of Day
S/S	=	Start/Stop
OPB	=	Override Push Button
CSR	=	Current Sensing Relay
OAT	=	Outdoor Air Temperature
RAT	=	Return Air Temperature
EAT	=	Exhaust Air Temperature
LAT	=	Leaving Air Temperature
SAT	=	Supply Air Temperature
MAT	=	Mixed Air Temperature
HCT	=	Heating Coil Temperature
CCT	=	Cooling Coil Temperature
LWT	=	Leaving Water Temperature
OAD	=	Outdoor Air Dampers
MAD	=	Mixed Air Dampers
EAD	=	Exhaust Air Dampers
PBUD	=	Parallel Blade Un-insulated Damper
PBID	=	Parallel Blade Insulated Damper
OBUD	=	Opposed Blade Un-insulated Damper
OBID	=	Opposed Blade Insulated Damper
HRW	=	Heat Recovery Wheel
H/C	=	Heating Coil
C/C	=	Cooling Coil
G/C	=	Glycol Oil
HCV	=	Heating Control Valve
CCV	=	Cooling Control Valve
HUMCV	=	Humidifier Control Valve
TCV	=	Temperature Control Valve
RHCV	=	Reheat Control Valve
SCV	=	Steam Control Valve
SAH	=	Supply Air Humidity
RAH	=	Return Air Humidity
HUM	=	Humidifier
AFS	=	Air Flow Sensor

SP	=	Static Pressure
FS	=	Freezestat
DP	=	Differential Pressure
CSR	=	Current Sensor (or Switch)
CO	=	Carbon Dioxide
AO	=	Analog Output
DO	=	Digital Output
AI	=	Analog Input
DI	=	Digital Input

3.4 MISCELLANEOUS SEQUENCES AND REQUIREMENTS

- .1 Power Fail Restart
 - .1 Upon power failure due to power outage or fire alarm, heat pumps will be shut down by Electrical.
 - .2 Upon power restoration, or fire alarm “Cleared”, restart equipment to “Start/Stop Operations”.

3.5 MISCELLANEOUS REQUIREMENTS

- .1 Coordinate dampers with ventilation. Control to provide damper, ventilation installations.
- .2 Refer to Section 23 05 53 01 – Mechanical Identification for identification requirements.

END OF SECTION